

BSc Zoology Series

Volume I

Animal Diversity



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BSc Zoology Series

Volume I

Animal Diversity

B N Pandey

Professor and Head

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(Affiliated to Bhupendra Narayan Mandal University, Madhepura)

Purnia, Bihar



Tata McGraw Hill Education Private Limited
NEW DELHI

McGraw-Hill Offices

New Delhi New York St Louis San Francisco Auckland Bogotá Caracas
Kuala Lumpur Lisbon London Madrid Mexico City Milan Montreal
San Juan Santiago Singapore Sydney Tokyo Toronto



Tata McGraw-Hill

Published by the Tata McGraw Hill Education Private Limited,
7 West Patel Nagar, New Delhi 110 008

BSc Zoology Series - (Volume-I)—Animal Diversity

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This edition can be exported from India only by the publishers,
Tata McGraw Hill Education Private Limited

ISBN (13) : 978-0-07-133001-5

ISBN (10) : 0-07-133001-1

Vice President and Managing Director: *Ajay Shukla*

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Typeset at Print-O-World, 2579, Mandir Lane, Shadipur, New Delhi 110 008, and printed at Pushp Print Services, B-39/12 A, Gali No. 1, Arjun Mohalla, Moujpur, Delhi 110 053

Cover Printer : SDR Printers

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PREFACE

This *BSc Zoology Series* of five volumes will be useful for all undergraduate students of life sciences. The series has been developed to follow a unique test-friendly approach to especially assist undergraduate-level students in exam preparation. Besides, the applicants of CSIR-NET, GATE, Civil Services and other competitive examinations will also find this series very helpful.

About The Series

The following five volumes collectively structure this series:

Volume 1: Animal Diversity

Volume 2: Cytology, Genetics and Molecular Genetics

Volume 3: Biochemistry, Physiology and Endocrinology

Volume 4: Ecology and Animal Behaviour

Volume 5: Evolution, Comparative Anatomy, Biometry, Economic Zoology and Animal Development

These volumes cover the latest syllabi, as per the UGC curricula, of BSc courses taught across different Indian universities. Each part of a volume in the series contains a synopsis which briefly introduces the theme and then details important features topic-wise. This is followed by a comprehensive section on objective-type questions which includes short-answer questions, long-answer questions, multiple-choice questions, fill in the blanks, true or false questions, and questions based on reasoning and diagrams.

This arrangement has been ideated to first get the students acquainted with a chapter by going through the synopsis and then attempt to answer different sets of questions based on that chapter. Such a flow seeks to encourage self-study and aids quick revision of the topics in a lesson. While the synopsis provides a clear framework and considerable depth to topic-wise study of the syllabi, the stupendous variety in exercises covers a broad spectrum of learning tools.

What Makes This Series Unique?

The changing pattern of syllabus of academic life-science courses has induced a change in the type of questions appearing in undergraduate-level examinations of major universities and noted competitive tests. A distinct alteration in the nature of objective questioning has been identified. Objective questions, now part of compulsory questions, include the variations mentioned above. It then becomes imperative that the students be made fully conversant with this new pattern.

However very few books, adequately containing the required pedagogical features, are available to facilitate such a pattern of study. Recognising the growing interest of students and a need for a comprehensive yet basic-level text, I have authored this *BSc Zoology Series* to aid test-ready academic study.

Besides students, this series will amply assist various faculty members in the design and preparation of periodical tests for internal evaluation, question papers for undergraduate-level university examinations as well as CSIR-NET, GATE and Civil Services examinations, etc.



Salient Features Of The Series

- Apposite theory to aid quick revision for examinations
- Wide range of chapter-end exercises designed as per undergraduate examinations
- Surplus artwork to help develop a holistic understanding of concepts

Volume I : Animal Diversity

Introduction

The branch of science dealing with 'life' is known as 'Biology' and it has two branches—Botany (*Study of plants*) and Zoology (*Study of animals*). Animals are eukaryotic multicellular heterotrophs that ingest their food and have characteristic embryonic development. Biologists have identified 1.3 million living species of animals. It is evident from various studies that animals began to diversify more than a billion years ago. Though origin of all animals can be traced to a common ancestor, they have different types of forms, structural organisations and complexity as well as development patterns.

Subsequently, scientists have classified animals into taxonomic categories based on their similar characteristics, also commonly known as *animal classification* and scientifically as *taxonomy*. This is important for the identification of different species of animals by providing specific names as well as establishing relationships between animals and the study of fossils. The animal kingdom has 35 phyla, of which 11 are major phyla.

Highlight

This volume elucidates all the important groups of the animal kingdom such as Protozoa, Porifera, Coelenterates, Helminthes, Annelids, Arthropods, Molluscs, Echinoderms, Fishes, Amphibians, Reptiles, Birds and Mammals

Organisation Of Topics

This volume, *Animal Diversity*, presents a study of the important groups of the animal kingdom in ample detail. These groups, introduced briefly below, are organised in the following manner:

Protozoa (*protos*—first; *zoon*—animals) are acellular or non-cellular animals exhibiting 'protoplasmic level of organisation'. This section discusses Protozoa with respect to the variety of species, microscopic measurements and as a connecting link between plants and animals. It includes their division as herbivores and consumers, free living and parasites, symbionts, and on the basis of their locomotion. Many diseases caused by Protozoa have also been listed.

Porifera (*Porous*—pore; *ferro*—to bear), the most primitive multicellular group of plant-like fixed animals, are exclusively marine except a single family of freshwater species. This section discusses the nature of cells, tissues and bodily features of Porifera. It differentiates and explains the separate branch of Parazoa. Classification on the basis of the nature of their endoskeleton along with their use has also been included.

Coelenterates (*koiilos*—cavity; *enteron*—cavity) are a group of radiata that typically bear tentacles and nematocysts. This section discusses their diploblastic nature, characteristic 'tissue level of organisation', body structure and functions, and habitats.

Ctenophora (*kestos*—comb; *phors*—bearing) are a small marine pelagic group of animals having transparent gelatinous bodies that lack nematocysts. This section discusses their characteristics, body structure, and methods of locomotion and feeding.

Platyhelminthes (*platys*–flat; *helminth*–worm) are acoelomate, dorsoventrally flattened and triploblastic group of animals having bilateral symmetry and ‘organ level of organisation’. This section discusses various members of this phylum, and their body structures with respect to presence and absence of certain systems and organs.

Aschelminthes (*askes*–cavity; *helminth*–worm) are unsegmented triploblastic pseudocoelomate group of animals having thread-like or cylindrical body which is covered by the cuticle. This section discusses their nature as free living, epizotic and parasitic and provides information on diseases likely to be caused by their parasitic forms.

Annelids (*annulus*–ring; *eidos*–form) are triploblastic, coelomate, bilaterally symmetrical group of animals having elongated, cylindrical or flattened body. The phylum includes more than 17,000 living species; both free living and parasitic. Besides, regular characteristics and nature, this section also discusses the great ecological significance of Annelids.

Arthropoda (*arthro*–jointed; *poda*–legs) is the largest phylum of the animal kingdom having more than one million species. Arthropods account for 80% of all known animal species. This section discusses the reasons Arthropods are considered the most successful group of animals on the planet with respect to their diversity, habitat, adaptability, body structure, contribution to human food supply, etc. It also explains why Annelids are considered to be their closet evolutionary relatives.

Mollusca (*mollis*–soft) is one of the most diverse groups on the planet with more than 50,000 living species. This section discusses Molluscs with respect to their habitat, diversity, body structure, etc. A list of the important members of this phylum with their characteristics is provided. It elucidates why Molluscs are considered important members of ecological communities and informs of ways in which they are very useful for humans.

Echinodermata (*echinos*–spine; *derma*–skin) are a group of marine animals having a characteristic water vascular system, pedicellariae and tube feet. This section discusses their habitat, differentiation on the basis of sex, body structure, role in the ecological system as a staple diet of many organisms, etc. How sea urchins can pose health problems to humans and their use in farming has also been explained.

Chordata is the highest developed phylum. This section describes the various members of this phylum with respect to body structure, including the three sub-phyla which comprise about 44,000 species; of which 41,700 are vertebrates alone.

Pisces (Fishes) are the group of vertebrates which are aquatic and ectothermic and are characterised by the presence of paired fins, gills, dermal scales and lateral line sense organs. Besides body structure, this section describes them as an important source of food and details their use in biological control of pests.

Amphibians are the first group of vertebrates having limbs which evolved during Devonian period. This section discusses Amphibians with respect to their habitat, diversity of species, their unique adaptation to terrestrial mode of life and as a connecting link between fishes and reptiles. It also informs of decline in the number of the amphibians due to environmental destruction.

Reptiles are the first group of vertebrates which adapted to the terrestrial mode of life. This section describes their body structure-especially air breathing and vertebrate characteristics, habitat, diversity, etc., with specific examples.

Aves (Birds) are warm-blooded tetrapod vertebrates which can fly. Birds have been called ‘glorified reptiles’. This section discusses birds with respect to their body structure, special features that aid flight, parental care, migration patterns, use to humans, etc. It also informs of reasons in decline in the number of species of the birds around the world.



Mammals are highly developed group of vertebrates which are warm-blooded. This section describes body structure, habitats, adaptability, diversity, etc., of mammals. It emphasises on humans as part of this class.

Online Learning Centre

For further interesting resources and supplements please visit <http://mhhe.com/pandey/ad1/vol1>

Acknowledgements

Writing this series has been a tremendous yet fulfilling endeavour. All the volumes have taken a final shape after endless inputs of time and effort. Though many teachers and students assisted me in compiling this book, I must especially mention the effort made by my colleague, O P Ambasta who extended immense support in myriad ways for bringing out the series in its present form. I am also indebted to my associate, Dr A K Jha for his many valuable contributions.

I am grateful to the following reviewers for their helpful suggestions for improving the contents of this series.

A K Ojha – *Rajendra College, Balangir, Odisha*

P N Pandey – *SSPG College, Ayodhya, Uttar Pradesh*

S P Sinha – *Bhagalpur University, Bhagalpur, Bihar*

Budhadeb Manna – *University of Calcutta, Kolkata, West Bengal*

I am thankful to the team at Tata McGraw Hill Education, most notably Smruti Snigdha for giving me the opportunity to author this series and Renu Upadhyay for helpful suggestions to improve the quality of the content and regular reminders for timely completion of the project. It has been a pleasure to work with Nimisha Kapoor and Yukti Sharma, who took great care during the copy-editing and production processes of all the volumes.

I welcome all feedback, criticisms and suggestions for improvements in all the volumes from teachers, students and all other readers of this series. You can write to me at b.n.pandey@hotmail.com.

B N Pandey

Publisher's Note

Do you have a feature request? A suggestion? We are always open to new ideas (the best ideas come from you!). You may send your comments to tmh.sciencemathsfeedback@gmail.com (Don't forget to mention the title and author's name in the subject line).

ANIMAL DIVERSITY

Introduction

- Taxonomy is the science of classifying organisms.
- The term 'taxonomy' was proposed by August de Candolle (1778–1841).
- Classification of animals is necessary due to the following reasons:
 - (a) To identify different species of animals.
 - (b) To provide specific names to organisms.
 - (c) To establish evolutionary relationships between organisms.
 - (d) It is helpful in the study of fossils which needs a proper system of classification.

History of Classification

- Aristotle (384–322 BC) divided animals into two groups, viz., Anaima (animals without red blood) and Enaima (animals with red blood). Enaima is subdivided into Ovipara (egg laying) and Vivipara (give birth to young ones).
- Theophrastus (327–287 BC), classified plants on the basis of form and texture. He is known as the 'Father of Botany.'
- John Ray (1627–1705) coined the term 'species'. He described more than 18,000 plants and animals in his *Historia Generalis Plantarum*. He also gave the key for identification of species.
- Modern classification of animals is based on Carolus Linnaeus (1707–1778) method. He is known as the 'Father of Taxonomy'. He introduced the system of binomial nomenclature.
- The Linnean system uses two Latin names, i.e., 'genus' and 'species' to designate each type of organism. A genus is a higher level category that includes one or more species under it. Such a dual level designation is termed as binomial nomenclature. Linnaeus described more than 4,400 species of animals and 7,700 species of plants.
- A trinomial system of classification is used by scientists to describe subspecies, e.g., *Homo sapiens sapiens*.

Taxonomic Hierarchy

- The various groups used in classification are called taxa.
- The arrangement of taxa is known as hierarchy.



- In order to study living things, scientists classify each organism into the following categories:

- (a) Kingdom
- (b) Phylum
- (c) Class
- (d) Order
- (e) Family
- (f) Genus
- (g) Species

Kingdom is the highest rank in any biological classification. The next taxonomic rank is class followed by order, family, genus and species. Species is the lowest rank in biological classification.

Types of Classification

Organisms can be classified either on the basis of structural similarities, i.e., organisms with similar structures are placed in the same group, or on the basis of their evolutionary history, i.e., organisms that share similar evolutionary history are placed in the same group. These two ways of classification are termed as

- (a) **Phenetics** It is the method of classification based on physical similarities or other observable traits.
- (b) **Cladistics** It is the method of classification based on genetical, biochemical and morphological analysis, which establish relationship between organisms based mainly on evolutionary history.

Classification of Organisms

(1) Two Kingdom System

- According to this system of classification, all living things in the world have been divided into two kingdoms, viz., Animalia and Plantae.
- This system of classification is being used since the time of Aristotle. However, it was finalised by Linnaeus in 1758.

(2) Three Kingdom System

- It was given by Ernst Haeckel (1866).
- He divided all living things into three kingdoms, viz., Animalia, Plantae and Protista.
- He introduced kingdom Protista to include unicellular Protozoa and algae.
- However, this system is defective as it keeps both eukaryotes and prokaryotes together and there is no separation of unicellular and multicellular organisms.

(3) Four Kingdom System

- It was proposed by Copeland (1956).
- He divided all living things in four kingdoms, viz., Animalia, Plantae, Protista and Monera.
- He introduced kingdom Monera to include prokaryotes.

(4) Five Kingdom system

- Five kingdom system of classification was proposed by American ecologist, Robert H Whittaker (1969).

- He introduced the kingdom Fungi as they differ from other microorganisms. The five kingdoms proposed by Whittaker are Animalia, Plantae, Protista, Monera and Fungi.
- The five kingdoms suggested by Whittaker are based on the following three criteria:
 - (a) Complexity of cell structure
 - (b) Complexity of body structure
 - (c) Mode of nutrition
- The five kingdoms proposed by Whittaker excluded viruses from living beings.
- The chief characteristics of five kingdoms are given below.

Kingdom–Monera

- (a) Lack true nucleus
- (b) Autotrophic or heterotrophic
- (c) Some forms move through flagellum
- (d) Example: Bacteria, Cyanobacteria

Kingdom–Protista (Protists)

- (a) Unicellular
- (b) True nucleus is present (Eukaryotes)
- (c) Autotrophic or heterotrophic
- (d) Cilia, flagella and pseudopodia are present in some forms
- (e) Example: *Amoeba*, *Euglena*, diatoms

Kingdom–Fungi

- (a) Multicellular
- (b) True nucleus is present
- (c) Heterotrophic
- (d) Generally do not move from place to place
- (e) Example: Yeast, mushroom, etc.

Kingdom–Plantae (Plants)

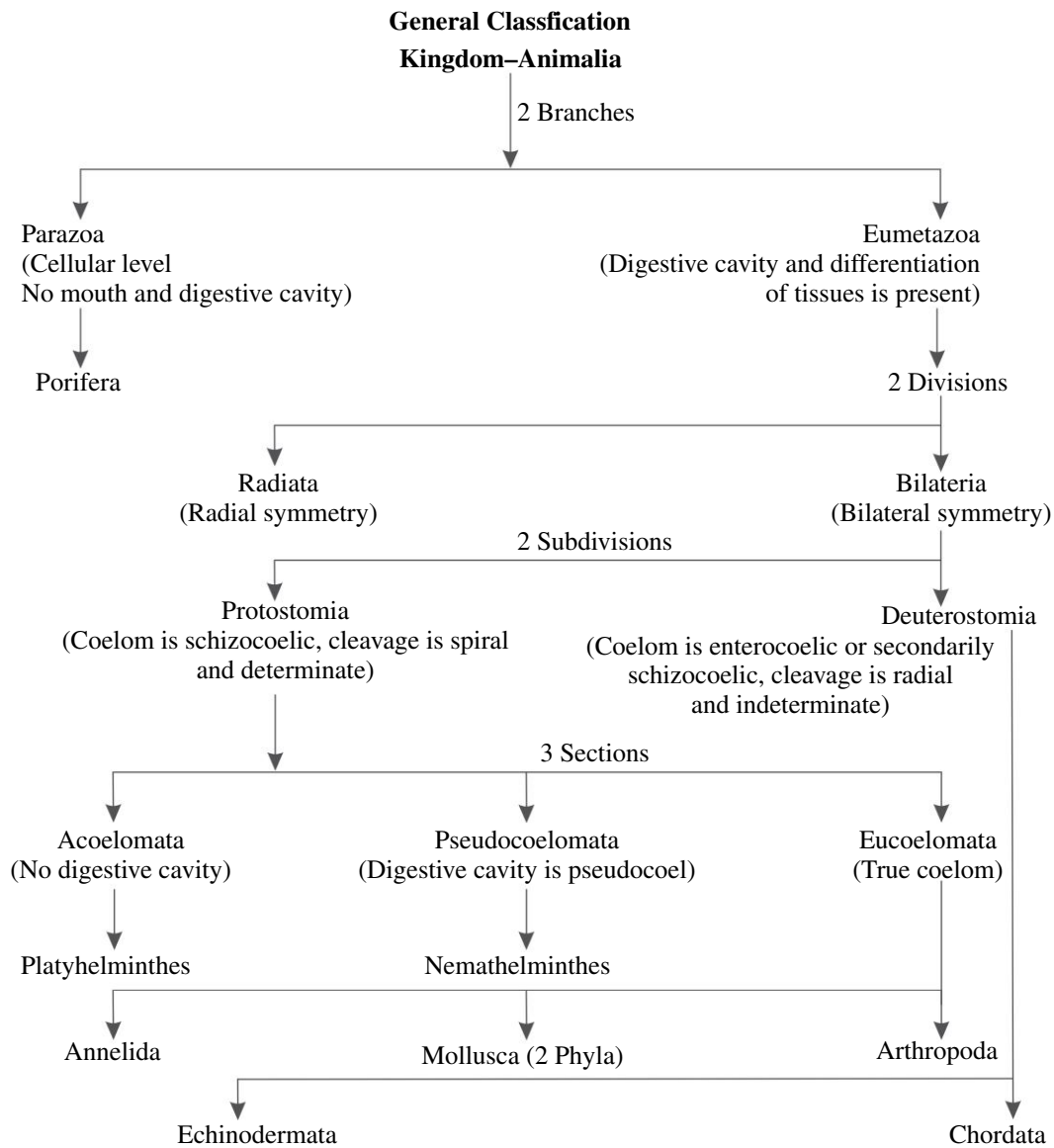
- (a) Autotrophic
- (b) Multicellular
- (c) Nucleus is present
- (d) Unable to move
- (e) Example: Multicellular algae, flowering plants

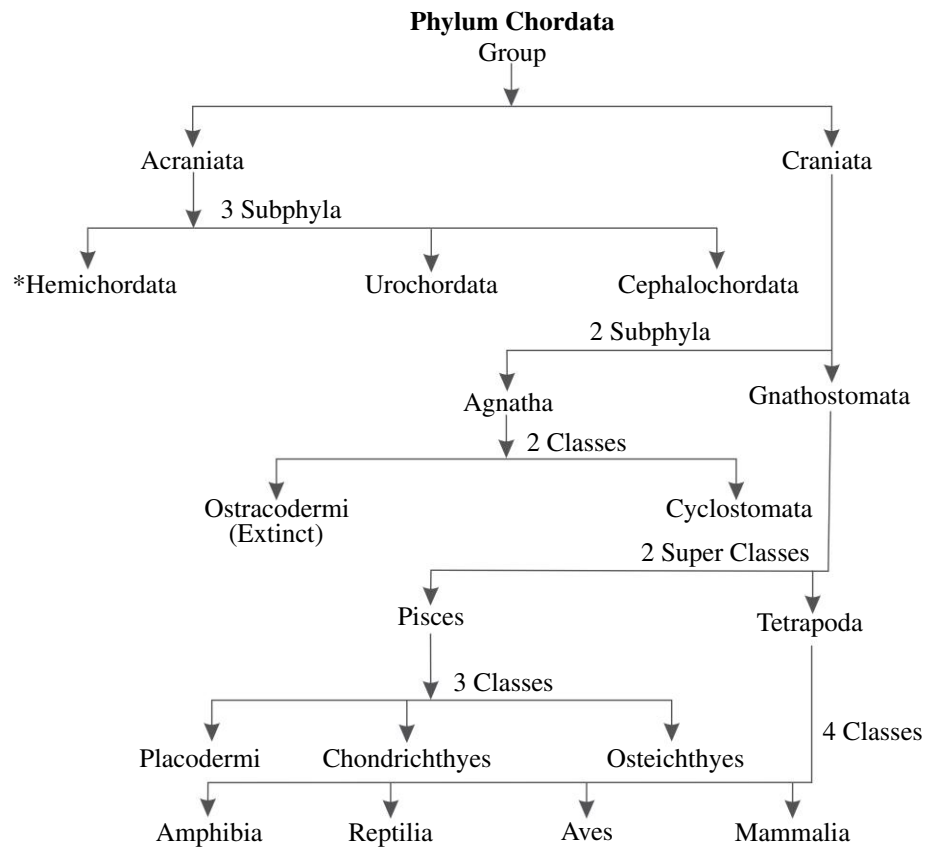
Kingdom–Animalia (Animals)

- (a) Heterotrophic
- (b) Multicellular
- (c) Nucleus is present
- (d) Can move
- (e) Example: Human, birds, frogs

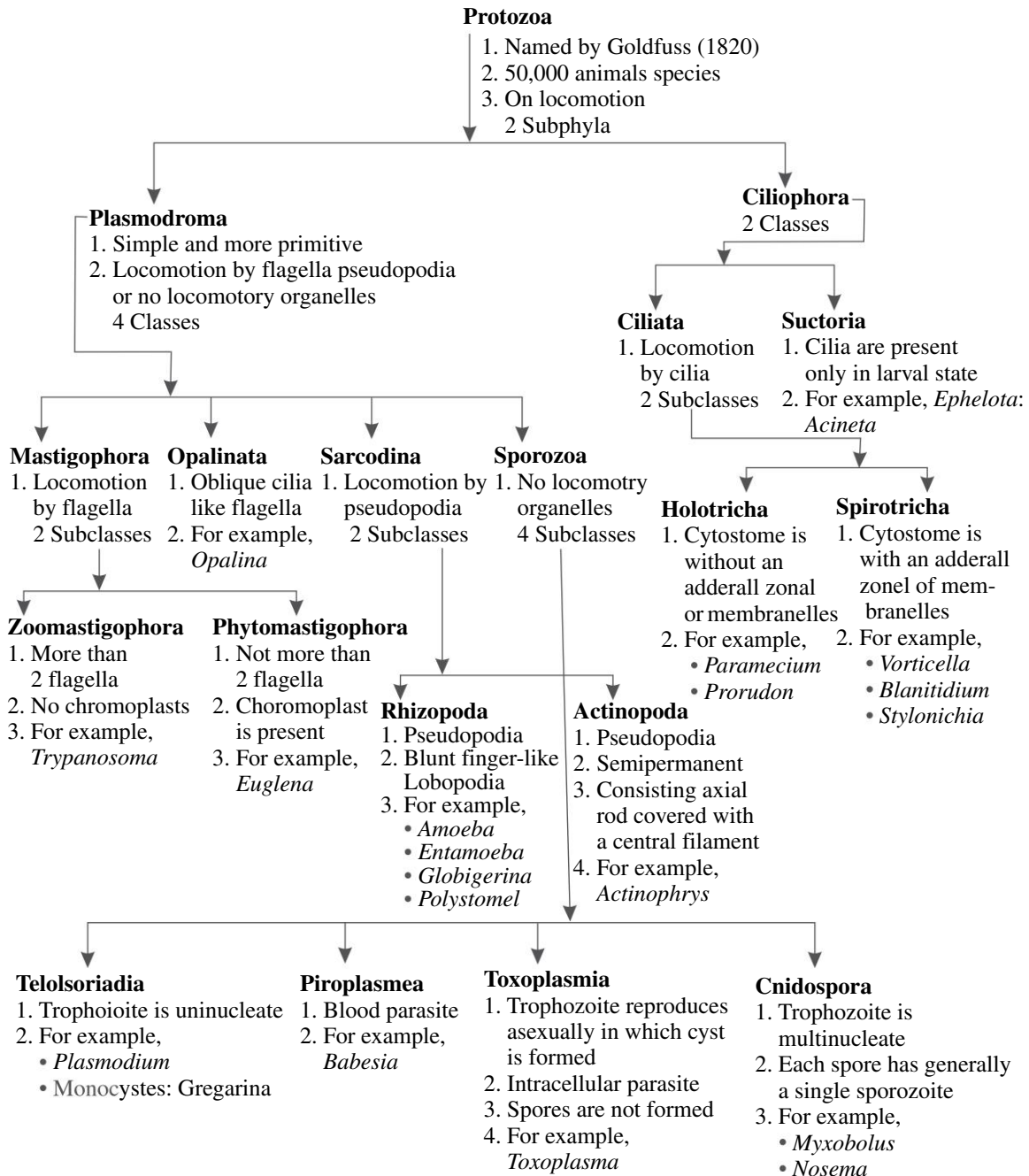
(5) Six Kingdom System

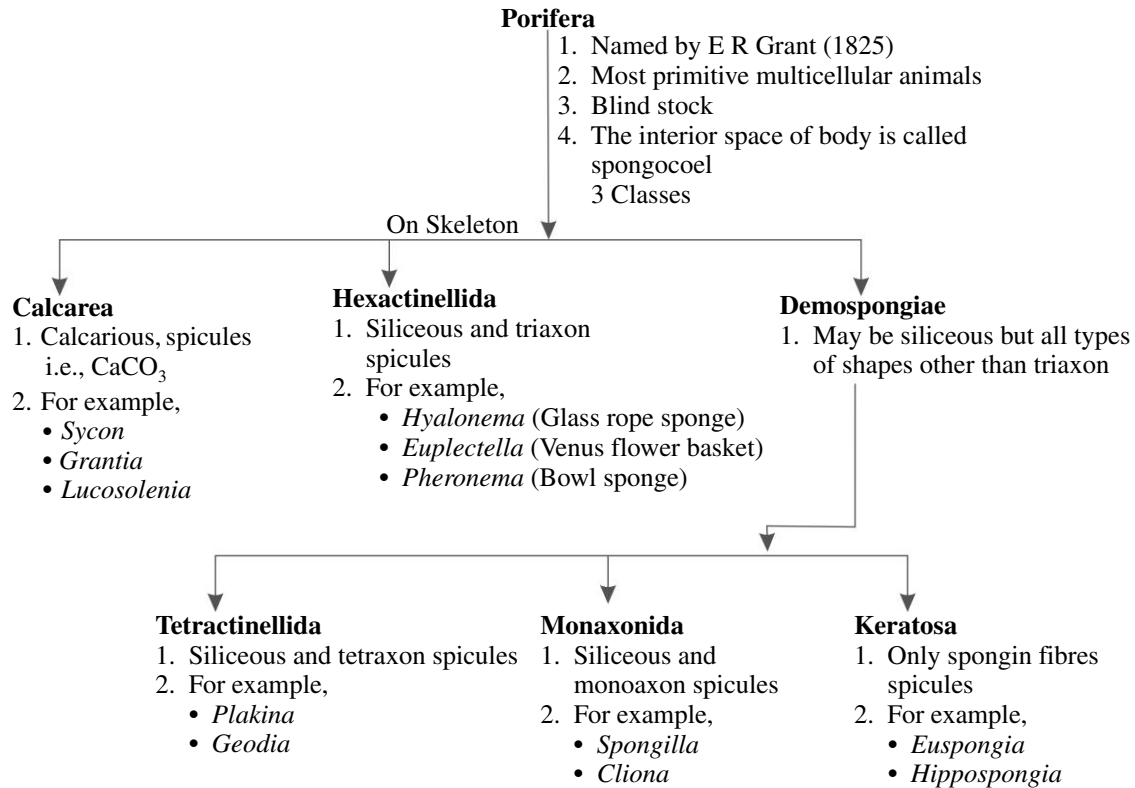
- Six kingdom system of classification was proposed by Cavalier-Smith (2004).
- These six kingdoms are Bacteria (includes archaebacteria as a part of its subkingdom), Protozoa (e.g., Amoebozoa, Choanozoa, Alveolata and Rhizaria), Chromista (e.g., Halophyta, Cryptophyta and Heterokonta), Plantae (e.g., Land plants, red and green algae), Fungi and Animalia.
- Chromista are a eukaryotic subgroup and the name chromista was introduced by Cavalier-Smith (1981).

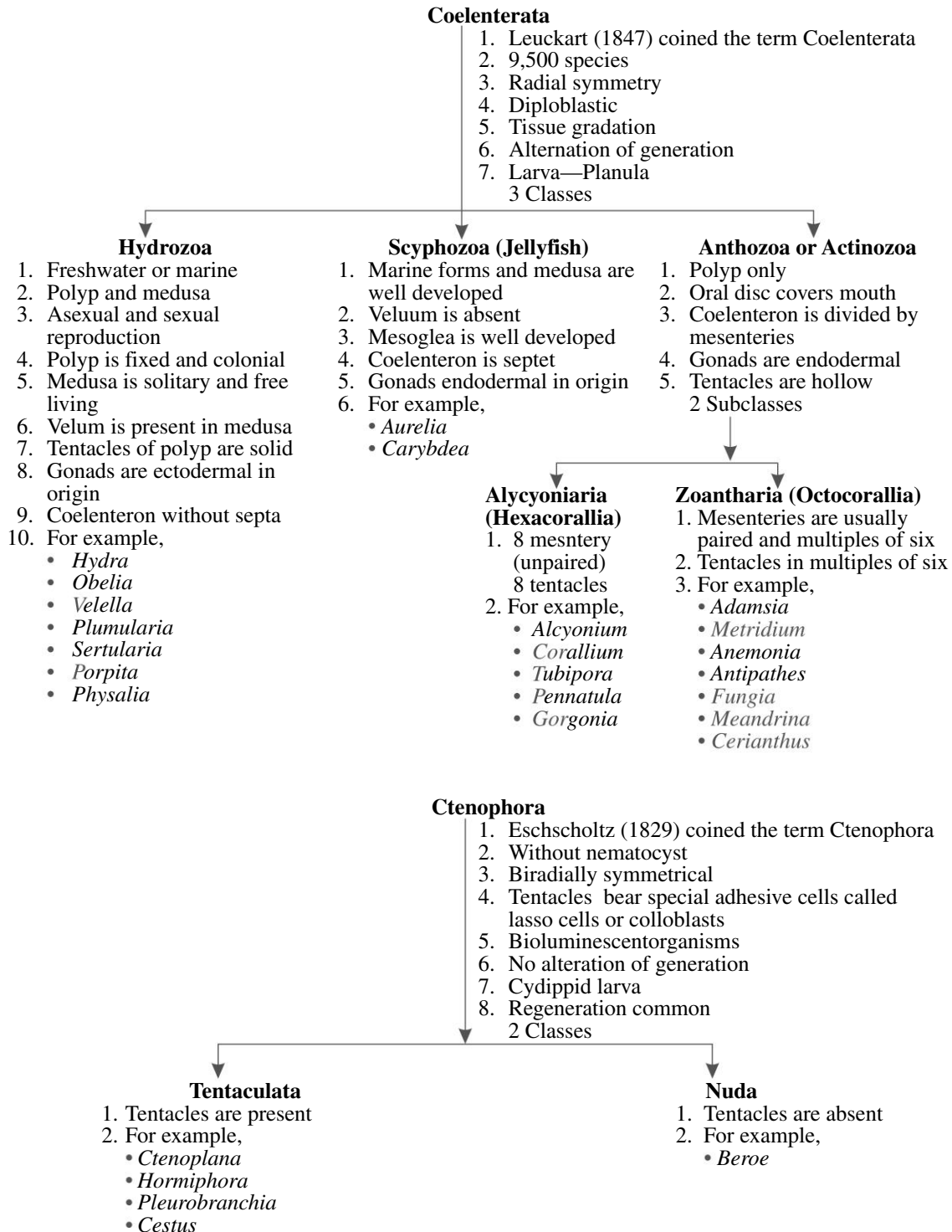




* In modern classification, Hemichordata has been separated from the chordata and has been given the status of a separate phylum.







Tentaculata

1. Tentacles are present
2. For example,
 - *Ctenoplana*
 - *Hormiphora*
 - *Pleurobranchia*
 - *Cestus*

Nuda

1. Tentacles are absent
2. For example,
 - *Beroe*

Platyhelminthes

1. Gegenbauer (1858) proposed the term
2. Minot (1876) spelled the phylum as Platyhelminthes
3. 10,000–15,000 species
4. Triploblastic
5. Dorsoventrally flattened, Bilaterally symmetrical
6. Coelom filled with parenchyma (A kind of connective tissue)
7. Mesoderm forms reproductive organs
8. Cuticular covering
9. Organ grade of body organisation
10. Digestive system is incomplete (Anus absent)
11. Bisexual (Monoecious)
12. Excretion by flame cells
13. Nervous systems is ladder-like

3 Classes

Turbellaria

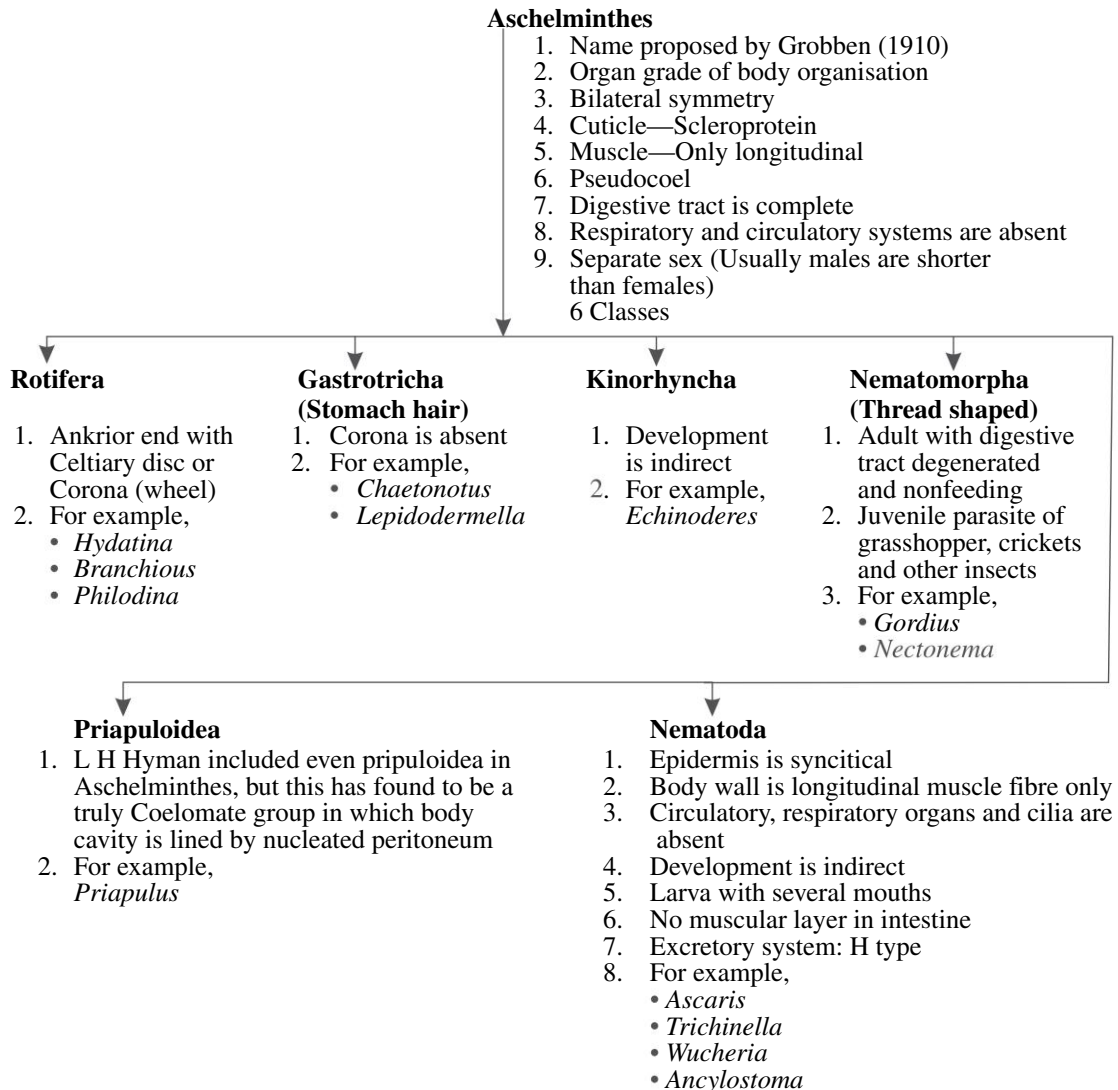
1. Mostly free living
2. Ciliated cellular or syncytial epidermis
3. Provided with mucus cells
4. Ribbon-like covered and rod-like bodies called rhabdites
5. For example, *Convoluta*

Trematoda

1. Ecto-endoparasite
2. Suckers and sometimes hooks are present
3. Cilia are absent (except larval stages)
4. Body is covered with cuticle
5. Life cycle is simple or complicated
6. For example, *Fasciola*

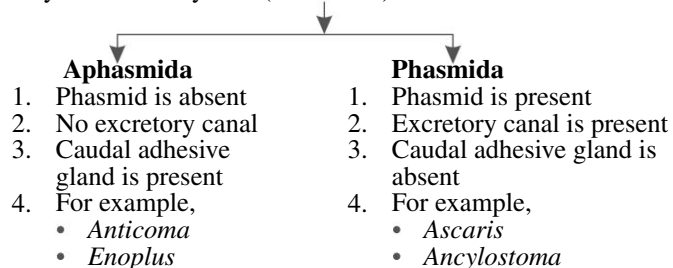
Cestoda

1. Exclusively endoparasite
2. Epidermis, rhabdites and cilia are absent
3. Body is ribbon-like and covered with thick cuticle
4. Embryo is hooked
- For example, *Taenia*



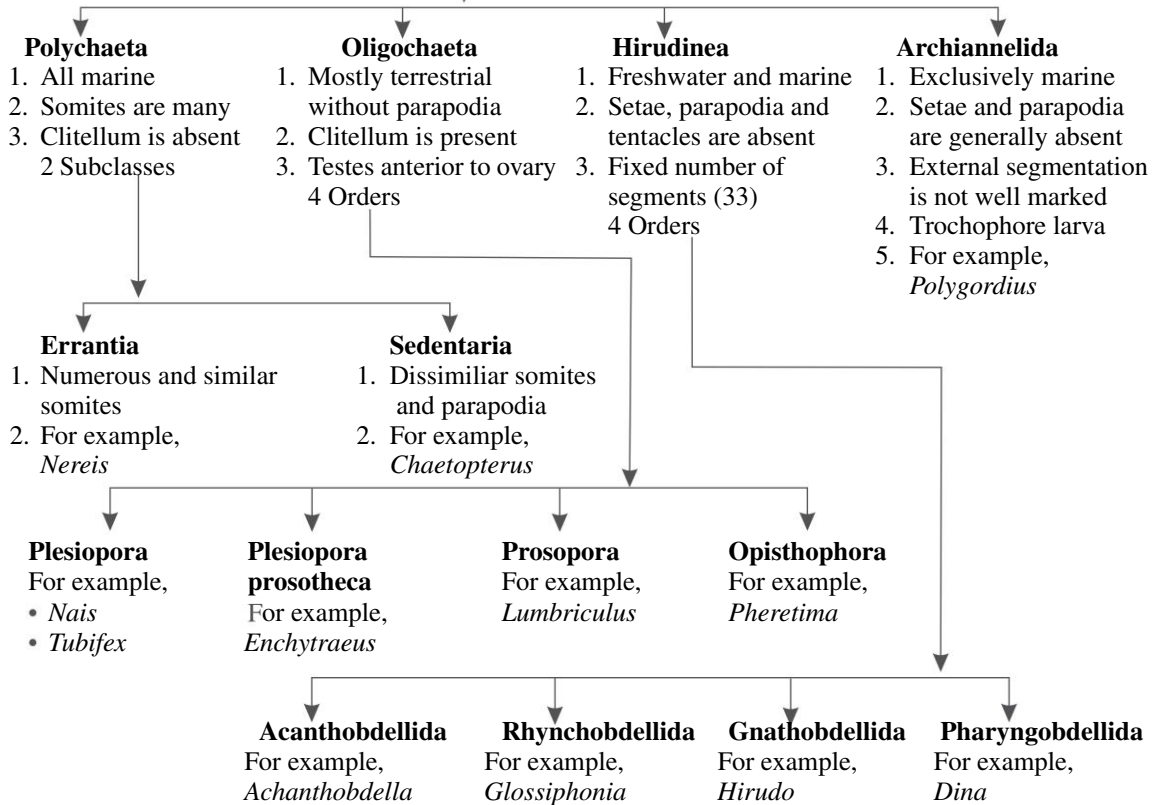
* Phasmid – A pair of unicellular caudal sensory pouches

* Eutely – Number of cells constant particularly in nervous system (Nematode)



Annelida

1. Similar rings or segments—Metameres or somites;
Homonomous metamerism
 2. Development of true coelom
 3. Nephridia is well developed
 4. Capable of complete regeneration
 5. Cephalisation firstly appeared
 6. Mesoderm is not solid
 7. Polychaetae and oligochaetae term given by Grube (1851)
 8. Pair appendages are not jointed
 9. Only group which uses chaetae as locomotory organ
 10. The phylum Annelida was established by Lamarck (1801)
- 4 Classes



Arthropoda

1. One million species
 2. Von Siebold (1845)
 3. 80 per cent of all known animals
 4. Bilaterally symmetrical and metamerically segmented
 5. Body is covered with cuticle
 6. True coelom is reduced to haemocoelom
 7. Stripe muscle
 8. Open circulatory system, artery opens into sinuses
 9. Excretion by green glands or malpighian tubules
 10. Excretory products—Urates, ammonia, Amines, Guanine
 11. Compound eyes with mosaic vision
- 7 Subphyla

Onychophora

1. Terrestrial
 2. Primitive
 3. Numerous pairs of stumpy legs
 4. For example, *Peripatus*
- * Presently Onychophora has been given the status of a separate phylum

Tardigrada

1. Aquatic
2. 4 pairs of stumpy and unjointed legs
3. For example, *Water bear*

Pantostomida (Linguatulida)

1. Parasite
2. No circulatory and respiratory organs
3. For example, *Linguatule*

Trilobita

1. Extinct
2. For example, *Trilobites*

Chelicerata

1. Terrestrial and predaceous
2. Body—2 parts
3. Cephalothorax is unsegmented
4. Abdomen is segmented

Pentopoda (Pycnogonida)

- (Sea Spider)
1. Small marine
 2. Spider-like animal
 3. Vestigial stomach
 4. 4 eyes
 5. For example, *Nymphon*, *Pycnogonum*

Mandibulata

1. Terrestrial, freshwater, marine
2. Body of 2 divisions—Cephalothorax and abdomen or 3 divisions—Head, trunk and abdomen
3. Respiration by gills or trachea
4. Excretion by glands or malpighian tubules

Merostomata

1. Marine
2. Compound eye
3. 5 or 6 pairs of abdominal appendages modified as gills
4. Spike-like telson

Arachnida

1. Terrestrial simple eyes
2. Cephalothorax with 6 pairs of appendages including 4 pairs of walking legs
3. For example, *Scorpion*, *Spiders*, *Ticks*, *Mites*

Payropoda

1. Heart and trachea are absent
2. Eyes are lacking
3. For example, *Pauropus*

Crustracea

1. Cuvier (1800)
2. Mostly aquatic and gills breather
3. Head with 2 pairs of antennae and 3 pairs of jaw
4. Compound eye
5. Respiration by gills or body surface
6. Excretion by antenae glands
7. For example, *Crabs*, *Palaemon*, *Sacculina*

Xiphosura

For example, *Limulus*

Eurypterida

For example, *Eurypterus*

Myriapoda

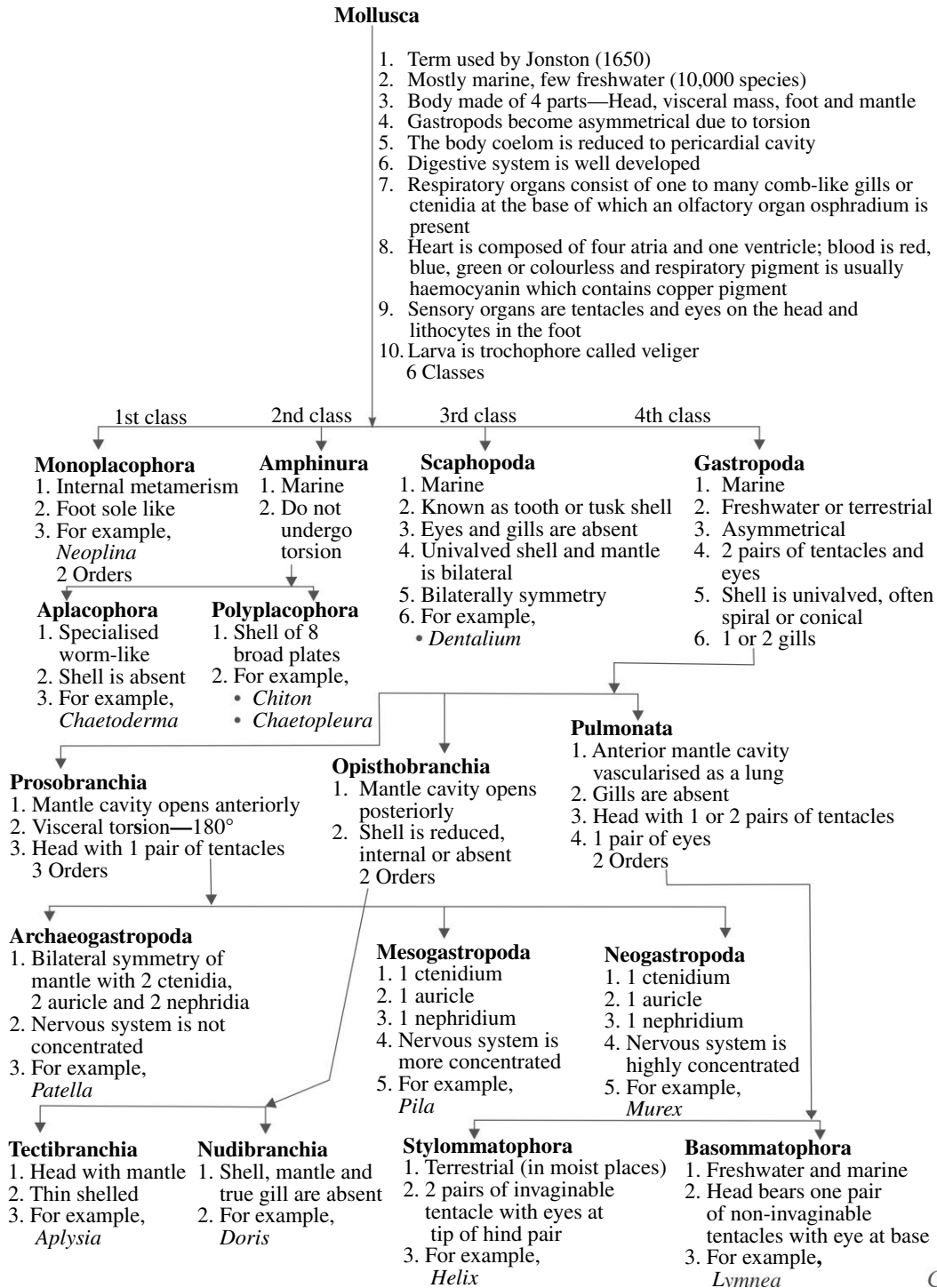
1. Letreille (1796)
2. Terrestrials air breather
3. 1 pair of antennae
4. 3 pairs of jaws
5. More than 2 pairs of legs
6. For example, *Scolopendra*, *Centipodes*, *Millipes*

Insecta

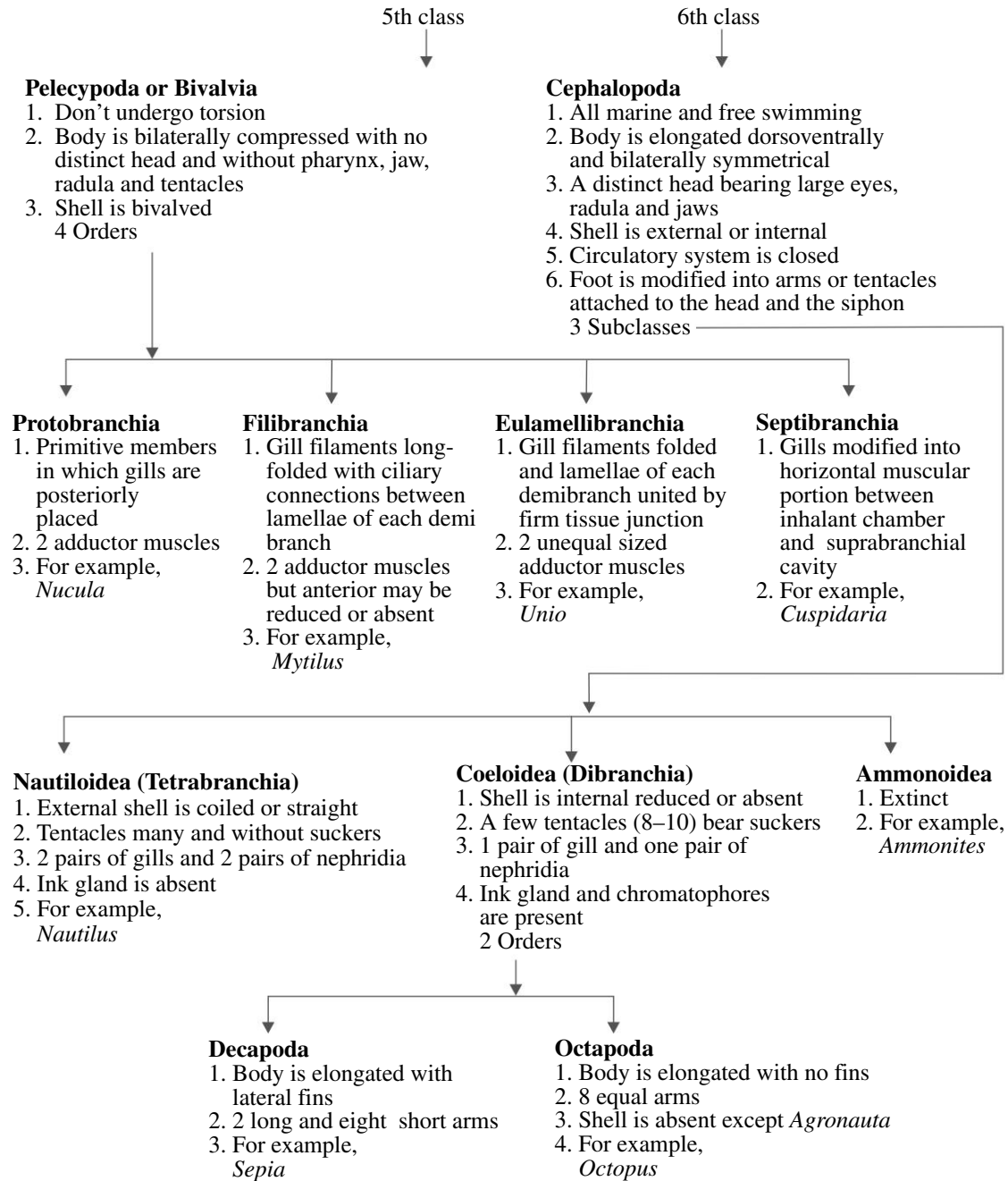
1. Terrestrial and aquatic
2. Respiration by trachea
3. Body of 3 distinct regions—Head, thorax and abdomen
4. 1 pair of antennae
5. 3 pairs of jaws
6. 3 pairs of walking legs
7. 1 or 2 pairs of wings
8. Excretion by malpighian tubules
9. For example, *Bees*, *Cockroach cocus*, *Lepisma*

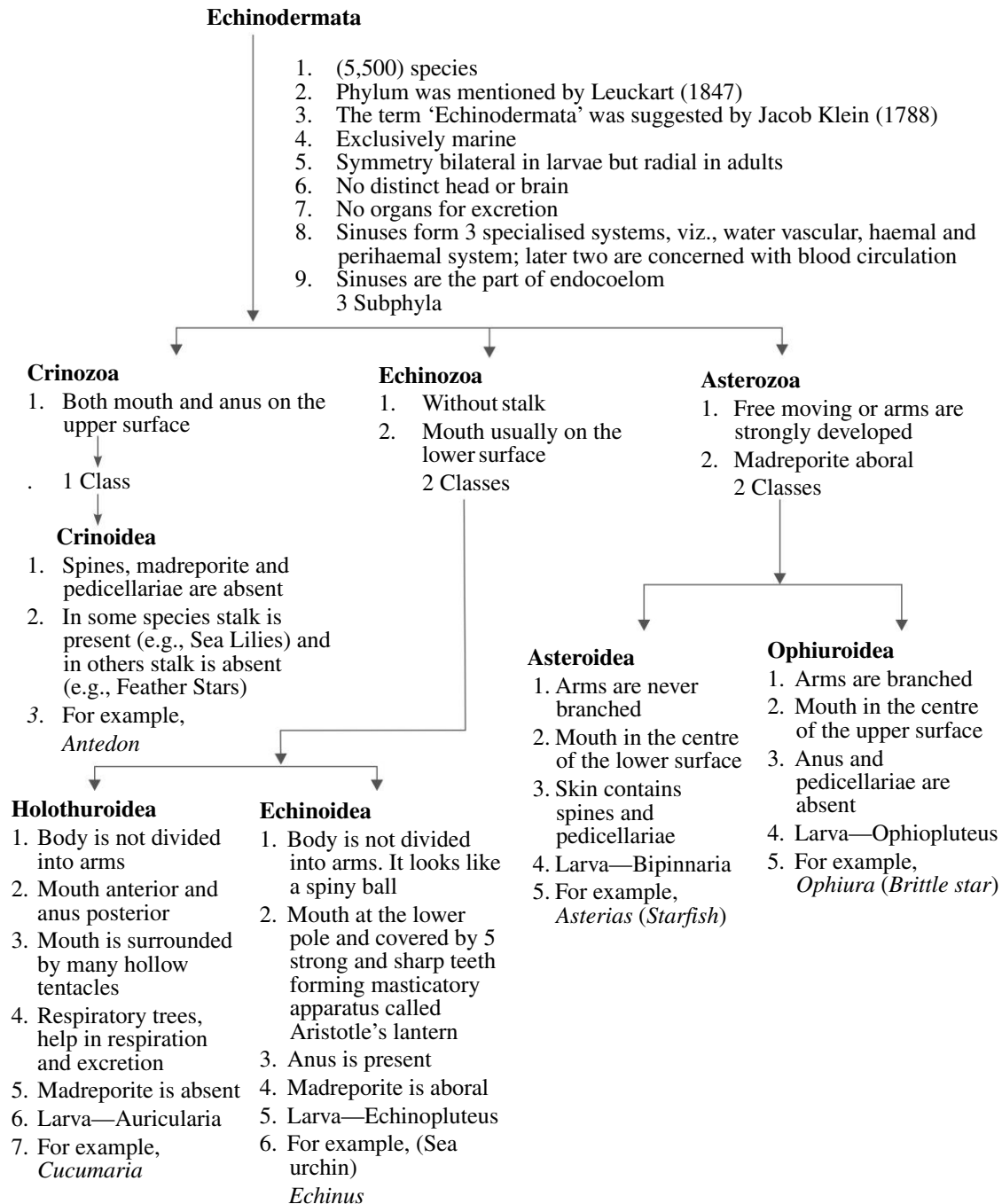
Symphyla

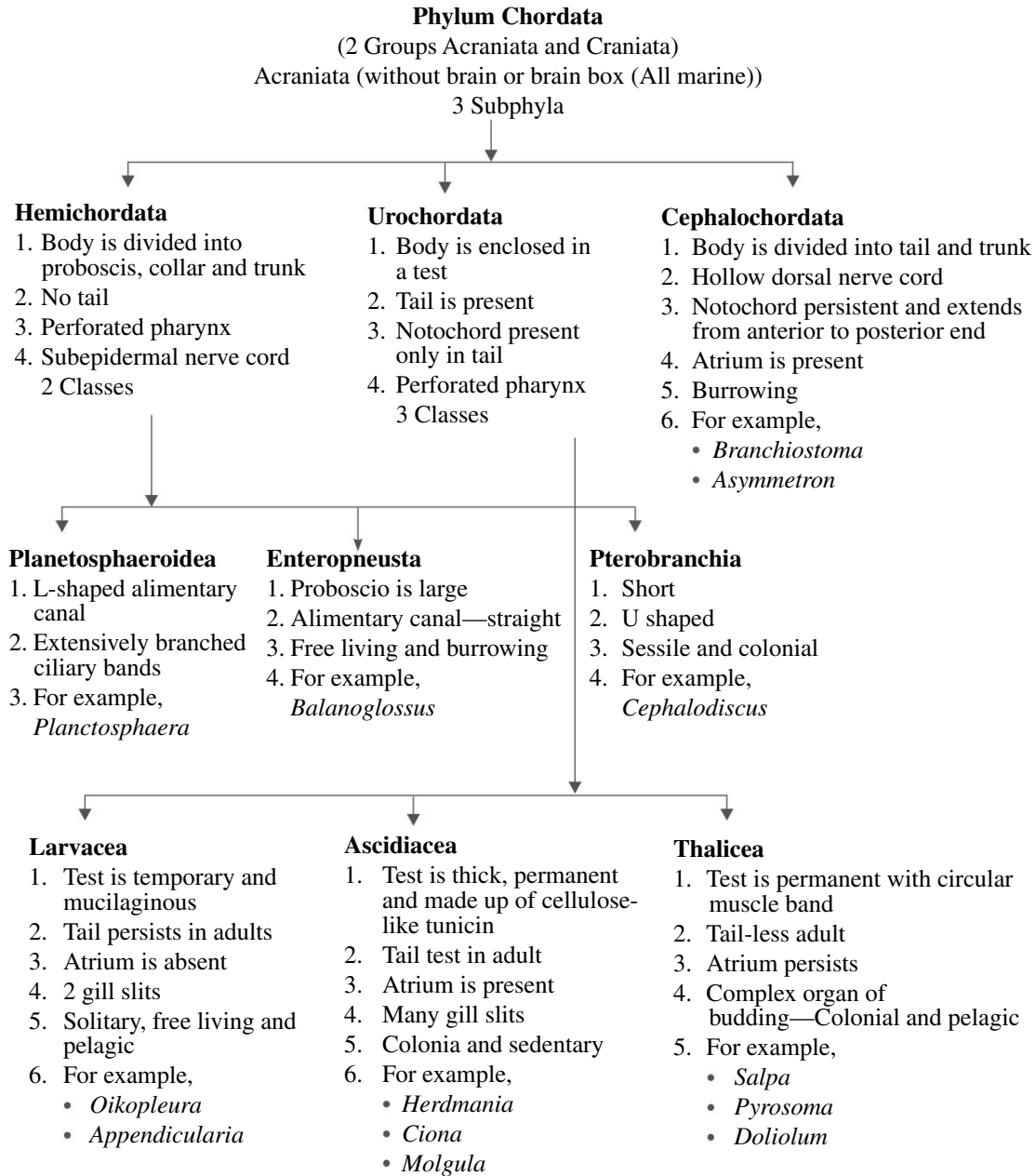
1. Eyes are lacking
2. Antennae present
3. For example, *Scutigrella*

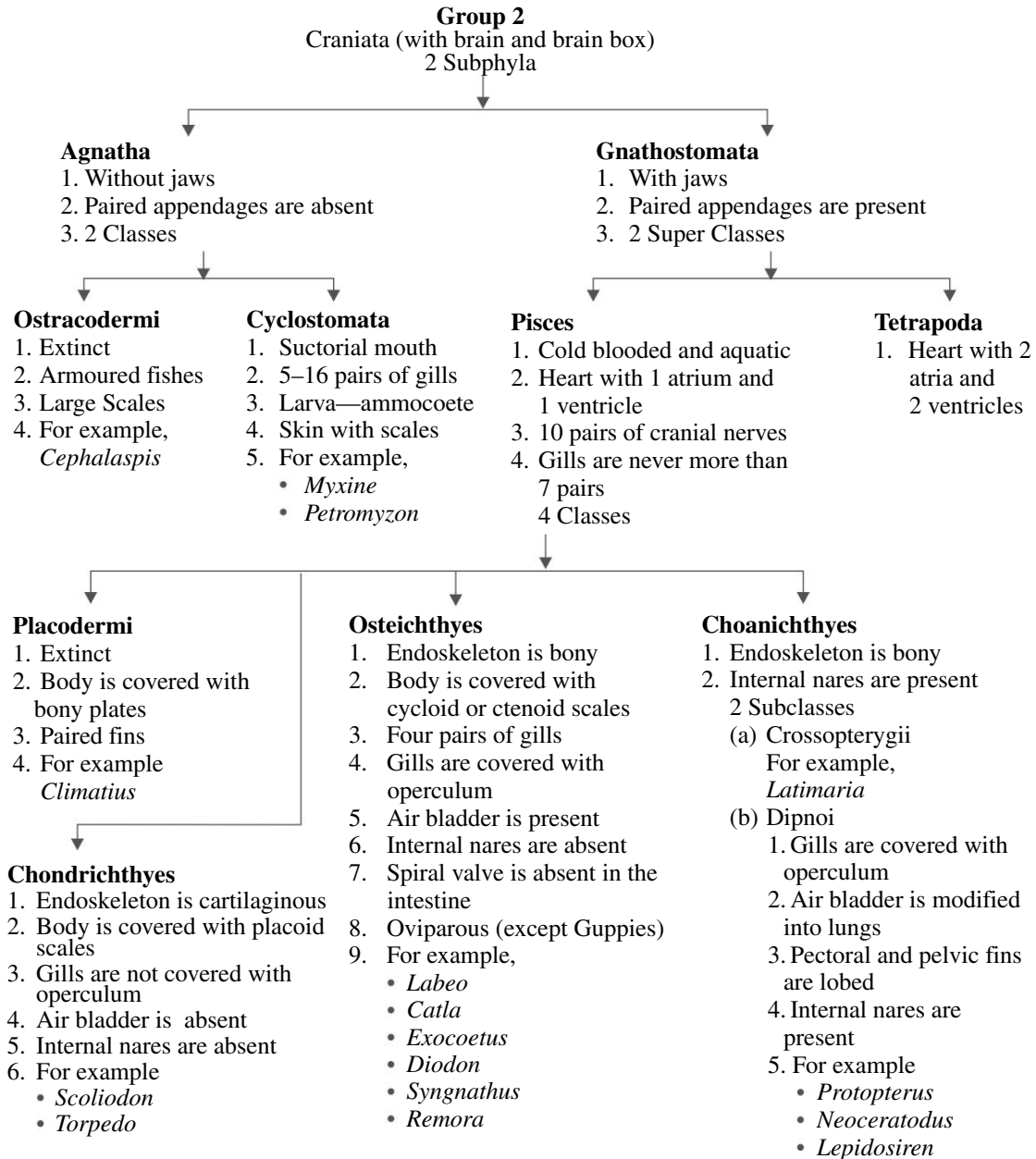


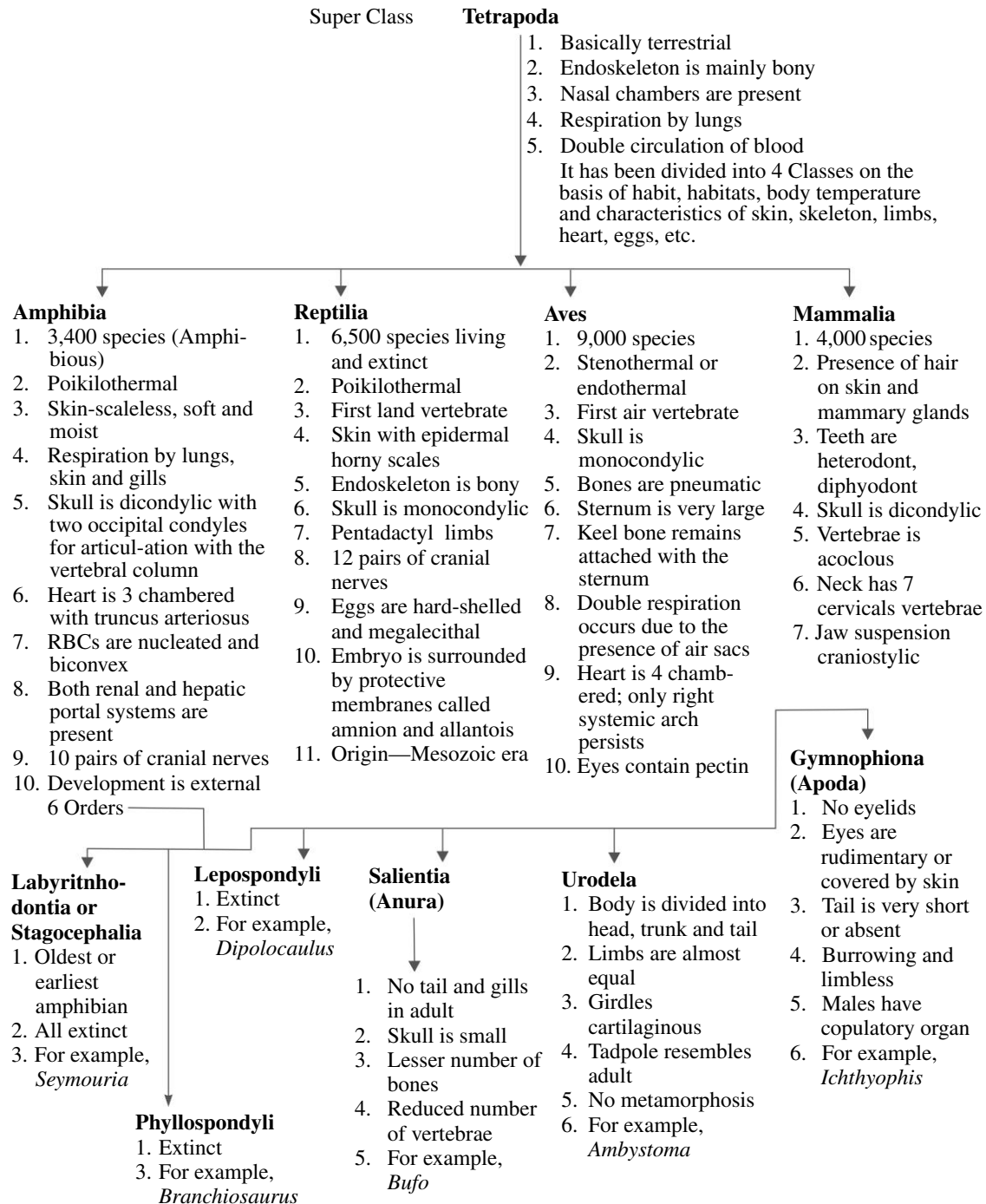
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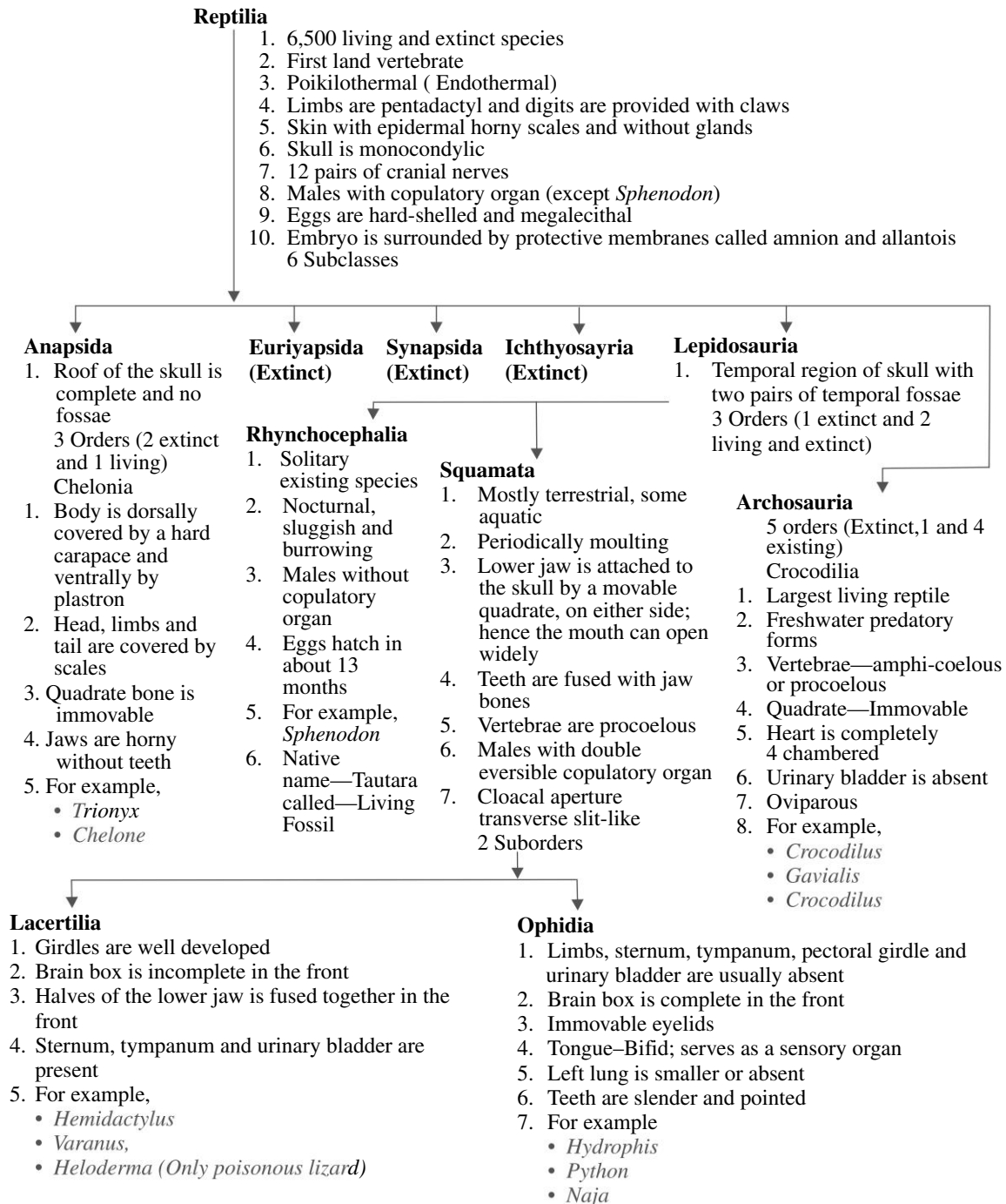


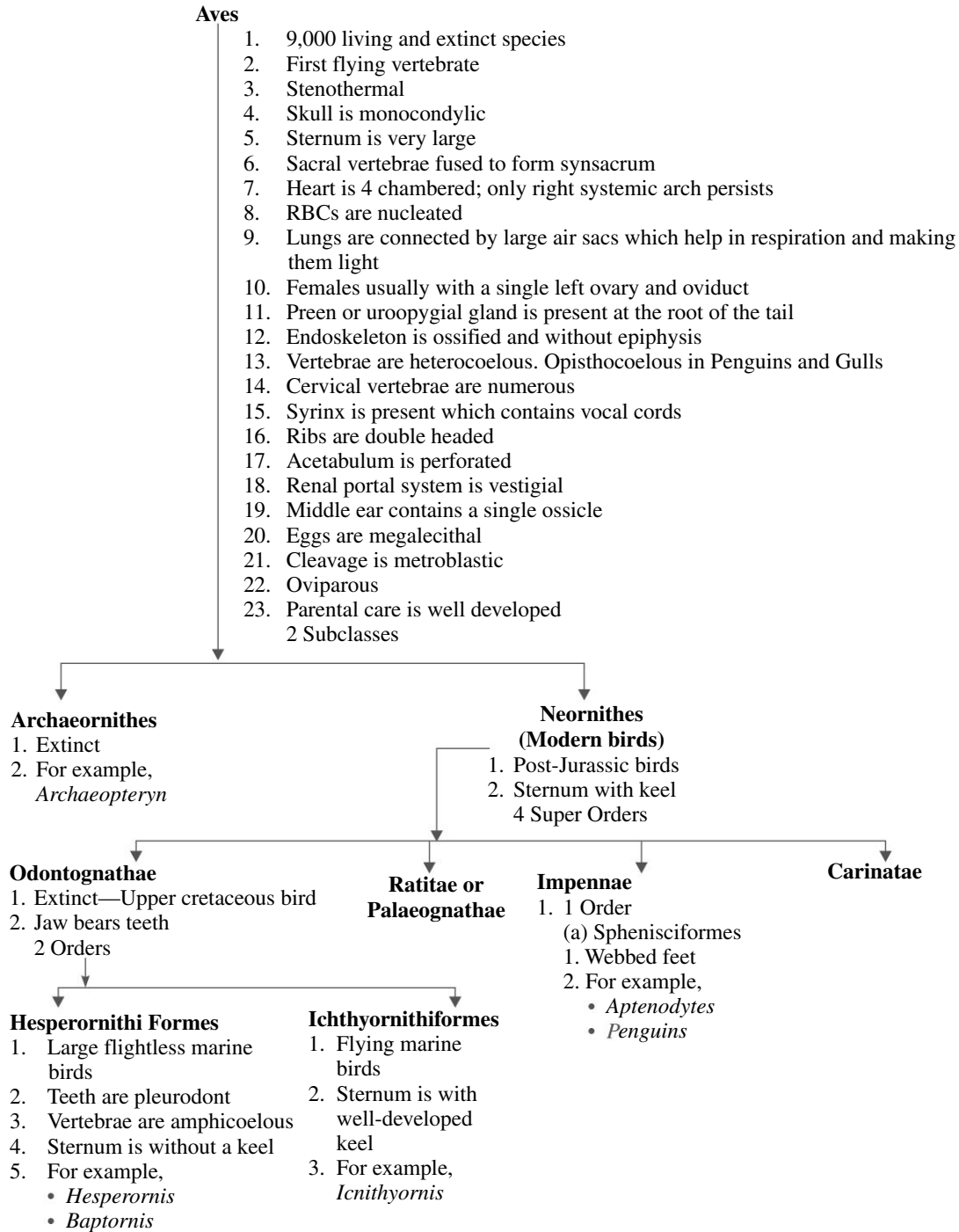


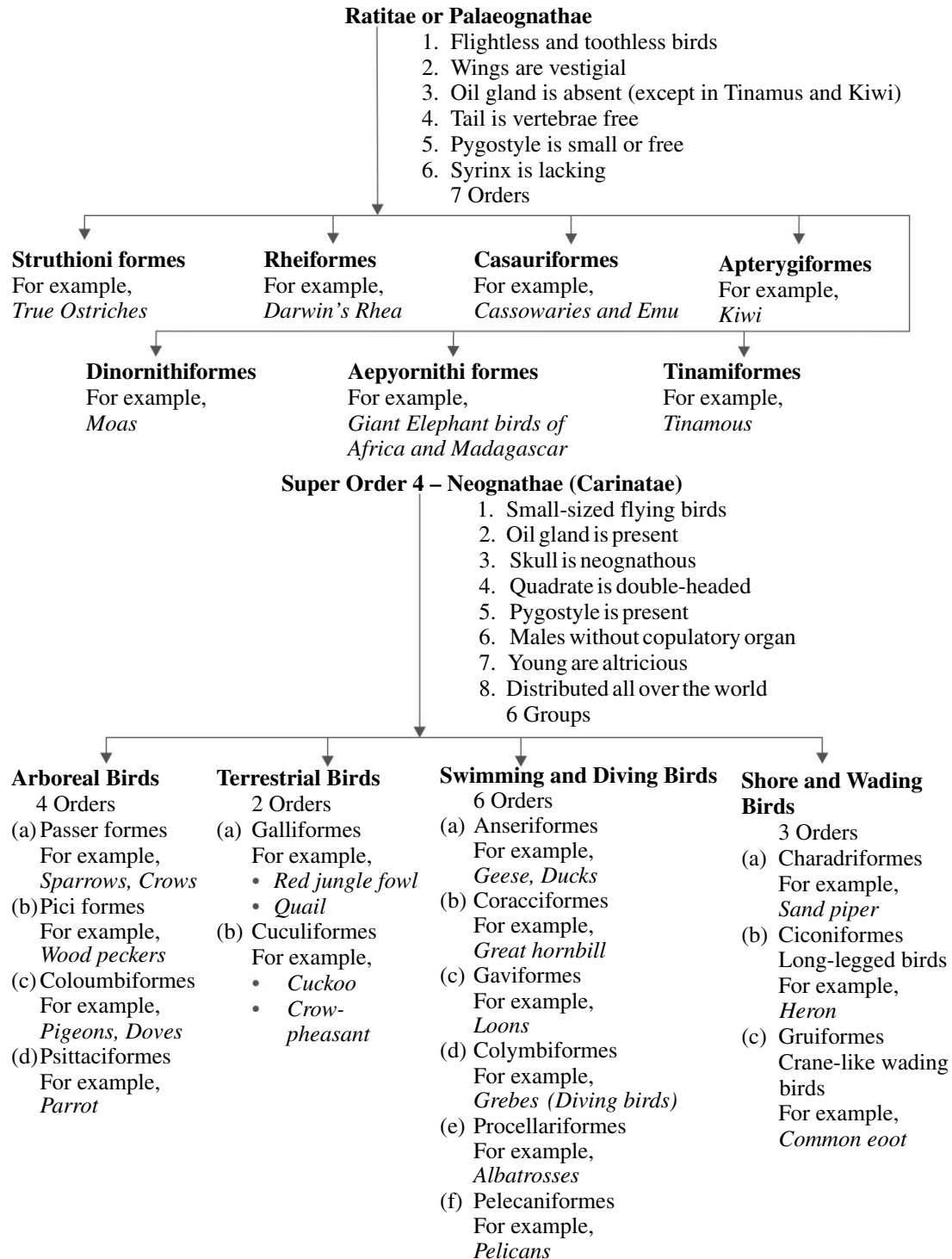


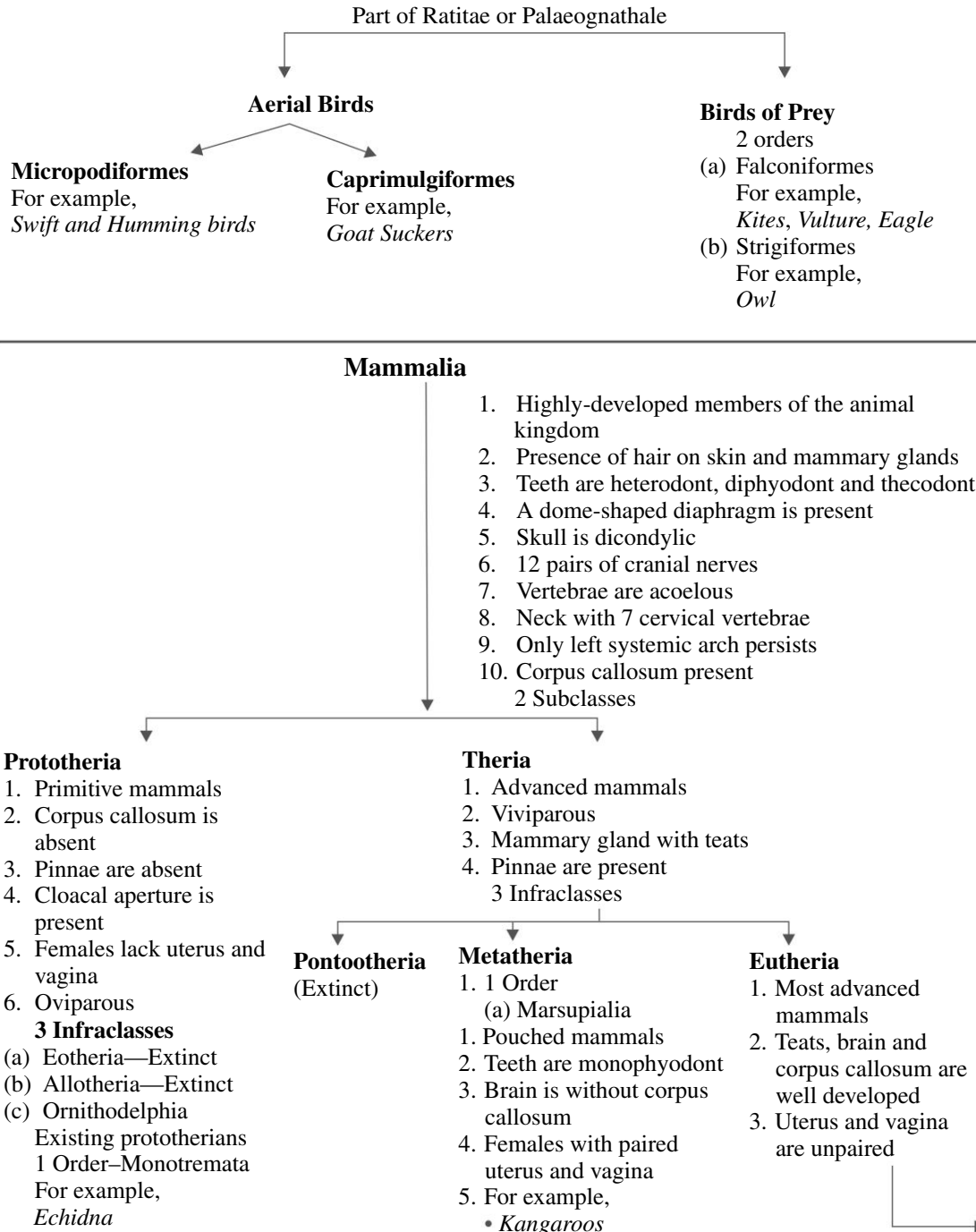












The living orders of infraclass Eutheria are:

Insectivora	For example, Hedgehog, Mole
Dermoptera	For example, Flying Lemur
Chiroptera	For example, Bat
Edentata	For example, Arboreal sloth
→ Pholidota	For example, Pangolin
Rodentia (Largest order)	For example, House mouse
Lagomorpha	For example, Rabbit, Hare
Carnivora	For example, Tiger, Cat, Seal, Walrus
Cetacea	For example, Blue whale
Sirenia	For example, Sea cow
Tubulidentata	For example, Aardvark
Proboscidea	For example, Elephant
Hyracoidea	For example, Conies
Perissodactyla	For example, Horse, Zebra, Rhinoceros
Artiodactyla	For example, Pigs, Camels, Ox, Hippopotamus
Primates	For example, Lemur, Humans, Chimpanzee, Gibbon

GENERAL CLASSIFICATION

Short-Answer Questions

1. Who was the first zoologist to attempt the classification of animals?
Answer: Aristotle (384–322 BC)
2. Who laid the foundation of taxonomy?
Answer: Carolus Linnaeus
3. Write the first act in taxonomy.
Answer: The first act in taxonomy is 'identification'.
4. How many systems of classification are there?
Answer: Two—Natural and artificial
5. What is phylogenetic classification?
Answer: The classification based on natural relationships among organisms and origin is known as phylogenetic classification.
6. Name three codes of nomenclature.
Answer: International code of botanical, zoological and bacteriological nomenclature
7. What is species?
Answer: Species is the basic unit of classification.
8. Who introduced binomial nomenclature?
Answer: Carolus Linnaeus
9. What is binomial nomenclature?
Answer: Each organism is designated by two names, first the generic name, followed by the specific name.
10. What is trinomial nomenclature?
Answer: In certain cases, a third word is used to describe the subspecies after the first two words and this is known as trinomial nomenclature. For example, *Homo sapiens sapiens*
11. Name the organisms which are not included in any kingdom.
Answer: Viruses and viroids
12. How many types of structural organisations are found in animals?
Answer: Five
13. Who proposed the five kingdom system of classification?
Answer: Robert H Whittaker (1969)
14. Name the groups of the five kingdom systems of classification, in which organisms are grouped today.
Answer: Monera, Protista, Fungi, Plantae and Animalia

15. What are the criteria of the five kingdom system of classification?
Answer: (a) Complexity of cell structure
 (b) Complexity of body structure
 (c) Mode of nutrition
 (d) Ecological lifestyles
 (e) Phylogenetic relationships
16. What is the name of the modern method of classification based on evolutionary history?
Answer: Cladistics
17. Arrange the following in ascending order – Phylum, kingdom, class, species, genus, order and family.
Answer: Species – genus – family – order – class – phylum – kingdom
18. Define different types of body plans found in animals.
Answer:
 (a) Cell aggregate body plan – There are many cells in the body which function almost independently. For example, Porifera.
 (b) Blind sac plan – There is a single cavity in the body that has a single opening which functions both in ingestion and egestion. For example, Coelentrata and Platyhelminthes.
 (c) Tube within tube body plan – The body contains two tubes in which the outer tube is formed by the body wall and the inner one by the digestive tract. The digestive tract is complete, having a mouth and an anus. It is of two types:
 (i) Protostomatic – Mouth is derived from blastopore and appears first. For example, Aschelminthes, Annelida Arthropoda and Mollusca.
 (ii) Deuterostomatic – Anus appears first from the blastopore of the embryo. For example, Echinodermata and Chordata.
19. Define acoelomates.
Answer: Acoelomates are those animals that lack a coelom. The only cavity in the body is the digestive cavity.
20. What are diploblastic and triploblastic animals?
Answer: Animals having two germinal layers, viz., outer ectoderm and inner endoderm with noncellular mesogloea between these two layers are known as diploblastic. For example, Coelenterates. Animals having three germinal layers, viz., outer ectoderm, middle mesoderm and inner endoderm are known as triploblastic. For example, Platyhelminthes, Annelida, Arthropoda, Chordata, etc.

PROTOZOA

Short-Answer Questions

1. Define Protozoa.
Answer: Protozoa are the simplest microscopic unicellular animals.

2. What is Protozoology?
Answer: Protozoology is the study of Protozoa.
3. Name a shelled Protozoa?
Answer: *Arcella*
4. How are Protozoans classified?
Answer: Protozoa are classified on the basis of locomotory organelles.
5. What are pseudopodia?
Answer: Pseudopodia are temporary projections from the cell of a Protozoan, leucocyte, used for locomotion and feeding.
6. What are lobopodia?
Answer: Blunt tubular finger-like pseudopodia having ectoplasm and endoplasm are called lobopodia. Lobopodia are found in *Amoeba* and *Entamoeba*.
7. Name a flagellate having both pseudopodia and flagella.
Answer: *Mastigamoeba*
8. Name the Protozoa that shows alternation of generation.
Answer: *Elphidium*
9. What type of movement is possible by (a) Cilia and (b) Flagella?
Answer: (a) Pendular movement and (b) Undular movement
10. Which Protozoan is usually commensal on humans?
Answer: *Entamoeba coli*
11. Name a soil *Amoeba*.
Answer: *Pelomyxa*
12. Give the zoological name of slipper animalcule.
Answer: *Paramecium*
13. Which ciliate has no cilia at any stage in the life cycle?
Answer: *Phalocrocleptes*
14. What are contractile vacuoles?
Answer: Contractile vacuoles are specialised water-filled vacuoles found in sarcodina, ciliates and flagellates, but are absent in sporozoa. They are water-balancing structures.
15. What is kinety?
Answer: The kinetosomes and kinetodesma together constitute an infraciliary apparatus called kinety.
16. Name the parasites that cause the diseases given below:
Answer: (a) Malaria – *Plasmodium sp.*
(b) Amoebiasis – *Entamoeba histolytica*
(c) Giardiasis – *Giardia lamblia*
(d) Sleeping sickness – *Trypanosoma gambiense*
(e) Kala azar – *Leishmania donovani*
(f) Toxoplasmosis – *Toxoplasma gondii*
(g) Trichomoniasis – *Trichomonas vaginalis*
17. In general, how do algae and Protozoans differ?
Answer: Algae are autotrophic (photosynthetic), while almost all Protozoans are heterotrophic.

18. Name the group of Protozoa having both flagella and pseudopodia.
Answer: Radio-flagellata
19. Name a light-producing Protozoa.
Answer: *Noctulica*
20. Name the ciliate that can perform longitudinal binary fission.
Answer: *Vorticella*
21. Which animal is regarded as a connecting link between Protozoa and Porifera.
Answer: *Proterospongia*
22. Name the locomotory organelles that are useful in locomotion and feeding in Protozoa.
Answer: Pseudopodia and cilia
23. Name mastigophorans having, one, two, four, four pairs and many flagella.
Answer: (a) One – *Trypanosoma*
(b) Two – *Ceratium*
(c) Four – *Trichomonas*
(d) Four pairs – *Giardia*
(f) Many – *Trichonympha*
24. Name a multinucleate Protozoa.
Answer: *Opalina*
25. What are trichocysts?
Answer: Trichocysts are rod-like or oval structures which are characteristic of many ciliates.
26. Name the Protozoa which shows paedogamy.
Answer: *Actinophrys*
27. Name the infective stage of:
(a) *Plasmodium*, (b) *Entamoeba*
Answer: (i) Sporozoite, (ii) Tetra nucleate cyst
28. Give one example each of free-swimming ciliate, crawling ciliate and stalked ciliate.
Answer: (a) Free swimming ciliate – *Paramecium*
(b) Stalked ciliate – *Vorticella*
(c) Crawling ciliate – *Euplotes*
29. What are ciliates?
Answer: Ciliates are Protozoa that move and obtain food with the help of cilia.
30. Which Protozoan parasite exists only in the trphozoite stage?
Answer: *Trichomonas vaginalis*
31. Name two binucleate Protozoans.
Answer: (a) *Paramecium*, (b) *Vorticella*
32. Name the locomotory organelles of Protozoa.
Answer: Pseudopodia, flagella and cilia
33. Which Protozoa has both plant- and animal-like nutrition?
Answer: *Euglena*

34. Name different modes of asexual reproduction in Protozoa.
Answer: Binary fission, multiple fission, budding and plasmotomy

Long-Answer Questions

1. Classify Protozoa giving characteristic features and examples of each group.
2. Describe various modes of nutrition in Protozoa.
3. Give an account of various modes of locomotion in Protozoa.
4. Write short notes on:
 - (a) Pathogenic Protozoa
 - (b) Contractile vacuole
 - (c) Palmella stage
5. Distinguish between:
 - (a) Micronucleus and macronucleus
 - (b) Amoeboid movement and euglenoid movement
 - (c) Flagella and cilia
 - (d) Holozoic and saprozoic nutrition
6. Describe the structure and life history of *Entamoeba histolytica*.
7. Describe various modes of reproduction in *Paramecium*.

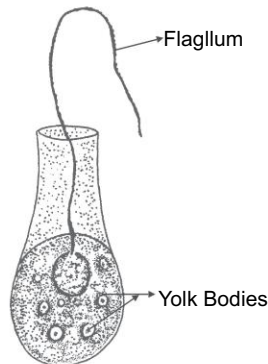
PORIFERA

Short-Answer Questions

1. Define Porifera.
Answer: Porifera is the phylum that includes most primitive multicellular animals having cellular grade of organisation, sessile and are of various shapes.
2. Write two chief characteristics of the phylum Porifera.
Answer: (a) Cellular grade of organisation and presence of choanocytes with flagella.
(b) Presence of canal system.
3. Which type of body organisation is found in sponges?
Answer: Cellular grade of organisation
4. In which group is the first step towards multicellularity encountered?
Answer: Sponges

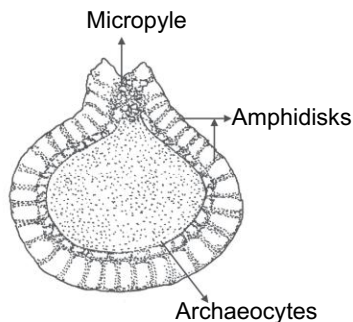
5. What is the basis of classification of the phylum Porifera?
Answer: Nature of skeleton
6. Name the spicules that are never triaxon.
Answer: Siliceous spicules
7. Give two similarities between Porifera and Coelenterata.
Answer: (a) Both are acoelomates (lack body cavities).
(b) Both lack bilateral symmetry.
8. Give two major differences between Porifera and Coelenterata.
Answer: (a) In Porifera, the body organisation is of the cellular type, while in Coelenterata body organisation is tissue grade.
(b) In Coelenterata, there is alternation of polyps and medusae but not in Porifera.
9. Write the names of two principal types of cells found in sponges.
Answer: (a) Pinacocytes that form dermal epithelium or pinacoderm
(b) Choanocytes that form gastral epithelium or gastroderm
10. In which type of canal system is spongocoel usually obliterated?
Answer: Leuconoid type
11. Name the cells which are diagnostic to sponges.
Answer: Choanocytes
12. What will happen if ostia and osculum of *Sycon* are sealed with wax?
Answer: The animal will die due to lack of nutrition and respiration as there will be no flow of water.
13. What will happen if flagella of choanocytes of *Sycon* are removed?
Answer: There will be no flow of water because beating of flagella creates water current and ultimately the animal will die due to lack of respiration and nutrition.
14. What are archaeocytes?
Answer: Archaeocytes are amoeba-like cells found in sponges which give rise to other cells (totipotent in nature).
15. Name the sponges in which definite epidermis is lacking.
Answer: Sponges belonging to class hexactinellida
16. Which cells secrete spongin?
Answer: Spongioblasts
17. What is the name of cells that line internal cavities and canals of sponges?
Answer: Choanocytes
18. Write names of two commercial sponges.
Answer: (a) Bath sponge (*Euspongia*)
(b) Venus's flower basket (*Euplectella*)
19. Which one is the largest sponge?
Answer: *Spheciospongia vesparum*
20. Which type of canal system is found in *Leucosolenia*?
Answer: Ascon type
21. What is the name of food storage cells of *Leucosolenia*?
Answer: Thesocytes

22. Name the boring sponge.
Answer: Cliona
23. Name the larval forms of Sponges.
Answer: Amphiblastula and parenchymyula
24. Name the largest class of the phylum Porifera.
Answer: Demospongiae
25. Name the animal having many inlets and one outlet.
Answer: Sponges
26. Which are the well-known enemies of sponges?
*Answer: (a) Coral reef fish
(b) Limpets and
(c) Nudibranchs*
27. What is gemmule?
Answer: Gemmule is the asexual reproductive body of sponges which is derived from archaeocytes.
28. Name the pores through which water enters and leaves the body of sponges.
Answer: Ostia and osculum
29. Identify the cell shown in the diagram.



Answer: Choanocyte

30. Identify the figure given below and mention to which phylum it is associated.



Answer: Gemmule of sponge and it is associated with phylum Porifera.

Long-Answer Questions

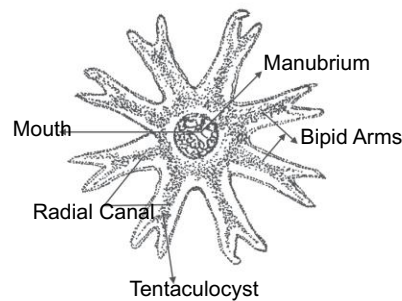
1. Classify Porifera giving suitable examples.
2. Trace the evolution of canal system in sponges.
3. Draw a neat and labelled diagram of the following:
(a) LS of *Sycon*, (b) Parenchymula larva, (c) *Euplectella*
4. Write short notes on:
(a) Spicules
(b) Gemmule
(c) Choanocytes
(d) Spongilla
5. Give an account of skeleton in sponges.
6. Describe different kinds of cells found in *Sycon* and give their function.
7. Describe larval forms of sponges.

COELENTERATA

Short-Answer Questions

1. Define Coelenterata.
Answer: Coelenterata is the phylum of diploblastic, acoelomate animals having cnidoblasts and gastrovascular body in which all functions are performed by tissues and never by organs.
2. Which type of body organisation is found in Coelenterata?
Answer: Tissue grade of organisation
3. Name the three classes of phylum Coelenterata.
Answer: Hydrozoa, scyphozoa and anthozoa
4. Which class of Coelenterata is represented only by the polyp stage?
Answer: Anthozoa (actinozoa)
5. What are interstitial cells?
Answer: Interstitial cells are small, oval or round cells having a large nucleus, found in the members of the phylum Coelenterata. They form nematocysts, germ cells and other cells. Thus, they are totipotent.
6. Give similarities between polyp and medusa.
Answer: (a) Both are radially symmetrical and diploblastic.
(b) Both lack anus and in both mouth is homologous.

- (c) Both are carnivorous.
(d) Digestion is extracellular as well as intracellular.
7. Name the Coelenterata which is bilaterally symmetrical.
Answer: *Halistemma*
8. What is the zoological name of red coral?
Answer: *Corallium rubrum*
9. Name the animals that exhibit the highest degree of polymorphism in the animal kingdom.
Answer: Members of the order siphonophora (phylum Coelenterata)
10. Name some polymorphic Coelenterates.
Answer: *Physalia* (Portuguese man-of-war), *Porpita*, *Verella* and *Halistemma*
11. Name a Coelenterata in which polyp reproduces both asexually and sexually.
Answer: *Hydra*
12. What is a pneumatophore?
Answer: (a) Pneumatophore is a gas-filled vesicle.
(b) It functions as float and assists in swimming.
(c) It is an inverted medusa without mesogloea having muscular walls and gas glands.
(d) Pneumatophore shows great variation in its structure and size in different siphonophores.
13. Which cells of *Hydra* are only found in the epidermis?
Answer: Cnidoblasts
14. What is the function of musculo-epithelial layer found in the body wall of Coelenterates?
Answer: It helps in contraction, relaxation and in bending movements.
15. What is name of the larva shown in the diagram?

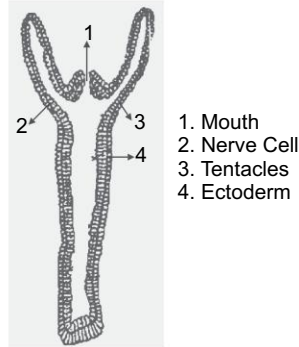


Answer: Ephyra

16. What is metagenesis?
Answer: The alternation between asexual and sexual reproductive form is known as metagenesis.
17. What are nematocysts?
Answer: Nematocysts are stinging thread-like organelles.
18. Name the free swimming phase of *Obelia*.
Answer: Medusa
19. What is the name of the digestive cavity of Coelenterates?
Answer: Gastrovascular cavity (Coelenteron)
20. Name the Coelenterates that lack exoskeleton.
Answer: *Hydra*, *Aurelia* and Sea anemone

21. Draw LS of Hydra showing mouth, tentacles, ectoderm and nerve cell.

Answer:



- 1. Mouth
- 2. Nerve Cell
- 3. Tentacles
- 4. Ectoderm

LS of Hydra

22. Write the different forms of polyp and mention their function.

Answer: (a) Gastro zooid – Nutrition

(b) Dactylo zooid – Offence and defence

(c) Gono zooid – Reproduction

23. Name the animal in which tetramerous radial symmetry is found.

Answer: *Aurelia* (Jellyfish)

24. Name the Coelenterata having many mouths.

Answer: *Rhizostomum*

25. What is mesogloea?

Answer: Mesogloea is a jelly-like noncellular substance present two layers—Outer ectoderm and inner endoderm of Coelenterates.

26. Which type of digestion occurs in Coelenterata?

Answer: Intracellular and intercellular

27. What are different types of coral reefs?

Answer: Coral reefs are of three types:

(a) Fringing reef which is formed near the shore

(b) Barrier reef which grows away from the shore

(c) Atoll reef which is circular enclosing a lagoon

28. Where is the Great Barrier Reef located?

Answer: Australia

Long-Answer Questions

1. Classify phylum Coelenterata giving suitable examples.

2. Write short notes on:

(a) Polyp

- (b) Medusa
 - (c) Metagenesis
 - (d) Corals
3. Classify following animals giving suitable reasons:
- (a) *Madrepora*
 - (b) *Pennatula*
 - (c) *Obelia*
 - (d) *Metridium*

CTENOPHORA

Short-Answer Questions

1. Define Ctenophora.
Answer: Ctenophora is a small phylum of biradially symmetrical marine radiata with eight meridional rows of ciliary plates and without nematocysts.
2. What are unique characters of Ctenophora?
Answer: (a) Presence of comb plates for swimming
(b) Presence of adhesive cells called colloblasts
(c) Presence two anal pores
3. Name a Ctenophora that lacks tentacles.
Answer: *Beroe*
4. Name the Ctenophora having nematocyst.
Answer: *Euchlora rubra*
5. What are colloblasts?
Answer: Colloblasts are adhesive cells found in Ctenophores. They are widespread on tentacles and are used to capture prey.
6. Name the larva of Ctenophora.
Answer: Cydippid
7. Members of which class of Ctenophora bear tentacles?
Answer: Tentaculata
8. Mention the advancement of Ctenophora over Coelenterata.
Answer: Ctenophores show advancement over Coelenterates in having:
 - (a) Complete digestive tract
 - (b) Presence of apical sense organ
 - (c) Determinate cleavage
 - (d) Presence of independent muscle cell developed from mesenchyme
 - (e) Triploblastic due to the presence of well-developed ecto-mesoderm

9. How many swimming plates are found in Ctenophora?
Answer: Eight, which are radially arranged
10. Name the endoparasitic Ctenophora.
Answer: *Gastrodes parasiticum* which is the larval form of free-living *Eulampetia pancerina*
11. Name the Ctenophora that lacks swimming plates.
Answer: *Coeloplana*
12. What is the common name of *Cestum*?
Answer: Venus's girdle
13. Why are Ctenophores commonly known as Comb jellies?
Answer: They are known so due to the presence of comb plates.

Long-Answer Questions

1. Classify phylum Ctenophora giving characters and examples of each group.
2. Write short notes on:
 - (a) Comb plates
 - (b) Colloblasts
 - (c) Cydippid larva
3. Discuss the affinities of Ctenophora.

PLATYHELMINTHES

Short-Answer Questions

1. Define Platyhelminthes.
Answer: Platyhelminthes are triploblastic, bilaterally symmetrical acoelomate, having organ grade of organisation lacking anus, skeletal, circulatory and respiratory system.
2. Which type of body plan is found in Platyhelminthes?
Answer: The body plan of Platyhelminthes is blind sac, i.e., there is a single aperture both for mouth and anus.
3. Name three classes of the phylum Platyhelminthes and give examples.

Answer:

Class	Example
(a) Turbellaria	– <i>Dugesia</i> (Planaria)
(b) Trematoda	– <i>Fasciola hepatica</i> (Liver fluke)
(c) Cestoda	– <i>Taenia solium</i> (Tapeworm)

4. In which class of Platyhelminthes is the epidermis absent both in larva and the adult?

Answer: Cestoda

5. Name the class of Platyhelminthes in which pharynx is eversible .

Answer: Turbellaria

6. Name the species of *Taenia* in which rostellum is absent.

Answer: *Taenia saginata*

7. Members of which class of Platyhelminthes lack alimentary canal.

Answer: Cestoda (ex*Taenia solium*)

8. What is the function of acetabulum?

Answer: It helps in attachment.

9. Name different larval forms of liver fluke.

Answer: Miracidium, sporocyst, redia, cercaria and metacercaria

10. Name the free-swimming larval stages of liver fluke.

Answer: Miracidium and cercaria

11. Name the body parts of *Taenia*.

Answer: Scolex, neck and strobila (body segments)

12. How many types of proglottids are found in *Taenia*?

Answer: Three types of proglottids are found in *Taenia*:

- (a) Immature proglottids – They are anterior proglottids which are broader than longer and lack reproductive organs.
- (b) Mature proglottids – They are middle proglottids and are more or less squarish in shape having both male and female sex organs.
- (c) Gravid proglottids – They are posterior proglottids which are longer than broader having branched uterus packed with fertilised eggs.

13. What is apolysis?

Answer: The phenomenon of breakdown of gravid proglottids is known as apolysis.

14. How many suckers are found in the scolex of *Taenia*?

Answer: Four

15. How does human infection of *Taenia* occur?

Answer: By consuming undercooked meaty pork

16. Name the reproductive organs which are found in liver fluke but absent in tapeworm.

Answer: Prostate glands, cirrus sheath and Laurer's canal

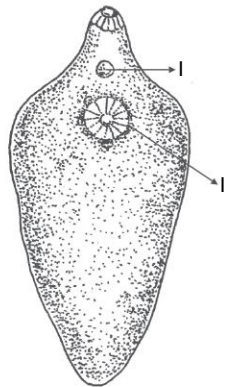
17. Name the trematode having following characteristics:

- Answer: (a) Pharynx is absent
(b) There is no redia stage

(c) Cercariae developing from one egg will produce individuals of one sex

Answer: *Schistosoma* (Blood fluke)

18. In the given figure of liver fluke, identify the part labelled as I and II.



Answer: I. – Genital pore, II. – Acetabulum

19. In which class of Platyhelminthes are rhabdites found?

Answer: Turbellaria

20. How many tapeworms can live in one host?

Answer: Only one

21. Name the Platyhelminthes which exhibits symbiotic phenomenon.

Answer: *Convoluta*

22. Name the cestode which exhibits exogenous and endogenous budding.

Answer: *Echinococcus granulosus*

23. What is the zoological name of the dwarf tapeworm?

Answer: *Hymenolepis nana*

24. Name the trematode in which male and female are separate, but the two are found together in pairs

Answer: *Schistosoma* (Blood fluke)

25. Name a viviparous Platyhelminthes.

Answer: *Gyrodactylus*

26. What is the name of turbellaria that shows external segmentation?

Answer: *Procerodes lobata*

27. What are flame cells?

Answer: Flame cells are excretory structures of Platyhelminthes (*Taenia*). Besides excretion they are also osmoregulatory in function.

Long-Answer Questions

1. Classify phylum Platyhelminthes giving characteristics and examples of each class.

2. Draw labelled diagrams of:
(a) Larval forms of liver fluke, (b) Gravid proglottid of *T. solium*
3. Write short notes on:
(a) Scolex
(b) Hexacanth larva
(c) Cysticercus
(d) Gravid proglottid
5. Give an account of parasitic adaptation in Platyhelminthes.
6. Write short notes on:
(a) Rhabdites
(b) Flame cells
(c) Taeniasis
(d) Dwarf tapeworm

ASCHELMINTHES

Short-Answer Questions

1. Define Aschelminthes.
Answer: Aschelminthes is a phylum of unsegmented triploblastic pseudocoelomate, cylindrical or thread-like worms having bilateral symmetry and body wall covered with cuticle and epidermis.
2. Which type of body organisation is found in nematodes?
Answer: Organ grade organisation
3. Mention five characters of nematodes.
Answer: (a) Triploblastic, pseudocoelomate and bilaterally symmetrical
(b) Syncytial epidermis
(c) Musculoglandulo pharynx
(d) Presence of dorsal and ventral nerve cords
(e) Didelphic
4. Name the sensory organs of Aschelminthes.
Answer: Papillae, amphids, phasmids, eye spots and ciliated pits
5. Which type of cleavage occurs in Aschelminthes?
Answer: Spiral and determinate
6. What is pseudocoelom?
Answer: The space between alimentary canal and body wall that lacks lining of coelomic epithelium is known as pseudocoelom.
7. Name three parasitic nematodes.
Answer: (a) *Ascaris lumbricoides*

(b) *Ancylostoma duodenale*

(c) *Wuchereria bancrofti*

8. What is eutely?

Answer: Eutely is a condition in which individuals of a species maintain constant number of cells in the body.

9. How many times does molting occurs in the life cycle of *Ascaris*?

Answer: Four

10. Give two general characteristics of *Ascaris*.

Answer: (a) Largest intestinal roundworm

(b) Most common intestinal helminth in humans

11. Name the only region of the nematodes in which cell division occurs after hatching.

Answer: Reproductive organs

12. Name the intermediate host of *Wuchereria bancrofti*.

Answer: *Culex pipiens*

13. Name a viviparous nematode.

Answer: *Wuchereria bancrofti*

14. Mouth of *Ascaris* is guarded by how many lips?

Answer: Three

15. What is the name of body cavity of nematodes?

Answer: Pseudocoelom

16. How does infection of *Ascaris* occur in humans?

Answer: *Ascaris* infection in humans occurs when s/he happens to eat food or drink water contaminated with shelled eggs of *Ascaris* which contain second stage or rhabditoid larvae.

17. In humans, where does the filaria worm reside?

Answer: Lymph vessels and lymph nodes

18. What is the name of larva of filaria?

Answer: Microfilaria

19. Name the H-shaped cells found in *Ascaris* and their function.

Answer: They are called renette cells and their function is excretion.

20. How can a male *Ascaris* be differentiated from a female *Ascaris*?

Answer: The posterior end of a male *Ascaris* is curved and is provided with a pair of penial spicules.

21. Name the parasite that causes elephantiasis.

Answer: *Wuchereria bancrofti*

22. Which type of movement is shown by the sperms of *Ascaris*?

Answer: Amoeboid movement

23. Name the parasite that enters the human body through skin of the feet.

Answer: *Ancylostoma duodenale* (Hookworm)

24. Name the nematode that infects the eye.

Answer: Loa loa

Long-Answer Questions

1. Give the characters of the phylum Aschelminthes up to class giving examples.
2. Draw neat and labelled diagrams of the following:
 - (a) TS of male and female *Ascaris*
 - (b) *Microfilaria*
3. Write short notes on:
 - (a) *Ancylostoma*
 - (b) *Wuchereria bancrofti*
 - (c) *Enterobius vermicularis*

ANNELIDA

Short-Answer Questions

1. What is Annelida?
Answer: Annelida is a phylum of soft-bodied, bilaterally symmetrical, triploblastic, coelomate and metamerically segmented animals.
2. Name a sanguivorous Annelida.
Answer: Leech (*Hirudinaria granulosa*)
3. What are setae?
Answer: Setae are elongated, more or less S-shaped structures which are made up of chitin and are hardened as well as strengthened by sclerotised protein. They are locomotory organs of class oligochaeta.
4. Write the name of the locomotory organs of Annelida.
Answer: Setae, parapodia and suckers
5. Name the Annelida in which male is parasite in the uterus of female.
Answer: *Bonellia viridis*
6. Which type of circulatory system is found in earthworms?
Answer: Closed
7. Name Annelida in which:
Answer: (a) Clitellum is absent – *Nereis*
(b) Clitellum is permanently present – *Pheretima posthuma*
(c) Clitellum is temporarily present – *Hirudinaria granulosa*

8. The blood of which Annelida contains both haemoglobin and chlorocruorin pigments?

Answer: *Serpula*

9. Name the Annelids in which the blood vascular system is partially open.

Answer: *Arenicola* and fan worm

10. Name a marine oligochaeta.

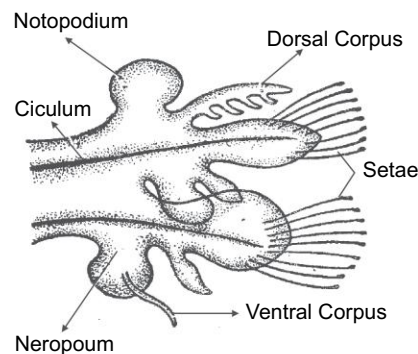
Answer: *Helodrilus*

11. What is *Heteronereis*?

Answer: *Heteronereis* is the sexual phase of *Nereis*. Its reproductive part is called epitoke while nonreproductive part is called atoke.

12. Draw a neat and labelled diagram of parapodium of *Nereis*.

Answer:



Parapodium of *Nereis*

13. What are exonephric and enteronephric nephridia?

Answer: Those nephridia that open to the outside through nephridiopores on the surface of the body wall are called exonephric nephridia, while those nephridia that do not open to the outside through nephridiopores are called enteronephric nephridia.

14. Give the location and function of blood glands in earthworms.

Answer: In earthworms blood glands are located in 4th, 5th and 6th segments and they produce blood.

15. What are chloragogen cells?

Answer: These are yellow cells present around the intestine of earthworms. They are sites of deamination of amino acids as well as synthesis of urea. They are similar to the liver of vertebrates.

16. What is the name of the body cavity of leech.

Answer: Haemocoel

17. Name the three types of nephridia found in earthworms.

Answer: (a) Pharyngeal nephridia

(b) Septal nephridia

(c) Integumentary nephridia

18. What is hirudin?

Answer: Hirudin is an anticoagulant. It is secreted by the salivary glands of leeches.

19. In which member of Annelida are parapodia, setae, cirri and gills entirely absent?

Answer: *Polygordius*

20. Name the leech which:
(a) Lacks anterior sucker
(b) Anterior segments with coelomic compartments bear setae
Answer: Acanthobdella
21. What is the significance of clitellum?
Answer: The clitellar glands of clitellum secrete cocoon.
22. What is clitellum?
Answer: Clitellum is a reproductive structure and is the characteristic of oligochaetes (though it is also present temporarily in hirudinea). In earthworms, it is located in 14th, 15th and 16th segments.
23. Mention some points favouring the argument that members of class hirudinea have evolved from oligochaetes.
*Answer: (a) Presence of clitellum and similarity in reproduction
(b) Presence of anterior setae
(c) Presence of coelomic compartments in only a single leech*
24. Mention the most striking difference between leeches and other Annelids.
Answer: In leeches, there is loss of distinct coelom.
25. What is the name of larva of phylum Annelida?
Answer: Trochophore
26. In which animal is the botryoidal tissue found?
Answer: Leech
27. Name the class of Annelida in which locomotion occurs by parapodia.
Answer: Polychaeta
28. Name a soilvorous animal.
Answer: Earthworm
29. Name a viviparous Annelid.
Answer: Ctenodrilus
30. How is digestion carried out in leeches?
*Answer: In leeches, digestion is carried out with the help of a symbiotic bacterium, *Pseudomonas hirudinis*.*

Long-Answer Questions

1. Classify phylum Annelida giving characteristics and examples of each class.
2. Write short notes on:
 - (a) *Heteronereis*
 - (b) Botryoidal tissue
 - (c) Trochophore larva
 - (d) Economic importance of earthworms

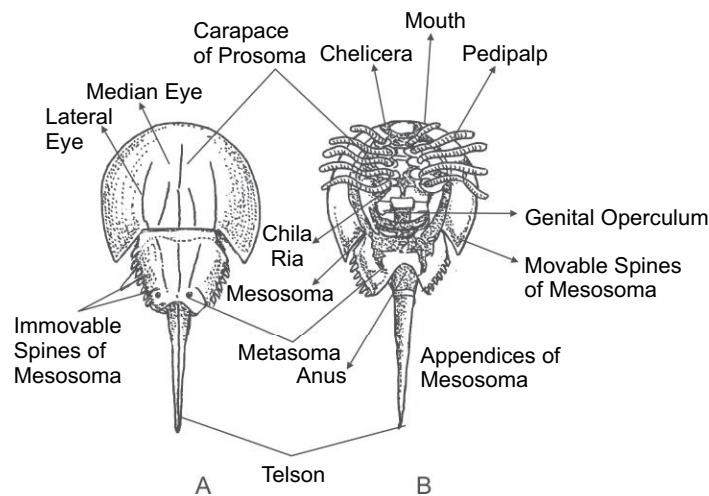
3. Draw neat and labelled diagrams of:
 - (a) TS of *Pheretima* passing through gizzard
 - (b) TS of *Pheretima* passing through intestine
 - (c) TS of a leech passing through crop
4. Classify following animals:
 - (a) *Polygordius*
 - (b) *Arenicola*
 - (c) *Nereis*
 - (d) *Chaetopteurs*

ARTHROPODA

Short-Answer Questions

1. Define Arthropoda.
 Answer: Arthropoda is the largest phylum of the animal kingdom, members of which are triploblastic, bilaterally symmetrical, have a coelom which is reduced and contain jointed appendages and body is covered with cuticle.
2. Give characteristic features of the class insecta.
 Answer: (a) Insecta is the largest class in which body is divisible into head, thorax and abdomen.
 (b) Head consists of six fused segments and bears a pair of compound eyes, a pair antennae and mouth parts which are variously modified.
 (c) Thorax is made up of three segments and each segment bears a pair of legs. Two pairs of wings are present, borne on second and third segments.
 (d) Abdomen consists of 7–11 segments and is devoid of legs.
 (e) Respiration by trachea
 (f) Excretion by Malpighian tubules
 (g) Sexes are separate
 (h) Development is generally accompanied by metamorphosis and is sometimes direct.
3. Write two reasons for the success of Arthropoda.
 Answer: (a) Presence of exoskeleton of chitin
 (b) Presence of jointed appendages
4. Name the body cavity of Arthropods.
 Answer: Haemocoel
5. Which type of circulatory system is found in Arthropoda?
 Answer: Open type
6. What are various organs of respiration in Arthropoda?
 Answer: General body surface, tracheae, gills, book gills and book lungs

7. Name excretory organs of Arthropods.
Answer: Malpighian tubules, green glands and coxal glands
8. How many pairs of walking legs are found in arachnids?
Answer: Four pairs
9. Give the number of appendages in *Palaemon*.
Answer: Nineteen pairs
10. How many segments form the head capsule of a cockroach?
Answer: Six embryonic segments
11. Name a viviparous Arthropoda.
Answer: *Palamnaeus* (Scorpion)
12. In which animal is hastate plate found?
Answer: *Palaemon*
13. Name the Arthropoda that lacks appendages and anus.
Answer: *Proteolepas*
14. Name the animal having the following characteristics:
(a) Marine
(b) Respiration by book gills
(c) Excretion by coxal or brick red glands
Answer: *Limulus* (King crab)
15. What is the name of the only crustacean which is terrestrial?
Answer: *Amadillidum*
16. Name the crustacean that causes parasitic castration to its host.
Answer: *Sacculina* (Root headed barnacle)
17. Identify the animal shown in the diagram shown in dorsal (A) and ventral (B) views. Mention its common name, respiratory organ and excretory organs.



Answer: The animal is *Limulus*. Following are some of its features:

- (a) Common name is Horseshoe crab or King crab
- (b) Respiratory organ is book gills
- (c) Excretory organ is coxal glands

18. What is the zoological name of silverfish?

Answer: *Lepisma*

19. Name some useful insects.

Answer: (a) *Apis indica* (Honeybee)

(b) *Bombyx mori* (Silkworm)

(c) *Tachardia lacca* or *Laccifer lacca* (Lac insect)

20. Name the animal which is known as the connecting link between Annelida and Arthropoda. Write its Annelidan and Arthropodan characteristics.

Answer: *Peripatus*

Annelidan characteristic	Arthropodan characteristic
(a) Segmented body	Body covered with chitinous cuticle
(b) True head is lacking	Presence of antennae
(c) Hollow and unjointed appendages	Jaws are modified appendages
(d) Simple and straight alimentary canal	Presence of haemocoel
(e) Paired segmentally arranged nephridia	Presence of trachea
(f) Presence of cilia in the reproductive tract	Pattern of development is similar to that of Arthropoda

21. What is the name of the earliest hatching stage of crustaceans?

Answer: Nauplius larva

22. What is the name of the only hermaphrodite insect in which self-fertilisation occurs?

Answer: *Icerya purchasi*

23. Which crustacean is found in salt lakes and ponds?

Answer: *Artemia*

24. Name the animal which is colourless in well-aerated water and pink in stagnant water.

Answer: *Daphnia*

25. In which crustacean was luminescence first observed?

Answer: Ostracods (*Vargula*, *Cypridina* and *Conchoecia*)

26. Name the most important commercial shrimp.

Answer: *Penaeus*

27. Give one difference between *Culex* and *Anopheles*.

Answer: *Culex* sits parallel to the surface while *Anopheles*' body remains inclined at an angle of 45 degrees to the surface.

28. In which group of animals are males killed by females (in some species) after copulation?

Answer: Spiders

29. What is the significance of ootheca in cockroaches?

Answer: Fertilisation of eggs occurs in ootheca. Development of eggs up to the nymph stage takes place in the ootheca as well.

30. Name the different mouth parts found in insects with examples.
Answer: (a) Biting and chewing type – Cockroach
(b) Siphoning type – Butterfly
(c) Piercing and sucking type – Mosquito
(d) Chewing and lapping type – Honeybee
(e) Sponging type – Housefly
31. Name two insects which are harmful to humans.
Answer: (a) *Eutermes* (Termite)
(b) *Schistocerca gregaria* (Migratory desert locust)
32. Write the name of larva of:
(a) Silkworm
(b) Honeybee
(c) Mosquito
(d) Housefly
Answer: (i) Caterpillar
(ii) Grub
(iii) Wiggler
(iv) Maggot
33. Which species of mosquitoes are known to spread dengue fever?
Answer: *Aedes aegypti*
34. Give the name of respiratory organs of a scorpion.
Answer: Four pairs of book lungs
35. How many pairs of spiracles are found in cockroaches?
Answer: 10 pairs (Two pairs in thorax and eight pairs in abdomen)
36. How can male and female cockroaches be identified externally?
Answer: By the presence of a pair of anal styles in the 9th abdominal segment of male cockroaches, which are absent in female cockroaches.
37. Name that gland of cockroaches, the secretion of which helps in the formation of ootheca.
Answer: Collateral gland
38. What is mosaic vision?
Answer: Compound eyes are found in Arthropods, which are made up of a large number of ommatidia (Ommatidium is the structural and functional unit of the compound eye) and each ommatidium forms an independent image. Thus a part of the image is formed in each ommatidium. These collectively form a compound image known as mosaic vision.
39. Which type of image is formed by compound eyes in dark and bright light?
Answer: Superposition image in dark light and apposition image in bright light
40. In cockroaches, only apposition image is formed. Give reason.
Answer: Because in cockroaches, pigment cells do not contract.
41. What are halteres?
Answer: In mosquitoes and housefly, the second pair of wings is greatly reduced and becomes spine-like. These wings are called halteres, and they maintain the balance of the body during flight.

42. What are ozenocytes?
Answer: Ozenocytes are cells found in adult cockroaches in between hypodermal cells and the basement membrane. They secrete wax (lipids), which is transmitted to the surface of the cuticle.
43. What are elytra?
Answer: The first pair of wings of a cockroach is called elytra.
44. Ommatidia of which insect contains receptor for both green colour and ultraviolet rays.
Answer: Bees
45. What are centipedes?
Answer: Centipedes are fast moving, terrestrial, venomous and predatory Arthropods with long bodies and jointed legs.

Long-Answer Questions

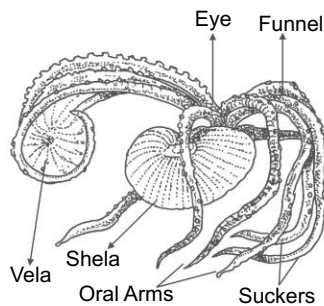
1. Give the general characters of phylum Arthropoda and classify it up to classes giving important characters and examples.
2. Write short notes on:
 - (a) Book lung
 - (b) Book gill
 - (c) Statocyst
 - (d) Parasitic castration
3. Give an account of mouth parts of insects.
4. Classify following animals giving suitable characters:
 - (a) *Limulus*
 - (b) *Sacculina*
 - (c) Scorpion
 - (d) Hermit crab
 - (e) *Scolopendra*
5. Draw a diagram of *Palaemon* showing antennules, walking legs, pleopods and uropods.
6. Draw a neat and well-labelled diagram of the nervous system of *Palaemon*.
7. Write short notes on:
 - (a) Malpighian tubules
 - (b) Coxal glands
 - (c) Economic importance of insects
 - (d) Nauplius larva

MOLLUSCA

Short-Answer Questions

1. Define Mollusca.
Answer: Mollusca is the second largest phylum, which includes triploblastic, soft-bodied, bilaterally symmetrical, unsegmented, coelomate animals which are generally shelled.
2. A typical Mollusca body is differentiated into how many parts?
Answer: Three parts—Head, foot and visceral mass
3. What is radula?
Answer: Radula is a special rasping organ found in many Mollusca. It is a chitinous sheath which bears many teeth.
4. Which type of circulatory system is found in Mollusca?
Answer: Open type
5. Name the respiratory pigment of *Aplysia*.
Answer: In *Aplysia*, respiratory pigment is absent.
6. Name three neurologically advanced Molluscs.
Answer: *Sepia*, Squid and *Octopus*
7. Name the class of Mollusca, whose members lack radula.
Answer: Bivalvia
8. Name the oldest known cephalopod fossil.
Answer: *Plectronoceras*
9. What is the function of osphradium?
Answer: Osphradium tests the physical and chemical nature of water.
10. Name two types of sperm found in *Pila*.
Answer: (a) Eupyrene sperms, which are small, having head, middle piece and tail. They are able to fertilise the ova.
(b) Oligopyrene sperms having tail with 3–5 cilia and are unable to fertilise the ova.
11. Which larva of Mollusca is an ectoparasite on fishes?
Answer: Glochidium larva
12. In which Mollusca does the female possess a shell, which is absent in the male?
Answer: *Argonauta* (Paper Nautilus)
13. Which pearl oysters produce the finest natural pearls?
Answer: *Pinctada margaritifera* and *Pinctada mertens*
14. Name some bivalves whose blood contains extracellular or intracellular haemoglobin.
Answer: *Arca*, *Lima* and *Noetia*

15. What is a mantle?
Answer: A mantle is a muscular, vascular and glandular fold of the dorsal body wall, which covers the body.
16. Name the only Mollusca which uses phosphate to construct its body parts.
Answer: *Cobcrephora*
17. Name the Mollusca in which shell is:
Answer: (a) Absent – *Octopus* (Devil fish)
(b) External – *Pila* (Apple snail)
(c) Internal – *Sepia* (Cuttlefish)
18. Give the name of the only cephalopod that possesses osphradium.
Answer: *Nautilus*
19. Name a viviparous Mollusca.
Answer: *Callistochiton viviparous*
20. Name the Molluscs that use their foot for jet propulsion.
Answer: Cephalopods
21. Are pearls formed by freshwater or marine species of Molluscs?
Answer: Pearls are formed by both marine and freshwater species.
22. Name the features of cephalopods that are directly or indirectly related to their active mode of life.
Answer: (a) Closed vascular system
(b) Well-developed eyes
(c) Accessory branchial hearts
(d) Complex nervous system
(e) Presence of chromatophores and ink gland
(f) Lack of gill cilia
23. What is ink gland?
Answer: Ink gland is a sac-like structure present on the posterior end of the mantle cavity in members of class cephalopoda. A duct from it opens into the rectum near the anus. It secretes ink, which is used for self-defence and capturing of prey.
24. Write the names of three harmful Molluscs.
Answer: (a) *Teredo* (b) Slugs (c) *Octopus*
25. Identify the animal shown in the diagram. Give its common name and phylum.



Answer: *Octopus*. Its common name is devil fish. It belongs to phylum Mollusca and class cephalopoda.

26. Name the larvae of Mollusca.
Answer: Trochophore, veliger and glochidium
27. What are the characteristic features of the nervous system of *Pila*?
(a) The visceral mass is twisted into a figure of '8' due to torsion.
(b) Most ganglia (except the visceral) become concentrated near the buccal mass.
28. Which is the largest class of the phylum Mollusca?
Answer: Gastropoda
29. What is the zoological name of shipworm?
Answer: *Teredo*
30. Which cephalopoda swims backward, except at the time of feeding?
Answer: *Nautilus*
31. In which bivalvia is the foot completely absent?
Answer: *Ostrea*
32. Name the Mollusca which lack eyes.
Answer: *Cirrothauma*
33. Name a boring bivalve that undergoes a sex change.
Answer: *Xylophaga*
34. Give the zoological name of Indian pearl star.
Answer: *Pinctada vulgaris*
35. Name a Mollusca that exhibits complete detorsion.
Answer: *Doris* (Sea lemon)

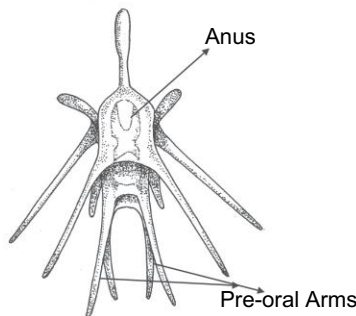
Long-Answer Questions

1. Classify Mollusca giving characteristic features and examples of each class.
2. Give an account of torsion in gastropods.
3. Draw a labelled diagram of nervous system of *Pila* and *Sepia*.
4. Give an account of modification of foot in gastropoda.
5. Write short notes on:
(a) Economic importance of Mollusca
(b) Glochidium larva
(c) Pearl formation
(d) Radula
(e) Osphradium
6. Draw diagrams of *Unio*:
(a) Passing through posterior region of gill
(b) Passing through middle of foot

ECHINODERMATA

Short-Answer Questions

1. Write the three main characteristics of Echinodermata.
Answer: (a) Body is covered with calcareous ossicles and dermal spines
(b) Presence of water vascular system
(c) Larvae are bilaterally symmetrical, while adults are radially symmetrical
2. Name the phylum whose members are exclusively marine.
Answer: Echinodermata
3. Which type of circulatory system is found in Echinoderms?
Answer: Open type, which is reduced and also known as the haemal system
4. What is madreporite?
Answer: Madreporite is a small disc-like perforated structure located on the aboral surface of the starfish through which water enters the body.
5. What is the function of tube feet?
Answer: Tube feet help in locomotion, respiration, food capturing as well as anchoring of the body to the substratum.
6. What is the water vascular system?
Answer: Water vascular system is a system of canals filled with sea water in the body of Echinoderms, which functions in gas exchange, feeding and secondarily in locomotion. It is derived both from hydrocoel and axocoel.
7. Identify the larva shown in the diagram.



Answer: Pluteus larva of sea urchin

8. Name a hermaphrodite asteroid species.
Answer: *Asterina gibbosa*
9. Name the species of starfish in which brachiolaria larva is never formed.
Answer: *Astropecten*, *Ludia* and *Asterina*

10. Name the commensal Echinoderms.
Answer: Ophiuroids
11. Name a six-armed Ophiuroids.
Answer: Ophiactis
12. What is the name of pedicellariae of echinoids that contain poison glands?
Answer: Globiferous pedicellariae
13. In which echinoids is Aristotle's lantern absent?
Answer: Heart urchins
14. What is the name of the opening of the water vascular system?
Answer: Madreporite
15. In which group of Echinoderms are distinct gonads lacking?
Answer: Crinoids
16. What are cuvierian tubules?
Answer: Cuvierian tubules are sticky tubules found in holothurians, which are discharged at a potential predator.
17. What are tube feet?
Answer: Tube feet are tentacle-like structures found in Echinoderms, having suction pads at their extremities. They are hydraulically controlled by the water vascular system.
18. Name one of the largest and most venomous starfish.
Answer: Acanthaster planci (Crown of thorns)
19. What are pedicellariae?
Answer: Pedicellariae are spine-like small structures present on the body of Echinoderms, which are mesodermal in origin and are generally embedded in the dermis. They provide protection.
20. Name the animal in which respiratory trees are found?
Answer: Cucumaria (Sea cucumber)
21. Name the larval form of sea cucumber.
Answer: Auricularia
22. What is Aristotle's lantern?
Answer: Aristotle's lantern is a biting and chewing apparatus present in some members of echinoidea (Sea urchin).
23. Name the Echinoderms in which autotomy serves as a form of asexual reproduction.
Answer: Allostichaster polyplax and Coscinasterias calamaria. In these species the body is broken into unequal parts and then the missing limbs are regenerated.
24. Which echinoderm is harmful to the pearl industry?
Answer: Asterias (Starfish)
25. Name two predators of starfish.
*Answer: (a) Charonia tritonis (Triton trumpet)
(b) Trapezia sp. (Reef crab)*
26. How does the starfish capture its prey?
Answer: The stomach is extruded over the prey, and thus the digestive organs surround the prey. The

digestive juices that are secreted liquefy soft tissues of the prey. Thereafter, the digested mass along with the stomach is sucked up.

27. What is ambulacral groove?

Answer: Ambulacral groove is a groove containing tube feet running down below the oral surface of Echinoderms.

28. In which groups of Echinoderms is the digestive system incomplete?

Answer: Ophiuroidea

Long-Answer Questions

1. Classify the phylum Echinodermata up to classes, mentioning characters and examples of each class.
2. Give an account of water vascular system in Echinoderms.
3. Describe the characteristics of the phylum and class to which *Asterias* belongs.
4. Write short notes on:
 - (a) Aristotle's lantern
 - (b) Madreporite
 - (c) Pedicellariae
 - (d) Tube feet
 - (e) *Holothuria*
5. Draw neat and labelled diagrams of larval forms of Echinoderms.
6. Classify following animals giving suitable reasons:
 - (a) *Echinus*
 - (b) *Antedon*
 - (c) Basket star
 - (d) *Ophiothrix*
7. Draw diagrams of straight-type and crossed-type pedicellariae.

CHORDATA

Short-Answer Questions

1. What is Chordata?
Answer: Animals having a notochord are called chordata.

2. Who created the phylum Chordata?
Answer: Balfour (1880)
3. Write three distinguishing characteristics of chordata.
Answer: (a) Presence of notochord
(b) Presence of dorsal tubular nerve cord
(c) Presence of pharyngeal gill slits
4. Write four points about notochord.
(a) Notochord is a flexible, rod-like structure present in the embryo of all chordates.
(b) It is formed by cells derived from the mesoderm.
(c) It is found ventral to the neural tube.
(d) In some animals, it persists throughout life while in others (vertebrates), it becomes transformed into the vertebral column
5. Write important characteristics of protochordata.
Answer: (a) Exclusively marine
(b) Head, skull, vertebral column, jaws and brain are lacking
(c) Sexes are separate or united
(d) Gonoducts generally absent
(e) Development indirect with free-swimming larval stage
6. Give an example of typical chordata.
Answer: *Amphioxus*
7. Give two degenerate characters of *Amphioxus*.
(a) Lack of endoskeleton (cartilaginous or bony)
(b) Lack of gonoducts
8. Give the unique features of the circulatory system of *Amphioxus*.
Answer: It is without heart and respiratory pigment.
9. Distinguish between agnatha and gnathostomata.
Answer:

Agnatha	Gnathostomata
(a) Paired appendages are absent	Paired appendages are present
(b) True jaws are absent	True jaws are present
(c) Notochord persists in adults	Notochord may persists in adults or modified into vertebral column
(d) There are two semicircular canals in the internal ear	There are three semicircular canals in the internal ear
10. Name the excretory organs of *Herdmania*.
Answer: Neural gland, pyloric gland and nephrocytes
11. In which subphylum of protochordata is the oral hood present?
Answer: Cephalochordata
12. Give five characteristics that differentiate cephalochordata from urochordata.

Answer:

Characteristics	Cephalochordata	Urochordata
(a) Segmentation	Present	Absent
(b) Test	Absent	Present
(c) Nephridia	Present	Absent
(d) Heart	Absent	Present
(e) Sex	Unisexual	Bisexual
(f) Adult	Free swimming	Sedentary

13. Write the chief characteristics of urochordata.

Answer: (a) Exclusively marine and solitary or colonial forms

(b) Body covered with test

(c) Adults are unsegmented, without paired appendages with degenerate body

(d) Blood vascular system open

(e) Notochord is present only in larval tail

(f) Mostly hermaphrodite

(g) Metamorphosis is retrogressive

14. What is retrogressive metamorphosis?

Answer: Retrogressive metamorphosis involves transformation of advanced larva into simple adult. It is the characteristic of ascidians, the larva of which bears all the chordate characters which are absent in the adult.

15. In which animal is the notochord present only in larval tail?

Answer: *Herdmania*

16. What is notogenesis?

Answer: Notogenesis is the formation of notochord.

17. Name some animals that retain the post-embryonic notochord.

Answer: *Amphioxus*, tunicate larvae, lamprey, hagfish and African lungfish

18. What are vertebrates?

Answer: Animals having vertebral column are called vertebrates.

19. Name the urochordata that retains larval characteristic throughout life and shows neoteny.

Answer: *Oikopleura*

20. Name a urochordata which is dimorphic and exhibits alternation of generation.

Answer: *Salpa*

21. Name a viviparous urochordata.

Answer: *Clavellina*

22. Name the colonial thaliacean which is luminescent and lacks tailed larval stage.

Answer: *Pyrosoma*

23. Why is the coelom greatly reduced in ascidians?

Answer: Due to great development of atrium

24. What is the significance of ascidian tadpole larva?

Answer: (a) The ascidian larva provides the basis for inclusion of ascidians under the phylum chordata, as larva possesses chordate characteristic.

(b) Adult ascidians are sedentary but the larvae are free swimming and thus help in the dispersal of the species

25. Write the differences between anamniota and amniota.

Answer:

Anamniota	Amniota
(a) Mainly aquatic	Mainly terrestrial
(b) Two pairs of fins or limbs	Generally two pairs of pentadactyl limbs
(c) Cold blooded	Warm blooded
(d) Cranial nerves–10 pairs	Cranial nerves–12 pairs
(e) Kidneys are mesonephric	Kidneys are metanephric
(f) Males lack copulatory organs	Males with copulatory organs (except birds)
(g) Fertilisation is external	Fertilisation is internal
(h) Development is indirect	Development is direct
(i) Amnion is absent	Amnion is present
(j) Includes Cyclostomata, Pisces and amphibia	Includes, reptiles, birds and mammals.

26. How many pairs of cranial nerves are present in hagfish?

Answer: Eight pairs

27. Name the larva of *Petromyzon*.

Answer: Ammocoete

28. In which Cyclostomata is only one semicircular canal present?

Answer: *Myxine* (Hagfish)

29. Which type of egg is found in *Petromyzon*?

Answer: Telolecithal

30. Name the muscle that assists in the sucking action of buccal funnel?

Answer: Radial muscles

31. Name the earliest jawed vertebrates.

Answer: Placoderms

32. During which period did placoderms flourish?

Answer: Devonian

Long-Answer Questions

1. Classify phylum chordata up to classes, giving characters and examples.
2. Give the general characteristic of vertebrates.

PISCES

Short-Answer Questions

1. What is ichthyology?
Answer: The science dealing with the study of fishes is called ichthyology.

2. What is pisciculture?
Answer: Rearing and capturing of fishes is known as pisciculture.

3. Name the golden age of fishes.
Answer: Devonian

4. Write differences between cartilaginous and bony fishes.
Answer:

Cartilaginous fishes	Bony fishes
(a) Cartilaginous endoskeleton	Bony endoskeleton
(b) Mouth is ventral	Mouth is terminal
(c) 5–7 pairs of gills	4 pairs of gills
(d) Operculum is absent	Operculum is present
(e) Swim bladder is absent	Swim bladder is present
(f) Spiral valve is present	Spiral valve is absent
(g) Sexual dimorphism is present due to presence of claspers in males	Sexual dimorphism is absent

5. What is a venous heart?
Answer: The heart containing only deoxygenated blood is called venous heart. Such a heart is found in *Scoliodon* and other fishes (except Dipnoi).

6. Name the fish in which the labyrinthine organ is found.
Answer: *Anabas testudineus* (Climbing perch)

7. Write two characteristic features of fishes.
Answer: (a) Presence of paired fins with fin rays
 (b) Presence of gills borne on gill arches

8. Name various types of scales found in fishes.
Answer: (a) Placoid scale
 (b) Cycloid scale
 (c) Ctenoid scale
 (d) Ganoid scale
 (e) Cosmoid scale

9. In which group of fishes are scales derived, both from epidermis and dermis?
Answer: Elasmobranchs

10. In which fish is the electric organ derived from the tail muscle?
Answer: *Electrophorus* and skates
11. Name the most primitive caudal fin.
Answer: Protocercal
12. Name the fish in which pelvic fins are modified to form a brood pouch.
Answer: Male *Hippocampus* (Sea horse)
13. What is the number of freshwater fish species in India?
Answer: 801
14. Who worked on the Indian dogfish (*Scoliodon sorrakowah*) for the very first time?
Answer: E M Thillayapallam first worked on *Scoliodon sorrakowah*, and his work was published in 1928 in the series of *Indian Zoological Memoirs*.
15. Which type of scale is found in *Scoliodon*?
Answer: Placoid scale
16. How many pairs of gill slits are found in *Scoliodon*?
Answer: Five pairs
17. Which type of dentition is found in *Scoliodon*?
Answer: Homodont, ployphyodont and lyodont
18. What are claspers?
Answer: In dogfish, the medial part of pelvic fins becomes modified for transferring sperms during copulation, called claspers.
19. Write characteristic features of Dipnoi.
Answer: (a) They are commonly known as lungfishes
(b) Air bladder is modified to form lung for aerial respiration
(c) Pre-maxillae or maxillae are absent
(d) Internal nares are absent and spiracles absent
(e) Pectoral and pelvic fins are modified to form lobed or filamentous fins
20. Name the three living genera of lungfishes.
Answer: (a) *Protopterus*
(b) *Neoceratodus*
(c) *Lepidosiren*
21. What are weberian ossicles?
Answer: Weberian ossicles are a chain of four bony pieces which connect the anterior end of the air bladder with the membranous labyrinth.
22. Name two fishes that show warm-blooded adaptations.
Answer: Tuna and swordfish
23. What is swim bladder?
Answer: The swim bladder is an elongated air-filled sac present just below the vertebral column in bony fishes, which keeps the fish buoyant and prevents it from sinking when it stops swimming.
24. Name the fishes in which parental care is done through:
Answer: (a) Coiling round eggs – *Pholis*
(b) Nest building – *Gasterosteus aculeatus* (Stickleback)

- (c) Shelter in mouth – *Tilapia*
 (d) Mermaid's purse – *Scyllium*
 (e) Viviparity – *Cyamatogaster aggregatus*
25. Which type of scale is found in ganoid fishes?
 Answer: Ganoid
26. Name two fishes in which scales are absent.
 Answer: (i) *Heteropneustes fossilis* (Singhi)
 (ii) *Wallago attu*
27. Name a viviparous fish.
 Answer: *Cyamatogaster aggregatus*
28. What is mermaid's purse?
 Answer: Oviparous sharks lay fertilised eggs inside a protective horny egg covering called mermaid's purse.
29. Define catadromous and anadromous migration. Give examples.
 Answer: Movement from freshwater to seawater is known as catadromous migration (e.g., *Anguilla*), while movement from seawater to freshwater is known as anadromous migration (e.g., *Hilsa*).
30. What is the difference between drying oil and semidrying oil?
 Answer: Oil rich in iodine content is called drying oil, while oil poor in iodine content is called semi-drying oil.
31. What is isinglass?
 Answer: Isinglass is a gelatinous product obtained from the air bladder of certain fishes (carps, perches, salmons and catfishes). It is used for making jellies, clarification of wines and beer.
32. What are ampullae of Lorenzini?
 Answer: Ampullae of Lorenzini are sensory canals in sharks. They are in the form of a network of jelly-filled canals. They respond to a weak electric field and possibly respond to water pressure, temperature and salinity.
33. Give the uses of scales.
 Answer: (a) Scales form protective covering
 (b) The arrangement, number, type and structure of scales help in the identification and classification of a species of a fish
 (c) Scales help in the determination of age

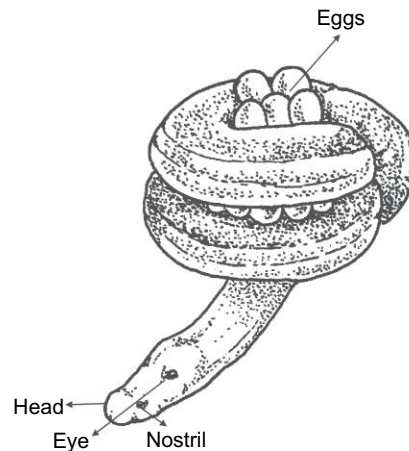
Long-Answer Questions

1. Describe general characters of fishes.

AMPHIBIA

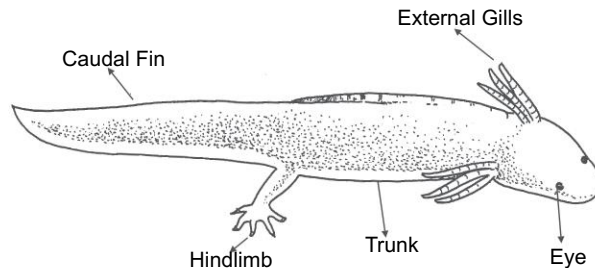
Short-Answer Questions

1. Which animal group is regarded as intermediate between fishes and reptiles?
Answer: Amphibia
2. Name the amphibian having following characteristics:
(a) Long slender worm-like body
(b) Limbs and girdles are lacking
(c) Minute dermal scales buried in the skin
(d) Internal fertilisation
Answer: Ichthyophis
3. Name the toad that fertilises its eggs internally.
Answer: Ascaphus truei
4. What is neoteny?
Answer: Retention of sexual maturity during larval stage is known as neoteny.
5. What is the common name of *Gastrotheca*?
Answer: Marsupial frog
6. Which one is the smallest frog?
Answer: Phylllobates limbatus
7. Identify the animal shown in the diagram. Give its two main features.



Answer: The animal is *Ichthyophis*. Its two important features are:
(i) It is a limbless amphibian
(ii) Skin contains concealed calcified scales and females guard the eggs

8. Identify the larva shown in the diagram and mention the phenomenon associated with it.



Answer: Axolotl larva of *Ambystoma tigrinum*. It exhibits the phenomenon of neoteny.

9. What are tadpoles?

Answer: Tadpoles are the immature (larval) forms of the frog that hatch from the egg.

10. Why do Amphibians lay eggs in water?

Answer: Amphibians lay eggs in jelly-like masses and if the eggs are not covered with water, they will dry up and die, as eggs lack egg shells like reptiles and birds.

11. Eggs of most amphibians become larger after they are laid?

Answer: Because eggs absorb water and they swell up several times higher than their original volume

12. What is indicated by the presence or absence of a lot of frogs in an area?

Answer: The presence of a lot of frogs in an area is indicative of good environment and likewise sudden decline in the number or absence of frogs indicates changing environment.

13. When did the earliest known frog appear?

Answer: The earliest known frog appeared in the late Jurassic period (190 million years ago).

14. What is difference between frogs and toads?

Answer: Frogs have generally smooth and slippery skin, long legs and good jumping ability, and they lay eggs in a cluster. Toads have rough, warty skin and chunky bodies with short hind legs, a modest hopping ability and lay eggs in long chains, clusters or singly.

15. How many occipital condyles are found in the amphibian skull?

Answer: Two (Dicondylie)

16. Name the larva that shows neoteny.

Answer: Axolotl larva

17. Give one example of each with reference to amphibia:

Answer: (a) Viviparity – *Typhlonectes*
 (b) Carrying of eggs in vocal sacs – *Rhinoderma darwinii*
 (c) Male that keeps larvae in mouth – *Arthroleptis*
 (d) Mud nest – *Hyla fabre*
 (e) Coiling around eggs – Female *Ichthyophis*

18. Which amphibian is used as a test in diagnosis of human pregnancy?

Answer: *Xenopus laevis*

19. In which continent are *Bufo* not found?

Answer: Australia

Long-Answer Questions

1. Classify modern amphibians giving characters and examples of each order.
2. Give an account of parental care in amphibia.
3. Write short notes on:
 - (a) Neoteny
 - (b) Economic importance of amphibia
 - (c) *Rana goliath*
 - (d) Anura

REPTILIA

Short-Answer Questions

1. Name the first class of vertebrates that adapted for terrestrial mode of life.
Answer: Reptilia
2. What is herpetology?
Answer: Herpetology is the study of reptiles.
3. Name living orders of class reptilia giving examples of each class.
Answer: (a) Chelonia – *Chelone*
(b) Rhynchocephalia – *Sphenodon*
(c) Squamata – *Draco*
(d) Crocodilia – *Alligator*
4. Which type of jaw suspension is found in reptiles?
Answer: Streptostylic
5. Name a poisonous lizard and state where it is found.
Answer: *Heloderma* which is found in America
6. In which reptile is the heart four chambered?
Answer: Crocodiles
7. What is foramen of panizza?
Answer: In crocodiles, both systemic arches are connected by a small opening at their base, which is called foramen of panizza.
8. Name the reptile having large and short sinus venosus.
Answer: Sinus venosus is large in turtles and small in snakes.

9. Write five differences between lacertilia and ophidia.

Answer:

Lacertilia	Ophidia
(a) Eyelids are movable	Eyelids are immovable
(b) Nictitating membranes are present	Nictitating membranes are absent
(c) Sternum, episternum and urinary bladder generally are present	Sternum, episternum and urinary bladder are absent
(d) Single occipital condyle	Triple occipital condyle
(e) Jugal bone is present	Jugal bone is absent

10. What is *Barkudia*?

Answer: *Barkudia* is a limbless lizard.

11. T-shaped interclavicle is the characteristic of which class?

Answer: Reptilia

12. Reptilian skull is monocondylic or dicondylic?

Answer: Monocondylic

13. Name a reptile which can change its colour.

Answer: *Chameleon*

14. Name a mammal-like reptile.

Answer: *Pelycosauria*

15. Which type of vertebrae is found in squamata?

Answer: Procoelous

16. What are carapace and plastron?

Answer: The exoskeleton of chelonia is in the form of an armoured shell of bony plates, consisting of two pieces—the dorsal carapace and the ventral plastron. The carapace consists of several plates, while plastron consists of nine pieces.

17. What are fangs?

Answer: Fangs are certain specialised maxillary teeth of poisonous snakes, which are attached to maxillary bones. They are long, curved, sharp and pointed and act as a syringe to inject poison into the victim.

18. Give examples of snakes whose poison is (a) neurotoxin and (b) haemotoxin.

Answer: (a) Neurotoxin – Cobra

(b) Haemotoxin – Viper

19. Name a viviparous snake.

Answer: *Hydrophis*

20. What are the different steps involved in the biting mechanism of snakes?

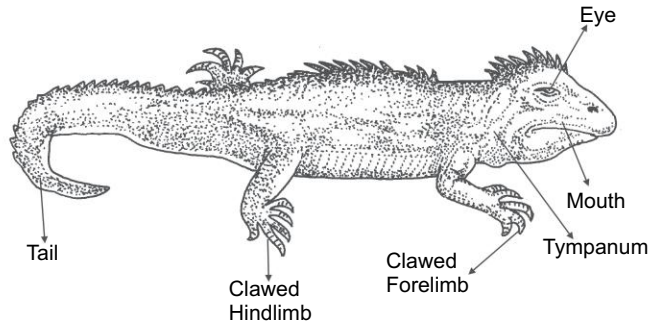
Answer: (a) Opening of mouth

(b) Rotation of maxilla

(c) Closure of the mouth

(d) Injection of venom

21. Identify the animal shown in the diagram. Give its five unique features.



Answer: The animal is *Sphenodon punctatum*. Its five important features are:

- (a) It is found in New Zealand and is commonly known as tuatara.
 - (b) It is the single representative of the order rhynchocephalia
 - (c) It persisted from very earlier times (Permian)
 - (d) It lacks a copulatory organ and pecten in eyes
 - (e) A pineal or parietal or third eye is present
22. Name the largest poisonous snake.
Answer: *Ophiophagus hannah* (King cobra)
23. How will you differentiate between a cobra and coral snake?
Answer: In cobras the hood is present but in coral snakes it is absent.
24. Name the largest Indian pitless viper.
Answer: *Vipera russelli* (Russell's viper)
25. How is antivenin prepared?
Answer: Antivenin is prepared by injecting increased dosages of snake venom into a horse until the horse becomes fully immunised. The blood serum is separated and preserved, known as antivenin.
26. Which is the largest snake in the world?
Answer: The largest snake in the world belongs to the family boidae, which includes boa and python.
27. Name the snake that spits or ejects venom in a fine spray.
Answer: *Naja nigricollis* (Black-necked cobra)

Long-Answer Questions

1. Classify living reptiles up to orders, giving their characteristic features and examples.
2. Write short notes on:
 - (a) *Sphenodon*
 - (b) *Seymouria*
 - (c) Significance of reptilian skull

- (d) Poisonous snakes
(e) Snake venom
3. Draw a labelled diagram of the skull of a poisonous snake showing biting mechanism.

AVES

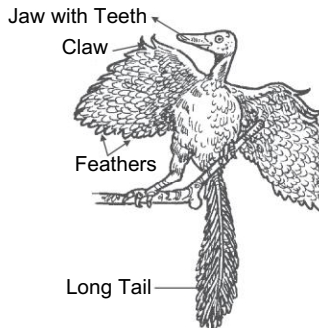
Short-Answer Questions

- What are birds?
Answer: Birds are endothermic, feathered, winged, bipedal and egg-laying group of vertebrates, having the ability to fly.
- Which ability of birds distinguishes them from other vertebrates?
Answer: Ability to fly
- During which period did birds evolve?
Answer: During Mesozoic era from reptiles (150 million years ago)
- Write the three main characteristics of birds which are not found in any other group.
Answer: (a) Presence of feathers
(b) Presence of bills
(c) Presence of wishbone (furcula)
- Name two super orders of the subclass neornithes.
(a) Palaeognathae
(b) Neognathae
- What are the chief differences between carinatae and ratitae?
Answer:

Carinatae	Ratitae
(a) Includes all flying birds	Includes all flightless birds
(b) Down feathers are present	Down feathers are absent
(c) Sutures in skull are absent	Sutures are persistent
(d) Pygostyles are well developed	Pygostyle is absent or poorly developed
(e) Uropygial gland is present	Uropygial gland is absent
(f) Syrinx is present	Syrinx is absent (except rhea)
(g) Copulatory organ is absent	Copulatory organ is present

- Name the birds that keep eggs between their body and feet.
Answer: Male emperor penguins
- Which type of kidney is found in birds?
Answer: Metanephric
- In birds, which muscles are well developed for flight?
Answer: Pectoral muscles

10. Name the first vertebrate to have warm blood.
Answer: Birds
11. What is the name of the V-shaped bone found in birds?
Answer: Furcula (Wishbone)
12. What is syrinx?
Answer: Syrinx is the sound box of the birds.
13. What is the name of the comb-like structure found in the eye of birds?
Answer: Pecten. It is found in all birds except kiwi.
14. Which feathers form the general body covering of bird?
Answer: Contour feathers
15. What is pterylosis?
Answer: The arrangement of feathers on the body of birds is known as pterylosis.
16. Name two birds that cannot fly.
Answer: Penguins and ratites
17. What is synsacrum?
Answer: Synsacrum is a skeletal structure in birds, which is formed by the fusion of the last few vertebrae with the pelvis.
18. Name a bird having binocular vision.
Answer: Owl
19. What is uropygial gland?
Answer: Uropygial gland is a gland in the base of most birds. It secretes an oily substance which is used by birds for preening.
20. How do birds ventilate their lungs?
Answer: Birds ventilate their lungs by means of air sacs.
21. What is crop milk?
Answer: Crop milk is the secretion of lining of the crop in parent birds (pigeon, flamingo, some penguins and dove) which is regurgitated to young birds.
22. Name the birds having two foveas in each eye.
Answer: Humming bird and albatrosses
23. Name the bird shown in the diagram?



Answer: *Archaeopteryx*. It is a connecting link between reptiles and birds.

24. How many air sacs are found in pigeons?
Answer: In pigeons there are nine major air sacs.

Long-Answer Questions

1. Describe characteristics of birds and add a note on their economic importance.
2. Write short notes on:
 - (a) *Archaeopteryx*
 - (b) Flight adaptations in birds
 - (c) Migratory birds
4. Give an account of palate in birds.

MAMMALIA

Short-Answer Questions

1. Give three characteristics of mammals.
Answer: (a) Presence of hair on the body
(b) Presence of external ears (Pinnae)
(c) Presence of mammary glands
2. Name the subclasses of mammals.
Answer: (a) Prototheria
(b) Metatheria
(c) Eutheria (Placentalia)
3. Give one example each of:
Answer: (a) Prototheria – *Echidna*
(b) Metatheria – *Macropus* (Kangaroo)
(c) Pholidota – *Manis* (Pangolin)
(d) Artiodactyla – *Bos indicus* (Ox)
(e) Sirenia – *Halicore* (Dugong)
4. Name characteristic features of primates.
Answer: (a) Presence of epidermal hairs on the body
(b) Presence of mammary glands
(c) Presence of external ears
(d) Forward eyes with binocular and stereoscopic vision

5. Write five peculiar characteristics of *Echidna*.
Answer: (a) Egg-laying mammals
(b) Milk gland without teats
(c) Marsupial or epipubic bone present
(d) Imperfectly warm-blooded
(e) Presence of tarsal spurs in males
6. During which era did mammals evolve?
Answer: Mammals evolved during the Mesozoic era (Triassic period) from reptiles.
7. How many occipital condyles are found in mammals?
Answer: Two (Dicondylic)
8. Name the tallest animal in the world.
Answer: Giraffe
9. Name the largest flying mammal.
Answer: Black flying fox
10. Name the mammals having the maximum number of nipples.
Answer: Pigs and short-tailed opossum of the genus *Monodelphis* has 27 nipples.
11. Name the two shortest mammals.
Answer: Shrews and bats
12. Name the order of class mammalia whose members are fully aquatic.
Answer: Cetacea
13. Name a eusocial mammal in which the queen mates with several males.
Answer: Naked mole rat
14. Name the main channel of perception in chiroptera.
Answer: Echolocation
15. Name the mammals having chemical defence.
Answer: Skunk
16. Name the only marsupial found in the northern hemisphere.
Answer: *Didelphis virginiana* (opossum)
17. Name the bone which found in metatheria but not in other mammals.
Answer: Epipubic
18. Name metatheria that lack the chevron bone.
Answer: Koala and wombats
19. What is a diaphragm?
Answer: Diaphragm is a muscular septum in mammals that divides the body cavity into thoracic cavity and abdominal cavity.
20. Name the mammals that lack corpus callosum.
Answer: Prototheria (e.g., *Echidna*)
21. In which mammal is the tail well developed and aids in balancing?
Answer: *Macropus* (Kangaroo)

22. What is marsupium?

Answer: Marsupium is a fold of skin on the ventral side of a female kangaroo, which is supported by the epipubic bone. Immature young ones are nourished in it.

23. How many bones form the lower jaw of mammals?

Answer: Only one bone known as dentary on each side

24. What is the characteristic feature of the mammalian brain?

Answer: Presence of corpus callosum, which is not found in any other group of animals

Long-Answer Questions

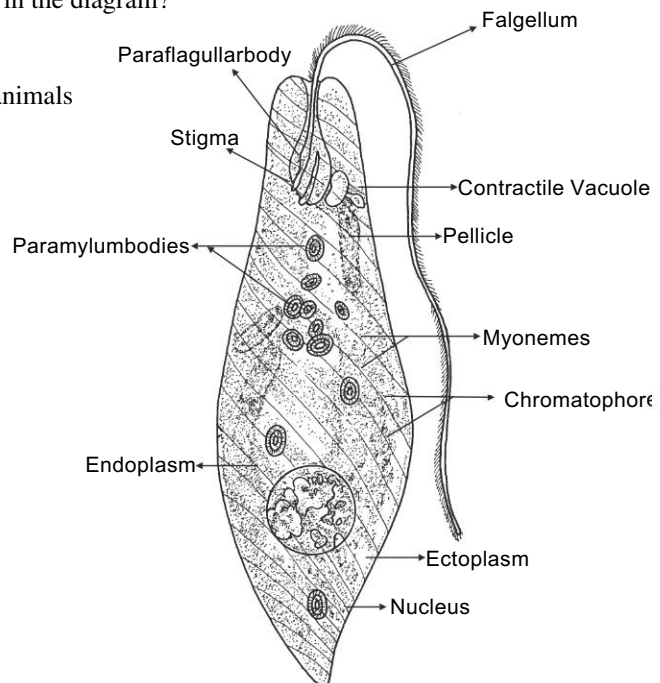
1. Classify mammalia giving suitable examples.
2. Name the animal which is regarded as a connecting link between reptiles and mammals. Mention its reptilian and mammalian characters.
3. Write short notes on:
 - (a) Cetacea
 - (b) Primates
 - (c) Blubber
 - (d) *Desmodus*
 - (e) Marsupium
4. Give an account of general organisation and affinities of metatheria.

TAXONOMY

Questions based on Diagrams

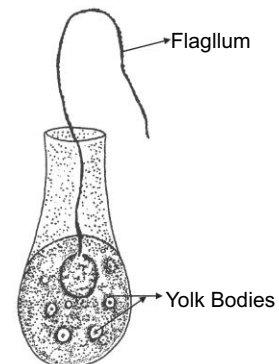
1. What is incorrect about the animal shown in the diagram?

- (a) Digenetic parasite
- (b) Alternation of generation
- (c) Connecting link between plants and animals
- (d) Colonial Protozoan



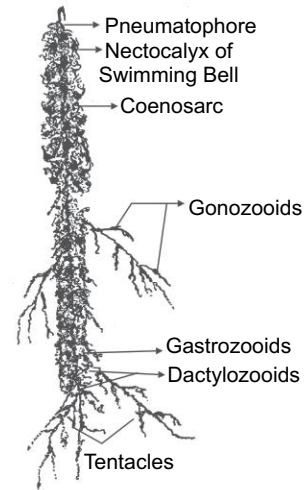
2. The cell shown in the diagram is the characteristic of the phylum:

- (a) Hemichordata
- (b) Echinodermata
- (c) Arthropoda
- (d) Porifera



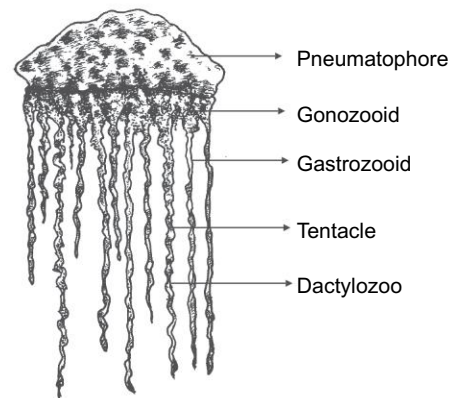
3. This Coelenterate is bilaterally symmetrical:

- (a) *Halistemma*
- (b) *Plumularia*
- (c) *Sertularia*
- (d) *Tubularia*



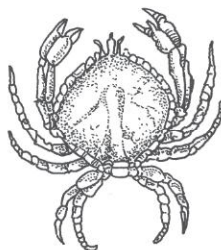
4. Which one of the following is incorrect about the animal shown in the diagram?

- (a) Portuguese man-of-war
- (b) Colony of polyps
- (c) Class hydrozoa
- (d) Metagenesis

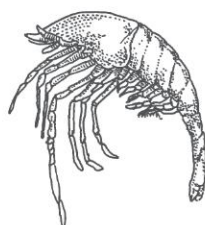


5. In the animals shown below which one is a living fossil and regarded as the connecting link between Annelida and Arthropoda?

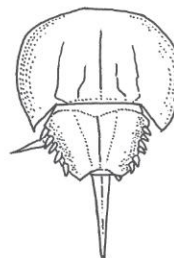
- (a) I
- (b) II
- (c) III
- (d) IV



I



II



III



IV

6. Select the correct match of the larval forms shown in the diagram to their respective phylum:

A	B	C	D
(a) Mollusca	Echinodermata	Hemichordata	Platyhelminthes
(b) Mollusca	Hemichordata	Echinodermata	Aschelminthes
(c) Arthropoda	Hemichordata	Annelida	Arthropoda
(d) Echinodermata	Hemichordata	Arthropoda	Platyhelminthes



A



B



C



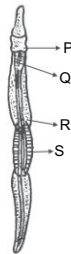
D

7. In the above larval forms, which one is the larva of the animal regarded as the connecting link between nonchordata and chordata?

(a) D (b) C (c) A (d) B

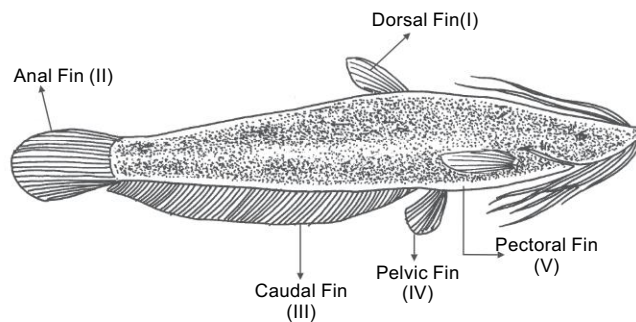
8. In the diagram of *Balanoglossus*, hepatic region is represented by the letter:

(a) P (b) Q (c) R (d) S



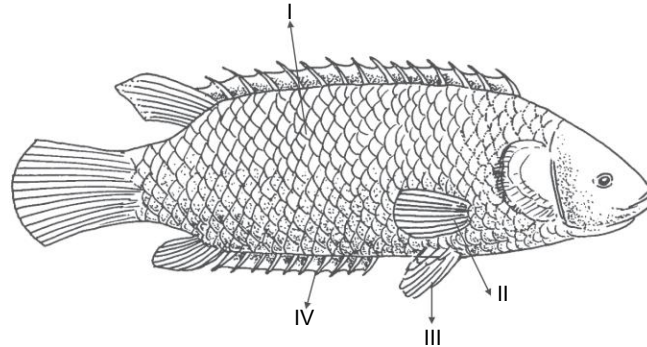
9. In the diagram showing *Heteropneustes*, identify the incorrectly labelled parts:

(a) I and II (b) II and III (c) III and IV (d) IV and V



10. Identify the fish.

- (a) *Anabas* (b) *Labeo* (c) *Clarius* (d) *Heteropneustes*

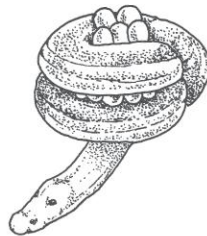


11. In the above diagram, pectoral fin is represented by the letter:

- (a) I (b) II (c) III (d) IV

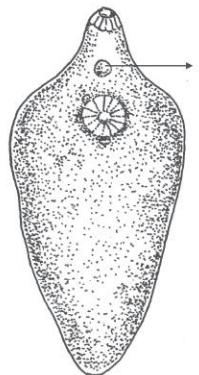
12. What is incorrect about the animal shown in the diagram?

- (a) Macrolecithal egg (b) Carotid arch is present in the adult
(c) Oviparous (d) Belongs to class amphibian and order apoda



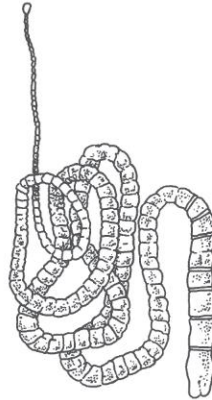
13. In the diagram of liver fluke shown below, the part labelled as indicates:

- (a) Oral sucker (b) Ventral sucker (c) Genital pore (d) Excretory pore

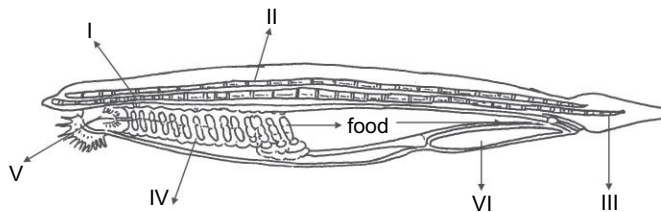


14. Tick the incorrect statement about the animal shown in the diagram.

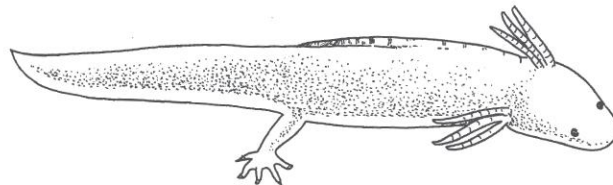
- (a) Digenetic parasite (b) Cyclomorphosis
(c) Proglottids (d) Apolysis



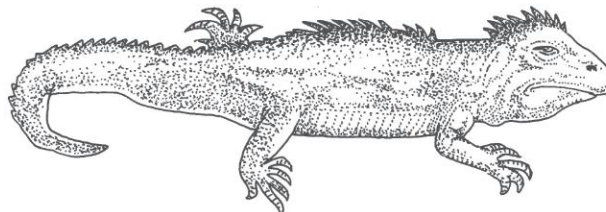
15. The three chordate characters in the diagram of *Amphioxus* are represented by the letters:
- (a) I, II and III (b) I, II and IV (c) II, III and IV (d) III, IV and VI



16. Which one of the following is applicable to the animal shown in the diagram?
- (a) Apolysis (b) Cryptobiosis (c) Eutely (d) Neoteny



17. Tick the incorrect statement about the animal shown in the diagram.
- (a) Burrowing, carnivorous and nocturnal
 (b) Clawed pentadactyl limbs
 (c) Ductus caroticus and ductus arteriosus are lacking
 (d) It is a living fossil.



18. The animal shown in the diagram shows similarities with *Sphenodon* in having:

- (a) Amphicoelous vertebrae
- (b) Free cervical ribs
- (c) Free abdominal ribs
- (d) All

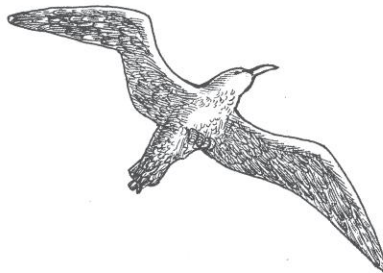


19. Which one of the following is not applicable to the animal shown above in the diagram?

- (a) Monocondylic skull
- (b) V-shaped furcula
- (c) Scales are lacking on the body and limbs
- (d) Connecting link between reptiles and birds

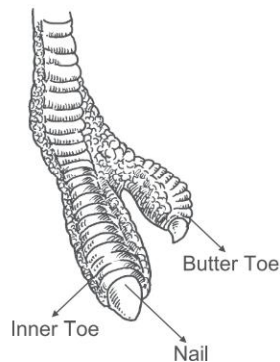
20. What is incorrect about this bird?

- (a) Marine tube nosed and long-winged bird
- (b) Well-developed olfactory receptors
- (c) Come to land only during breeding season
- (d) Able to extract nourishment from bee wax



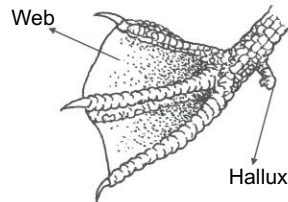
21. The leg is adapted for:

- (a) Running
- (b) Perching
- (c) Swimming
- (d) Climbing



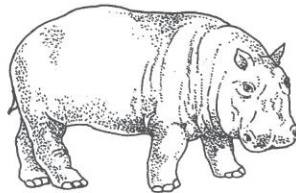
22. The foot shown below is found in:

- (a) Kingfisher (b) Duck (c) Pelican (d) Eagle



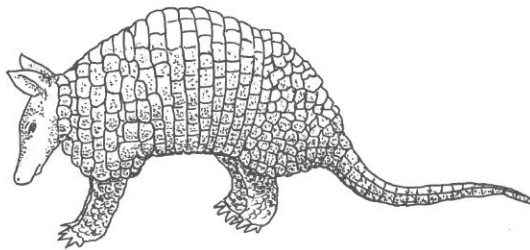
23. The peculiarity of this animal is:

- (a) Lack of tail (b) Narrow muzzle (c) Red sweat (d) Amphibious



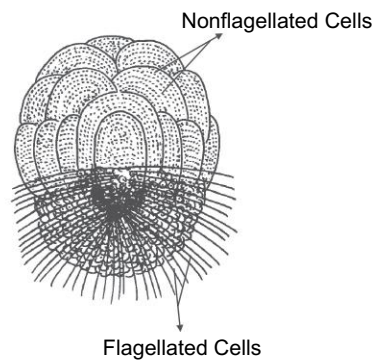
24. What is incorrect about the given animal?

- (a) Belongs to order edentata (b) Well-developed dermal skeleton
(c) Fossorial and nocturnal (d) Tongue is long but not protrusible



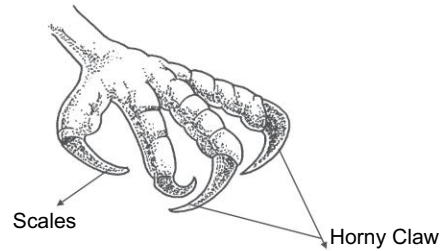
25. This is the characteristic larva of:

- (a) Calcareous sponges (b) *Obelia*
(c) Aurelia (d) *Polystoma*



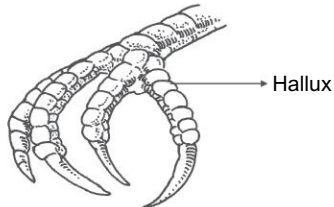
26. The given diagram of leg is of:

- (a) Perching type (b) Wading type (c) Raptorial type (d) Wading type



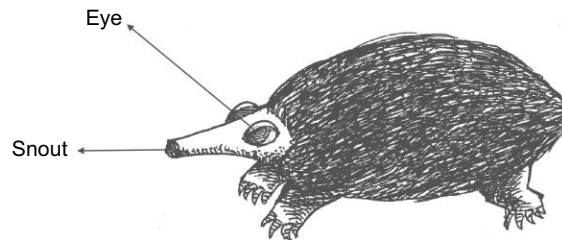
27. Identify the foot:

- (a) Perching type (b) Climbing type (c) Clinging type (d) Scratching type



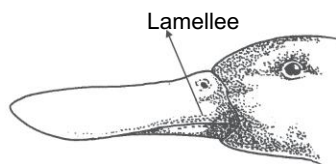
28. Which one of the following is not applicable to this animal shown in the diagram?

- (a) Oviparous
 (b) Connecting link between reptiles and mammals
 (c) Teeth are well developed
 (d) Only left aortic arch is present



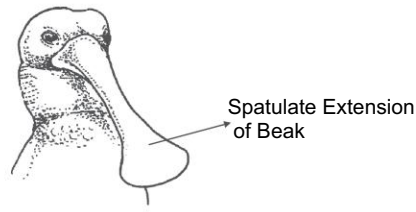
29. The beak is adapted for:

- (a) Fish eating (b) Insect eating
 (c) Water and mud straining (d) Cutting



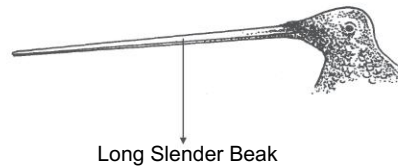
30. The beak is characteristic of:

- (a) Spoonbill (b) Pelican (c) Swift (d) Stork



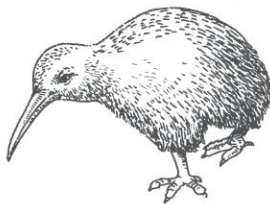
31. The beak is a flower-probing beak and is the characteristic of:

- (a) Pelican (b) Stork (c) Humming bird (d) Bubo



32. What is incorrect about the bird shown in the diagram?

- (a) Smallest living flightless bird (b) Nocturnal and burrowing
(c) Lack of sense of smell (d) Nostrils are located near the apex of the beak

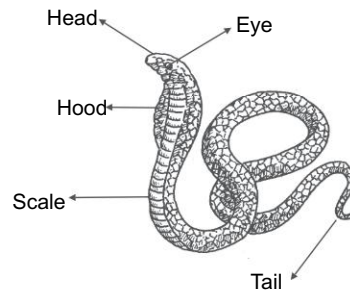


33. Consider the following statements about this snake:

- (A) Small scales on the head (B) Third supra labial touches the eye
(C) Hemi penis (D) Fourth infra labial is the largest

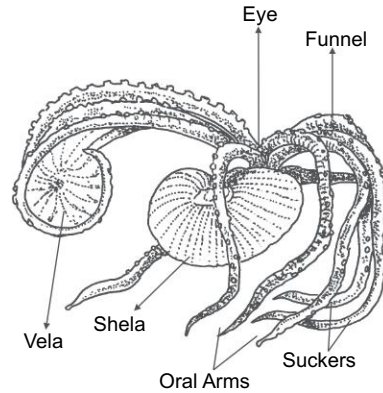
The incorrect statements are:

- (a) A and B (b) B and C (c) A and C (d) C and D



34. The animal shown in the diagram belongs to phylum:

- (a) Echinodermata (b) Mollusca (c) Arthropoda (d) Hemichordata

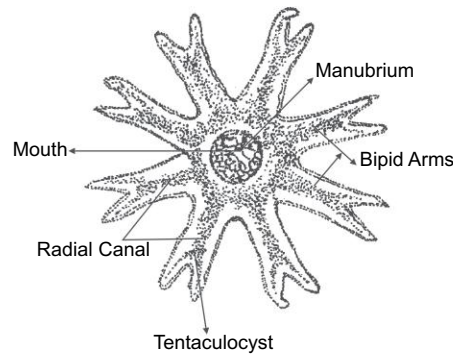


35. Which one of the following is not applicable to the animal shown above?

- (a) Octapoda (b) Ink gland (c) Internal shell (d) Devil fish

36. The larva belongs to phylum:

- (a) Porifera (b) Coelenterata (c) Platyhelminthes (d) Mollusca

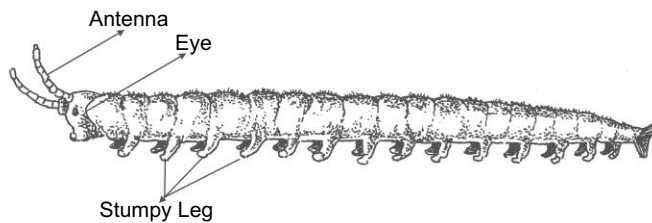


37. The name of the larva shown above is:

- (a) Amphiblastula (b) Glochidium (c) Tornaria (d) Ephyra

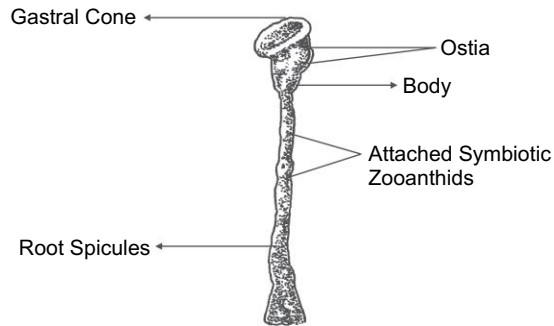
38. The animal shown in the diagram is:

- (a) *Peripatus*
(b) A connecting link between Annelida and Arthropoda
(c) Viviparous
(d) All



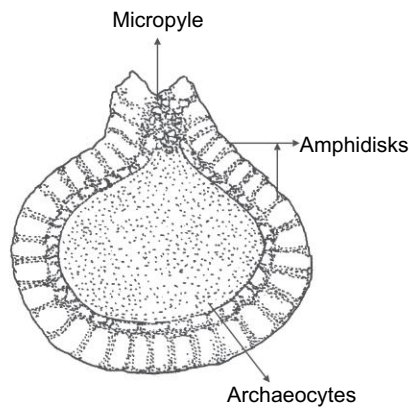
39. The animal belongs to phylum:

- (a) Porifera (b) Coelenterata (c) Echinodermata (d) Hemichordata



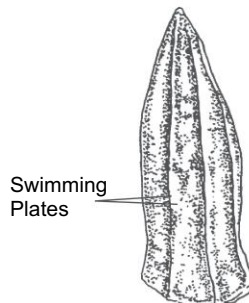
40. What is correct about the diagram?

- (a) Planula larva of Coelenterates (b) Gemmule of sponges
(c) Choanocyte of sponge (d) Spicule of sponges

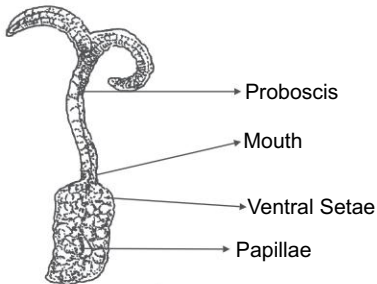


41. The animal shown in the diagram:

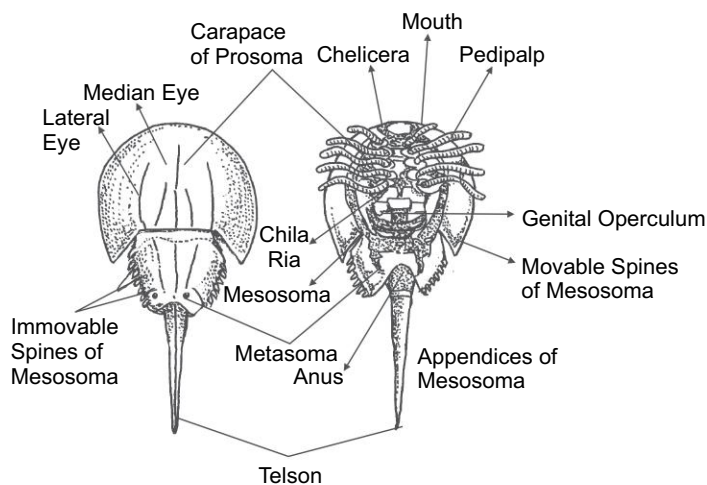
- (a) Belongs to phylum Ctenophora
(b) Commonly known as sea mitres or mitre jellyfish
(c) Lacks tentacles
(d) All



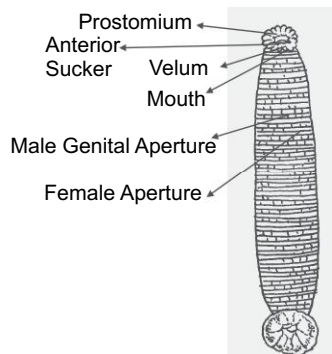
42. Which one of the following is a false statement about the animal shown in the diagram?
- (a) It is a marine animal. (b) It shows sexual dimorphism.
(c) Males are parasite in the uterus of female. (d) It possesses two nephridia which act as uteri.



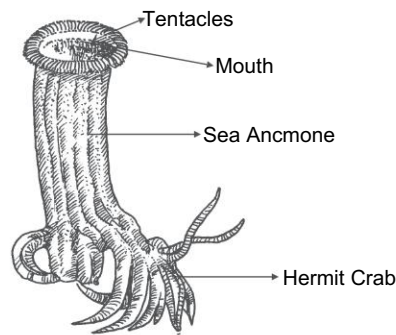
43. What is wrong about this animal?
- (a) Horseshoe crab (b) Living fossil (c) Hastate plate (d) Book gills



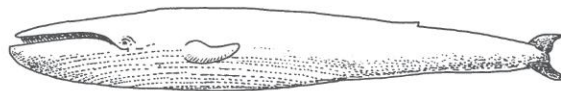
44. In the animal shown in the figure, which gland is distributed all over the body?
- (a) Sucker glands (b) Clitellar glands (c) Slime glands (d) Prostomial glands



45. Which one of the following is found in the animal shown above in the diagram:
 (a) Typhlosole (b) Intestinal caeca
 (c) Enteronephric nephridia (d) None
46. The association shown by the diagram is:
 (a) Commensalism (b) Parasitism (c) Antibiosis (d) Predation



47. Zoological name of this animal is:
 (a) *Orcinus orca* (b) *Physeter catodon*
 (c) *Monodon monoceros* (d) *Balaenoptera musculus*



Answers to Questions based on Diagrams

1. (a)	2. (d)	3. (a)	4. (d)	5. (d)	6. (a)	7. (b)	8. (d)
9. (b)	10. (a)	11. (b)	12. (b)	13. (a)	14. (b)	15. (b)	16. (d)
17. (c)	18. (d)	19. (c)	20. (d)	21. (a)	22. (b)	23. (c)	24. (d)
25. (a)	26. (c)	27. (a)	28. (c)	29. (c)	30. (a)	31. (c)	32. (c)
33. (b)	34. (b)	35. (c)	36. (b)	37. (d)	38. (d)	39. (a)	40. (b)
41. (d)	42. (d)	43. (c)	44. (c)	45. (d)	46. (a)	47. (c)	

PROTOZOA

Multiple-Choice Questions

1. Protozoans are:
 - (a) Highly varied and unicellular
 - (b) Eukaryotes
 - (c) Typically cellwall-less
 - (d) All
2. Free-living Protozoans tend to consume:
 - (a) Animal debris
 - (b) Plant debris
 - (c) Bacteria and other Protozoa
 - (d) All
3. Generally parasitic Protozoans do not require an exogenous source of essential lipids for:
 - (a) Replication
 - (b) Differentiation
 - (c) Locomotion
 - (d) Life cycle completion
4. *Perkinsus marinus* is a protozoan parasite of:
 - (a) *Crassostrea virginica*
 - (b) *Aplysia*
 - (c) *Hydra vulgaris*
 - (d) *Carcinus*
5. Helizoans:
 - (a) Are immobile
 - (b) Are spherical
 - (c) Have radiating hair-like pseudopods
 - (d) All
6. Consider the following statements:
 - (A) Some flagellates and ciliates have collars or sheaths
 - (B) In *Podophyra*, tentacles are hollow and suctorial
 - (C) In the schizogony of Protozoa, mitosis and cytokinesis are not directly temporally linked.
 - (D) In sporozoa , motility is absent except gametes

The correct statements are:

 - (a) All
 - (b) A and D
 - (c) B and C
 - (d) A, B and D
7. Which one of the following is acquired by cat litter?
 - (a) *Giardia lamblia*
 - (b) *Plasmodium sp*
 - (c) *Toxoplasma gondii*
 - (d) None of these
8. In congenital toxoplasmosis, a mother is infected:
 - (a) At the time of conception
 - (b) During pregnancy
 - (c) Both (a) and (b)
 - (d) Neither of these
9. In induced *Trypanosoma cruzi* infection, there is persistent elevation of:
 - (a) Phosphorylated extracellular signal regulated Kinase (ERK)
 - (b) AP-1
 - (c) NF_κB
 - (d) All

10. Which one of the following is not applicable to *Elphidium*?
 (a) Proloculum (b) Alternation of generation
 (c) Cyphonautes (d) Dimorphism
11. Which one of the following is a reserve food in Protozoans?
 (a) Paramylum (b) Volutin granules (c) Oil globules (d) All
12. Dinoflagellates lack:
 (a) Chlorophyll 'a' (b) Chlorophyll 'b' (c) Chlorophyll 'c' (d) All
13. Consider the following statements with reference to dinoflagellates:
 (A) Dinoflagellates are common marine and freshwater flagellates
 (B) They contain xanthophylls pigments
 (C) Typical dinoflagellates possess two flagella
 (D) One flagellum lies in a longitudinal groove called the sulcus, and the other flagellum is transverse and located in a groove called the girdle
 The incorrect statements are:
 (a) A, B and D (b) A and C (c) B and C (d) None
14. Definite mating types have been shown to exist in the species of:
 (a) *Paramecium* and *Tetrahymena* (b) *Euplotes*
 (c) *Stylonychia* (d) All
15. Which one of the following is not applicable to *Opalina*?
 (a) Cilia (b) Cytopyge (c) Plasmotomy (d) Endocommensal
16. The two forms of *Elphidium* differ in:
 (a) Their structure (b) Number of nuclei (c) Mode of reproduction (d) All
17. Alar processes and retral processes are related to:
 (a) *Elphidium* (b) *Opalina* (c) *Noctulica* (d) *Balantidium*
18. Match column I with column II and select the correct answer using answer codes:
- | Column I (Animal) | Column II (Type of flagellum) |
|----------------------|-------------------------------|
| (A) Acronematic | 1. <i>Volvox</i> |
| (B) Pentachronematic | 2. <i>Urcoelus</i> |
| (C) Stichonematic | 3. <i>Euglena</i> |
| (D) Pentonematic | 4. <i>Paranema</i> |
- Answer codes:
- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 4 | 1 | 2 | 3 |
| (b) | 1 | 2 | 3 | 4 |
| (c) | 3 | 1 | 2 | 1 |
| (d) | 2 | 4 | 1 | 3 |
19. Which one of the following is an incorrect match?
 (a) *Euglena* – Holophytic (b) *Vorticella* – Myxotropic
 (c) *Amoeba* – Holozoic (d) *Polytoma* – Saprozoic
20. Consider the following statements:
 (A) Chagas disease is common in Mexico and South America
 (B) It is caused by *Trypanosoma cruzi*

- (C) The chronic form of Chagas disease is characterised by the dysfunction of the central and peripheral nervous system
- (D) It is thought that Charles Darwin suffered from chronic Chagas disease following his trip to South America
- The incorrect statement is:
- (a) None (b) A (c) C (d) D
21. Which one of the following pathological changes is not produced by the *Trypanosoma gambiense*?
- (a) Decreased ESR
(b) Reduced coagulation time
(c) Altered and even reversed albumin/globulin ratio
(d) Increased cerebrospinal fluid
22. Which one of the following is incorrect with reference to *Monocystis*?
- (a) Monogenetic life cycle (b) Mostly intracellular trophozoite
(c) Nonpathogenic to host (d) Nonmotile zygote
23. Which one of the following is not applicable to *Vorticella*?
- (a) Peristomial disc (b) Undulating membrane
(c) Polyploid nucleus (d) Trichocyst
24. Plasmodial infections in humans are accompanied by:
- (a) Enlargement of spleen (b) Decrease in RBC count
(c) Thinning of blood plasma (d) All
25. Which one of the following is an incorrect match?
- (a) Palmella stage – *Vorticella* (b) Sporozoite – *Plasmodium*
(c) Oral groove – *Paramecium* (d) Osmotrophy – *Trypanosoma*
26. Which one of the following is incorrect with reference to *Plasmodium*?
- (a) A definite host (b) An intermediate host
(c) An Arthropod vector (d) Extracellular replication
27. The parasitic Protozoa which uses acetate as a substrate for fatty acid synthesis:
- (a) *Trypanosoma cruzi* (b) *Leishmania donovani*
(c) *Plasmodium falciparum* (d) All
28. Which one of the following Protozoans has the ability to synthesise long chain essential fatty acid?
- (a) *Perkinsus marinus* (b) *Podophyra*
(c) *Toxoplasma gondii* (d) *Giardia lamblia*
29. Toxoplasmosis is acquired by:
- (a) Eating raw meat (b) Through contact with an infected feline
(c) Both (a) and (b) (d) Eating raw or uncooked meat
30. Which one of the following is incorrect with reference to *Cryptosporidium parvum*?
- (a) Lacks definite host
(b) Infective stage is oocyst
(c) Obligate intracellular parasite of many species
(d) None
31. What is incorrect about *Coleps*?
- (a) Marine flagellate (b) Rapid swimmer (c) Voracious feeder (d) None of these

32. The ectoplasm of Protozoa contains organelles not associated with:
 (a) Reproduction (b) Locomotion (c) Feeding (d) Protection
33. Which one of the following is not a protective or supporting organelle of Protozoa?
 (a) Oral basket (b) Branchial basket
 (c) Costa and Cresta (d) Axostyle and parabasal apparatus
34. *Zelleriella* is a parasitic Protozoan in the colon of:
 (a) Humans (b) Birds (c) Frogs (d) Cockroaches
35. Consider the following statements:
 (A) Radiolaria and foraminifera are largest in size amongst the Protozoans
 (B) *Spirostomum ambiguum* is the smallest among freshwater ciliates
 (C) A polyenergid nucleus contains a single set of chromosomes
 (D) The multi-gene DNA vaccine developed to prevent infection by the *Plasmodium falciparum* incorporates five genes

The incorrect statements are:

- (a) A and B (b) B and C (c) A and D (d) C and D
36. Match column I with column II and select the correct answer using answer codes:
 Column I (Protozoans) Column II (Mode of nutrition)
 (A) *Amoeba* 1. Caprozoic
 (B) *Euglena* 2. Holozoic
 (C) *Dimastigamoeba* 3. Saprozoic
 (D) *Trypanosoma* 4. Mixotrophic
- Answer codes:
- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 2 | 4 | 3 | 2 |
| (b) | 2 | 1 | 4 | 3 |
| (c) | 1 | 4 | 2 | 3 |
| (d) | 2 | 4 | 1 | 3 |
37. Which one of the following is an incorrect match?
 (a) Symbiosis – *Trichonympha* (b) Commensalism – *Balantidium*
 (c) Parasitism – *Trypanosoma* (d) Free living – *Paramecium*.
38. Which one of the following is a freshwater shelled Protozoans?
 (a) *Diffflugia* (b) *Allogromia* (c) *Noctulica* (d) *Arcella*
39. Match column I with column II and select the correct answer using answer codes:

	Column I	Column II
(A)	Trichocyst	1. <i>Opalina</i>
(B)	Flagellum	2. <i>Paramecium</i>
(C)	Shell	3. <i>Polystomella</i>
(D)	Buds	4. <i>Euglena</i>

Answer codes:

	A	B	C	D
(a)	2	4	3	1
(b)	3	1	2	4
(c)	1	4	3	2
(d)	2	4	1	3

40. Which one of the following Protozoans is found in both fresh and marine water?
 (a) *Arcella* (b) *Opalina* (c) *Allogromia* (d) *Trichomonas*
41. Which one of the following is applicable to ciliates?
 (a) Cilia (b) Nuclear dimorphism
 (c) Conjugation (d) All of these
42. Which one of the following is applicable to Protozoa?
 (a) Physiological division of labour (b) Alternation of generation
 (c) Radial symmetry (d) Larval forms
43. Telotroch is found in:
 (a) *Vorticella* (b) *Scypha* (c) *Obelia* (d) Starfish
44. Sexual reproduction of Protozoa differs from sexual reproduction of Metazoa in that in the Protozoan it is:
 (a) Somatic (b) Gametic
 (c) Both somatic and gametic (d) None of these
45. Cyclosis is shown by:
 (a) *Paramecium* (b) *Scypha* (c) *Trypanosoma* (d) Hydra
46. Which one of the following is a diploid stage of *Plasmodium*?
 (a) Schizont (b) Oocyst (c) Megagamete (d) Microgamete
47. Which one of the following is a correct statement?
 (a) Trophozoites of *Plasmodium* are found in the liver cells of humans.
 (b) Sporozoites of *Plasmodium* are formed in sporoblasts.
 (c) Liberation of merozoites along with toxin causes shivering in malaria.
 (d) Schizont stage of *Plasmodium* is the feeding stage.
48. In *Paramecium*, undigested food is passed out through:
 (a) Vestibule (b) Cytopharynx (c) Cypopyge (d) Cytostome
49. The zygote of *Plasmodium* soon becomes worm-like and motile, which is known as:
 (a) Oocyst (b) Ookenite (c) Sporont (d) Sporozoite
50. Gametogony in *Plasmodium* occurs in:
 (a) Erythrocytes of humans (b) Liver of humans
 (c) Stomach of female *culex* (d) Sporozoite
51. Which one of the following is the smallest luminescent organism?
 (a) *Nosema* (b) *Noctulica* (c) *Balantidium* (d) *Trichomonas*
52. Black water fever is caused by:
 (a) *Plasmodium vivax* (b) *Plasmodium falciparum*
 (c) *Plasmodium ovale* (d) *Plasmodium malariae*
53. Match column I with column II and select the correct answer using answer codes:

Column I

- (A) *Plasmodium vivax*
 (B) *Plasmodium falciparum*
 (C) *Plasmodium ovale*
 (D) *Plasmodium malariae*

Column II

1. Quartan malaria
 2. Benign tertian malaria
 3. Malignant tertian malaria
 4. Mild tertian malaria

Answer codes:

	A	B	C	D
(a)	2	3	4	1
(b)	2	4	3	1
(c)	1	3	4	2
(d)	4	2	1	3

54. What is incorrect about haemozoin?
 (a) It is a ferric ion derivative of haeme.
 (b) It is used haematin and forms toxic material.
 (c) It is stored in the cytoplasm of trophozoite.
 (d) When released, it causes shivering and body pain.
55. Which one of the following is applicable to *Opalina*?
 (a) Contractile vacuole (b) Chromatophores
 (c) Conjugation (d) Anisogametes
56. Column I shows types of pseudopodia and column II contains Protozoans. Match these two columns and select the correct answer using answer codes:
- | Column I | Column II |
|----------------|-----------------------|
| (A) Rhizopodia | 1. <i>Amoeba</i> |
| (B) Lobopodia | 2. <i>Radiolaria</i> |
| (C) Axopodia | 3. <i>Elphidium</i> |
| (D) Filopodia | 4. <i>Actinophrys</i> |
- Answer codes:
- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 3 | 1 | 4 | 2 |
| (b) | 1 | 4 | 3 | 2 |
| (c) | 2 | 4 | 1 | 3 |
| (d) | 1 | 3 | 4 | 2 |
57. This phase of *Plasmodium* is resistant to medicines:
 (a) Pre-erythrocytic phase (b) Post-erythrocytic phase
 (c) Erythrocytic phase (d) None of these
58. *Balantidium* is a:
 (a) Ciliate (b) Flagellate
 (c) Sporozoa (d) Free-living Protozoa
59. Which one of the following diseases is not frequent in India?
 (a) Malaria (b) Kala-azar (c) Sleeping sickness (d) Amoebic dysentery
60. In which one of the following is a contractile vacuole not found?
 (a) *Entamoeba* (b) *Paramecium* (c) *Euglena* (d) *Amoeba*
61. Which one of the following is a polygenetic parasite?
 (a) *Trypanosoma* (b) *Sacculina* (c) *Trichomonas* (d) None of these
62. Which one of the following shows polymorphism?
 (a) *Plasmodium* (b) *Trypanosoma* (c) *Noctulica* (d) *Schistosoma*
63. Suctorial tentacles are found in:
 (a) *Vorticella* (b) *Ephelota* (c) *Opalina* (d) *Nosema*

64. Kappa particles are found in:
 (a) *Trypanosoma* (b) *Trichomonas* (c) *Paramecium* (d) *Ephelota*
65. Which one of the following forms of *Trypanosoma* lacks flagellum?
 (a) Trypanosomal form (b) Crithidial form
 (c) Leptomonad form (d) Leishmanial form
66. Ex-flagellation results in the formation of:
 (a) Sperms (b) Ova (c) Polar bodies (d) None of these
67. Which one of the following is not a mode of reproduction in *Paramecium*?
 (a) Conjugation (b) Autogamy (c) Plasmotomy (d) Endomixis
68. *Anopheles* is to malaria, so is:
 (a) *Culex* to Ascariasis (b) Tse-tse fly to Plague
 (c) Sandfly to Kala-azar (d) Mayfly to Sleeping sickness
69. The contractile vacuoles of Protozoa are analogous to the _____ of vertebrates.
 (a) Kidney (b) Liver (c) Lung (d) Stomach
70. Duration of erythrocytic cycle in *P. malariae* is:
 (a) 72 hours (b) 48 hours (c) 40 hours (d) 30 hours
71. Which one of the following is a parasite in the mouth of humans?
 (a) *Entamoeba coli* (b) *Entamoeba gingivalis* (c) *Balantidium* (d) *Trichomonas*
72. Each cilium in *Paramecium* arises from:
 (a) Kinetosome (b) Trichocyst (c) Kinetodesmata (d) Kinetochore
73. The antibody produced by *Plasmodium* in the blood of humans is:
 (a) Haemozoin (b) Haematin (c) Haemotoxin (d) None of these
74. The cilia of *Paramecium* are longer at the:
 (a) Anterior end (b) Posterior end (c) Mouth region (d) Cytopyge
75. Which one of the following is a histozoic Protozoa?
 (a) *Eimeria* (b) *Giardia* (c) *Entamoeba* (d) All of the above
76. Relation between swamps, malaria and mosquitoes was first pointed out by:
 (a) Lancisi (1717) (b) Charles Laveran (1880)
 (c) Golgi (1885) (d) Jeffrey (1882)

77. Match column I with column II and select the correct answer using answer codes:

Column I

- (A) Maure's dots
 (B) Ziemann's dots
 (D) STD
 (D) Metacyclic form

Column II

1. *Trichomonas*
 2. *Plasmodium falciparum*
 3. *Trypanosoma gambiense*
 4. *Plasmodium malariae*

Answer codes:

	A	B	C	D
(a)	4	1	3	2
(b)	2	1	3	4
(c)	4	3	1	2
(d)	2	4	1	3

78. Which one of the following is not applicable to *Elphidium*?
 (a) Dimorphic (b) Calcareous shell (c) Cilia (d) Holozoic nutrition
79. Caudal tuft is found in:
 (a) *Trypanosoma* (b) *Trichomonas* (c) *Paramecium* (d) *Polystomella*
80. In which one of the following Protozoans is the shell made up of nitrogenous element?
 (a) *Arcella* (b) *Euglypha* (c) *Elphidium* (d) *Microgromia*
81. Both flagellum and pseudopodia are found in:
 (a) *Trichomonas* (b) *Mastigamoeba* (c) *Chrysamoeba* (d) *Cryptomonas*
82. Which one of the following causes the pebrine disease in silkworms?
 (a) *Ephelota* (b) *Noesma* (c) *Balantidium* (d) *Noctulica*
83. Which one of the following contains two similar and identical nuclei?
 (a) *Giardia* (b) *Euglypha* (c) *Tetrahymena* (d) *Nina*
84. In which one of the following do tentacles play the role of the gullet?
 (a) Myxosporidea (b) Suctorians (c) Sarcodina (d) Haplosporea
85. Oblique binary fission is found in:
 (a) *Paramecium* (b) *Ceratium* (c) *Vorticella* (d) *Noctulica*
86. Collar cells are found in:
 (a) *Trichomonas* (b) *Proterospongia* (c) *Chilomonas* (d) *Nosema*
87. Infection of which one of the following parasites in early months of pregnancy results in abortion or still birth?
 (a) *Chilomonas* (b) *Toxoplasma gondii*
 (c) *Trichomonas vaginalis* (d) *Isopora hominis*
88. Which one of the following is a shell-less helizoan?
 (a) *Elphidium* (b) *Actinophrys* (c) *Collozoum* (d) *Acanthometra*
89. Fossilised shells of _____ often occur in petroleum bearing rocks.
 (a) Gastropods (b) Cephalopods (c) Radiolarians (d) Foraminiferans
90. The disease espundia is caused by:
 (a) *Leishmania tropica* (b) *Leishmania donovani*
 (c) *Leishmania brasiliensis* (d) *Trypanosoma cruzi*
91. Which one of the following is a parasite in the seminal vesicle of an earthworm?
 (a) *Monocystis* (b) *Opalina* (c) *Eimeria* (d) *Nyctotherus*
92. Which one of the following parasites invades the cerebrospinal fluid?
 (a) *Leishmania* (b) *Plasmodium* (c) *Trypanosoma* (d) *Ancylostoma*
93. Luciferin is found in:
 (a) *Trichomonas* (b) *Ceratium* (c) *Noctulica* (d) *Trichonympha*
94. Exo-erythrocytic cycle is absent in:
 (a) *Plasmodium falciparum* (b) *Plasmodium malariae*
 (c) *Plasmodium ovale* (d) *Plasmodium vivax*
95. Malaria day is celebrated on:
 (a) August 15 (b) August 20 (c) October 5 (d) June 30

96. Which form of *Trypanosoma* lacks flagellum?
 (a) Amastigote (b) Epimastigote (c) Promastigote (d) Trypomastigote
97. In *Paramecium*, the genetic information is contained in:
 (a) Kappa particles (b) Micronucleus
 (c) Macronucleus (d) Both micro and macronuclei
98. In a weak electric current, *Amoeba* moves towards:
 (a) Anode (b) Cathode (c) Becomes stationary (d) Dies
99. The Kinetoplast of *Trypanosome* is related with:
 (a) Reproduction (b) Locomotion (c) Nutrition (d) Protection
100. Which one of the following is not applicable to *Plasmodium*?
 (a) Sporozoite (b) Ootheca (c) Ookenite (d) Ex-flagellation
101. Signet ring stage is lacking in the life cycle of:
 (a) *Plasmodium vivax* (b) *Plasmodium malariae*
 (c) *Plasmodium falciparum* (d) *Plasmodium ovale*
102. In the life cycle of *Plasmodium*, all stages are haploid except:
 (a) Schizont (b) Merozoite (c) Oocyst (d) Sporozoite
103. In which one of the following is cytoplasm not divided into ectoplasm and endoplasm?
 (a) *Leishmania donovani* (b) *Paramecium*
 (c) *Trichonympha* (d) *Entamoeba histolytica*
104. Which one of the following is characterised by having two similar nuclei?
 (a) *Opalina* (b) *Protoopalina* (c) *Acineta* (d) *Ancistrocoma*
105. Which one of the following is not a correct statement?
 (a) In many flagellates, the spindle is entirely intranuclear.
 (b) In cryptomonads, amoeboid form are rare.
 (c) *Trichomonas tenax* is a parasite in the human vagina.
 (d) Dinoflagellate toxins are nerve poisons.
106. The characteristic feature of class Sporozoa is the:
 (a) Presence of pseudopodia (b) Presence of contractile vacuole
 (c) Parasitism (d) Two or more nuclei
107. Which one of the following species of *Plasmodium* is confined to tropical Africa?
 (a) *P.vivax* (b) *P.falciparum* (c) *P.ovale* (d) *P.malariae*
108. The nonmotile, nonfeeding and nonpathogenic form of *Entamoeba histolytica* is the:
 (a) Metacyst (b) Minutaform (c) Trophozoite (d) Tetranucleate cyst
109. Which one of the following is an incorrect match?
 (a) *Plasmodium* – Digenetic
 (b) Ookinete – Motile zygote
 (c) Oocyst of *Plasmodium* – Liver of humans
 (d) Exflagellation – Malegamete
110. Signet ring stage and amoeboid stage appeared during:
 (a) Pre-erythrocytic cycle (b) Exo-erythrocytic cycle
 (c) Erythrocytic cycle (d) Sexual cycle

111. What is correct with reference to endomixis in *Paramecium*?
 (a) Nuclear changes occur in single individual.
 (b) Fusion of pronuclei does not occur.
 (c) Meiosis does not occur.
 (d) All of the above.
112. Schuffner's dots are found in the _____ of *Plasmodium*:
 (a) Trophozoite stage (b) Ookenite stage
 (c) Merozoite (d) Sporozoite
113. Consider the following statements about extrusomes:
 (A) Extrusomes are found in dinoflagellates
 (B) They are important in the formation of red and blacks tides
 (C) They are membrane-bound structures of eukaryotes
 (D) There is a variety of different types of extrusomes which are homologous
 The correct statements are:
 (a) All (b) A, B and C (c) B and C (d) C and D
114. Trophozoite is the _____ stage of Protozoa:
 (a) Active (b) Feeding (c) Multiplying (d) All
115. The protozoan infection can be life-threatening in a patient with:
 (a) AIDS (b) Diabetes (c) Brain tumour (d) TB
116. In the haemoflagellates, which of the following terms designate the trophozoite stage?
 (a) Amastigote (b) Promastigote (c) Epimastigote (d) All
117. *Acanthamoeba* species are:
 (a) Free living (b) Inhabit soil
 (c) Inhabit water (d) Free living and inhabit soil or water
118. The endosome lacks DNA in:
 (a) Parasitic amoebas (b) *Trypanosoma*
 (c) Both a and b (d) None of these
119. Which one of the following proteins displays numerous defects in chromosome segregation and mitotic assembly in *Trypanosoma brucei*?
 (a) TbAGO1 (b) TbPW11 (c) Lmp11 (d) GIAGO1
120. *Trypanosoma brucei* is found alternately in the digestive tract of the tse-tse fly and the blood stream of a mammalian host. It adapts to this different environments by activating specific programmes of:
 (a) Differentiation of antigenic variation (b) Production of hormones
 (c) Suppressing immune system (d) All of these
121. The mouth of *Phyllopharyngea* is surrounded by a microtubular ribbon called the:
 (a) Sucking disc (b) Phyllae (c) Kinetia (d) Peristome

Answers to Multiple-Choice Questions

1. (d) 2. (d) 3. (c) 4. (a) 5. (d) 6. (a) 7. (c) 8. (c)
 9. (d) 10. (c) 11. (d) 12. (a) 13. (d) 14. (d) 15. (b) 16. (d)

17. (a)	18. (b)	19. (b)	20. (a)	21. (a)	22. (b)	23. (d)	24. (d)
25. (a)	26. (d)	27. (d)	28. (a)	29. (c)	30. (d)	31. (a)	32. (a)
33. (b)	34. (c)	35. (b)	36. (d)	37. (b)	38. (d)	39. (a)	40. (c)
41. (d)	42. (b)	43. (a)	44. (c)	45. (a)	46. (b)	47. (c)	48. (c)
49. (b)	50. (c)	51. (b)	52. (b)	53. (a)	54. (b)	55. (d)	56. (a)
57. (b)	58. (a)	59. (c)	60. (a)	61. (d)	62. (b)	63. (b)	64. (c)
65. (d)	66. (a)	67. (c)	68. (c)	69. (a)	70. (a)	71. (b)	72. (a)
73. (d)	74. (b)	75. (d)	76. (a)	77. (d)	78. (c)	79. (c)	80. (a)
81. (b)	82. (b)	83. (a)	84. (b)	85. (b)	86. (b)	87. (b)	88. (b)
89. (d)	90. (c)	91. (a)	92. (c)	93. (c)	94. (a)	95. (b)	96. (d)
97. (b)	98. (b)	99. (b)	100. (b)	101. (c)	102. (c)	103. (a)	104. (b)
105. (c)	106. (c)	107. (c)	108. (b)	109. (c)	110. (c)	111. (d)	112. (a)
113. (b)	114. (d)	115. (a)	116. (d)	117. (d)	118. (a)	119. (a)	120. (a)
121. (b)							

Fill in the Blanks

- _____ is a connecting link between Protozoa and Porifera.
- Hyaline cap is made up of _____.
- The chromatin of macronucleus of Protozoans is known as _____, while that of micronucleus is known as _____.
- Chagas disease is caused by _____.
- Oriental sore is caused by _____.
- Kerona* is a _____ and ectoparasite on _____.
- The gap period between inoculation of sporozoites into human blood and the first appearance of malarial fever is called _____.
- Cryptozoites of *Plasmodium* are formed in _____.
- Digestion of cellulose in termites is carried out by _____.
- Infective stage of *Trypanosoma gambiense* is _____.
- _____ is the grand old man of intestine.
- Amoeba* cannot digest _____.
- A trinucleate Protozoan is _____.
- _____ was the first Protozoan parasite discovered by _____.
- Opalina* is a parasite in the rectum of _____.
- Plasmochin drug is effective on _____ of *Plasmodium*.
- Giardia* prevents absorption of _____ by the host.

18. Nuclear DNA of *Amoeba* is _____.
19. Lysolecithin which destroys RBCs in a malarial patient is secreted by _____.
20. _____ is a rare infectious Protozoan parasite amongst human beings.
21. In some Protozoans, the nucleus divides into two and the two nuclei fuse together. This phenomenon is known as _____.
22. _____ is the asexual division of a multinucleate animal in which the cytoplasm divides but the nuclei do not.
23. Hemixis has been reported in many species of _____.
24. In radiolaria, _____ condition is a provision for spore formation.
25. Axopodia helps in _____.
26. *Stentor* reproduces by _____ and _____.
27. *Balantidium* is a _____ parasite.
28. Sarcosporidiosis is caused by _____.
29. *Trypanosoma* completes its life cycle in the _____ of humans and _____ and _____ of the tse-tse fly.
30. *Trypanosoma cruzi* is transmitted by _____.
31. The coccidians are intracellular parasites of _____ and _____.
32. Among the heliozoans, sexual reproduction is known in _____ and _____.
33. In *Elphidium*, the _____ form produces amoebulae by asexual fusion, which develop into _____.
34. In *Elphidium*, the zygote develops into _____.
35. *Elphidium* creeps slowly with the help of _____.
36. Flagellum without mastigonemes and terminal filaments is known as _____.
37. *Costia necatrix* is a parasite on the epidermal cells of _____.
38. *Hydramoeba hydroxena* is found on the epidermis of _____.
39. _____ is the motile feeding stage of Protozoa.
40. In *Paramecium aurelia*, each exconjugant produces _____ daughter individuals, each with _____ meganucleus and _____ micronucleus.
41. In *Aggregata eberthi*, schizogony occurs in _____, gamogony and sporogony take place in the _____.
42. Sexual reproduction in flagellates has been rarely observed except in the _____ and _____.
43. In species of *Trichonympha*, reduction divisions are _____.
44. In the palmella stage, the organism loses its _____ becomes a ball-like _____ structure.
45. The foraminiferans first appeared in the _____ period.
46. In *Plasmodium malariae*, the arrangement of merozoites is _____ like.
47. Trichocysts are organelles of _____ and _____.

48. Conjugation of *Paramecium* involves the exchange of _____.
49. In *Euglypha*, the shell is made up of _____ plates.
50. _____ is the infective stage of *Entamoeba histolytica*.
51. The skeleton of dead foraminifera and radiolarians sink to the bottom and form the _____.
52. Protozoa showing plasmotomy are _____ and _____.
53. Hydrogenosomes are found in _____.
54. In euglenoid flagellate, _____ stigma and paraflagellare are not found .
55. Limestone (Eocene period) are made up largely of the taste of _____.
56. The tentacles of suctorian are provided with structures called _____.
57. In _____, the micronucleus ramifies into branches.
58. The ciliate _____ lives on the prostomylacirri of a stabillid polychaete.
59. In ciliate, conjugation is preceded by _____ division of _____.
60. In *Paramecium*, a cilium moves in _____ different planes in the course of a complete cycle beat.
61. *Plasmodium vivax* requires _____ hours to complete the development of erythrocytic stages.
62. All zooflagellates posses a kinetoplast which contains _____ and is located within a large _____.
63. Most Protozoa exist in two stages of life, which are _____ and _____.
64. In *Vorticella*, conjugation results in the formation of _____ individuals.
65. Parasitic Protozoans do not posses any elaborate organelles except _____ parasite.
66. _____ is the most common mode of reproduction in parasitic Protozoa.
67. The zygote sporozoan is usually protected by a cyst except _____.
68. *Polykrikos* is a _____ Protozoan.
69. The process of taking the cystic form in Protozoa is called _____ while transforming back to trophozoite is known as _____.
70. _____ are special rod-like structures found in *Peranema* and help in food capturing.
71. The zygocysts of _____ can be easily obtained by collecting faecal strings of dermes-tides.
72. _____ is a Protozoan having blue cytoplasm.

Answers to Fill in the Blanks

1. <i>Proterospongia</i>	2. Ectoplasm	
3. Trophochromatin, idochromatin	4. <i>Trypanosona cruzi</i>	5. <i>Leishmania tropica</i>
6. Ciliate, <i>Hydra</i>	7. Incubation period	8. Liver of humans
9. <i>Trichonympha</i>	10. Metacyclic form	11. <i>Giardia</i>
12. Fat	13. <i>Paramecium aurelia</i>	14. <i>Giardia</i> , Leuwenhoek

15. Frog and toad	16. Gametocytes	17. Fat
18. Double helical	19. <i>Plasmodium malariae</i>	20. <i>Isopora hominis</i>
21. Automixis	22. Plasmotomy	23. <i>Paramecium</i>
24. Polyenergic	25. Food capturing	26. Binary fission, conjugation,
27. Ciliate	28. <i>Sarcocystis</i>	
29. Blood, midgut and salivary gland	30. <i>Triatoma megista</i>	31. Invertebrates, Vertebrates
32. <i>Actinosphaerium</i> , <i>Actinophrys</i>	33. Microspheric, megalospheric	34. Microspheric,
35. Rhizopodia	36. Anemantic	37. Fishes
38. <i>Hydra</i>	39. Trophozoite	40. Two, one, two
41. Sea anemone, cuttlefish	42. Chlorophyceae, metamonads	43. Postzygotic
44. Flagella, nonmotile	45. Cambrian	46. Rosette
47. Offence, defence	48. Micronuclei	49. Silicious
50. Tetranucleate cyst	51. Oceanic ooze	52. <i>Opalina</i> , <i>Pelomyx</i>
53. Ciliates	54. <i>Paranema trichophorum</i>	55. Foraminiferans
56. Haptocysts	57. <i>Dendrosomides</i>	58. <i>Phalacrociptes</i>
59. Meiotic, micronucleus	60. Three	61. 48
62. DNA, mitochondrion	63. Trophozoite, cyst	64. Seven
65. Ciliates	66. Multiple fission	67. Haemosporidea
68. Colonial	69. Encystation, excystation	70. Trichites
71. <i>Pyxinia</i>	72. <i>Stentor coerules</i>	

True or False

1. Paramylum is a polysaccharide which gives blue colour with iodine.
2. Kinetoplast of *Trypanosoma* is a self-replicating body.
3. Autogamy brings about rejuvenation.
4. *Amoeba* is ammonotellic.
5. *Diffugia* is a shelled amoeba found in freshwater.
6. Schuffner granules are formed in the life cycle of *Trypanosoma*.
7. Dumdum fever is caused by *Leishmania donovani*.
8. Kala-azar is transmitted by fruitfly.
9. Red tide on the surface of the sea is due to *Ceratium*.
10. *Zoochlorella* shows symbiosis with *Paramecium bursaria*.
11. Some Protozoans feed on nitrogen-fixing bacteria.

12. Under low current, *Paramecium* moves towards the anode.
13. African antelopes serve as reservoir for *Trypanosoma*.
14. Pyrenoids are centre of respiration.
15. Red dinoflagellates are responsible for red tides.
16. Metabody is found in *Euglena*.
17. Food reserve in encysted *Entamoeba* is starch.
18. *Entamoeba coli* causes pyrrhoea.
19. Biological control of malaria is done by *Gambusia* fish.
20. Number of flagella in *Giardia* is six.
21. Photosensitivity of *Euglena* is due to paraflagellar body.
22. Paralytic shellfish poisoning is related with *Noctulica*.
23. Egyptian pyramids are made up of rocks formed from foraminiferan shells.
24. Posterior end of *Amoeba* can be recognised by uroid.
25. Protozoa are protists, exhibiting heterotrophic nutrition and various types of locomotion.
26. Foraminiferous rocks are useful in checking the logs during well drilling.
27. In the US, Protozoa infection tends to occur to the greatest extent among AIDS patients.
28. Protozoans are not complete organisms.
29. Protozoa occur wherever moisture is present.
30. In dinoflagellates, division is longitudinal.
31. Radiolarians are relatively small Protozoa.
32. The radiolarians are among the oldest known fossils.
33. Phytoflagellates are primarily saprozoic.
34. *Giardia* is a bilaterally symmetrical flagellate.
35. Different forms of *Trypanosoma* have been named mainly on the basis of arrangement of flagellum, its place of origin and the course through the body.
36. The macronucleus of *Vorticella* is polyploid.
37. Oral ciliature is well developed in *Coleps*.
38. The polyenergid condition is a means of spore formation.
39. *Entamoeba coli* is a parasite in the intestine of humans.
40. Axopodia are organelles of locomotion.
41. The cyst of *Amoeba* is reproductive.
42. *Paramecium* never feeds while scrimming fast.
43. *Oodinium* is an ectoparasite on the body of *Oikopleura*.
44. Ectoparasites are common in Protozoa.
45. *Balantidium coli* is an endocommensal in humans.
46. *Euglena gracilis* can regenerate its chloroplast, if lost in darkness.
47. Sporozoans show evolutionary relations to both flagellates as well as sarcodina.

48. *Paramecium* can pass through only about 350 continuous asexual generations.
49. Macronucleus of *Paramecium* is critical in sexual reproduction.
50. In an electric field, *Amoeba* moves towards the anode.
51. In *Entamoeba histolytica*, chromatid bodies are found in the metacyst.
52. The cyst wall of *Euglena* is made up of carbohydrates.
53. *Nosema notabilis* is an example of hyperparasitism.
54. In *Vorticella*, conjugating gametes are isogametes.
55. In *Paramecium*, the direction and intensity of beat is controlled by levels of Ca^{++} and K^{+} ions.
56. In ciliophora, sexual reproduction involves the formation of free gametes.
57. The endoplasm of *Paramecium bursaria* is filled with green *Zoochlorellac*.
58. In suctoria, conjugation takes place between two attached individuals which are located side by side.
59. In *Paramecium*, the direction of effective stroke is longitudinal to the transverse axis of the body.
60. *Clamydophrys* is caprozoic.
61. In Paris, a large number of buildings are built of limestone, exclusively composed of shells of *Hiliolina*.
62. Cruzipain is a major *T. cruzi* antigen.
63. Recently, it has been shown that Schwann cell invasion by *T. cruzi* suppressed host cell apoptosis is caused by growth deprivation.
64. Dinoflagelletes are exclusively marine.
65. In *Clathrulina*, multiple fission takes place in an inactive condition.
66. Fossils of foraminiferans are useful in determining the approximate age of sediment.
67. *Plasmodium*, *Leishmania* and *T. cruzi* are aerobes.
68. *P. ovale* causes bird malaria.
69. *I. multifilis* causes itch in fishes, resulting in serious damage to fishery.
70. *Nosema bombycis* often multiplies in the ovary of silkworms and is transmitted from generation to generation through infected eggs.
71. *Vorticella* does not encyst.

Answers to True or False

1. True	2. True	3. True	4. True	5. True	6. False	7. True	8. False
9. False	10. True	11. True	12. False	13. True	14. False	15. True	16. True
17. False	18. False	19. True	20. False	21. True	22. False	23. True	24. True
25. True	26. True	27. True	28. False	29. True	30. False	31. False	32. True
33. False	34. True	35. True	36. True	37. False	38. False	39. False	40. False
41. False	42. True	43. True	44. False	45. True	46. False	47. True	48. True
49. False	50. False	51. False	52. True	53. True	54. False	55. True	56. False
57. True	58. True	59. False	60. True	61. True	62. True	63. True	64. False
65. False	66. True	67. True	68. False	69. True	70. True	71. True	

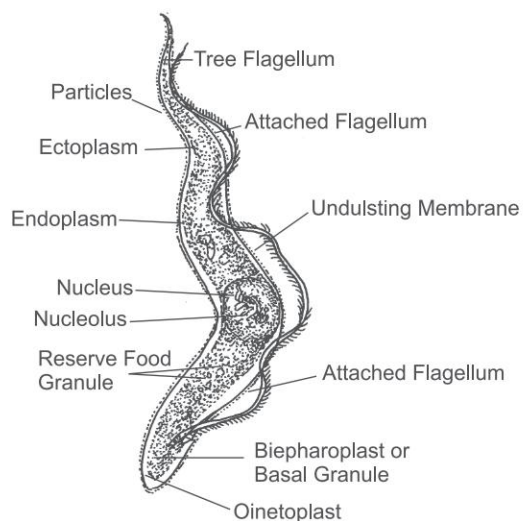
Give Reasons

1. *Plasmodium* lacks contractile vacuole.
 - Because *Plasmodium* lives in the blood or tissue fluid, which is an isotonic medium. Hence, there is no need of a contractile vacuole.
2. Cruzipain may be a survival factor for cardiomyocytes.
 - Because it released them from apoptosis and stimulate arginase-2.
3. A polyenergid nucleus has several sets of chromosomes.
 - Because mitosis occurs repeatedly inside the nuclear membrane.
4. No vaccine for malaria has been developed.
 - Because the life cycle of the parasite is complex and the several stages in humans are morphologically and antigenically distinct; and immunity is stage-specific.
5. Protozoa reduce fertility of the soil.
 - Because some species of Protozoa found in the soil feed upon nitrogen-fixing bacteria and thus reduce the fertility of the soil.
6. In a stronger current, *Paramecium* moves towards the anode.
 - Because in a stronger current, a greater number of cilia beat backward than forward. So, *Paramecium* moves towards the anode.
7. *Trypanosoma* is polymorphic.
 - Because it exists in four forms—*Leishmania*, *leptomonad*, *crithidial* and *trypanosomal*.
8. Protozoans are considered to be totipotent eukaryotic cells.
 - Because they have the capacity to divide and one cell can perform all the functions.
9. There is no vaccine for *Trypanosoma*.
 - Because the parasites periodically change the surface antigens—the markers that identify them as foreign to the immune system.
10. *Coleps* and *Didinium* can consume very large prey.
 - Because they can open their mouth to a great extent, almost as wide as the diameter of the body itself.
11. *Euglena* is a connecting link between plants and animals.
 - Because it possesses chlorophyll-like plants; hence can prepare its own food in the presence of sunlight and it feeds as other animals.
12. The shape of some flagellates remains very constant.
 - Because the body is enclosed by a heavy pellicle or by a cell wall or a skeleton of cellulose.
13. *Opalina* is neither a ciliate nor a flagellate.
 - Because:
 - (a) It has many nuclei while in ciliates, nuclei are dimorphic.
 - (b) In *Opalina* there is no conjugation, while in ciliates it is common.
 - (c) It lacks gullet, chromatophores and contractile vacuole found in flagellates.

14. *Mastigamoeba* is regarded as a connecting link between *mastigophora* and *rhizopoda*.
 - Because it is a permanently amoeboid form having a single flagellum and many pseudopodia.
15. Physiological division of labour is not exhibited by Protozoans.
 - Because the single-celled body of Protozoa performs all the vital functions.
16. In many parasites, changes in virulence, drug susceptibility and other characteristics may occur.
 - Because the rapid multiplication rate of many parasites increases the chances of mutation.
17. Composition of nutrients is not usually an important factor in pathogenesis of Protozoa.
 - Because the amount that is utilised by parasitic Protozoa are relatively small.
18. In the Atlantic Ocean, large areas of bottom are covered with a type of mud called Glovigerinaooze.
 - Because it is rich in tests of *Glovigerina* and related genera.
19. Asexual reproduction is the more frequent and predominant form of reproduction in Protozoa.
 - Because a large numbers of parasites have to be produced for the efficient exploitation of the host.
20. Ciliates are among the most diverse and awesome cells in the biological world.
 - Because of the tremendous variety in inciliary arrangement and functions.
21. Research on the metabolism of parasites is of immediate interest.
 - Because pathways that are essential for the parasites but not the host are potential targets for anti-protozoa compounds that block the pathway but are safe for humans.

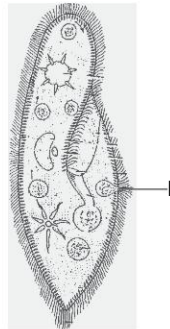
Questions based on Diagrams

1. Which one of the following is incorrect?
 - (a) *Trypanosoma*
 - (b) It causes sleeping sickness.
 - (c) Its intermediate host is tse-tse fly.
 - (d) It possesses many mitochondria.



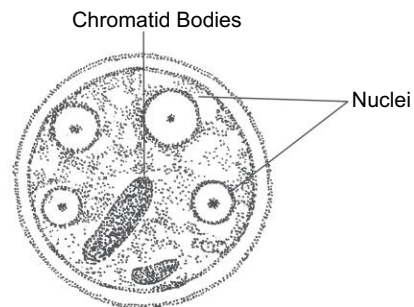
2. Identify the name of labelled part I.

- (a) Vestibule
- (b) Cytopyge
- (c) Cytostome
- (d) Cytopharynx



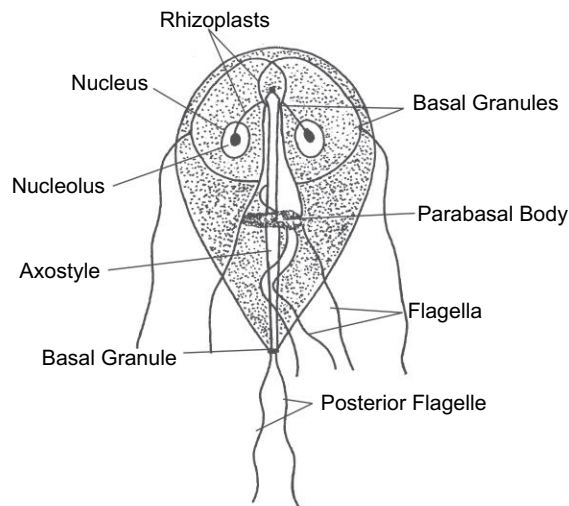
3. Identify the given diagram.

- (a) Trophozoite of *Plasmodium*
- (b) Sporozoite of *Plasmodium*
- (c) Infective stage of *Entamoeba*
- (d) Metacercaria of *Fasciola*



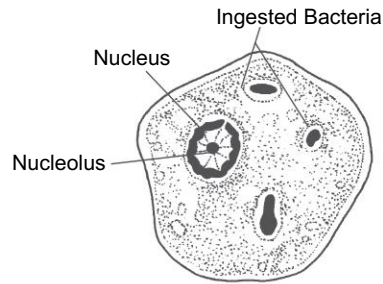
4. What is the name of the animal shown in the diagram below?

- (a) *Trichonympha*
- (b) *Trichomonas*
- (c) *Giardia*
- (d) *Allogromia*

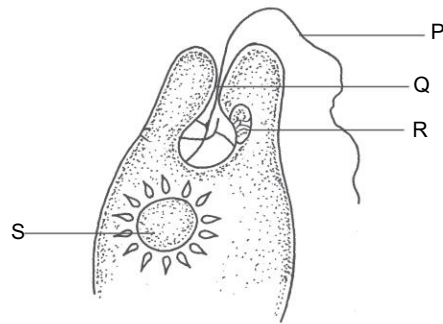


5. This species of *Entamoeba* does not form a cyst:

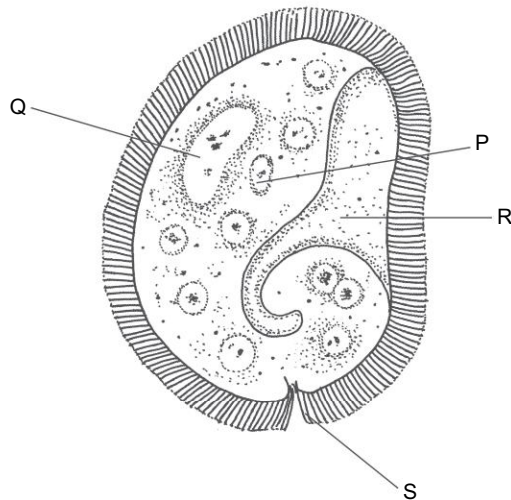
- (a) *E. histolytica*
- (b) *E. gingivalis*
- (c) *E. hartmanni*
- (d) Both (b) and (c)



6. In the diagram of *Euglena*, stigma is represented by the letter:
 (a) P (b) Q (c) R (d) S



7. In diagram of *Nyctotherus*, cytostome is shown by the letter:
 (a) P (b) Q (c) R (d) S



Answers to Questions-based on Diagrams

1. (d) 2. (b) 3. (c) 4. (c) 5. (c) 6. (c) 7. (c)

PORIFERA

Multiple-Choice Questions

1. Which one of the following is applicable to Porifera?
(a) Protoplasmic grade of organisation (b) Cellular grade of organisation
(c) Tissue grade of organisation (d) Organ grade of organisation
2. Members of phylum Porifera are:
(a) Free swimming (b) Bilaterally symmetrical
(c) Radially symmetrical (d) Biradially symmetrical
3. Members of the phylum Porifera lack the power of:
(a) Locomotion (b) Respiration (c) Nutrition (d) Reproduction
4. Which one of the following secretes acid?
(a) *Chalina* (b) *Halichondria* (c) *Tethya* (d) *Cliona*
5. Members of the phylum Porifera are:
(a) Coelomate (b) Pseudocoelomate (c) Coelomate (d) Haemocoelomate
6. The cavity enclosed by endodermal cells in sponges is known as:
(a) Spongocoel (b) Haemocoel (c) Pseudocoel (d) Coelenteron
7. Ostia and osculum are found in members of the phylum:
(a) Porifera (b) Coelenterata (c) Platyhelminthes (d) Annelida
8. Choanocytes cells are found in:
(a) Protozoa (b) Coelenterates (c) Sponges (d) Flatworms
9. Classifications of the phylum Porifera is based on:
(a) Locomotor organs (b) Nature of skeleton
(c) Mode of reproduction (d) Nature of excretory products
10. In sponges, digestion is:
(a) Intracellular (b) Extracellular
(c) First extracellular than intracellular (d) First intracellular followed by extracellular
11. Canal system is the unique feature of phylum:
(a) Porifera (b) Coelenterata (c) Platyhelminthes (d) Echinodermata
12. The simplest type of canal system is the:
(a) Ascon type (b) Sycon type (c) Leucon type (d) Rhagon type
13. Consider the following statements:
(a) Carnivorous sponges lack choanocytes
(b) All freshwater and some marine sponges have leuconoid body plan
(c) In the genome of sponges, most of the components needed to form post-synaptic proteins are present

(d) Sponges are a source of cytotoxins, antibiotics and antiviral compounds

The incorrect statements are:

- (a) None (b) A, B and C (c) A and C (d) B and D

14. Sponges are:

- (a) Terrestrial (b) Mostly marine (c) Freshwater (d) Estuarine

15. Skeleton of sponges is:

- (a) Calcareous (b) Siliceous (c) Spongin fibres (d) All

16. Skeleton of sponges is secreted by:

- (a) Scleroblasts (b) Porocytes (c) Choanoderm (d) Pinacoderm

17. Which one of the following is true about sponges?

- (a) Ostia and osculum (b) Choanocytes
(c) Canal system (d) All

18. Which one of the following is different?

- (a) Mono axon (b) Tri axon (c) Tetra axon (d) Axon

19. Spongocoel is lined with:

- (a) Choanocytes (b) Pinacocytes (c) Nematocytes (d) Mycocytes

20. Osculum is found in:

- (a) *Hydra* (b) *Pila* (c) *Sacculina* (d) Sponges

21. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) <i>Oscarella</i>	1. Contain intracellular bacteria
(B) <i>Verongia</i>	2. Lacks both spongin and spicule skeleton
(C) <i>Hippospongia</i>	3. Decomposition of shell and coral
(D) Boring sponges	4. Skeleton is made up of only sponging fibres

Answer codes:

A	B	C	D
(a) 2	1	4	3
(b) 4	2	3	1
(c) 3	1	2	4
(d) 2	3	4	1

22. Consider the following statements about *Euplectella*:

- (a) Not found in the Antarctic (b) Commensal relation with *Spongicola*
(c) Well-developed epidermis of pinacocytes (d) Commonly known as Venus flower basket

The correct statements are:

- (a) All (b) A, B and D (c) A and D (d) B and D

23. Which one of the following is a freshwater sponge?

- (a) *Euspongia* (b) *Hippospongia* (c) *Cliona* (d) *Spongilla*

24. Venus flower basket belongs to the phylum:

- (a) Porifera (b) Coelenterata (c) Protozoa (d) Echinodermata

25. Sponges are:

- (a) Free swimming (b) Parasites (c) Plant-like fixed (d) Symbionts

26. Locomotion does not take place in:
 (a) Earthworms (b) *Octopus* (c) *Sycon* (d) *Hydra*
27. Members of this family of sponges feed by capturing and digesting whole animals:
 (a) Axinellidae (b) Cladorhizidae (c) Spongillidae (d) Poecilosceridae
28. Match column I with column II and select the correct answer using answer codes:
- | Column I | | Column II | |
|------------------|--|--------------------------|--|
| (A) Myocytes | | 1. Skin cells of sponges | |
| (B) Archaeocytes | | 2. Ability to contract | |
| (C) Mesenchyme | | 3. Proteinaceous matrix | |
| (D) Pinacocytes | | 4. Totipotent cells | |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 2 | 4 | 1 | 2 |
| (b) 4 | 3 | 2 | 1 |
| (c) 3 | 4 | 1 | 2 |
| (d) 2 | 4 | 3 | 1 |
29. Which one of the following is applicable to sponges?
 (a) Totipotency and cellular mobility (b) Choanocytes and external pores
 (c) Mineral spicules and cellular mobility (d) All
30. Consider the following statements about demospongiae:
 (A) Demospongiae includes most of the world sponges
 (B) They have asconoid, syconoid or leuconoid grade of construction
 (C) In them, spicules are secreted extracellularly
 (D) Some members of this class lack both spongin and spicules
- The incorrect statements are:
 (a) None (b) A and B (c) B and C (d) A and D
31. Gonads of sponges are formed by:
 (a) Ectoderm (b) Endoderm (c) Archaeocytes (d) Scleroblasts
32. In sponges, fertilisation is:
 (a) Self and external (b) Self and internal (c) Cross and external (d) Cross and internal
33. Larva of *Scypha* is:
 (a) Ephyra (b) Planula (c) Parenchymula (d) Redia
34. The mode of nutrition in sponges is:
 (a) Holozoic (b) Holophytic (c) Saprophytic (d) Parasitic
35. *Euspongia* is popularly known as:
 (a) Bath sponge (b) Venus flower basket (c) Boring sponge (d) Horseshoe sponge
36. Dead man's finger is the common name of:
 (a) *Cliona* (b) *Chalina* (c) *Spongilla* (d) *Hyalonema*
37. Gemmules are:
 (a) Free-living organisms (b) Parasitic organism
 (c) A sexual reproductive body of sponges (d) Asexual reproductive body of *Planaria*

38. The mesenchyme of sponges contains:
 (a) Choanocytes (b) Archaeocytes (c) Nematocytes (d) All
39. *Hyalonema* is a:
 (a) Protozoan (b) Porifera (c) Coelenterate (d) Mollusca
40. Which one of the following statements is incorrect?
 (a) Members of class calcarea are exclusively marine.
 (b) Members of class hexactinellida are exclusively marine.
 (c) Members of class demospongiae are mostly marine and a few are freshwater.
 (d) Members of class demospongiae are exclusively freshwater.
41. Sponges lack:
 (a) Special organ for respiration (b) Special organ for excretion
 (c) Special nerve and sensory cells (d) All
42. The common chamber present in all sponges:
 (a) Coelenteron (b) Spongocoel (c) Haemocoel (d) Pseudocoel
43. Larvae are active but adults are fixed-like plants in:
 (a) Starfish (b) *Hydra* (c) Sponges (d) Crabs
44. Nerve cells are not found in:
 (a) Platyhelminthes (b) Coelenterates (c) Sponges (d) Echinoderms
45. The path of water in a sponge is:
 (a) Ostia → incurrent canal → prosopyle → radial canal → apopyle → excurrent canal → spongocoel → osculum
 (b) Ostia → incurrent canal → prosopyle → spongocoel → osculum
 (c) Ostia → radial canal → apopyle → spongocoel → osculum
 (d) Osculum → spongocoel → apopyle → prosopyle → osculum
46. Coeloblastula is the:
 (a) Larva of Coelenterates (b) Hollow blastula of sponge
 (c) Blastula of Annelids (d) Blastula of *Unio*
47. The sponge which is harmful to the oyster industry is:
 (a) *Hyalonema* (b) *Chalina* (c) *Cliona* (d) *Hippospongia*
48. In the history of animal evolutions:
 (a) Protozoa are regarded as the first step towards multicellularity
 (b) Sponges are regarded as the first step towards multicellularity
 (c) Coelenterates are regarded as the first step towards multicellularity
 (d) None
49. Sponges are distinct from metazoans:
 (a) As they are fixed animals (b) They lack tissue grade of organisation
 (c) They lack organ grade of organisation (d) They possess canal system
50. Most specialised structures present in sponges are:
 (a) Canals (b) Flagellated chambers (c) Spicules and gemmules (d) All
51. Sponges are an excellent material for studying:
 (a) Mechanism of gene action

- (b) Cellular behaviour in the problems of developmental biology
(c) Tissue culture
(d) Physiology of cells
52. Protocyte cells are found in:
(a) Protozoa (b) Porifera (c) Coelenterates (d) Annelida
53. Consider the following statements with reference to hexactinellida:
(A) They are entirely marine and are found in shallow water
(B) Choanocytes are restricted to finger-shaped chambers
(C) Cellular dermal epithelium is well marked
(D) Spongin is lacking
The correct statements are:
(a) All (b) A, B and C (c) B and C (d) B and D
54. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) <i>Halichondria</i>	1. Canal system is rhagon type
(B) <i>Tethya</i>	2. Sexes are separate
(C) <i>Euspongia</i>	3. Spongin fibres are completely lacking
(D) <i>Spongilla</i>	4. Crumb of breed sponge

Answer codes:

A	B	C	D
(a) 2	1	4	3
(b) 4	3	2	1
(c) 4	1	3	2
(d) 3	1	2	4
55. Sponges lack:
(a) Muscle cells (b) Neurons (c) Organised tissues (d) All
56. Which one of the following is incorrect about archaeocytes?
(a) Cellular totipotency (b) Involved in food transport
(c) Contractile (d) Motile stem cells
57. In sponges, flow of water current in the body is maintained by:
(a) Collar cells (b) Amoeboid cells (c) Epithelial cells (d) All
58. Sponges lack:
(a) Ostia (b) Porocytes (c) Flagella (d) Cilia
59. Which one of the following sponges changes colour when it changes sex?
(a) *Euspongia mollisima* (b) *Halichondria moorei*
(c) *Euspongia officinalis* (d) *Leucetta*
60. The spicules of demsopongiae are never:
(a) Mono axon (b) Tri axon (c) Tetra axon (d) Poly axon
61. Which one of the following is an incorrect match?
(a) Amphiblastula – Sponge (b) Canal system – Sponges
(c) Tissue grade of organisation – Sponges (d) Choanocytes – Sponges

62. Amphiblastula and parenchymula are related with the life cycle of:
 - (a) Flatworm
 - (b) Leeches
 - (c) Sponges
 - (d) Echinoderms
63. The continuous water current, flowing through the body of sponges helps in:
 - (a) Nutrition
 - (b) Respiration and excretion
 - (c) Reproduction
 - (d) All
64. Best commercial sponges are found in:
 - (a) Warm, shallow water of the Mediterranean
 - (b) Pacific Ocean
 - (c) Indian Ocean
 - (d) Atlantic Ocean
65. Trophocyte cells of sponges:
 - (a) Secrete slimy substance
 - (b) Supply nutrients to developing cells
 - (c) Contain reserve food granules
 - (d) Contain pigment granules
66. Which one of the following is absent in sponges?
 - (a) Cnidoblasts
 - (b) Choanocytes
 - (c) Myocytes
 - (d) Thesocytes
67. Myocytes of sponges:
 - (a) Secrete a slimy substance
 - (b) Supply nutrients to developing cells
 - (c) Form sphincters around osculum and ostia
 - (d) Form testis and ovary
68. Tick the incorrect match:
 - (a) Sex cells – Develop from archaeocytes during breeding season
 - (b) Theocytes – Contain reserve food granules
 - (c) Chromocytes – Totipotent cells
 - (d) Myocytes – Highly contractile cells
69. The correct sequence for *Leucosolenia* is:
 - (a) Zygote → coeloblastula → parenchymula → adult
 - (b) Zygote → parenchymula → coeloblastula → adult
 - (c) Zygote → coeloblastula → ephyra → adult
 - (d) Zygote → coeloblastula → amphiblastula → adult
70. Six-rayed siliceous spicules are found in the members of class:
 - (a) Calcarea
 - (b) Hexactinellida
 - (c) Demospongiae
 - (d) All
71. In sponges, the food which comes through water current is ingested by:
 - (a) Pinacocytes
 - (b) Choanocytes
 - (c) Chromocytes
 - (d) Thesocytes
72. Gemmules of sponges contain:
 - (a) Choanocytes
 - (b) Archaeocytes
 - (c) Ova and sperms
 - (d) None
73. Mesenchyme of sponges consists of:
 - (a) Gemmules
 - (b) Chromocytes
 - (c) Skeletal elements
 - (d) Skeletal elements and amoeboid cells
74. Which one of the following statements is incorrect?
 - (a) Archaeocytes are totipotent cells.
 - (b) Pinacoderm is made up of pinacocytes.
 - (c) Myocytes are contractile cells.
 - (d) Thesocytes are reproductive cells.
75. Which one of the following cells is only found in sponges?
 - (a) Comb plates
 - (b) Cnidoblasts
 - (c) Collar cells
 - (d) Glutinant cells
76. Which one of the following cavities is found in sponges?
 - (a) Coelenteron
 - (b) Haemocoel
 - (c) Pseudocoel
 - (d) Paragastric cavity

77. Which one of the following is different?
 (a) Sterogastrula (b) Parenchymula (c) Planula (d) Amphiblastula
78. Pinacocytes are found in:
 (a) Starfish (b) Devil fish (c) Jellyfish (d) *Sycon*
79. A precious gift to the newly married couples in Japan is:
 (a) *Euplectella* (b) *Euspongia* (c) *Cliona* (d) *Spongilla*
80. Which one of the following is different?
 (a) *Sycon* (b) *Euspongia* (c) *Spongilla* (d) *Spongicola*
81. The totipotent cells of sponges are:
 (a) Myocytes (b) Chromocytes (c) Archaeocytes (d) Choanocytes
82. Sponges have:
 (a) Connective tissue (b) Epithelial tissue (c) Both (d) None
83. Sponges differ from the metazoa:
 (a) As they are fixed animals. (b) They lack cellular organisation.
 (c) They lack division of labour. (d) They possess great power of regeneration.
84. The spicules may be absent in the members of class:
 (a) Calcarea (b) Hexactinellida (c) Demospongiae (d) None
85. Which one of the following symmetries of spicules is not found in sponges?
 (a) Tri axon (b) Tetra axon (c) Pent axon (d) Poly axon
86. Spicules are:
 (a) Separate (b) Connected by joints (c) Fused (d) All
87. What is incorrect about glass sponge?
 (a) Found in very deep water (b) Produces no toxin
 (c) Six rayed spicules (d) Conules
88. Which one of the following is incorrect about choanocytes?
 (a) Create water current
 (b) Participate in the ingestion of food and differentiation of sex cells
 (c) Take part in the secretion of mesohyl
 (d) Are the main cells of outer cellular layer of choanoderm
89. Choanocytes are large in the members of class:
 (a) Calcarea (b) Hexactinellida (c) Demospongiae (d) Scaphapoda
90. Demospongiae lacks:
 (a) Incubate stereo gastrula larvae (b) Asters
 (c) Spongin B (d) Microscleres
91. In which one of the following sponges is spongin A is always present?
 (a) *Tethya* (b) *Axinella* (c) *Biemna* (d) All
92. The nonflagellated cells of amphiblastula do not give rise to:
 (a) Porocytes (b) Scleroblasts (c) Amoebocytes (d) Epidermis
93. Which one of the following is an incorrect match?
 (a) Asconoid canal system – *Leucosolenia* (b) Eurypylous canal system – *Leucilla*
 (c) Aphodal canal system – *Oscarella* (d) Diplodal canal system – *Spongilla*

94. In which one of the following are megascleres and microscleres not distinctly separable?
 (a) *Plakina* (b) *Oscarella* (c) *Craniella* (d) *Ancorina*
95. *Spongicola* belongs to class:
 (a) Calcarea (b) Hexactinellida (c) Demospongiae (d) None
96. The spicules of *Sycon* are made up of:
 (a) Silica (b) Calcium carbonate
 (c) Spongin fibres (d) A combination of sponging fibres and silica
97. Sponges are:
 (a) Herbivorous (b) Carnivorous (c) Sanguivorous (d) Omnivorous
98. All sponges have a great power of:
 (a) Locomotion (b) Regeneration (c) Autotomy (d) All
99. Symbiotic anemones are found in:
 (a) *Sycon* (b) Root tuft of *Hyalonema*
 (c) Radial canal of *Spongilla* (d) Spongocoel of *Leucosolenia*
100. Animal nature of sponges was established by Ellis on the basis of:
 (a) Nature of skeleton (b) Water current flowing through their body
 (c) Mode of reproduction (d) Power of regeneration
101. *Leucosolenia* is sessile colonial, marine animal and belongs to class:
 (a) Calcarea (b) Hexactinellida (c) Demospongiae (d) Hydrozoa
102. Calcoblast is associated with:
 (a) Canal system of sponges (b) Reproductive system of sponges
 (c) Skeletal elements of sponges (d) Spongocoel of sponges
103. Which one of the following is different?
 (a) Calcoblasts (b) Silicoblasts (c) Spongioblasts (d) Cnidoblasts
104. Which one of the following statements is not true about *Leucosolenia*?
 (a) They are marine animals having primitive structural plan.
 (b) They have asconoid type of canal system.
 (c) Their larva is parenchymula.
 (d) Their skeleton is made up of a combination of sponging fibres and silica.
105. Rhagon type of canal system is found in:
 (a) *Sycon* (b) *Leucosolenia*
 (c) *Spongilla* (d) Larval stages of sponges
106. Prosopyle:
 (a) Is an intracellular pore in the porocytes
 (b) Opening of the radial canal into spongocoel
 (c) Asexual reproductive body
 (d) Intracellular pore located in grooves of the body
107. The endodermal cells of sponges are known as:
 (a) Choanocytes (b) Amoebocytes (c) Spongioblasts (d) Cnidoblasts

108. Canal system in sponges was discovered by:
 (a) Goldfuss (b) Eliss (c) R E Grant (d) Klein
109. The freshwater sponges belong to class:
 (a) Demospongiae (b) Calcarea (c) Hexactinellida (d) Actinozoa
110. Which one of the following is different?
 (a) *Spongilla* (b) *Sycon* (c) *Euplectella* (d) *Hyalonema*
111. Presence of tri-axon spicules is a characteristic of:
 (a) Calcarea (b) Hydrozoa (c) Hexactinellida (d) Demospongiae
112. Tylostyles are found in:
 (a) Protozoan (b) Sponges (c) Coelenterates (d) Mollusca
113. The enemies of sponges are:
 (a) Coral-reef fish (b) Limpets (c) Nudibranchs (d) All
114. In *Leucosolenia*, digestion takes place in:
 (a) Spongocoel (b) Food vacuoles (c) Pinacoderm (d) Trophocytes
115. In sponges, power of regeneration is due to:
 (a) Archaeocytes (b) Choanocytes (c) Myocytes (d) Trophocytes
116. In sponges, the food is ingested by:
 (a) Nematocysts (b) Choanocytes (c) Myocytes (d) Thesocytes
117. In Demospongiae, the canal systems is of:
 (a) Ascon type (b) Sycon type (c) Leucon type (d) Rhagon type
118. Which one of the following is present in sponges?
 (a) Nerve cells (b) Sensory cells (c) Gland cells (d) Choanocytes
119. The softest and best sponges are:
 (a) Mediterranean sponges (b) Red Sea sponges
 (c) Caribbean sponges (d) Antarctica sponges
120. In Demospongiae, reproduction is:
 (a) Asexual (b) Viviparous (c) Oviparous (d) All
121. Spicules are amphidisc in:
 (a) *Euplectella* (b) *Hyalonema* (c) *Farnera* (d) *Geodia*
122. In sponges, the type of growth pattern displayed is influenced by:
 (a) Availability of space (b) The type and velocity of water current
 (c) The nature and inclination of the substratum (d) All
123. Which one of the following is not associated with Porifera?
 (a) Ostia (b) Porocytes (c) Intima (d) In situ fertilisation
124. Consider the following statements about *Leucosolenia*:
 (A) It is a member of class calcarea (B) It is sessile colonial and marine
 (C) Cleavage is holoblastic and unequal (D) Reproduces asexually by gemmule formation
 The incorrect statements are:
 (a) None (b) A and C (c) B and C (d) C and D

112 Animal Diversity

125. Choanocytes have much higher _____ digesting activity:
 (a) Proteolytic (b) Carbohydrate (c) Lipolytic (d) All
126. Consider the following statements about *Scypha*:
 (A) Commonly known as crown sponge
 (B) Body plan asconoid type
 (C) Ostia are intracellular
 (D) A narrow tube called prosodus is present between the incurrent canal and the flagellated chambers.
 The incorrect statements are:
 (a) None (b) A and B (c) B and D (d) C and D
127. Which one of the following is not applicable to *Euplectella*?
 (a) Sieve plate (b) Root tuft (c) Parietal gaps (d) Stone canal

Answers to Multiple-Choice Questions

1. (b)	2. (c)	3. (a)	4. (d)	5. (a)	6. (a)	7. (a)	8. (c)
9. (b)	10. (a)	11. (a)	12. (a)	13. (a)	14. (b)	15. (d)	16. (a)
17. (d)	18. (d)	19. (a)	20. (d)	21. (a)	22. (d)	23. (d)	24. (a)
25. (c)	26. (c)	27. (b)	28. (d)	29. (d)	30. (c)	31. (c)	32. (d)
33. (c)	34. (a)	35. (a)	36. (b)	37. (c)	38. (b)	39. (b)	40. (d)
41. (d)	42. (b)	43. (c)	44. (c)	45. (a)	46. (b)	47. (c)	48. (b)
49. (b)	50. (d)	51. (b)	52. (b)	53. (d)	54. (b)	55. (d)	56. (c)
57. (a)	58. (d)	59. (b)	60. (b)	61. (c)	62. (c)	63. (d)	64. (a)
65. (b)	66. (a)	67. (c)	68. (c)	69. (a)	70. (b)	71. (b)	72. (b)
73. (d)	74. (d)	75. (c)	76. (d)	77. (c)	78. (d)	79. (a)	80. (d)
81. (c)	82. (d)	83. (c)	84. (c)	85. (c)	86. (d)	87. (d)	88. (d)
89. (a)	90. (b)	91. (a)	92. (c)	93. (c)	94. (a)	95. (d)	96. (b)
97. (d)	98. (b)	99. (b)	100. (b)	101. (a)	102. (c)	103. (d)	104. (d)
105. (d)	106. (a)	107. (a)	108. (c)	109. (a)	110. (a)	111. (c)	112. (b)
113. (d)	114. (b)	115. (a)	116. (b)	117. (c)	118. (d)	119. (a)	120. (d)
121. (b)	122. (d)	123. (c)	124. (d)	125. (d)	126. (d)	127. (d)	

Fill in the Blanks

- The term 'Porifera' was coined by _____.
- The sponges are distinct from Protozoa in having cellular grade of organisation, and from metazoans in lacking _____.

3. The body of sponges is perforated by many small pores called _____.
4. The space enclosed by the body of a sponge is called _____.
5. The first calcarea known were from the _____ period.
6. The highest degree of folding occurs in _____ sponges.
7. Externally, syconoid sponges are similar to asconoid sponges, except that their body wall is _____.
8. Large spicules are called _____.
9. Sponges have a fossil record extending from the _____ to recent time.
10. The closet single-celled relatives of sponges are _____.
11. Spicules are produced by _____ cells.
12. The animal nature of sponges was established by _____.
13. Flagellated larva of sponges is the _____.
14. Choanocytes are _____ in origin.
15. The largest sponges belong to class _____.
16. In sponges, the rate of water flow is fastest through _____ and slowest through _____.
17. Motile stage in the life cycle of a sponge is the _____.
18. Bipolar collencytes are called _____.
19. Spongin fibres are secreted by _____.
20. Porocytes are tubular cells extending from the epidermis to _____.
21. Regeneration in sponges was studied by _____.
22. In sponges, glycogen is stored in _____.
23. Pinacocytes are _____ in origin.
24. Choanocytes were discovered by _____.
25. In *Scypha*, the skeleton consists of _____ spicules.
26. Family _____ contains most of the freshwater sponges.
27. Desmocytes are mainly found in the members of class _____.
28. Gemmule of a sponge is _____ bud.
29. Adult members of this phylum are sessile while larvae are free-swimming _____.
30. Study of sponges is called _____.
31. The leuconoid type of canal system exists in three grades: _____, _____ and _____.
32. Canal system is lined with flagellated cells called _____.
33. The sponge which is given as wedding gift in Japan is _____.
34. The ciliated larva of sponges passes to the outside through the _____.
35. The skeleton of members of class _____ is made up of siliceous spicules.

Answers to Fill in the Blanks

1. R E Grant (1836)	2. Tissue grade of organisation	3. Ostia
4. Spongocoel	5. Devonian	6. Leuconoid
7. Thicker	8. Megalascleres	9. Precambrian
10. Choano flagellates	11. Sclerocyte	12. John Ellis (1765)
13. Amphiblastula	14. Endodermal	15. Demospongiae
16. Osculum, Flagellated chambers	17. Larva	18. Desmacytes
19. Spongioblasts	20. Spongocoel	21. H V Wilson (1907)
22. Thesocytes	23. Ectodermal	24. James Clark (1807)
25. Calcareous	26. Spongillidae	27. Demospongiae
28. Internal	29. Porifera	30. Parazoology
31. Eurypylous, aphodal, diplodal	32. Choanocytes	33. <i>Euplectella</i>
34. Osculum	35. Hexactinellida	

True or False

1. Sponges are the first group of animals that have specialised cells for performing special functions.
2. Sponges are radially symmetrical or asymmetrical.
3. A few species of sponges are autotrophic.
4. Sclerosponges have a massive exoskeleton of calcium carbonate.
5. Sponges are more abundant and more diverse in tropical water.
6. Choanocytes are biflagellate.
7. Gemmules of sponges are internal buds.
8. Spongocoel is a common chamber in sponges.
9. In sponges, the cleavage is holoblastic and may be equal or unequal.
10. Generally *Leucosolenia* is solitary.
11. In *Adocia*, spongin is used as an interspicular cement.
12. *Sycon* has an asconoid structure.
13. *Clathrina* is a permanently asconoid structure lacking dermal membrane.
14. The germ layers of sponges are equivalent to the ectoderm and endoderm of metazoa.
15. In *Leucosolenia*, fertilisation is external.
16. The porocytes are noncontractile in nature.
17. In the members of order homocoela, only the radial canals are linked with the choanocytes.
18. *Tethya* can contract its entire body.

19. *Leucosolenia* is hermaphrodite and protandrous.
20. Neptune's cup is the common name of *Hippospongia*.
21. Many sponges produce a toxic or poisonous substance.
22. Some reef fish and hawksbill turtle are natural enemies of sponges.
23. All sponges are filter feeders.
24. Sponges have permanent gonads.
25. Water flow and choanocytes have been lost in most known carnivorous sponges.
26. *Oscarella lobularis* becomes brownish in light and remains deep red in light.
27. Sponges of class demospongiae are of bright colour.
28. Lophocytes are mobile and contractile cells.
29. Spongin A is a long unbranched fibril.
30. Spongin B is a large branched fibre.
31. The larvae of demospongiae are partly or completely ciliated.
32. The collar of choanocyte is noncontractile in nature.
33. Calcareous sponges are inhabitants of deep water and are found in all oceans.
34. In sponges, fertilisation is in situ.
35. The osculum of sponges is developmentally similar to the mouth of Coelenterates.
36. *Zoochlorellae* live in the amoebocytes of freshwater sponges and are passed on in larvae or gemmules.
37. *Spongicola* belongs to phylum Porifera.
38. In sponges, the current of water depends upon the completely coordinated beating of the flagella of choanocytes.
39. In eurypylous, canal system, apopyles open direct into the ex-current channels.
40. Porocytes are present in all sponges.
41. The skeleton of *Leucosolenia* is formed calcareous spicules.

Answers to True or False

1. True	2. True	3. False	4. True	5. False	6. False	7. True	8. True
9. True	10. False	11. True	12. False	13. True	14. False	15. False	16. False
17. False	18. True	19. True	20. False	21. True	22. True	23. True	24. False
25. True	26. False	27. True	28. False	29. True	30. True	31. True	32. False
33. False	34. True	35. False	36. False	37. False	38. False	39. True	40. False
41. True							

Give Reasons

1. Sponges are unique among animals.
 - Because sponges continuously remodel themselves to fine-tune their filter-feeding system.
2. Asconoid sponges are the smallest members of the phylum Porifera.
 - Because of their smallest surface area.
3. Boring sponges are important.
 - Because they transform solid calcium present in shells into the liquid form, which is reused to build new constructions.
4. Pinacocytes can change the size of the openings of ostia.
 - Because they are contractile.
5. Most sponges are found in quiet and clear water.
 - Because sediments stirred up by the water current would block their pores, thus all vital processes like feeding, respiration and excretion will become difficult.
6. The colony of spongilla is green.
 - Because of the presence of a green alga *Zoochlorellae* in its tissues.
7. In sponges, a constant flow of water through the body is essential.
 - Because there is no other circulating fluid in the body, and this constant flow of water helps in vital processes like the supply of food and oxygen and the removal of waste materials.
8. Sponges are of great interest to developmental biologists.
 - Because of their ability to reconstitute themselves, if their cells are separated into suspension.
9. Sponges are rarely eaten by animals.
 - Because of their bad taste, odour and presence of sharp spicules.
10. Sponges have been placed in a separate subkingdom 'Parazoa'.
 - Because of their isolated phylogenetic position as they lack mouth and digestive cavity. The entire body is perforated and has a unique canal system.
11. *Scypha* is more advanced in comparison to *Leucosolenia*.
 - Because in *Scypha*, the body wall is some what folded, whereas *Leucoselina* lacks any folding in its body wall.
12. The germ layers of metazoans are not equivalent to the ectoderm and endoderm of Porifera.
 - Because in metazoans, the ectoderm develops from the cells of the animal pole, whereas in sponges, the ectoderm is derived from the lower granular cells of the vegetal pole. Likewise, in metazoans, the cells of the vegetal pole form the endoderm, whereas in sponges, the flagellated upper cells of the animal pole form the endoderm.
13. In freshwater sponges, the flagellated chambers are well-adopted for filtering individual bacterium.
 - Because in freshwater sponges, the prosopyles are 5 μm in diameter, whereas the space between the adjacent microvilli of the collars are 0.1 μm in diameter and due to this, flagellated chambers can filter individual bacterium.
14. A sponge is a useful model for the human immune system.
 - Because it exhibits the workings of an immune system at the cellular level.

COELENTERATA

Multiple-Choice Questions

1. Tissue grade of organisation is shown by:
(a) Protozoans (b) Sponges (c) Coelenterates (d) Platyhelminthes
2. Members of the phylum Coelenterate are:
(a) Generally terrestrial (b) Generally freshwater
(c) Generally marine (d) May be terrestrial or freshwater
3. Coelenterates are characterised by:
(a) Spongocoel (b) Haemocoel (c) Coelenteron (d) Pseudocoel
4. Which one of the following is not applicable to Coelenterates?
(a) Radially symmetrical (b) Diploblastic and multicellular
(c) Polymorphism (d) Anus
5. In Coelenterates skeleton is:
(a) External (b) Internal (c) External or internal (d) Absent
6. Characteristic of Coelenterates is the presence of:
(a) Colloblasts (b) Cnidoblasts (c) Choanocytes (d) Collar cells
7. Polypoid and medusoid stages are associated with:
(a) Sponges (b) Coelenterates (c) Platyhelminthes (d) Molluscs
8. Metagenesis is shown by:
(a) Sponges (b) Coelenterates (c) Annelids (d) Echinoderms
9. Polymorphism is found in:
(a) Molluscs (b) Arthropods (c) Annelids (d) Coelenterates
10. Which one of the following is a radially symmetrical diploblastic animal?
(a) Earthworm (b) Liver fluke (c) *Hydra* (d) *Ascaris*
11. Mesogloea is present in the phylum:
(a) Porifera (b) Coelenterata (c) Platyhelminthes (d) Annelida
12. In which one of the following Coelenterates is the skeleton absent?
(a) Jellyfish (b) *Physalia* (c) *Hydra* (d) *Tubipora*
13. Which one of the following is not a class of Coelenterata?
(a) Hydrozoa (b) Scyphozoa (c) Anthozoa (d) Bryozoa
14. Nervous system is in the form of nerve network in:
(a) Sponges (b) *Hydra* (c) Tapeworms (d) Earthworms

15. Both polyp and medusa are found in:

(a) Anthozoa	(b) Scyphozoa	(c) Hydrozoa	(d) Bryozoa
16. Only polyp stage is found in the members of the class:

(a) Hydrozoa	(b) Scyphozoa	(c) Anthozoa	(d) None
17. Smallest polyp among Coelenterate is the:

(a) Sea anemone	(b) <i>Hydra</i>	(c) <i>Pennatula</i>	(d) <i>Aurelia</i>
18. The number of tentacles in *Hydra* is:

(a) 2–4	(b) 4–8	(c) 6–10	(d) 10–14
19. The true statement pertaining to Coelenterates is:

(a) They are multicellular animals having tissue grade of organisation and spongocoel
(b) They are multicellular animals having tissue grade of organisation, division of labour and coelenteron
(c) They are diploblastic animals having organ grade of organisation and coelenteron
(d) They are bilaterally symmetrical diploblastic animals exhibiting division of labour
20. Which one of the following is different?

(a) <i>Ascaris</i>	(b) Leech	(c) <i>Taenia</i>	(d) <i>Hydra</i>
21. Jellyfish belongs to phylum:

(a) Chordata	(b) Porifera	(c) Coelenterata	(d) Arthropoda
22. Corals belong to phylum:

(a) Echinodermata	(b) Mollusca	(c) Arthropoda	(d) Coelenterata
23. *Hydra* belongs to class:

(a) Hydrozoa	(b) Scyphozoa	(c) Anthozoa	(d) Bryozoa
24. Which one of the following is a Coelenterate?

(a) Sea cow	(b) Sea urchin	(c) Sea cucumber	(d) Sea pen
25. Coral reefs are formed by:

(a) Sponges	(b) Coelenterates	(c) Annelids	(d) Molluscs
26. Portuguese man-of-war is a:

(a) Sponge	(b) Polymorphic Echinoderm
(c) Coral	(d) Polymorphic Coelenterate
27. *Hydra* is a:

(a) Terrestrial animal	(b) Marine animal	(c) Freshwater animal	(d) Estuarine animal
28. *Hydra* remains attached with the substratum by:

(a) Colloblast	(b) Pedal disc	(c) Oral disc	(d) Acetabulum
29. *Hydra* is:

(a) Herbivorous	(b) Carnivorous	(c) Sanguivorous	(d) Omnivorous
30. In *Hydra*, digestion is:

(a) Intracellular	(b) Extracellular
(c) First extracellular followed by intracellular	(d) First intracellular followed by extracellular
31. In *Hydra*, respiration is performed by:

(a) Gills	(b) General body surface	(c) Nematocyst	(d) Pedal disc

32. The tentacles of *Hydra* are:
 (a) Solid (b) Hollow (c) Solid and blind (d) Hollow and blind
33. *Hydra* can digest all types of food except:
 (a) Protein (b) Carbohydrate (c) Fat (d) Starch
34. In *Hydra*, nematocysts help in:
 (a) Food capturing (b) Paralysing prey
 (c) Both food capturing and paralysing prey (d) Digestion
35. The interrelationship between *Hydra* and *Chlorella vulgaris* is an example of:
 (a) Commensalism (b) Symbiosis (c) Parasitism (d) Neutralism
36. Totipotent cells found in the body of *Hydra* are called:
 (a) Interstitial cells (b) Amoebocytes (c) Archaeocytes (d) Cnidoblasts
37. In *Hydra*, new nematocysts are formed by:
 (a) Interstitial cells (b) Archaeocytes
 (c) Mesogloea (d) Epithelio-muscular cells
38. Endoderm of *Hydra* is:
 (a) Protective and sensory in function (b) Secretary in function
 (c) Digestive in function (d) Both secretary and digestive function
39. In *Hydra*, which one of the following is sensory in function?
 (a) Ectoderm (b) Endoderm (c) Mesogloea (d) All
40. Contraction in the body of *Hydra* is produced by the contraction of:
 (a) Epithelio-muscular cells (b) Interstitial cells
 (c) Cnidoblasts (d) Sensory cells
41. Cnidoblasts:
 (a) Help in locomotion (b) Help in attachment
 (c) Act as organ for offence and defence (d) Form gonads
42. Which one of the following is the largest cnidoblast in *Hydra*:
 (a) Volvent (b) Stenotele
 (c) Stereoline glutinant (d) Streptoline glutinant
43. In *Hydra*, Cnidoblasts are absent in:
 (a) Hypostome (b) Tentacles (c) Pedal disc (d) Body surface
44. In *Hydra*, all four types of cnidoblasts are found in:
 (a) Tentacles (b) Hypostome (c) Pedal disc (d) Body surface
45. Hypnotoxin is secreted by:
 (a) Interstitial cells (b) Gland cells
 (c) Nematocysts (d) Endothelio-muscular cells
46. Which one of the following cells is absent in the endoderm of *Hydra*?
 (a) Sensory cells (b) Nerve cells (c) Interstitial cells (d) Cnidoblasts
47. Excretion in *Hydra* takes place by:
 (a) Flame cells (b) Nephridia
 (c) Cnidoblasts (d) General body surface

48. Tick the incorrect match:
(a) Cnidoblasts – *Hydra* (b) Coelenteron – *Hydra*
(c) Choanocytes – *Obelia* (d) Polyps – Sea anemone
49. Functionally, nematocysts are related with:
(a) Locomotion (b) Food capture (c) Offence and defence (d) All
50. Gonads of *Hydra* develop from:
(a) Interstitial cells (b) Archaeocytes (c) Muscle cells (d) Cnidoblasts
51. Nitrogenous waste product of *Hydra* is:
(a) Ammonia (b) Urea
(c) Uric acid (d) Both ammonia and urea
52. When *Hydra* wants to move fast, it performs:
(a) Somersault movement (b) Cuttlefish-like movement
(c) Gliding (d) Swimming
53. *Hydra* reproduces by:
(a) Budding (b) Gametes formation (c) Fission (d) All
54. The gastrula of *Hydra* is formed by:
(a) Delamination (b) Epiboly (c) Emboly (d) Invagination
55. The larva of *Hydra* is:
(a) Ephyra (b) Planula (c) Parenchymula (d) No larval stage
56. During development *Hydra* moults:
(a) One time (b) Two times (c) Four times (d) No moulting
57. *Hydra* is:
(a) Oviparous (b) Viviparous (c) Unisexual (d) Unisexual or bisexual
58. Testis in *Hydra* is derived from:
(a) Cnidoblasts (b) Archaeocytes (c) Interstitial cells (d) None
59. Regeneration in *Hydra* was reported by:
(a) Leuckart (b) Trembley (c) Lamarck (d) Johnston
60. If *Hydra* is cut into many pieces:
(a) Each piece will develop into a young *Hydra*
(b) Each piece having a bit of nucleus will develop into a young *Hydra*
(c) Each piece having a bit of ectoderm and endoderm will gradually develop into a young *Hydra*
(d) Each piece will die
61. Polymorphism is shown by:
(a) Sponges (b) Coelenterates (c) Arthropods (d) Molluscs
62. Polymorphism is shown by the members of the class:
(a) Anthozoa (b) Hydrozoa (c) Scyphozoa (d) All
63. Which one of the following does not take place in *Hydra*?
(a) Gamete formation (b) Regeneration (c) Gastrulation (d) Mating
64. Which one of the following is not found in *Hydra*?
(a) Nervous tissue (b) Connective tissue (c) Epithelial tissue (d) Muscular tissue

65. In *Hydra*, nematocysts are abundant in:
 - (a) Hypostome
 - (b) Tentacles
 - (c) Pedal disc
 - (d) Middle part of the body
66. Members of this phylum are strictly aquatic:
 - (a) Protozoa
 - (b) Coelenterate
 - (c) Arthropoda
 - (d) Mollusca
67. Members of this phylum have a single aperture:
 - (a) Porifera
 - (b) Coelenterata
 - (c) Annelida
 - (d) Mollusca
68. Cnidoblasts are the monopoly of the phylum:
 - (a) Porifera
 - (b) Coelenterata
 - (c) Annelida
 - (d) Echinodermata
69. Adults of this phylum exist either in polyp or medusa form:
 - (a) Coelenterata
 - (b) Annelida
 - (c) Arthropoda
 - (d) Mollusca
70. Nutrition in *Hydra* is:
 - (a) Holozoic
 - (b) Holophytic
 - (c) Saprophytic
 - (d) Myxotrophic
71. In *Hydra*, anus is located:
 - (a) In the pedal disc
 - (b) Near the mouth
 - (c) In the middle part of the body
 - (d) Absent
72. Which one of the following is true about Coelenterates?
 - (a) Animals with stinging cells
 - (b) Body wall is diploblastic
 - (c) Animals having cell differentiation and division of labour
 - (d) All
73. In *Hydra*, besides assisting in feeding, the tentacles also help in:
 - (a) Locomotion
 - (b) Offence and defence
 - (c) Both a and b
 - (d) Excretion and reproduction
74. Which one of the following statements is incorrect about cnidoblasts?
 - (a) They are specialised cells, only found in Coelenterates.
 - (b) In *Hydra*, cnidoblasts are of four types.
 - (c) Once used, a cnidocyte becomes useless.
 - (d) A cnidocyte can be used many times.
75. Smallest nematocyst is the:
 - (a) Volvent
 - (b) Stereoline glutinant
 - (c) Streptoline glutinant
 - (d) Stenotele
76. Which one of the following is known as an independent effector?
 - (a) Cnidocytes
 - (b) Canal system
 - (c) Water vascular system
 - (d) Haemocoelomic system
77. Hypnotoxin is secreted by:
 - (a) Penetrant nematocyst
 - (b) Holotrichus nematocyst
 - (c) Atrichous nematocyst
 - (d) Volvent nematocyst
78. The most primitive nervous system is found in:
 - (a) Earthworms
 - (b) *Ascaris*
 - (c) *Polygordius*
 - (d) *Hydra*
79. The needle-like process of nematocyst is called:
 - (a) Cnidocil
 - (b) Butt
 - (c) Barb
 - (d) Nema

80. Nematocysts of *Hydra* are of:
 (a) Two types (b) Four types (c) Six types (d) Eight types
81. Which one of the following nematocysts is associated with locomotion in *Hydra*?
 (a) Penetrant (b) Streptoline glutinant (c) Stereoline glutinant (d) Volvent
82. Common digestive and body cavity is found in:
 (a) Coelenterates (b) Platyhelminthes (c) Aschelminthes (d) Echinoderms
83. *Hydra* prefers to remain at:
 (a) Low temperature and absence of light (b) Low temperature and high intensity of light
 (c) Moderate temperature and moderate light (d) High temperature and high intensity of light
84. Which one of the following is a false statement?
 (a) Any touch causes contraction of tentacles as well as the body of *Hydra*.
 (b) *Hydra* does not respond to water current.
 (c) In normal conditions *Hydra* likes to move away from the surface.
 (d) *Hydra* responds positively to strong and injurious chemicals.
85. The formation of coral reef is related with:
 (a) Sponges (b) Hydrozoa (c) Anthozoa (d) Scyphozoa
86. Class Scyphozoa of the phylum Coelenterate is characterised by the presence of :
 (a) Polyp (b) Medusa (c) Both polyp and medusa (d) Comb plates
87. Larva of Coelenterates is:
 (a) Glochidium (b) Trochophore (c) Planula (d) Parenchymula
88. Reserve food material in *Hydra* is
 (a) Glycogen (b) Starch (c) Paramylum (d) Cellulose
89. Pneumatophore is found in:
 (a) *Hydra* (b) *Obelia* (c) *Physalia* (d) Sea anemone
90. *Tubipora* belongs to class:
 (a) Anthozoa (b) Hydrozoa (c) Scyphozoa (d) Asteroidea
91. Gastrovascular cavity is without partitions in:
 (a) Hydrozoa (b) Scyphozoa (c) Anthozoa (d) None
92. Metagenesis is shown by:
 (a) *Physalia* (b) *Pennatula* (c) *Obelia* (d) *Aurelia*
93. In which one of the following are nerve cells present but the brain is absent?
 (a) Coelenterates (b) Protozoa (c) Porifera (d) Platyhelminthes
94. A bioluminescent Coelenterate is:
 (a) *Obelia* (b) *Hydra* (c) *Aurelia* (d) *Physalia*
95. *Obelia* colony is:
 (a) Monomorphic (b) Dimorphic
 (c) Trimorphic (d) May be monomorphic or dimorphic
96. *Fungia* is popularly known as:
 (a) Organ pipe coral (b) Sea fan (c) Mushroom coral (d) Brain coral

97. Organ pipe coral is the common name of:
(a) *Tubipora* (b) *Alcyonium* (c) *Pennatula* (d) *Gorgonia*
98. In anthozoa, the skeleton is:
(a) External (b) Internal (c) External or internal (d) Absent
99. Red coral is:
(a) *Alcyonium* (b) *Tubipora* (c) *Meandrina* (d) *Corallium*
100. Sea feather belongs to phylum:
(a) Echinodermata (b) Arthropoda (c) Coelenterata (d) Protozoa
101. Skeleton of Coelenterates is made up of:
(a) Calcium carbonate (b) Horny material
(c) Spongin fibres (d) Calcium carbonate or horny material
102. Which one of the following is absent in Coelenterates?
(a) Cnidoblasts (b) Larval forms (c) Metagenesis (d) Coelom
103. Which one of the following is not digested by the *Hydra*?
(a) Protein (b) Carbohydrate (c) Fat (d) Starch
104. Which one of the following is different?
(a) *Physalia* (b) *Metridium* (c) *Pennatula* (d) *Corallium*
105. *Hydra* receives impulses and stimuli through:
(a) Nerve cells (b) Sensory cells (c) Cnidoblasts (d) None
106. Mesogloea of *Hydra* is secreted by:
(a) Ectoderm (b) Endoderm
(c) Both ectoderm and endoderm (d) Cnidoblasts
107. This type of locomotion is not found in *Hydra*:
(a) Gliding (b) Creeping (c) Floating (d) Swimming
108. In *Hydra*, undigested residues are egested through:
(a) Anus (b) Rupturing of body wall
(c) Mouth (d) All
109. Which one of the following is not a part of cnidoblast?
(a) Butt (b) Stylet (c) Lasso (d) Comb plates
110. Nutritive muscular cells of *Hydra* contain:
(a) Flagella (b) Cilia
(c) Pseudopodia (d) Flagella and pseudopodia
111. Which one of the following is applicable to *Hydra*?
(a) Polymorphism (b) Metagenesis (c) Segmentation (d) None
112. Which one of the following is incorrect about nectocalyx (nectophore)?
(a) Typical medusoid form (b) Velum is present
(c) Mouth is present (d) Tentacles and sense organs are lacking
113. Nematocyst does not take part in:
(a) Food capturing (b) Locomotion (c) Offence and defense (d) Reproduction

114. Tentaculocyst is the sensory organ of:
(a) *Ascaris* (b) Prawn (c) Starfish (d) *Aurelia*
115. Polymorphism in Coelenterate is due to:
(a) Sedentary mode of life (b) Tissue grade of organisation
(c) Division of labour (d) Multicellularity
116. The nematocysts *Hydra* involves in food capture:
(a) Penetrant (b) Volvent
(c) Penetrant and streptoline (d) Streptoline and stereoline
117. Division of labour is shown by:
(a) *Elphidium* (b) *Hyalonema* (c) *Spongilla* (d) *Obelia*
118. Which one of the following is known as brain coral?
(a) *Tubipora* (b) *Fungia* (c) *Meandrina* (d) *Corallium*
119. The polyp is _____ symmetrical individual:
(a) Radially (b) Biradially (c) Radiobilaterally (d) All
120. Scyphozoans lack:
(a) Skeleton (b) Specialised organs for respiration and excretion
(c) Head (d) All
121. Largest nematocyst among Coelenterate is found in:
(a) *Physalia* (b) *Porpita* (c) *Halitemma* (d) *Diphyes*
122. The float of *Physalia* contains highest percentage of:
(a) Oxygen (b) Nitrogen (c) Argon (d) Hydrogen
123. The siphonophores lacking pneumatophore (float) are found in:
(a) *Diphyes* (b) *Paraya* (c) *Vallela* (d) *Abyla*
124. Which one is a solitary coral?
(a) *Favia* (b) *Tubipora* (c) *Flabellum* (d) *Oculina*
125. In which one of the following are nematocysts usually located on tentacles?
(a) Fire corals (b) Sea anemones (c) Sea firs (d) All
126. In which one of the following are nematocysts limited to their outer epidermis?
(a) Hydrozoa (b) Scyphozoa (c) Anthozoa (d) All
127. Gonophore is lacking in:
(a) *Hydractinia* (b) *Tubularia* (c) *Plumularia* (d) None
128. Which one of the following is popularly known as sea whip?
(a) *Corallium* (b) *Leptogorgia* (c) *Heliopora* (d) *Clavularia*
129. Pneumatophore is devoid of:
(a) Muscular walls (b) Gas glands (c) Mesogloea (d) None
130. The polyp of *Obelia* lacks:
(a) Mesenteries (b) Stomodaeum (c) Sex cells (d) All
131. Consider the following statements about *Obelia*:
(A) Medusoid phase is dominant (B) Planula with blastopore and coelenteron
(C) Scyphistoma and ephyra are present (D) Cleavage is holoblastic and unequal

The correct statements are:

- (a) All (b) B, C and D (c) B and C (d) None

132. Which one of the following is not applicable to *Obelia*?

- (a) Sea fur (b) Metagenesis (c) Polymorphism (d) Strobilation

133. Animals showing radial symmetry :

- (a) Are sessile (*Hydra*) (b) Drift with the water currents (Jellyfish)
(c) Are very slow moving (Sea star) (d) All

134. Which one of the following is not a polyp?

- (a) Jellyfish (b) *Hydra* (c) Corals (d) Sea anemone

135. Coelenterates have cells that respond to:

- (a) Light (b) Touch (c) Pull of gravity (d) All

136. *Obelia* lacks:

- (a) Gastric pouches (b) Oral arms (c) Gastric filaments (d) All

137. Siphonoglyphs are lacking in:

- (a) *Antipathes* (b) *Tubipora* (c) *Corallium* (d) *Zoanthus*

138. *Polypodium* is a parasite in the ovary of:

- (a) Frog (b) Sturgeon (c) Earthworm (d) Dogfish

139. Consider the following statements about hexacorallia:

- (A) They have branched tentacles
(B) They can be either solitary or live in colonies
(C) They may be soft or supported by a calcareous form
(D) The tropical coral reefs have been predominantly built by the hexacorallia

The correct statements are:

- (a) All (b) A, B and C (c) B, C and D (d) B and D

140. The endoderm of *Hydra* is:

- (a) Muscular (b) Digestive (c) Vascular and secretory (d) All

141. In which one of the following Coelenterates is the symmetry bilateral?

- (a) *Verella* (b) *Halitemma* (c) *Xenia* (d) *Telesto*

142. Match column I with column II and select the correct answer using answer codes:

Column I

- (A) *Rhizostoma*
(B) *Cyanea arctica*
(C) *Corallium*
(D) *Porpita*

Column II

1. Polymorphic colony
2. Dimorphic colony
3. Sea blubber
4. Polystomatous

Answer codes:

	A	B	C	D
(a)	4	3	2	1
(b)	3	1	4	2
(c)	2	3	2	1
(d)	4	1	2	3

143. Free-swimming medusa is lacking in:
 (a) *Sertularia* (b) *Plumularia* (c) *Tubularia* (d) All
144. Consider the following statements:
 (A) Blastostyle has mouth but lacks tentacles
 (B) Polyp and medusa are homologous structures
 (C) *Aurelia* lacks muscles and nerve rings
 (D) In *Aurelia*, gastrula is formed by delamination and immigration of ectodermal cells in blastocoel
 The incorrect statements are:
 (a) A and B (b) A and D (c) C and D (d) None
145. Which one of the following is an incorrect match?
 (a) *Renilla* – Axial skeleton present (b) *Fungia* – Mushroom coral
 (c) *Meandrina* – Brain coral (d) *Gorgonia* – Sea fan
146. Statocyst is lacking in:
 (a) *Hydra* (b) *Hydractinia* (c) *Pennaria* (d) All
147. Which one of the following is different?
 (a) Sea hare (b) Sea fan (c) Sea feather (d) Sea whip
148. The fish *Nomeus* shows commensal relationship with:
 (a) *Porpita* (b) *Physalia* (c) *Halitemma* (d) *Rhizostoma*
149. The siphonozoid may be modified as:
 (a) Mesozooid (b) Autozooid (c) Both a and b (d) Palpon and cyston
150. Mesozooid of Hickson is present in:
 (a) *Hydroctena* (b) *Pennatularia* (c) *Vellela* (d) *Physalia*
151. Nectocalyx is found in siphonophora except:
 (a) *Physalia* (b) *Porpita* (c) *Halitemma* (d) *Diphyes*
152. Cyston is _____ in function:
 (a) Respiratory (b) Circulatory (c) Digestive (d) Excretory
153. Palpons act as dactylozooids in:
 (a) *Physalia* and *Porpita* (b) *Vellela* and *Porpita*
 (c) *Diphyes* and *Vellela* (d) *Halitemma* and *Vellela*
154. Alcyonacea includes:
 (a) Blue corals (b) Horny corals (c) Black corals (d) Soft corals
155. Which one of the following is the largest hydrozoan polyp?
 (a) *Pennaria* (b) *Corymorpha* (c) *Sertularia* (d) *Hydractinia*
156. What is incorrect about *Polypodium*?
 (a) Bilateral symmetry (b) Presence of gonoducts
 (c) Inversion of layers during parasitic life (d) None
157. Consider the following statements:
 (A) Most hydrozoa have separate sexes
 (B) In hydrozoa, fertilisation is internal
 (C) There is no copulation in hydrozoa
 (D) The hydrozoa are the first animals in which sperm attractants have been demonstrated

The incorrect statements are:

- (a) All (b) A and B (c) C and D (d) None

158. Which one of the following is incorrect with reference to coral reefs?

- (a) Coral reefs occur in water having a temperature range of 20–28°C.
 (b) The diversity of reef corals decreases in higher latitudes to about 30° north and south.
 (c) The greatest concentration of reefs occurs near the equator.
 (d) Table reefs are large open reefs having lagoon.

159. The Coelenterates differ from Ctenophores in:

- (a) Radial symmetry (b) Having nematocysts
 (c) In having polyp stage (d) All

160. *Hydra* was called polyp by:

- (a) Trembley (b) Linnaeus (c) Reaumer (d) Leeuwenhoek

161. In which one of the following nematocysts of *Hydra* is the butt lacking?

- (a) Volvent (b) Stenotele (c) Large glutinant (d) None

162. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Metagenesis	1. Sexual reproduction
(B) <i>Heliopora</i>	2. <i>Aurelia</i>
(C) Bioluminescent	3. <i>Obelia</i>
(D) Medusa	4. Blue coral

Answer codes:

A	B	C	D
(a) 3	4	1	2
(b) 3	4	2	1
(c) 1	4	3	2
(d) 2	3	4	1

163. Which one of the following is a correct match?

- (a) *Cordylophora lacustaris* – Freshwater (b) Volvent – Largest nematocyst
 (c) Fringing reef – Common in Pacific Ocean (d) Otolith – Nematocyst

164. *Metridium* lacks:

- (a) Oral disc (b) Suctorial mouth (c) Column (d) Capitulum

165. Which one of the following is not related with the phylum Coelenterata?

- (a) Hydrula (b) Amphiblastula (c) Ephyra (d) Scyphistoma

166. Which one of the following is not a medusoid zooid?

- (a) Gonozooid (b) Gonophores (c) Nectozooid (d) Phyllozooid

Answers to Multiple-Choice Questions

1. (c)	2. (c)	3. (c)	4. (d)	5. (c)	6. (b)	7. (b)	8. (b)
9. (d)	10. (c)	11. (b)	12. (a)	13. (d)	14. (b)	15. (c)	16. (c)
17. (b)	18. (c)	19. (b)	20. (d)	21. (c)	22. (d)	23. (a)	24. (d)
25. (b)	26. (d)	27. (c)	28. (b)	29. (b)	30. (c)	31. (b)	32. (d)

33. (d)	34. (c)	35. (b)	36. (a)	37. (a)	38. (d)	39. (a)	40. (a)
41. (c)	42. (b)	43. (c)	44. (a)	45. (c)	46. (d)	47. (d)	48. (c)
49. (d)	50. (a)	51. (a)	52. (a)	53. (d)	54. (a)	55. (d)	56. (d)
57. (d)	58. (c)	59. (b)	60. (c)	61. (b)	62. (b)	63. (d)	64. (a)
65. (b)	66. (b)	67. (b)	68. (b)	69. (a)	70. (a)	71. (d)	72. (d)
73. (c)	74. (d)	75. (a)	76. (a)	77. (a)	78. (d)	79. (a)	80. (b)
81. (c)	82. (a)	83. (c)	84. (d)	85. (c)	86. (b)	87. (c)	88. (a)
89. (c)	90. (a)	91. (a)	92. (c)	93. (a)	94. (d)	95. (c)	96. (c)
97. (a)	98. (c)	99. (d)	100. (c)	101. (d)	102. (d)	103. (d)	104. (a)
105. (b)	106. (c)	107. (b)	108. (c)	109. (d)	110. (d)	111. (d)	112. (c)
113. (d)	114. (d)	115. (c)	116. (d)	117. (d)	118. (c)	119. (d)	120. (d)
121. (c)	122. (b)	123. (a)	124. (c)	125. (d)	126. (a)	127. (d)	128. (b)
129. (c)	130. (d)	131. (d)	132. (d)	133. (d)	134. (a)	135. (d)	136. (d)
137. (c)	138. (b)	139. (c)	140. (d)	141. (b)	142. (a)	143. (d)	144. (b)
145. (a)	146. (d)	147. (a)	148. (b)	149. (c)	150. (b)	151. (a)	152. (d)
153. (b)	154. (d)	155. (b)	156. (d)	157. (d)	158. (d)	159. (d)	160. (c)
161. (a)	162. (b)	163. (a)	164. (b)	165. (b)	166. (a)		

Fill in the Blanks

- The term 'Coelenterate' was coined by _____.
- Phylum Coelenterate includes three classes, viz., _____, _____ and _____.
- The oldest hydrozoa are _____.
- Scyphozoa differs from hydrozoa in having _____ gastric tentacles.
- Coelenterates have two basic forms: free-swimming _____ and sessile _____.
- In Coelenterates, muscles are mostly _____ muscular.
- Cnidocytes are of three types, viz., _____, _____ and _____.
- Polyps and medusae are _____ symmetrical.
- In medusae, the only supporting structure is the _____.
- Stony corals secrete massive _____ exoskeleton.
- Gastrulation of the coeloblastula is described as a mixture of _____ and _____.
- In Coelenterates, tentacles are used for _____ and _____.
- All scyphazoa have only _____ form.
- The most distinctive feature of Coelenterates is the possession of _____.

15. All anthozoans are marine and most are sedentary except, free-swimming _____ stages.
16. The cells of Coelenterates are organised into _____.
17. In the life cycle of Coelenterates, polyp and medusa may develop alternately and the process is called _____.
18. In Coelenterates, in between the outer ectoderm and the inner endoderm, a noncellular substance is present, called _____.
19. _____ class of Coelenterate has the maximum number of species.
20. A Coelenterate passes wastes out through its _____.
21. In anthozoa, gonads are _____ in origin.
22. Baby coral polyps are called _____.
23. In Coelenterates, nerve rings occur only in the orders _____ and _____.
24. Common coral reef is the _____ reef.
25. _____ algae lives inside the coral tissue.
26. In *Obelia*, the reproductive cells are derived from _____.
27. Polyp is the _____ zooid.
28. Velum is a characteristic of _____ meduse.
29. The horizontal thread-like root of *Obelia* colony is called _____.
30. Coelenterates are unlike the sponges in that the Coelenterates have _____.
31. The internal body cavity of Coelenterates is called _____, which functions like a stomach.
32. The nitrogenous waste product of Coelenterates is _____.
33. _____ nematocyst anchors the animal.
34. There are _____ gastric pouches in *Aurelia*.
35. *Hydra* is unable to digest _____.
36. Regeneration in *Hydra* was discovered by _____.
37. A coral island having a central shallow lake is called _____.
38. Coral reef is formed of _____.
39. Coral colonies are most abundant in _____ seas.
40. The main types of reef are _____ reef, _____ reef and _____.
41. _____ reefs are the most common types of reef throughout the world.
42. The Great Barrier Reef of _____ is the largest coral reef of the world.
43. *Zoochlorella* is a symbiotic alga of _____.
44. Gametes of *Hydra* are formed from _____ cells.
45. _____ is a group of nematocysts.
46. The needle-like process of cnidocyte is called _____.
47. Reef forming corals mainly belong to order _____.

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48. In *Obelia*, the number of gonad is _____.
49. The ephyra larva is characterised by the presence of _____ long bifid arms.
50. _____ are the sense organs of *Aurelia*.
51. The skeleton of solitary polyp is called _____.

Answers to Fill in the Blanks

1. Leuckart (1847)	2. Hydrozoa, scyphozoa, anthozoa	3. Graptolites
4. Endodermal	5. Medusae, polyps	6. Epithelio
7. Nematocyst, spirocyst, typhlocyst	8. Radially	9. Mesogloea
10. Calcium carbonate	11. Delamination, multipolar proliferation	12. Offence, defence
13. Medusoid	14. Nematocysts	15. Larval
16. Tissues	17. Metagenesis	18. Mesoglea
19. Anthozoa	20. Mouth	21. Endodermal
22. Planula	23. Coronatae, Cubomedusae	24. Barrier
25. Zooxanthallae	26. Ectoderm	27. Nutritive
28. Hydrozoan	29. Hydrorhiza	30. Nerves
31. Gastrovascular cavity	32. Ammonia	33. Glutinant
34. Four	35. Starch	36. Trembley 1744
37. Atoll	38. Limestone	39. Tropical
40. Fringing, barrier, atoll	41. Fringing	42. Australia
43. <i>Hydra viridissima</i>	44. Interstitial	45. Cnidom
46. Cnidocil	47. Madreporaria	48. Four
49. Eight	50. Tentaculocysts	51. Corallite

True or False

1. Coelenterates have blind sac body plan.
2. *Obelia* is a trimorphic sedentary Coelenterate.
3. Gastrula of *Hydra* is solid.
4. *Aurelia* is a bioluminescent organism.
5. The lining of gastrovascular cavity in *Hydra* contains cnidoblasts.
6. Glutathione is a polysaccharide.
7. Asexual reproduction is not common in sea anemone.

8. Statocyst is the balancing organ of *Obelia* medusa.
9. The nematocysts of anthozoa are devoid of cnidocil.
10. *Heliopora* is a horny coral.
11. Blastostyles are asexually reproducing zooids of *Obelia*.
12. *Millepora* is a stinging coral.
13. Velum and statocyst are lacking in polyps.
14. The skeleton of *Tubipora* is internal and is covered by the ectoderm.
15. The *Obelia* colony is sexless.
16. Siphonophora shows the highest degree of polymorphism.
17. Development of *Hydra* involves ecdysis.
18. Myofibrils of *Hydra* are striated.
19. *Hydra vulgaris* is colourless.
20. Velum is a characteristic of hydrozoan medusae.
21. Suvadiva of Maldives is the largest coral island.
22. Barrier reef is formed near the sea shore.
23. Anthozoa shows alternation of generation.
24. Coelenterates are the first group of animals to show the tendency of division of labour.
25. Autozooids are reproductive zooids.
26. Siphon is a modified form of gastrozooid.
27. Phylloid resembles with the medusa.
28. *Velella* lacks tentillia.
29. In *Aglaura* and *Liriope*, there is no polypoid stage.
30. Planula can be solid or hollow.
31. Hydroids are important members of fouling communities.
32. Coelenterates have tissues but no organs.
33. Portuguese man-of-war is really a large colony of medusae and polyps.
34. Corals reproduce without a medusa stage.
35. Corals are frequently symbiotic.
36. *Madrepore* is a solitary coral.
37. *Peachia* leads a parasitic life in the larval condition in the ovary of a frog.
38. Scyphozoa lacks true velum.
39. In *Capria*, there are eight tentacles.
40. Portuguese man-of-war is venomous.
41. Stalked jellyfish lack medusa stage.

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42. Corals do not have a medusa stage.
43. Many corals are luminous.
44. In corals, both eggs and sperms are produced by polyps.
45. The coral *Lophelia pertusa* lives in symbiosis with alga.
46. Anthozoans are the most primitive Coelenterates.
47. In Coelenterates, nerve cells are bipolar.
48. In Coelenterates, gonads are ductless.
49. *Polypodium hydriforme* is the only known metazoan adapted to intracellular parasitism.
50. *Polypodium hydriforme* has only parasitic stage.
51. Coral reefs are abundant where the surrounding water contains relatively high amounts of suspended materials.

Answers to True or False

1. True	2. True	3. True	4. True	5. False	6. False	7. False	8. True
9. True	10. False	11. True	12. True	13. True	14. True	15. True	16. True
17. False	18. False	19. True	20. True	21. True	22. False	23. False	24. True
25. False	26. True	27. False	28. True	29. True	30. True	31. True	32. True
33. True	34. True	35. True	36. True	37. False	38. True	39. False	40. True
41. True	42. True	43. True	44. True	45. False	46. True	47. False	48. True
49. True	50. False	51. False					

Give Reasons

1. Coelenterates are an interesting group of animals.
 - Because they are found in two forms, viz., polyp and medusa.
2. Sea wasps are considered dangerous.
 - Because of their stings, which are dangerous. If a person is badly stung, it can even be fatal.
3. The medusae drift with sea currents.
 - Because they swim slowly.
4. The sea anemone is so called.
 - Because its upper free end looks like a flower.
5. Reefs are generally considered to be autotrophic.
 - Because of the presence of a photosynthetic organism at their base.

6. Coral reefs are commonly located in tropic and subtropic regions
 - Because corals are adversely affected by low temperatures.
7. Jellyfishes are rarely found in fossil form.
 - Because they may contain 99 per cent water, so they are not fossilised.
8. *Hydra* is negatively chemotropic.
 - Because it avoids chlorinated water.
9. The greatest concentration of coral reefs occurs near the equator.
 - Because of higher water temperature.
10. There is zonation of reef organisms.
 - Because the environmental conditions differ across the reef.
11. The muscular system of medusa is highly developed.
 - Due to the fact that the muscular part of epithelial muscular cells increases to form elongated striated muscle fibre, while the epithelial part degenerates.
12. When one tentacle of Coelenterates is touched, all the tentacles react and pull in.
 - Because they have an evenly distributed nerve net that causes a reaction from the entire body when one part is touched.
13. Coelenterates are called chunk feeders.
 - Because they eat their food in chunks.
14. Colonial corals can form huge structures called reefs.
 - Because they have the ability to produce a hard outside skeleton that is made up of mainly limestone.
15. Alcyonaria group of corals can be easily recognised.
 - Because of the presence of its eight tentacles around the mouth.

CTENOPHORA

Multiple-Choice Questions

1. Which one of the following is applicable to Ctenophores?
(a) Venus girdle (b) Sea gooseberries (c) Comb jellies (d) All
2. Which one of the following is a true statement?
(a) Ctenophores are more complex than sponges.
(b) Ctenophores are as complex as cnidarians.
(c) Ctenophores are less complex than bilaterians.
(d) All
3. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Cestida	1. Short tentacles and jellyfish-like umbrella
(B) Cydippida	2. The largest Ctenophores
(C) Thalassocalycida	3. Combs are lacking in many and pharynges are as suckers
(D) Platyctenida	4. Ribbon shaped

Answer codes:

A	B	C	D
(a) 2	4	1	3
(b) 4	2	1	3
(c) 3	4	2	1
(d) 4	3	2	1
4. Which one of the following is applicable to Ctenophores?
(a) Radial or bilateral symmetry of organs
(b) Stomodaeum
(c) Mesenchyme which is partly gelatinous and partly cellular
(d) All
5. Consider the following statements about Ctenophores:
(A) Multicellular body with radial or biradial symmetry
(B) Body contains a mouth, internal cavity and anal pores
(C) Well-developed sub-epidermal nerve net
(D) Swim by means of comb plates
The correct statements are:
(a) All (b) A and B (c) B and C (d) A, B and C
6. Sea sword is applicable to:
(a) *Eulampetia pancerina* (b) *Cestus veneris*
(c) *Beroe ovata* (d) *Mnemiopsis leidyi*

7. Which one of the following is a sessile Ctenophores?
(a) *Bolinopsis vitrea* (b) *Cestus veneris* (c) *Tjallfiella tristoma* (d) *Mnemiopsis leidyi*
8. Venus girdle is applicable to:
(a) *Beroe* (b) *Cestum* (c) *Pleurobrachia* (d) *Leucothea*
9. Ctenophores are:
(a) Bilateral symmetrical organisms (b) Lack ciliary plates
(c) Provided with nematocysts (d) None
10. Colloblasts are lacking in:
(a) *Cestus veneris* (b) *Euchlora rubra*
(c) Both (a) and (b) (d) *Mnemiopsis*
11. What is not common between Coelenterates and Ctenophores?
(a) Presence of mesogloea (b) Presence of statocyst
(c) Presence of diffused nerve network (d) Presence of determinate type of cleavage
12. What is incorrect about *Coeloplana*?
(a) Marine solitary Ctenophore (b) Tentacles are paired and retractile
(c) Swimming plates present (d) Nematocysts are lacking
13. Ctenophores control water flow around themselves for:
(a) Capture and eating of prey (b) Escaping from predators
(c) Movement by jet propulsion (d) All
14. The Ctenophore that has become an exotic pest in the Black and Caspian seas is:
(a) *Mnemiopsis* (b) *Pleurobrachia* (c) *Coeloplana* (d) All
15. What is not true about Ctenophores?
(a) Comb plates (b) Medusa only (c) Polyp only
(d) Position of paired tentacles changes symmetry to biradial
16. Ctenophores differ from Coelenterates in having:
(a) Complete digestive system (b) No nematocysts
(c) No alternation of generation (d) All
17. Which one of the following is correct about Ctenophores?
(a) Colonial (b) Sessile (c) Actinula (d) None
18. Consider the following statements:
(A) *Coeloplana* is a benthic Ctenophore
(B) *Coeloplana* is bilaterally symmetrical
(C) In platyctenids, fertilisation occurs inside the parent bodies
(D) In Ctenophore, juveniles of some species are able to reproduce before attaining adulthood
The incorrect statements are:
(a) A and B (b) A, B and D (c) B and D (d) None
19. The basic structures related with the evolution of Ctenophores are:
(a) Biradial symmetry
(b) Biradial symmetry and arrangement of comb plates
(c) Arrangement of comb plates and tentacles
(d) Biradial symmetry, bioluminescent and loss of nematocysts

20. Gastrovascular system contains anal pores in:
 (a) Corals (b) Ctenophores (c) Sea anemone (d) *Cerianthus*
21. In which one of the following Ctenophores are nematocysts present?
 (a) *Beroe ovata* (b) *Euchlora rubra* (c) *Leucothea* (d) *Mnemiopsis leidyi*
22. Consider the following statements with reference to lobate Ctenophores:
 (A) Tentacles are lacking (B) Tentacles are short
 (C) Tentacles lack sheaths (D) Tentacles move near the mouth
 The correct statements are:
 (a) A (b) B, C and D (c) B and C (d) B and D
23. Blue water scuba and submersible collecting are applicable to:
 (a) Porifera (b) Ctenophora (c) Platyhelminthes (d) Echinodermata
24. Which one of the following is incorrect about beroids?
 (a) Lack tentacles (b) Prey on other Ctenophores
 (c) Lack comb plates (d) Stiffened cilia act as teeth
25. Self-fertilisation occurs rarely in the Ctenophores:
 (a) *Cestum* (b) *Velamen* (c) *Mnemiopsis* (d) *Ocropsis*
26. Most primitive order of Ctenophores having least modified to Ctenophore plan:
 (a) Cydippida (b) Beroida (c) Cestida (d) Lobata
27. Which one of the following is lacking in Ctenophores?
 (a) Metagenesis (b) Coelom
 (c) Respiratory, circulatory and respiratory system (d) All
28. Larvae of which one of the following is parasitic on *Salpa fusiformis*?
 (a) *Eulampetia pancerina* (b) *Beroe ovata*
 (c) *Mnemiopsis leidyi* (d) *Cestum*
29. Consider the following statements about nuda:
 (A) There is no tentacle (B) Large mouth
 (C) Eat prey larger than themselves (D) Gullet contains hooks
 The incorrect statements are:
 (a) A, C and D (b) B and C (c) C and D (d) None
30. Cydippid is the larval form of:
 (a) Coelenterates (b) Platyhelminthes (c) Hemichordates (d) Ctenophores
31. In which one of the following Ctenophores is the tentacle not found in any stage of life?
 (a) *Coeloplana* (b) *Ctenoplana* (c) *Beroe* (d) *Mertensia*
32. Which one of the following is not applicable to Ctenophores?
 (a) Cell-tissue grade organisation (b) Anal pore
 (c) Statocyst (d) All
33. Tentacles are branched in:
 (a) *Pleurobrachia* (b) *Velamen* (c) *Ctenoplana* (d) *Cestum*
34. Which one of the following is found in the Red Sea?
 (a) *Bathytена* (b) *Coeloplana* (c) *Deiopea* (d) *Cestus*

35. Which one of the following is viviparous?
 (a) *Bolinopsis* (b) *Beroë* (c) *Ctenoplana* (d) *Tjalfiella*
36. What is incorrect about Ctenophores?
 (a) No segmentation (b) Monomorphic
 (c) Pores ending the digestive canals (d) None
37. Venus girdle lives in the:
 (a) Atlantic and Pacific oceans (b) Mediterranean sea
 (c) Antarctic water (d) All
38. Meridional canals are lacking in:
 (a) *Beroë* (b) *Ctenoplana* (c) *Hormiphora* (d) All
39. Which one of the following is sessile in adult stage?
 (a) *Tjalfiella* (b) *Ctenoplana* (c) *Coeloplana* (d) All
41. Disogeny is applicable to:
 (a) Porifera (b) Ctenophora (c) Mollusca (d) Echinodermata

Answers to Multiple-Choice Questions

1. (d) 2. (d) 3. (b) 4. (d) 5. (a) 6. (b) 7. (c) 8. (b)
 9. (d) 10. (b) 11. (d) 12. (c) 13. (d) 14. (a) 15. (c) 16. (d)
 17. (d) 18. (d) 19. (b) 20. (b) 21. (b) 22. (b) 23. (b) 24. (c)
 25. (c) 26. (a) 27. (d) 28. (a) 29. (d) 30. (d) 31. (c) 32. (d)
 33. (a) 34. (b) 35. (d) 36. (d) 37. (d) 38. (b) 39. (d) 40. (b)
 41. (b)

Fill in the Blanks

- Comb jellies are the common name of animals belonging to the phylum _____.
- Ctenophores are characterised by eight rows of _____ which are used for locomotion.
- Many Ctenophores resemble biradially symmetrical jellyfish, but lack the Coelenterates whorl of _____ around the mouth.
- Platyctene Ctenophores are only found in _____ water.
- Most common cydippid Ctenophores are the species of the genus _____.
- All carnivorous Ctenophores have specialised adhesive cells called _____.
- Ctenophores are _____ symmetrical.
- Gonads of Ctenophores are _____ in origin.
- Mertensia ovum* (Sea nut) is found in _____ water.

10. The body of Ctenophores consists of two layers of cells called _____ and _____.
11. The main sense organ in Ctenophores is the _____, located near the anus.
12. Tentacles of Ctenophores are provided with _____ cells.
13. In Ctenophores, the cleavage is _____.
14. In Ctenophores, bisymmetry of adults is established in the early _____ celled stage.
15. Ciliary plates and adhesive colloblasts are the characteristics of members belonging to phylum _____.
16. In Ctenophores, food is liquidised in _____ by enzymes.
17. *Hormiphora plumosa* is found in the _____ sea.
18. The phylum Ctenophora was recognised by _____.
19. In order _____ of the phylum Ctenophora, comb plates are found only in the larval stages.
20. Ctenophores having tentacles are placed in class _____.
21. The mesogloea of Ctenophores contains _____ cells.
22. In Ctenophores, production of light takes place in _____ canals.

Answers to Fill in the Blanks

1. Ctenophora	2. Cilia	3. Tentacles
4. Warm	5. <i>Pleurobrachia</i>	6. Colloblasts
7. Biradially	8. Endodermal	9. Cold
10. Epidermis, gastrodermis	11. Statocyst	12. Colloblast
13. Determinate	14. Four	15. Ctenophora
16. Pharynx	17. Mediterranean	18. Eschscholtz (1829)
19. Platyctenea	20. Tentaculata	21. Muscle
22. Meridional		

True or False

1. Ctenophores are also known as sea walnuts.
2. Ctenophores are voracious predators.
3. Many Ctenophores are bioluminescent.
4. Most of the Ctenophores are hermaphrodites.
5. *Beroe* preys on other Ctenophores.

6. Muscles in Ctenophores are mostly epitheliomuscular.
7. Nuda lacks tentacles.
8. In Ctenophores, digestion is both extracellular and intracellular.
9. Ctenophores remove their wastes through mouth and anus.
10. Nuda use chemicals to detect the presence of other Ctenophores in the water around them.
11. Ctenophores can regenerate lost body parts.
12. Platyctene Ctenophores are planktonic having comb plates only in larvae.
13. Ctenophores and medusae are related.
14. Ctenophores exhibit metagenesis.
15. Enteron of Ctenophores contains gastric filaments.
16. Tentacles of tentaculata are retractile.
17. Mostly Ctenophores are pelagic.
18. Some Ctenophores are colonial.
19. Ctenophores lack skeleton.
20. In *Beroe*, there is no trace of tentacles either in the adult stage or larval stage.
21. Ctenophores are found in all seas but not in the Arctic regions.
22. Tentacles of Ctenophores are solid.
23. Ctenophores show close similarity with the acoela.
24. The digestive tract of Ctenophores ends in an anal pore.
25. The swimming plates of Ctenophores are longitudinally arranged.
26. *Cestus veneris* (Venus girdle) is one of the smallest Ctenophores known.
27. Comb jellies are threatened/endangered animals.
28. Sperms of Ctenophores lack acrosome.
29. Ctenophores have a role as an invasive species.
30. The body plan of Ctenophores is similar to that of Cnidarians.
31. Ctenophores refract light.
32. Ctenophores use tentacles as a balancing organ during floating.
33. *Beroe* lacks an anal pore.
34. The gullet of Ctenophores is endoderm in origin.
35. All Ctenophores are carnivorous.

Answers to True or False

1. True	2. True	3. True	4. True	5. True	6. False	7. True	8. True
9. True	10. True	11. True	12. True	13. False	14. False	15. False	16. True

17. True	18. False	19. True	20. True	21. False	22. True	23. True	24. True
25. False	26. False	27. False	28. False	29. True	30. True	31. True	32. True
33. False	34. False	35. True					

Give Reasons

1. Oceanic Ctenophores tend to be more fragile than coastal species.
 - Because they do not need to tolerate wave action and sediment load of the coastal waters.
2. Ctenophores are considered to be holoplanktonic.
 - Because they carry out their entire life cycle on the plankton.
3. A few species of Ctenophores are very beautiful.
 - Because of their ability to produce green and blue-coloured light.
4. Comb jellies are known to effect fisheries.
 - Because of their habit to feed on eggs and fries of fishes.
5. These days studies of Ctenophores in ecology and fisheries related fields have increased.
 - Because of their roles as an invasive species.
6. It is difficult to preserve Ctenophores intact.
 - Because of their fragile nature.
7. Ctenophores are called comb jellies.
 - Because of the presence of ciliated comb plates.

PLATYHELMINTHES

Multiple-Choice Questions

- The first triploblastic group is:
(a) Coelenterata (b) Platyhelminthes (c) Annelida (d) Arthropoda
- Which one of the following is not a characteristic of Platyhelminthes?
(a) Triploblastic (b) Bilateral symmetry (c) Acoelomate (d) Coelomate
- Flame cells are an excretory organ of:
(a) Coelenterates (b) Platyhelminthes (c) Annelids (d) Molluscs
- Platyhelminthes are characterised by the lack of:
(a) Coelom (b) Anus (c) Exo or endoskeleton (d) All
- Cephalisation begins in:
(a) Roundworms (b) Flatworms (c) Cnidarians (d) Annelida
- Members of the phylum Platyhelminthes exhibit:
(a) Cellular grade of organisation (b) Tissue grade of organisation
(c) Tissue-organ grade of organisation (d) Organ system grade of organisation
- Which one of the following is a parasite on the epidermis and eyes of a marine fish?
(a) *Benedenia melleni* (b) *Dactylogyrus elegans*
(c) *Schistosoma haematobium* (d) *Mesostoma ehrenbergii*
- The mode of respiration in Platyhelminthes is:
(a) Aerobic (b) Anaerobic (c) Both (d) None
- The body of the Platyhelminthes is:
(a) Acoelomate (b) Pseudocoelomate (c) Coelomate (d) Haemocoelomate
- Members of the phylum Platyhelminthes are:
(a) Free living (b) Ectoparasite (c) Endoparasite (d) All
- In which one of the following parasites are cilia, sense organs and digestive system absent?
(a) Tapeworms (b) Liver flukes (c) *Ascaris* (d) *Ancylostoma*
- Tapeworms belong to class:
(a) Nematoda (b) Turbellaria (c) Trematoda (d) Cestoda
- Which one of the following is a digenetic parasite?
(a) *Ascaris* (b) Leech (c) *Entamoeba* (d) *Taenia*
- The intermediate host of *Taenia solium* is:
(a) Snail (b) Pig (c) *Culex* (d) Sheep

15. Which one of the following is not a stage in the life cycle of *Taenia*?
 (a) Onchosphere (b) Hexacanth (c) Cysticercus (d) Miracidium
16. Which one of the following is true about *Taenia solium*?
 (a) Pseudo metamerism (b) Absence of digestive system
 (c) Presence of hook (d) All
17. Body segments of tapeworms are known as:
 (a) Segments (b) Metameres (c) Proglottids (d) Annuli
18. The primary host the *Taenia solium* is:
 (a) Humans (b) Pig (c) Horse (d) Snail
19. Breakdown of gravid proglottids of *Taenia* is known as:
 (a) Apolysis (b) Autolysis (c) Topolysis (d) Autotomy
20. Alimentary canal of tapeworms is:
 (a) Coiled (b) Straight (c) U shaped (d) Absent
21. Oncosphere is found in the life cycle of:
 (a) *Ascaris* (b) Tapeworms (c) Liver flukes (d) Earthworms
22. Cysticercus is the larval stage of:
 (a) *Asterias* (b) *Obelia* (c) *Ancylostoma* (d) *Taenia*
23. Bladder worm occurs in the life cycle of:
 (a) Tapeworms (b) Liver flukes (c) *Aurelia* (d) *Schistosoma*
24. Anaerobic respiration is shown by:
 (a) Tapeworms (b) Planarians (c) Ants (d) Sea cucumber
25. *Taenia solium* is found in the:
 (a) Stomach of humans (b) Small intestine of humans
 (c) Large intestine of humans (d) Liver of humans
26. In *Taenia saginata*:
 (a) Rostellum and hooks are absent (b) Rostellum and hooks are present
 (c) Head is absent (d) Neck is absent
27. In *Taenia*, fertilised eggs are stored in:
 (a) Ovary (b) Oviduct (c) Vagina (d) Uterus
28. Tapeworms obtain nutrition by:
 (a) Sucking (b) Through general body surface
 (c) Scraping (d) Preparing own food
29. Gravid proglottid of *Taenia* has:
 (a) Highly branched uterus (b) Unfertilised ova (c) Mature sperms
 (d) Highly branched uterus containing fertilised eggs
30. In *Taenia*, new segments are formed by the proliferation of:
 (a) Strobila (b) Neck (c) Head (d) Head and neck
31. Glands associated with the reproductive system of *Taenia* are:
 (a) Conglobate gland (b) Cowper's gland
 (c) Yolk gland and Mehlis's gland (d) Prostate gland and perineal gland

32. The posterior most cells of morula in *Taenia* are called:
(a) Blastomeres (b) Micromeres (c) Onchoblasts (d) Totipotent
33. *Taenia solium* passes to the secondary host at the stage of:
(a) Cysticercus (b) Hexacanth (c) Bladder worm (d) Metacercidium
34. In *Taenia*, fertilisation is:
(a) Self and external (b) Self and internal (c) Cross and external (d) Cross and internal
35. Which one of the following statements is incorrect?
(a) In *Taenia*, fertilisation is internal and cross.
(b) In *Taenia*, the cleavage is holoblastic and unequal.
(c) Gravid proglottids of *Taenia* contains the fertilised eggs.
(d) Mehlis's glands of *Taenia* secrete a shell around the fertilised egg.
36. The anterior most conical portion of the head of *Taenia* is known as:
(a) Rostellum (b) Strobila (c) Hook (d) Sucker
37. Scolex is found in:
(a) Earthworms (b) *Ascaris* (c) *Ancylostoma* (d) *Taenia*
38. Locomotors organ of *Taenia* are:
(a) Setae (b) Parapodia (c) Cilia (d) Absent
39. Which one of the following is the true about *Taenia solium*?
(a) It has external segmentation.
(b) It lacks alimentary canal and locomotors organ.
(c) It has hooks and suckers.
(d) All
40. *Planaria* is a:
(a) Free-living animal (b) Parasite
(c) Symbiont (d) Commensal
41. Pharynx can be everted in:
(a) *Planaria* (b) Tapeworms (c) *Ascaris* (d) *Pila*
42. Regeneration is shown by:
(a) Earthworms (b) Tapeworms (c) *Ascaris* (d) *Planaria*
43. Anus is absent in:
(a) Earthworms (b) Starfish (c) Liver flukes (d) *Ascaris*
44. Human blood fluke is:
(a) *Echinococcus* (b) *Schistosoma* (c) *Ancylostoma* (d) *Diphyllbothrium*
45. Which one of the following females is lodged in the gynaecophoric canal of a male?
(a) *Schistosoma* (b) *Wuchereria bancrofti* (c) *Ancylostoma* (d) Shipworm
46. Which one of the following is not the larval stage of *Schistosoma*?
(a) Miracidium (b) Cercaria
(c) Redia (d) Redia and metacercaria
47. The infective stage of *Schistosoma* is:
(a) Cercaria (b) Metacercaria (c) Miracidium (d) Sporocyst

48. Schistosomiasis is caused by:
 (a) Liver flukes (b) Tapeworms (c) Shipworms (d) Blood flukes
49. Liver flukes belong to class:
 (a) Turbellaria (b) Trematoda (c) Cestoda (d) Nematoda
50. The primary host of *Fasciola hepatica* is:
 (a) Humans (b) Sheep (c) Pig (d) Snail
51. *Fasciola* is a:
 (a) Monogenetic ectoparasite (b) Digenetic ectoparasite
 (c) Monogenetic endoparasite (d) Digenetic endoparasite
52. The larval stage of a liver fluke which infects the intermediate host is:
 (a) Miracidium (b) Sporocyst (c) Cercaria (d) Metacercaria
53. Liver rot is caused by:
 (a) *Schistosoma* (b) *Trypanosoma* (c) *Fasciola hepatica* (d) *Taenia solium*
54. The correct sequence of larval stages in the life cycle of a liver fluke is:
 (a) Redia → cercaria → sporocyst → miracidium → metacercaria
 (b) Miracidium → redia → sporocyst → cercaria → metacercaria
 (c) Metacercaria → cercaria → sporocyst → redia → miracidium
 (d) Miracidium → sporocyst → redia → cercaria → metacercaria
55. Which one of the following is a tailed larva?
 (a) Miracidium (b) Redia (c) Cercaria (d) Metacercaria
56. Alternation of generation and alternation of host is found in:
 (a) Liver flukes (b) *Taenia solium* (c) *Trypanosoma* (d) *Sacculina*
57. Which one of the following larvae possesses a cyst?
 (a) Metacercaria (b) Cercaria (c) Miracidium (d) Redia
58. Which one of the following possesses the ability to swim?
 (a) Cercaria (b) Metacercaria (c) Redia (d) Sporocyst
59. Liver fluke sucks blood, lymph and bile from the wall of the bile duct with the help of:
 (a) Mouth (b) Scolex (c) Oral sucker (d) Acetabulum
60. Laurer's canal is found in:
 (a) Liver flukes (b) Tapeworms (c) Earthworms (d) Shipworms
61. Which one of the following is incorrect about liver flukes?
 (a) It is a digenetic parasite. (b) It has special sense organ.
 (c) It shows heterogamy. (d) It causes liver rot.
62. Which one of the following is the ciliated stage of a liver fluke?
 (a) Miracidium (b) Redia (c) Cercaria (d) Metacercaria
63. Parthenogenesis is shown by the larval form of:
 (a) *Fasciola hepatica* (b) *Taenia solium*
 (c) *Asterias* (d) *Sacculina*
64. Free-swimming larva coming out from the capsule of a liver fluke is:
 (a) Redia (b) Sporocyst (c) Miracidium (d) Cercaria

65. Tandem arrangement of testis is found in:
 (a) *Pila* (b) *Octopus* (c) *Ascaris* (d) Liver flukes
66. Larvae with hooks are found in the members of class:
 (a) Cestoda (b) Trematoda (c) Turbellaria (d) Hirudinea
67. Birth pore is found in:
 (a) Miracidium (b) Sporocyst (c) Tornaria (d) Auricularia
68. The complete life cycle of a liver fluke was studied by:
 (a) Gegenbaur (b) Addison (c) Thomas (d) Klein
69. Secondary host of *Fasciola hepatica* is:
 (a) Pig (b) Freshwater snail (*Limnaea*)
 (c) Dog (d) Earthworm
70. Cestodes are exclusively:
 (a) Free living (b) Parasites (c) Ectoparasites (d) Endoparasites
71. Polyembryony is shown by:
 (a) Tapeworms (b) Liver flukes (c) *Trypanosoma* (d) *Echinococcus*
72. Which one of the following is true about the life cycle of *Fasciola hepatica*?
 (a) Heterogamy and metagenesis (b) Digenetic
 (c) Polyembryony (d) All
73. *Fasciola hepatica* was discovered by:
 (a) Jehan de Brie (b) Gabucinus (c) Thomas (d) Gregory
74. Metratrem is associated with:
 (a) Digestive system of liver flukes (b) Reproductive system of liver flukes
 (c) Reproductive system of tapeworms (d) Reproductive system of cockroaches
75. What is common amongst *Fasciola*, *Planaria* and *Taenia*?
 (a) Body is segmented (b) Triploblastic and acoelomate
 (c) Parasitic forms (d) Alimentary canal is absent
76. All parasites have:
 (a) Well-developed locomotors organ (b) Well-developed sense organs
 (c) Well-developed digestive system (d) Well-developed reproductive system
77. Which one of the following is an incorrect match?
 (a) Liver fluke – Alimentary canal absent (b) Tapeworm – Bladder worm
 (c) *Planaria* – Free living (d) *Ascaris* – Rhabditiform
78. Poor development of some systems and enormous development of reproductive organs in Platyhelminthes is due to their:
 (a) Advancement over diploblastic animals (b) Primitive mode of life
 (c) Parasitic mode of life (d) Triploblastic and acoelomate nature
79. Which one of the following is absent in Platyhelminthes?
 (a) Metamerism (b) Coelom (c) Skeletal structure (d) All
80. Which one of the following is not a larval stage of flatworms?
 (a) Cercaria (b) Miracidium (c) Tornaria (d) Redia

81. Flame cells help in:
(a) Respiration (b) Excretion
(c) Osmoregulation (d) Both excretion and osmoregulation
82. Bladder worm causes:
(a) Cysticercosis (b) Taeniasis (c) Liver rot (d) Gambian fever
83. Dog tapeworm is:
(a) *Echinococcus* (b) *Schistosoma* (c) *Taenia saginata* (d) *Ancylostoma*
84. Suckers of tapeworm help in:
(a) Locomotion (b) Attachment (c) Sucking food (d) All
85. Measly pork contains:
(a) Onchospheres (b) Hexacanth (c) Cysticercus (d) All
86. *Taenia* infects pig at the stages:
(a) Cysticercus (b) Onchospheres (c) Eggs (d) None
87. *Schistosoma* is a parasite in:
(a) Blood (b) Intestine (c) Liver (d) Lung
88. Which one of the following is an incorrect match?
(a) Liver fluke – Liver rot (b) Tapeworm – Onchosphere
(c) *Planaria* – Digenetic (d) Platyhelminthes – Triploblastic
89. Which one of the following is not a class of Platyhelminthes?
(a) Turbellaria (b) Cestoda (c) Nematoda (d) Trematoda
90. Which one of the following is different?
(a) *Echinococcus* (b) *Taenia solium* (c) *Fasciola hepatica* (d) *Ascaris lumbricoides*
91. Which one of the following is not true?
(a) *Taenia* is acoelomate (b) Cestodes lack alimentary canal
(c) Cross fertilisation occurs in *Taenia* (d) Rostellum is absent in *T.saginata*
92. Redia larva of liver fluke multiplies by:
(a) Budding (b) Gametes formation
(c) Parthenogenesis (d) Transverse fission
93. Secondary host of *T. saginata* is:
(a) Pig (b) Cow/Buffalo (c) *Pila/Unio* (d) Dog/Cow
94. Flatworms are:
(a) Unsegmented (b) Bilaterally symmetrical
(c) Triploblastic and acoelomate (d) All
95. In which one of the following did the mesoderm first develop?
(a) Cnidarians (b) Platyhelminthes (c) Aschelminthes (d) Annelida
96. Polyclads are distinguished by their:
(a) Extremely branched gut (b) An eversible pharynx
(c) A complicated set of sexual organs (d) All
97. All the members of this group are either parasites or commensals:
(a) Temnocephalida (b) Tricladida (c) Polycladida (d) Acoela

98. Consider the following statements about acoela:
- (A) They lack intestines and oviducts
 - (B) They shed their eggs either through their skin or out of their mouth
 - (C) They live in a sort of symbiosis with flagellated algae of the genus *Chlamydomonas*
 - (D) They eat the algae but not digest them
- The incorrect statements are:
- (a) All
 - (b) A and B
 - (c) B and D
 - (d) None
99. In which one of the following are both hosts vertebrates?
- (a) *Diphylobothrium latum*
 - (b) *Taenia saginata*
 - (c) *Schistosoma indicum*
 - (d) None
100. In which one of the following is the nervous system in the form of a nerve net?
- (a) Acoels
 - (b) Cnidarians
 - (c) Ctenophores
 - (d) All
101. Cestodes have:
- (a) Mouth
 - (b) Gut
 - (c) Syncitial skin
 - (d) All
102. What is incorrect about miracidium?
- (a) A small free-living larval stage of parasitic flatworms
 - (b) Swims actively using cilia to find its Molluscan host
 - (c) Feed actively
 - (d) If unable to find a Molluscan host within 24 hours, they do not survive
103. The cestodes differ from the members of class turbellaria and trematoda in:
- (a) Having a digestive tract
 - (b) The complete absence of a digestive tract
 - (c) Having reversible pharynx
 - (d) The complete absence of oviducts
104. Biflagellate sperm is a characteristic of:
- (a) Flatworms
 - (b) Tongue worms
 - (c) Lugworms
 - (d) None
105. In flatworms, flame cells control:
- (a) Excretion
 - (b) Osmoregulation
 - (c) Both (a) and (b)
 - (d) None
106. Liver flukes lack:
- (a) Cirrus sheath
 - (b) Ootype
 - (c) Laurer's canal
 - (d) All
107. Which one of the following larval stages is not found in *Schistosoma*?
- (a) Miracidium
 - (b) Redia
 - (c) Cercaria
 - (d) Sporocyst
108. Tubellarians lack:
- (a) Testes
 - (b) Ovaries and yolk glands
 - (c) Uteri and yolk glands
 - (d) Oviducts and yolk glands
109. Consider the following statements about *Gyrocotyle fimbriata*:
- (A) A small cestode showing similarities with trematodes
 - (B) Scolex and strobila are present
 - (C) Digestive system is well developed
 - (D) Sometimes suckers are present
- The correct statements are:
- (a) All
 - (b) A, B and C
 - (c) B and C
 - (d) A and D
110. *Taenium solium* lacks:
- (a) Prostate glands
 - (b) Cilia and rhabdites
 - (c) Laurer's canal
 - (d) All

111. There is only one host in the cycle of:
 (a) *Polystoma* (b) *Diplozoon* (c) *Gyrodactylus* (d) All
112. *Echinococcus shiquicus* was first identified in 2006:
 (a) Tibetan foxes (b) Chinese foxes (c) Indian foxes (d) American dogs
113. Seasonal reproductive activity is shown by:
 (a) Turbellarians (b) Trematodes (c) Cestodes (d) None
114. What is incorrect about planarians?
 (a) Generally carnivorous or scavengers
 (b) The tube-like pharynx can be everted from the mouth
 (c) Food is partially digested externally
 (d) The tail is blunt
115. Which one of the following is incorrect about Platyhelminthes?
 (a) Bilateral symmetry (b) Dorsoventrally flattened body
 (c) Well-marked cephalisation (d) Segmentation lacking
116. In tapeworms, reproduction organs degenerate after capsule formation, except:
 (a) Ovary (b) Vagina (c) Uterus (d) Oviduct
117. Turbellarians are:
 (a) Free living (b) Commensal (c) Parasitic (d) All
118. Cercaria larva lacks:
 (a) Cilia (b) Penetration gland (c) Flame cells (d) None
119. Forked tail is a characteristic of:
 (a) Miracidium larva (b) Cercaria larva (c) Bipinnaria larva (d) Muller's larva
120. Consider the following statements:
 (A) Platyhelminthes are the first groups of triploblastic animals
 (B) The development of a third layer of cells called mesoderm resulted in further possibilities of increase in size and structural complexities
 (C) In Platyhelminthes, the mesoderm is split into somatic and splanchnic layers
 (D) In Platyhelminthes, the mesoderm produces a special type of tissue called parenchyma that fills up the body space
- In above statements, all are correct, except:
 (a) D (b) C (c) B (d) A
121. Species of the genus *Gyrodactylus* are common ectoparasites on the gills and body surface of the:
 (a) Freshwater fish (b) Marine fish (c) Tadpoles (d) All
122. *Polystoma integerrimum* is found in the bladder of:
 (a) Marine fish (b) Marine and freshwater fishes
 (c) Frogs (d) Frogs and toads
123. What is incorrect about turbellarians?
 (a) Show seasonal reproductive activity (b) Display asexual reproduction
 (c) Regeneration ability (d) None
124. The most primitive turbellarian:
 (a) Acoels (b) Triclad (c) Polyclads (d) Rhabdocoels

125. Each segment is hermaphrodite in:

- (a) *Planaria* (b) *Schistosoma*
(c) *Taenia* (d) *Taenia* and *Echinococcus*

126. An intermediate host is lacking in:

- (a) *Phyllobothrium* (b) *Hymenolepis nana*
(c) *Echinococcus granulosus* (d) None

127. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Rhabdites	1. <i>Fasciola hepatica</i>
(B) Laurer's canal	2. <i>Dugesia</i>
(C) Mehlis's gland	3. Excretion
(D) Flame cells	4. Reproduction

Answer codes:

A	B	C	D
(a) 2	1	4	3
(b) 4	2	3	1
(c) 3	4	1	2
(d) 2	4	1	3

128. Antibodies of *Echinococcus* can be detected with:

- (a) Complement fixation (b) ELISA
(c) Both (a) and (b) (d) None

129. Which one of the following is not applicable to *Echinococcus granulosus*?

- (a) Hydatiform worm (b) Hyper tapeworm
(c) Cyclophyllid cestode (d) None

130. The infective stage of a liver fluke is the:

- (a) Miracidium (b) Redia (c) Cercaria (d) Metacercaria

131. Consider the following statements:

- (A) Planarians are Platyhelminthes having the greatest degree of cephalisation
(B) Planarians have eye spots
(C) The auricles of planarians detect chemicals
(D) Miracidium does not feed

The incorrect statements are:

- (a) None (b) A and B (c) B and C (d) A and D

132. Which one of the following is not an intestinal parasite?

- (a) *Taenia saginata* (b) *Opisthorchis sinensis*
(c) *Diphyllobothrium* (d) *Fasciolopsis buski*

133. What is incorrect about *Schistosoma*?

- (a) Males and females are separate (b) No pharynx
(c) No redia stage (d) Cercaria without forked tail

134. What is incorrect about cercaria larva?

- (a) Heart-shaped body (b) Bifid intestine
(c) Well-developed oral and ventral suckers (d) Presence of lappets

135. Acoela lacks:
 (a) Excretory system (b) Intestines
 (c) Gonoducts and yolk glands (d) All
136. Cestodes are endoparasites and are devoid of:
 (a) Cilia (b) Alimentary canal (c) Rhabdites (d) All
137. Consider the following statements:
 (A) Flatworms are the first bilaterally symmetrical organisms in evolution
 (B) In addition to nerve cords, well-developed nerve nets are present in flatworms
 (C) The sperm of Platyhelminthes lacks an acrosome
 (D) The sperms of all Platyhelminthes contain varying amounts of glycogen granules
 The correct statements are:
 (a) All (b) B, C and D (c) A and C (d) A and D
138. Subtegumentary muscles are the characteristic of:
 (a) Cestodes (b) Trematodes (c) Turbellarians (d) All
139. Which one of the following is the site of egg composition and wall formation?
 (a) Receptaculum seminis (b) Ootype
 (c) Vitelline glands (d) Vagina
140. Hypodermic impregnation takes place in some:
 (a) Polyclads (b) Acoels (c) Rhadocoels (d) All
141. Which one of the following is a land planarian?
 (a) *Geoplana* (b) *Bipalium* (c) *Orthodemus* (d) All
142. Which one of the following is not applicable to *Schistosoma*?
 (a) Human blood fluke (b) Sexual dimorphism
 (c) Digenetic (d) Alternation of generation
143. Endolecithal eggs are found in:
 (a) Flatworms (b) Turbellarians (c) Archoophoran (d) All
144. Epidermis is soft and ciliated in:
 (a) Cestoda (b) Trematoda (c) Turbellaria (d) None
145. Uterine opening is lacking in:
 (a) *Echinococcus* (b) *Hymenolepis* (c) *Taenia* (d) All
146. Cyclops and freshwater fishes act as an intermediate host of:
 (a) *Hymenolepis* (b) *Diphyllbothrium* (c) *Fasciolopsis buski* (d) All
147. In *Taenia*, fertilisation occurs in:
 (a) Ovary (b) Oviduct (c) Ootype (d) Uterus
148. The larva of turbellarians is:
 (a) Muller's larva (b) Trochophore (c) Veliger (d) None

Answers to Multiple-Choice Questions

1. (b) 2. (d) 3. (b) 4. (d) 5. (b) 6. (d) 7. (a) 8. (b)
 9. (a) 10. (d) 11. (a) 12. (d) 13. (d) 14. (b) 15. (d) 16. (d)

17. (c)	18. (a)	19. (a)	20. (d)	21. (b)	22. (d)	23. (a)	24. (a)
25. (b)	26. (a)	27. (d)	28. (b)	29. (d)	30. (b)	31. (c)	32. (c)
33. (b)	34. (b)	35. (a)	36. (a)	37. (d)	38. (d)	39. (d)	40. (a)
41. (a)	42. (d)	43. (c)	44. (b)	45. (a)	46. (d)	47. (a)	48. (d)
49. (b)	50. (b)	51. (d)	52. (a)	53. (c)	54. (d)	55. (c)	56. (a)
57. (a)	58. (a)	59. (c)	60. (a)	61. (b)	62. (a)	63. (a)	64. (c)
65. (d)	66. (a)	67. (b)	68. (c)	69. (b)	70. (d)	71. (b)	72. (d)
73. (a)	74. (b)	75. (b)	76. (d)	77. (a)	78. (c)	79. (d)	80. (c)
81. (d)	82. (a)	83. (a)	84. (b)	85. (c)	86. (b)	87. (a)	88. (c)
89. (c)	90. (d)	91. (c)	92. (c)	93. (b)	94. (d)	95. (b)	96. (d)
97. (a)	98. (d)	99. (b)	100. (d)	101. (c)	102. (c)	103. (b)	104. (a)
105. (c)	106. (b)	107. (b)	108. (c)	109. (d)	110. (d)	111. (d)	112. (a)
113. (a)	114. (d)	115. (c)	116. (c)	117. (d)	118. (d)	119. (b)	120. (b)
121. (d)	122. (d)	123. (d)	124. (a)	125. (d)	126. (b)	127. (a)	128. (c)
129. (d)	130. (d)	131. (a)	132. (b)	133. (d)	134. (d)	135. (d)	136. (d)
137. (a)	138. (a)	139. (b)	140. (d)	141. (d)	142. (d)	143. (d)	144. (c)
145. (d)	146. (b)	147. (b)	148. (d)				

Fill in the Blanks

- The study of flatworms is called _____.
- The term Platyhelminthes was coined by _____.
- _____ was the first to observe tapeworms.
- The body of a tapeworm consists of _____, _____, and _____.
- Segments of a tapeworm are called _____.
- The number of proglottids in *Echinococcus granulosus* is _____.
- Breaking of gravid proglottids of *Taenia* is known as _____.
- In pigs, hexacanth larva gives rise to _____ and _____.
- All stages of *Taenia* are passed from the secondary host, except the _____ stage.
- Planaria* is a member of the class _____.
- Hydatid disease is caused by _____.
- Fasciola hepatica* was discovered by _____.
- In polyclads, a free-swimming larva is produced called _____ larva.
- In *Taenia*, the tip of the head contains a conical structure called _____.
- The shelled embryo of *Taenia solium* is called _____.

16. Rhabdites are secreted by _____ cells.
17. In most turbellarians, the sperm is biflagellate with _____ axoneme condition.
18. The body cavity of Platyhelminthes is filled with _____ consisting of connective tissue and fixed cells.
19. The excreted fluids of cestodes and digeneans mainly contain _____.
20. _____ are the microvilli-like structures of the tegument of cestodes.
21. The largest and most injurious parasite in the intestine of humans is _____.
22. In tapeworms, the area of proliferation is the _____.
23. _____ is a class of parasitic flatworms commonly called tapeworms.
24. A strobila is the sum of _____.
25. *Diphyllbothrium* is a genus of _____.
26. _____ is the human liver fluke.
27. _____ is the human lung fluke.
28. Typically cestodes body consists of a series of linearly arranged reproductive segments called _____.
29. The digestive system of *Planaria* is similar to that of *Hydra*, except in that the food is brought to the mouth through a muscular _____.
30. The cercaria in encysted condition is called _____.
31. The fertilised egg of *Taenia solium* develops into _____ larva.
32. In cestodes each segment is provided with sex organs, except the _____ and _____.
33. In cestodes, there are _____ longitudinal excretory vessels.
34. There are _____ hooks in the larva of cestodaria.
35. In *Taenia*, the cleavage is _____ and _____.
36. In *Taenia*, the cleavage results in the formation of three types of cells called _____, _____ and _____.
37. *Taenia saginata* is similar to *T. solium*, but it lacks _____ on the scolex.
38. Sporocyst larva divides to form _____ larva.
39. The free-swimming larvae of liver fluke are _____ and _____.
40. *Taenia solium* may cause neuro cysticercosis when cysticerci are found in the _____.
41. The triclads are also known as _____.
42. The fertilised egg of a liver fluke divides to form a small cell called _____ cells and a larger _____ cell.
43. *Taenia solium* has _____ suckers on its scolex.

Answers to Fill in the Blanks

1. Helminthology	2. Gegenbaur (1859)	3. Aristotle
4. Scolex, neck, proglottids	5. Proglottids	6. 3–4
7. Apolysis	8. Cysticercus, bladder worm	9. Adult
10. Turbellaria	11. <i>Echinococcus granulosus</i>	12. Jehan de Brie
13. Muller's	14. Rostellum	15. Oncosphere
16. Epidermal gland	17. 9–0	18. Parrenchyma
19. Ammonia	20. Microtriches	21. <i>Diphyllbothrium latum</i>
22. Neck	23. Cestoda	24. Proglottids
25. Tapeworm	26. <i>Clonorchis</i>	27. <i>Paragonium</i>
28. Proglottids	29. Protrusible pharynx	30. Metacercaria
31. Hexacanth	32. Head, neck	33. Four
34. 10	35. Holoblastic, unequal	
36. Macromeres, micromeres, mesomeres	37. Hooks	38. Redia
39. Miracidium, cercaria	40. Brain	41. Planarians
42. Propagatory and somatic	43. Four	

True or False

1. Platyhelminthes are the most primitive members of bilateria.
2. Platyhelminthes include flukes.
3. The tegument of *Taenia* is freely permeable to nutrients and water.
4. In tapeworms, strobilisation is the true metamerism.
5. The monogenetic trematodes are mostly ectoparasites of fish.
6. The digenetic trematodes constitute the largest group of parasitic flatworms.
7. In turbellarians, the transfer of sperms involves copulation.
8. All turbellarians are positively phototactic.
9. A cysticercus can survive for several years in the animal.
10. Cestodariae lack scolex and do not produce proglottids.
11. Turbellarians have a covering of cuticle.
12. In all members of the Platyhelminthes, the nervous system is concentrated at the head end.
13. *Taenia solium* is the major cause of acquired epilepsy all over the world.
14. Schistosomiasis is the second most prevalent tropical disease after malaria.
15. Planarians have an unbranched gut.
16. The eggs of *Taenia* do not hatch until they are eaten by the intermediate host.

17. Epidermis is lacking in *Taenia* and *Planaria*.
18. All flatworms are predaceous.
19. Parthenogenesis is the characteristic feature of all turbellarians.
20. In acoels, gastrulation occurs by epiboly.
21. The epidermis of *Planaria* lacks any tactile cell and chemoreceptive cell.
22. Flatworms exhibit adaptation of cephalisation.
23. In *Taenia*, there are two testes.
24. In *Taenia*, copulation occurs between two individuals.
25. Metacercaria larvae contain cystogenous glands.
26. Liver rot is caused by liver flukes.
27. Hooks are lacking in trematodes.
28. Taeniasis is more dangerous than cysticercosis.
29. Chinopodium oil is used for the expulsion of *Taenia*.
30. *Gyrodactylus* is viviparous.
31. *Bdelloura* lives as commensal on the book gills of the horseshoe crab.
32. In Platyhelminthes, the shape, number and arrangement of testis is species specific.
33. *Taenia solium* is longer than *T. saginata*.
34. Planarians are gregarious.
35. The nervous system of a liver fluke shows a bilateral arrangement.
36. Bilateral symmetry permits forward movement as well as to have sensory organs in the front.
37. The egg capsule of a liver fluke lacks an operculum.
38. When cysticercus larva becomes fully mature, it leaves the body of the pig.
39. Laurer's canal opens temporarily at the time of copulation.
40. *Taenia solium* is protandrous.
41. Certain freshwater planarians lay two types of eggs, viz., summer eggs and resting eggs.
42. In *Planaria*, the reproduction is not affected by the length of the day and temperature.

Answers to True or False

1. True	2. True	3. True	4. False	5. True	6. True	7. True	8. False
9. True	10. True	11. False	12. True	13. True	14. True	15. False	16. True
17. False	18. False	19. False	20. True	21. False	22. True	23. False	24. False
25. False	26. True	27. True	28. False	29. True	30. True	31. True	32. True
33. False	34. True	35. True	36. True	37. False	38. False	39. True	40. True
41. True	42. False						

Give Reasons

1. Platyhelminthes are commonly known as flatworms.
 - Because of their almost paper-thin structure.
2. Being an ancient phylum, nothing is known about the evolutionary history of Platyhelminthes.
 - Because they have soft bodies which do not preserve well as fossils.
3. Many parasitic species of Platyhelminthes are of importance to mankind.
 - Because they infect human bodies, as well as livestock.
4. Planarians are not liked by fish breeders.
 - Because they feed on fish eggs.
5. Acoela are the simplest turbellarians.
 - Because they lack intestines, oviducts and shed their eggs through skin or out of their mouth.
6. Flame cells are so called.
 - Because beating of their flagella appears like a flickering candle flame.
7. A few species of turbellaria are green.
 - Due to the presence of symbiotic algae.
8. Proglottids closet to scolex are least mature.
 - Because proglottids are produced continuously behind the scolex.
9. The nervous system of Platyhelminthes is ladder-like.
 - Because there are two longitudinal nerve cords having frequent connections between them.
10. The turbellarians exhibit typical Platyhelminthes structure.
 - Because members of the class trematoda and cestoda have become variously modified due to their parasitic mode of life.

ASCHELMINTHES

Multiple-Choice Questions

1. The members of phylum Aschelminthes are:
(a) Acoelomate (b) Coelomate (c) Pseudocoelomate (d) Haemocoelomate
2. Which one of the following is applicable to Nematomorpha?
(a) Cloaca (b) Excretory system (c) Lateral cords (d) None
3. The characteristic feature of members of the phylum Aschelminthes is the presence of:
(a) Coelom (b) Triploblastic body wall
(c) Syncytial epidermis (d) Presence of flame cells
4. Members of the phylum Aschelminthes are:
(a) Bilaterally symmetrical
(b) Unsegmented, having body tapering at both ends
(c) Triploblastic and pseudocoelomate
(d) All
5. Roundworms differ from flatworms in having:
(a) Flame cells (b) Triploblastic body
(c) Pseudocoel and syncytial epidermis (d) Arrangement of muscle layers and pseudocoel
6. The shape of the mast ax depends upon the mode of:
(a) Locomotion (b) Feeding adopted by the animal
(c) Excretory products (d) Respiration
7. Which one of the following is a pseudocoelomate animal?
(a) Tapeworm (b) Roundworm (c) Shipworm (d) Lugworm
8. Which one of the following is absent in the body wall of *Ascaris*?
(a) Cuticle (b) Epidermis
(c) Longitudinal muscle fibres (d) Circular muscle fibres
9. Which one of the following is absent in *Ascaris*?
(a) Mouth (b) Pharynx (c) Stomach (d) Rectum
10. *Ascaris* obtains liquid food from the body of host:
(a) Through mouth (b) By absorption through general body surface
(c) By pumping action of muscular pharynx (d) Prepares own food
11. Respiratory organ of *Ascaris* is the:
(a) Skin (b) Gill (c) Lung (d) None
12. The infection of *Ascaris* is more common in:
(a) Children (b) Older women (c) Younger men (d) Foetus

13. Cuticle of *Ascaris* is secreted by:

(a) Syncytial epidermis	(b) Pseudocoelom
(c) Longitudinal muscle fibres	(d) Circular muscle fibres
14. Which one of the following has no intermediate host?

(a) <i>Taenia solium</i>	(b) <i>Fasciola hepatica</i>
(c) <i>Ascaris lumbricoides</i>	(d) <i>Trypanosoma</i>
15. The posterior end of male *Ascaris* is:

(a) Straight	(b) Coiled	(c) Lobed	(d) Curved
16. Pineal setae are found in:

(a) Male <i>Ascaris</i>	(b) Female <i>Ascaris</i>	(c) <i>Taenia</i>	(d) <i>Echinococcus</i>
17. In *Ascaris*, phasmids:

(a) Help in respiration	(b) Help in digestion
(c) Help in holding the female during copulation	(d) Secrete chitinous covering around eggs
18. Which one of the following is not true about *Ascaris*?

(a) Triploblastic and bilateral symmetry	(b) Pseudocoel and syncytial epidermis
(c) Monogenetic parasite	(d) Didelphous condition of reproductive system
19. Larva of *Ascaris* is:

(a) Trochophore	(b) Miracidium	(c) Ephyra	(d) Rhabditiform
20. *Ascaris* is found in:

(a) Stomach of humans	(b) Liver of humans
(c) Intestine of humans	(d) Spleen of humans
21. Sexual dimorphism is shown by:

(a) <i>Taenia</i>	(b) <i>Ascaris</i>	(c) <i>Fasciola</i>	(d) Leech
22. What is incorrect about kinorhyncha?

(a) Exclusively marine	(b) Sexes are separate
(c) Distinct sexual dimorphism	(d) Generally benthonic in habitat
23. Male *Ascaris* can be distinguished from female by the presence of:

(a) Oral suckers
(b) Lips
(c) Curved posterior end with a pair of pineal setae
(d) Blunt posterior end
24. The excretory organs of *Ascaris* are:

(a) Flame cells	(b) Renette cells
(c) Nephridia	(d) General body surface
25. Nematodes lack:

(a) Pseudocoelom	(b) Protonephridia
(c) Eutely	(d) Prostate glands
26. Amphids are highly developed in:

(a) Parasitic nematodes	(b) Terrestrial nematodes
(c) Marine nematodes	(d) All
27. Column I contains sensory organ of *Ascaris*. Match column I with column II and select the correct match using answer codes:

Column I

- (A) Genital papillae
- (B) Phasmids
- (C) Labial papillae
- (D) Cervical papillae

Column II

- 1. Tactile
- 2. Gustatory
- 3. Chemoreceptor
- 4. Present in males and help in copulation

Answer codes:

	A	B	C	D
(a)	4	1	2	3
(b)	4	3	2	1
(c)	3	4	1	2
(d)	1	4	2	3

28. Which one of the following is not applicable to *Ascaris lumbricoides*:
- (a) Sexual dimorphism
 - (b) Buccal capsule
 - (c) Holozoic nutrition
 - (d) Monogenetic
29. Which one of the following is applicable to nematodes?
- (a) Bisexual
 - (b) A few are hermaphroditic
 - (c) Protandrous or parthenogenetic
 - (d) All
30. Consider the following statements:
- (A) *Wuchereria bancrofti* never gain access to the external environment
 - (B) *Fergusobia curriei* is parasitic in both plants and animals in different phases of its development
 - (C) In female nematodes, the position of vulva is fixed
 - (D) *Ascaris suum* is not harmful to its host
- The correct statements are:
- (a) All
 - (b) A and B
 - (c) B and C
 - (d) A, B and D
31. Which one of the following is a potato seed nematode?
- (a) *Globodera*
 - (b) *Meloidogyne*
 - (c) *Xiphinema*
 - (d) *Pratylenchus*
32. *Ancylostoma duodenale* is found in:
- (a) Sandy soil
 - (b) Sandy and clay soils
 - (c) Clay soil
 - (d) Swamps
33. Which one of the following is incorrect about rotifers?
- (a) Pseudocoelomate, triploblastic and cuticle
 - (b) Eutely, parthenogenesis and corona
 - (c) Lorica, protonephridia and mast ax
 - (d) None
34. Consider the following statements about Kinorhyncha:
- (A) They are pseudocoelomate having external cilia
 - (B) The head is retractable
 - (C) Stomach bears cuticular lining
 - (D) The nervous system is closely associated with the epidermis
- The incorrect statements are:
- (a) A and B
 - (b) B and C
 - (c) A and C
 - (d) C and D
35. The protein G-actin is thought to be lacking in the sperms of:
- (a) Nematodes
 - (b) Rotifers
 - (c) Molluscs
 - (d) Echinoderms

36. Which one of the following is not applicable to *C. elegans*?
 - (a) Apoptosis
 - (b) Model organism
 - (c) Space shuttle Columbia disaster
 - (d) Do not disrupt the function of specific genes by RNA interference
37. In mammals, filarial worms cause:
 - (a) Elephantiasis
 - (b) Chagas' disease
 - (c) Nagana
 - (d) All
38. Which one of the following is applicable to rotifers?
 - (a) Wheelanimacules
 - (b) Dioecious
 - (c) Copulation by hypodermic impregnation or through cloaca
 - (d) All
39. In which one of the following rotifers are males lacking?
 - (a) Bedelloidea
 - (b) Monogononta
 - (c) Seisonidea
 - (d) All
40. Pinworm is a parasite in the _____ of humans:
 - (a) Caecum
 - (b) Colon
 - (c) Appendix
 - (d) All
41. Which one of the following is applicable to *Ascaris*?
 - (a) Monodelphic
 - (b) Didelphic
 - (c) Polydelphic
 - (d) All
42. In nematodes, cell division stops after hatching, except in the:
 - (a) Neuron cells
 - (b) Liver cells
 - (c) Reproduction organs
 - (d) Rente cells
43. Consider the following statements about acanthocephala:

(A) Pseudocoelomate	(B) No trace of gut
(C) Invaginable proboscis	(D) Parasitic in vertebrates and there is no free-living stage

The incorrect statements are:

 - (a) B and C
 - (b) A and D
 - (c) B and D
 - (d) None
44. The excretory system of *Ascaris* is:
 - (a) S shaped
 - (b) I shaped
 - (c) H shaped
 - (d) M shaped
45. Presence of resistant cuticle in *Ascaris* is:
 - (a) Primitive character
 - (b) Degenerate character
 - (c) A specialised character with reference to parasitic mode of life
 - (d) None
46. In *Ascaris*, blood vascular system is:
 - (a) Well developed and open type
 - (b) Well developed and closed type
 - (c) Absent
 - (d) Poorly developed
47. During development, *Ascaris* moults:
 - (a) Two times
 - (b) Four times
 - (c) Six times
 - (d) Eight times
48. First and last moults of *Ascaris* occur in:
 - (a) Lung and intestine of humans
 - (b) Intestine and lung of humans
 - (c) Liver and lung of humans
 - (d) Liver and spleen of humans

49. Eggs of *Ascaris* that pass out from the body of humans are:
 - (a) Fertilised
 - (b) Fertilised and segmented
 - (c) Unfertilised
 - (d) Unfertilised and segmented
50. Fertilisation of eggs of *Ascaris* takes place in:
 - (a) Oviduct
 - (b) Upper part of uteri
 - (c) Lower part of uteri
 - (d) Vagina
51. Embryonic development in *Ascaris* takes place outside the body of host because it requires:
 - (a) More oxygen
 - (b) Low temperature
 - (c) Suitable moisture
 - (d) All
52. The infective stage of *Ascaris* is:
 - (a) Fertilised egg
 - (b) First stage larva
 - (c) Second stage larva
 - (d) Third stage larva
53. The correct match is:
 - (a) *Plasmodium* – *Culex*
 - (b) *Ascaris* – Human being
 - (c) *Taenia* – Snail
 - (d) *Trypanosoma* – Sand fly
54. Average life of *Ascaris lumbricoides* is:
 - (a) 9–12 months
 - (b) 12–24 months
 - (c) 24–36 months
 - (d) 36–72 months
55. The first two stages of larva of *Ascaris* occur in:
 - (a) Eggs themselves
 - (b) Body cavity of humans
 - (c) Intestine of humans
 - (d) Lung of humans
56. Olfactory sensitive organs found in the lips of *Ascaris* are:
 - (a) Amphids
 - (b) Phasmids
 - (c) Papillae
 - (d) Comb
57. Which one of the following is applicable to Aschelminthes?
 - (a) Metamerism
 - (b) Appendages
 - (c) Coelom
 - (d) None
58. The first stage larva in *Ascaris* egg develops in:
 - (a) Stomach of humans
 - (b) Intestine of humans
 - (c) Liver of humans
 - (d) Outside the body of humans
59. What is similar between rotifers, kinorhynch and some gastrotricha?
 - (a) Syncytial epidermis
 - (b) Retractable anterior end
 - (c) Segmented cuticle
 - (d) All
60. First Juvenile larva of *Ascaris* is:
 - (a) Rhabditiform
 - (b) Miracidium
 - (c) Redia
 - (d) Amphiblastula
61. Human beings become infected with *Ascaris lumbricoides*:
 - (a) By contaminated food and drinking water
 - (b) Inhalation of dust
 - (c) Moving bare-footed in a field
 - (d) Biting of female *Culex*
62. In which one of the following is the salivary gland absent?
 - (a) Cockroach
 - (b) Housefly
 - (c) Mosquito
 - (d) *Ascaris*
63. *Ascaris* is:
 - (a) Free living
 - (b) A symbiont
 - (c) A commensal
 - (d) A parasite
64. The correct sequence of developmental stages of *Ascaris* in humans is:
 - (a) Outside → stomach → liver → spleen → lung → intestine → outside
 - (b) Outside → trachea → lung → liver → intestine → outside
 - (c) Outside → trachea → lung → heart → liver → intestine → outside
 - (d) Outside → intestine → liver → heart → lung → intestine → outside

65. Which one of the following is a pseudocoelomate animal?
 (a) Earthworm (b) Tapeworm (c) Glowworm (d) Roundworm
66. Which one of the following is not applicable to kinorhynchs?
 (a) Exclusively marine (b) Sexes separate
 (c) Sexual dimorphism (d) Development indirect
67. Gastrotrichs differ from rotifers in:
 (a) Structure of digestive tracts (b) Structure of reproductive system
 (c) Cuticular specialisation of different types (d) Nervous system
68. Amphimixis, automixis and apomixes are shown by the nematode:
 (a) *Meloidogyne* (b) *C.elegans*
 (c) *Heterohabditis* (d) *Haemonchus contortus*
69. Which one of the following is free living?
 (a) *Enterobium* (b) *Rhabditis* (c) Whipworm (d) None
70. Juveniles of *Ancylostoma duodenale* are sensitive to:
 (a) Sunlight (b) High salt concentrations
 (c) Acidic pH of soils (d) All
71. Saeftigen's organ is found in:
 (a) Nematoda (b) Acanthocephala (c) Rotifera (d) Gastrotricha
72. Consider the following statements about *Caenorhabditis elegans*:
 (A) *C. elegans* is a free-living transparent nematode
 (B) Eggs are laid by hermaphrodite individuals
 (C) Hermaphrodite can mate with males or self-fertilise
 (D) *C. elegans* has five pairs of autosomes and one pair of sex chromosomes
 The incorrect statements are:
 (a) B, C and D (b) A and D (c) B and C (d) None
73. Consider the following statements:
 (A) The hookworms suck blood from the intestine of the host, which may result in anemia
 (B) Pelagic rotifers species exhibit cyclomorphosis
 (C) Rotifers lack salivary and gastric glands
 (D) In rotifers, the cleavage is holoblastic and unequal
 The correct statements are:
 (a) A, C and D (b) B, C and D (c) A and B (d) A and D
74. Free-living nematodes are found in:
 (a) Soil (b) Freshwater (c) Sea (d) All
75. Consider the following statements:
 (A) Nematomorphs are morphologically and ecologically similar to nematode worms
 (B) The adult worms are free living but larvae are parasites on crustacean beetles, orthopterans, etc.
 (C) Nematomorphs gut is nonfunctional
 (D) Nematomorphs lack respiratory, circulatory and respiratory systems
 The incorrect statements are:
 (a) All (b) B, C and D (c) B and D (d) None

76. What is incorrect with reference to nematodes?
 - (a) Bilaterally symmetrical
 - (b) Muscles in the body run in longitudinal direction
 - (c) Movable cilia and flagella are completely lacking
 - (d) None
77. What is incorrect about *Strongyloides stercoralis*?
 - (a) The mature adult can reproduce entirely in the human or may grow freely in soil.
 - (b) They produce auto-infections in humans.
 - (c) Their eggs hatch into larvae inside the intestine.
 - (d) Eggs are abundant in stool.
78. *Ascaris* inhibits absorption of:
 - (a) Proteins
 - (b) Carbohydrates
 - (c) Fats and nutrients
 - (d) All
79. Most damaging agent of sheep in the world is:
 - (a) *Ditylenchus*
 - (b) *Haemonchus contortus*
 - (c) *Bursaphelenchus xylophilus*
 - (d) *Deontostoma californicum*
80. Consider the following statements about *C. elegans*:
 - (A) A model organism
 - (B) Live in the soil
 - (C) Entire genome has been sequenced and developmental fate of every cell is known
 - (D) It is related with research project on NASA's STS-107 space mission.

The correct statements are:

 - (a) All
 - (b) A, B and C
 - (c) A and B
 - (d) C and D
81. Which one of the following has the shortest lifespan?
 - (a) Gastrotricha
 - (b) Rotifers
 - (c) *Drosophila melanogaster*
 - (d) *C. elegans*
82. Which one of the following is applicable to nematomorpha?
 - (a) Gordian worms
 - (b) Horsehair worms
 - (c) Gordiacea
 - (d) All
83. Trichinosis is caused by:
 - (a) *Loa loa*
 - (b) *Trichinella spiralis*
 - (c) *Trichuris trichiura*
 - (d) *Enterobius vermicularis*
84. Aberrant migration in *Ascaris* refers to:
 - (a) Migration of larva from intestine to lungs
 - (b) Migration of larva from intestine to heart
 - (c) Migration of larva from lungs to brain, eyes, spinal cord, etc.
 - (d) Migration of larva from intestine to liver, heart and lungs
85. In the body of a human, migration of larva of *Ascaris* starts from the intestine and ends in the:
 - (a) Liver
 - (b) Spleen
 - (c) Brain
 - (d) Intestine
86. The final moulting in rhabditiform larva of *Ascaris* takes place in the:
 - (a) Intestine
 - (b) Liver
 - (c) Heart
 - (d) Lungs
87. The number of renette cells in *Ascaris* are:
 - (a) One
 - (b) Two
 - (c) More than two
 - (d) Numerous

88. The sperm of *Ascaris* is:
(a) Without flagellum (b) Tailless
(c) Asymmetrical and amoeboidal (d) All
89. Infective eggs of *Ascaris* remain viable for:
(a) Six months (b) One year (c) Four years (d) Six years
90. Testis and ovary are telogenic in:
(a) *Ascaris* (b) Frogs (c) Snakes (d) Earthworms
91. In *Ascaris*, there are two:
(a) Testes (b) Ovaries (c) Seminal vesicles (d) Ejaculatory
92. Which one of the following is correct with reference to *Ascaris*?
(a) Females are smaller than males (b) Males have cloaca
(c) Females have cloaca (d) Epidermis is devoid of nucleus
93. Total number of apertures in male and female *Ascaris* is:
(a) One and two (b) Two and four (c) Three and four (d) Four and five
94. Parthenogenetic mode of development is found in members of class:
(a) Nematoda (b) Rotifera (c) Cestoda (d) Trematoda
95. In which one of the following classes is the digestive system complete in the larva, but degenerate in the adult?
(a) Nematoda (b) Cestoda (c) Trematoda (d) Nematomorpha
96. When a human swallows the egg of *Ascaris*, the larva present inside it is the:
(a) First stage larva (b) Second stage larva (c) Third stage larva (d) There is no larva
97. In *Ascaris*:
(a) There is single testis
(b) There are two ovaries
(c) There is a single seminal vesicle and two uterus
(d) All
98. Tick the incorrect match:
(a) Salivary gland – *Echinoderes* (b) Salivary gland – *Ascaris*
(c) Microfilaria – *Ancylostoma* (d) Renette cell – *Fasciola*
99. A constant number of cells in the body of *Ascaris* are maintained by:
(a) Syncytial epidermis (b) Lack of circular muscles
(c) Presence of thick cuticle (d) Retenette gland cell
100. Spicules in *Ascaris* help in:
(a) Attachment with the body of the host (b) Dilating the vulva
(c) Copulation (d) All
101. Rotifers are not characterised by:
(a) External cuticle (b) Foot (c) Ciliated crown (d) Mast ax
102. Which one of the following is correct about terrestrial nematodes?
(a) Rhabdtioids are hermaphrodite. (b) Self-fertilisation occurs in hermaphrodite forms.
(c) Parthenogenesis occurs in some forms. (d) All
103. In *Ascaris*, the cleavage is:
(a) Holoblastic and unequal (b) Spiral
(c) Determinate (d) All

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104. A common thing about all worms is that they are:
 (a) Triploblastic (b) Acoelomate (c) Pseudocoelomate (d) Segmented
105. Androdioecy is shown by:
 (a) *C. briggsae* (b) *C. elegans*
 (c) Both *C. elegans* and *C. briggsae* (d) *Bursaphelenchus xylophilus*
106. One of the only forms of life not known to have a natural virus:
 (a) *Dictyophyema renale* (b) *C. elegans*
 (c) *Fergusonina nicholsoni* (d) *Neochinor chynchus*
107. Which one of the following is incorrect about Aschelminthes?
 (a) Unsegmented body (b) Body cover with a cuticle
 (c) Pseudocoelomate (d) Straight muscular intestine
108. The rotifers that give birth to young ones:
 (a) *Philodina* (b) *Trochosphaera* (c) *Collotheca* (d) *Floscularia*
109. Eutely is not shown by:
 (a) Rotifera (b) Annelida (c) Gastrotricha (d) Nematoda
110. Horsehair worms are applicable to:
 (a) Nematomorpha (b) Nematoda (c) Rotifera (d) Gastrotricha
111. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|----------------------------------|---------------------------------|
| (A) Buccal capsule | 1. Nematomorpha |
| (B) Trochal disc | 2. Gastrotricha |
| (C) Adhesive glands | 3. Rotifera |
| (D) Cloaca present in both sexes | 4. <i>Ancylostoma duodenale</i> |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 4 | 3 | 2 | 1 |
| (b) 3 | 4 | 1 | 2 |
| (c) 2 | 1 | 4 | 3 |
| (d) 4 | 3 | 1 | 2 |
112. The only marine hairworm is the:
 (a) *Nectonema* (b) *Paragordius* (c) *Gordius* (d) *Ploima*
113. Consider the following statements about Aschelminthes:
 (A) Free living in the sexual phase and are parasitic in the asexual phase in the body cavity of Arthropoda
 (B) The females are inactive
 (C) The pseudocoel is much reduced
 (D) The digestive tract is vestigial and adults do not feed
- The above characters are applicable to:
 (a) Gastrotricha (b) Rotifera (c) Acanthocephala (d) Nematomorpha
114. Match column I with column II and select the correct answer using answer codes:
- | Column I (Parasite) | Column II (Host) |
|-----------------------------------|------------------|
| (A) <i>Dracunculus ophidensis</i> | 1. Human |
| (B) <i>D. insignis</i> | 2. Otter |

(C) *D. medinensis*

(D) *D. lutrae*

3. Reptiles

4. Dogs

Answer codes:

	A	B	C	D
(a)	4	3	2	1
(b)	3	4	1	2
(c)	2	1	4	3
(d)	3	4	2	1

115. Aschelminthes lacks:

- (a) Gut (b) Anus (c) Circulatory system (d) Excretory system

116. Which one of the following features of nematodes is shown by rotifers?

- (a) Apolysis (b) Cryptobiosis (c) Telogenic gonads (d) Buccal capsule

117. The only hard part in the body of rotifers:

- (a) Corona (b) Foot (c) Jaws (d) Cuticle

118. The corona of rotifers is used for:

- (a) Respiration (b) Respiration and locomotion
(c) Locomotion, respiration and excretion (d) Locomotion and feeding

119. Recent study on comparison of 18S gene sequences revealed that rotifers are more closely related to:

- (a) Nematoda (b) Brachiopoda (c) Acanthocephala (d) Gastrotricha

120. Consider the following statements:

- (A) The epidermis of nematodes consists of a mass of cellular materials and nuclei without separate membranes
(B) The cuticle of nematodes is periodically shed during their growing periods
(C) Generally, nematodes shed cuticle four times before reaching the adult stage
(D) The muscles of nematodes are activated by two nerves (dorsal and ventral)

The incorrect statements are:

- (a) None (b) A and C (c) B and C (d) D

121. Which one of the following rotifers shows asexual as well as sexual phase?

- (a) Monogonont rotifers (b) Bdelloid rotifers
(c) Seisnoid rotifers (d) None

122. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Cloaca is present in both sexes	1. <i>Enterobius</i>
(B) Double uterus	2. <i>Ascaris</i>
(C) Telogenic	3. <i>Dracunculus medinensis</i>
(D) Cephalic alae	4. <i>Nectonema</i>

Answer codes:

	A	B	C	D
(a)	4	3	1	2
(b)	3	4	1	2
(c)	2	1	4	3
(d)	4	3	2	1

123. Infection through *Cyclops* contaminated water is applicable to:
 (a) Guinea worms (b) Hookworms (c) Pinworms (d) Seatworms
124. In which one of the following is a protrusible head present?
 (a) Gastrotricha (b) Kinorhyncha (c) Rotifera (d) Nematomorpha
125. Which one of the following is correct about moulting of larvae of *Ascaris*?
- | | Outside | While within the egg | Lungs | Intestine |
|-------------------------|---------|----------------------|-------|-----------|
| (a) Number of moultings | 0 | 1 | 2 | 2 |
| (b) Number of moultings | 0 | 2 | 1 | 1 |
| (c) Number of moultings | 0 | 2 | 2 | 1 |
| (d) Number of moultings | 0 | 1 | 2 | 1 |
126. What is incorrect about *Wuchereria bancrofti*?
 (a) Sexual dimorphism (b) Two unequal copulatory spicules in males
 (c) Females with ovijector (d) Mouth simple with lips
127. Calabar swellings are associated with:
 (a) *Loa loa* (b) *Trichinella spiralis*
 (c) *Dracunculus medinensis* (d) *Ancylostoma duodenale*
128. Filaria is caused by:
 (a) *Wuchereria bancrofti* (b) *Brugia malayi*
 (c) *Brugia timoti* (d) All
129. Match column I with column II and select the correct answer using answer codes:
- | Column I (Parasite) | Column II (Site of infection) |
|----------------------------------|-------------------------------|
| (a) <i>Loa loa</i> | 1. Muscle |
| (b) <i>Wuchereria bancrofti</i> | 2. Bile duct |
| (c) <i>Opisthorchis felineus</i> | 3. Lymphatic system |
| (d) <i>Trichinella spiralis</i> | 4. Connective tissue |
- Answer codes:
- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 4 | 2 | 1 | 3 |
| (b) | 4 | 3 | 2 | 1 |
| (c) | 2 | 3 | 1 | 4 |
| (d) | 3 | 4 | 1 | 2 |
130. Which one of the following is a soil-transmitted Aschelminthes?
 (a) *Ascaris suum* (b) *Ancylostoma duodenale*
 (c) *Dracunculus medinensis* (d) *Trichuris trichiura*
131. Polymyarian condition is shown by:
 (a) *Ascaris* (b) *Trichuris* (c) *Oxyuris* (d) Liver fluke
132. Which one of the following is not applicable to *Wuchereria bancrofti*?
 (a) Sexual dimorphism (b) Copulatory spicules
 (c) Polydelphic (d) Viviparous
133. Aschelminthes lacks:
 (a) Cilia (b) Respiratory system (c) Circulatory system (d) All

134. What is incorrect about *Dracunculus*?
 (a) Lips present (b) Buccal capsule is well developed
 (c) Males without bursa (d) All
135. The excretory system of *Ascaris* lacks:
 (a) Internal openings (b) Cilia
 (c) Flame cells/nephridia (d) All
136. Which one of the following is a monogenetic nematode?
 (a) *Ascaris* (b) *Ancylostoma* (c) *Enterobius* (d) All
137. Lips are lacking in:
 (a) *Ancylostoma duodenale* (b) *Loa loa*
 (c) *Wuchereria bancrofti* (d) All
138. In which one of the following do the eggs leave the body of the mother and host in segmented condition:
 (a) *Ascaris* (b) *Ancylostoma* (c) *Enterobius* (d) *Trichuris*
139. Renette cells are found in:
 (a) Gastropoda (b) Nematoda (c) Cephalopoda (d) Annelida
140. Which one of the following is a viviparous parasite?
 (a) *Loa loa* (b) *Dracunculus medinensis*
 (c) *Wuchereria bancrofti* (d) All
141. Which one of the following is not a sense organ of Aschelminthes?
 (a) Amphids (b) Papillae (c) Setae (d) Statocyst

Answers to Multiple-Choice Questions

1. (c)	2. (d)	3. (c)	4. (d)	5. (c)	6. (b)	7. (b)	8. (d)
9. (c)	10. (c)	11. (d)	12. (a)	13. (a)	14. (c)	15. (d)	16. (a)
17. (c)	18. (d)	19. (d)	20. (c)	21. (b)	22. (c)	23. (c)	24. (b)
25. (b)	26. (c)	27. (b)	28. (b)	29. (d)	30. (c)	31. (a)	32. (a)
33. (d)	34. (c)	35. (a)	36. (d)	37. (a)	38. (d)	39. (a)	40. (d)
41. (d)	42. (c)	43. (d)	44. (c)	45. (c)	46. (c)	47. (b)	48. (a)
49. (b)	50. (c)	51. (d)	52. (c)	53. (b)	54. (a)	55. (a)	56. (a)
57. (d)	58. (d)	59. (d)	60. (a)	61. (a)	62. (d)	63. (d)	64. (d)
65. (d)	66. (c)	67. (c)	68. (a)	69. (b)	70. (d)	71. (b)	72. (d)
73. (c)	74. (d)	75. (d)	76. (d)	77. (d)	78. (d)	79. (b)	80. (a)
81. (a)	82. (d)	83. (b)	84. (c)	85. (d)	86. (a)	87. (a)	88. (d)
89. (d)	90. (a)	91. (b)	92. (b)	93. (c)	94. (b)	95. (d)	96. (b)
97. (d)	98. (a)	99. (d)	100. (b)	101. (a)	102. (d)	103. (d)	104. (a)
105. (b)	106. (b)	107. (d)	108. (a)	109. (b)	110. (a)	111. (a)	112. (a)
113. (d)	114. (b)	115. (c)	116. (b)	117. (c)	118. (d)	119. (c)	120. (a)
121. (a)	122. (d)	123. (a)	124. (b)	125. (d)	126. (d)	127. (a)	128. (d)
129. (b)	130. (b)	131. (a)	132. (c)	133. (d)	134. (d)	135. (d)	136. (d)
137. (d)	138. (c)	139. (b)	140. (d)	141. (d)			

Fill in the Blanks

1. The term 'Aschelminthes' was coined by _____.
2. Aschelminthes have _____ grade of organisation
3. The cuticle of *Ascaris* is secreted by _____.
4. There are _____ lips in *Ascaris*.
5. The rotifers are only known as far back as the _____ period.
6. _____ are the earliest known Aschelminthes.
7. Priapulida have been found in the _____ rock.
8. The first and last moults of *Ascaris* occur in the _____ of humans.
9. Pseudocoelom develops from _____.
10. The scientific study of parasitic worms is called _____.
11. Filariasis is usually diagnosed by observing microfilariae on _____ stained thick blood film.
12. Adult filarial worms live only in the _____ system.
13. Loiasis is caused by _____.
14. Rotifera were first described by _____.
15. The body of rotifers is covered with an external layer of chitin called _____.
16. The number of rectal glands in male *Ascaris* is six and _____ in female *Ascaris*.
17. _____ causes trichinosis in humans.
18. The juveniles of nematomorpha are parasites in _____.
19. Acanthocephala requires _____ hosts to complete their life cycle.
20. Dormant eggs of rotifers hatch in _____.
21. In the tail region of nematodes is a pair of unicellular glands called _____.
22. Nocturnal periodicity is shown by the larvae of _____.
23. The excretory system of *Ascaris* is _____ shaped.
24. _____ is the African eye worm.
25. The intermediate host of *loa loa* are the flies of genus _____.
26. Eutely is the characteristic feature of _____.
27. The egg having infective stage larva is called _____ egg.
28. *Wuchereria bancrofti* in human blood were reported by _____.
29. In India, *Wuchereria bancrofti* is distributed along the sea coasts and along the banks of big rivers except _____.

30. *Proales* is parasitic within the freshwater algae _____.
31. In parasitic rotifers, either the _____ or the _____ becomes modified as on organ of attachment.
32. Amphids are the blind invaginations of the _____.
33. In nematomorpha, pseudocoelom is reduced except _____.
34. Oxyurid nematodes are parasitic in the gut of _____ and _____.
35. Rotifers produce two types eggs called _____ eggs and _____ eggs.

Answers to Fill in the Blanks

1. Grobben (1990)	2. Organ-system	3. Epidermis	4. Three
5. Oligocene	6. Priapulida	7. Cambrian	8. Intestine
9. Blastocoel	10. Helminthology	11. Giemsa	12. Lymphatic
13. <i>Loa loa</i>	14. John Harris (1696)	15. Lorica	16. Three
17. <i>Trichinella spiralis</i>	18. Arthropods	19. Two	20. Females
21. Phasmids	22. <i>Wuchereria bancrofti</i>	23. H	24. <i>Loa loa</i>
25. <i>Chrysops</i>	26. Roundworms	27. Embryonated	28. Lewis (1872)
29. Indus	30. <i>Vaucheria</i>	31. Foot, mast ax	32. Cuticle
33. <i>Nectonema</i>	34. Invertebrates, vertebrates	35. Diploid amietic, haploid mictic	

True or False

1. In Aschelminthes, the epidermis is lacking.
2. Nematodes are pseudocoelomates.
3. Nematodes have regeneration ability.
4. Caudal sensory organs are present in rotifers.
5. In *Ascaris*, dorsal and ventral lines contain nerve cords.
6. Guinea worm is monogenetic.
7. Gastrotrichas are commonly known as belly-haired animalcules.
8. Cleavage in rotifers is spiral and determinate.
9. A caudal gland is present in many free-living nematodes.
10. In *Ascaris*, fertilisation takes place in oviducts.
11. *Brachionus* lacks distinct sexual dimorphism.

12. Sperms of *Ascaris* show amoeboid movement.
13. *Dactylopodola* transfers sperm as spermatophores.
14. Acanthocephalans lack mouths.
15. The nervous system of *Ascaris* is hypodermic.
16. The eggs of *Ancylostoma*, which are passed out along with the faeces, are infective to humans.
17. Buccal capsule is well developed in *Wuchereria*.
18. In *Ascaris*, testis is monorchic.
19. *Ascaris megalocephala* is found in pig.
20. Constancy in the number of cells in the body is found in nematodes.
21. Rotifers are provided with feeding organs.
22. *Rhabditis* are both free living and semiparasitic.
23. The eggs of *Ascaris* are mammilated.
24. *Trichinella* is found in voluntary muscles.
25. Pinworm is a digenetic nematode parasite.
26. In *Ascaris*, glycogen is stored in the liver.
27. The nitrogenous waste product of *Ascaris* is both ammonia and urea.
28. Larvae of *Ancylostoma duodenale* are better adapted to cooler climates.
29. Hookworms are smaller than *Ascaris lumbricoides*.
30. Some nematodes can undergo cryptobiosis.
31. Eggs of hookworms derive their nutrition from the host faeces through absorption.
32. Filariasis is commonly fatal.
33. A series of multiple bites by mosquitoes over a period of time is required to establish an infection by *Wuchereria bancrofti*.
34. Microfilariae are the infective form of filarial worms.
35. A nematode's muscle cells branch toward the nerves.
36. In male *Ascaris*, anus acts like cloaca.
37. Microfilariae cannot move against the blood stream.
38. Some nematode species transmit plant viruses through their feeding activity on roots.
39. Pelagic, rotifers swim continuously.
40. In rotifers, copulation occurs by hypodermic impregnation or through the cloaca.
41. The protonephridia of rotifers are not involved in osmoregulation.
42. Nematodes are not found in the polar region.
43. Females of some nematodes produce a pheromone to attract males.
44. The eggs of *Ascaris* can live outside the body for seven years in warm soil.
45. Rotifers are able to tolerate a wide range of ecological conditions.

46. The number of cells in nematode is small but not constant for each species.
47. The juveniles of *Trichuris* lack buccal stylet.
48. In mature female *Dracunculus medinensis*, alimentary canal and vulva disappear.
49. The filiform larva does not feed.
50. In *Ascaris*, gonads are telogenic.
51. Female *Ascaris* contains pre-and post-anal papillae.
52. Cuticle is segment in kinorhyncha.
53. Gonopore is lacking in acanthocephala.
54. Lemnisci help in protrusion of proboscis.
55. Copulation occurs in kinorhyncha.
56. Cloaca is lacking in gordioid.
57. Copulatory spicules are present in gordioid.
58. Segmentation of kinorhyncha is similar to that of Annelida and Arthropoda.
59. The digestive tract of *Chaetionotus* is generally coloured by the food materials present in it.
60. Saeffigen's organ helps in digestion.
61. In *Mesorhabditis belari* (a nematode), sperms do not fuse with the nucleus of the egg instead it simply initiates the cleavage.

Answers to True or False

1. False	2. True	3. False	4. False	5. True	6. False	7. True	8. True
9. True	10. False	11. False	12. True	13. True	14. True	15. True	16. False
17. False	18. True	19. False	20. True	21. True	22. True	23. True	24. True
25. False	26. False	27. True	28. True	29. True	30. True	31. True	32. False
33. True	34. True	35. True	36. True	37. False	38. True	39. True	40. True
41. False	42. False	43. True	44. True	45. True	46. False	47. False	48. True
49. True	50. True	51. False	52. True	53. False	54. True	55. False	56. False
57. True	58. False	59. True	60. False	61. True			

Give Reasons

1. Nematode can bend its body from side to side and is unable to crawl.
 - Because the long muscles present just below the epidermis are aligned longitudinally along the inside body.

2. In a person having pinworm infection, anal itching is more intense at night.
 - Because female pinworms usually lay their eggs at night.
3. In nematodes, body cavity is not a true coelom.
 - Because the body cavity is not lined with the epithelial layer derived from the mesoderm.
4. For diagnosing filaria, blood sample must be taken at night from the patient.
 - Because the microfilariae circulate at night (nocturnal periodicity) in the blood, when their mosquito vector generally bite. A decrease in temperature possibly attracts more microfilariae, as well.
5. Rotifers play an important role in energy flow and nutrient cycling.
 - Because of their high feeding and assimilation efficiencies.
6. *C. elegans* is a model organism.
 - Because:
 - (a) They are easy to breed and can be frozen.
 - (b) Due to their transparent body, it is easy to study developmental processes in the intact organism.
 - (c) They have a short life cycle.
7. *Ancylostoma duodenale* is an S-shaped worm.
 - Because of its flexure at the frontal end.
8. *C. elegans* is of particular importance in studying cellular differentiation.
 - Because the complete lineage of *C. elegans* has been determined.
9. *C. elegans* is not used in vaccine development.
 - Because they lack an adaptive immune system as well as presence of simple organs.
10. Aschelminthes lack fossil records.
 - Because they lack hard parts.
11. These days entomophagus species are much in demand.
 - Because they are being used in controlling insect pests through the world.
12. Development of some nematodes does not occur beyond the morula stage in the intestine.
 - Because in nematodes, development eggs require optimal conditions of oxygen, moisture and temperature which are not available in the intestine of the host.

ANNELIDA

Multiple-Choice Questions

1. Annelids are:
(a) Metamerically segmented and coelomate (b) Bilaterally symmetrical
(c) Triploblastic (d) All
2. The first true coelomate group is the:
(a) Coelenterates (b) Helminthes (c) Annelids (d) Arthropods
3. What is incorrect about Annelida?
(a) Closed circulatory system (b) Endodermal nephridia
(c) Mesodermal coelomoducts (d) Coelomic fluid acts as a hydraulic skeleton
4. Annelids are:
(a) Asymmetrical (b) Radially symmetrical
(c) Biradially symmetrical (d) Bilaterally symmetrical
5. Annelids are:
(a) Marine (b) Freshwater (c) Terrestrial (d) All
6. Circulatory system in Annelids is:
(a) Open type (b) Closed type (c) Both (d) None
7. Excretory organ in Annelids is:
(a) Nephridia (b) Malpighian tubules
(c) Flame cells (d) Green gland
8. Which one of the following is not true about Annelids?
(a) First true coelomate (b) Triploblastic
(c) Metamerism (d) Radial symmetry
9. Earthworms belong to class:
(a) Archiannelida (b) Oligochaeta (c) Polychaeta (d) Hirudinea
10. Leeches belong to class:
(a) Hirudinea (b) Crustacea (c) Oligochaeta (d) Asteroidea
11. *Nereis* belongs to phylum:
(a) Arthropoda (b) Annelida (c) Mollusca (d) Echinodermata
12. Which one of the following is different?
(a) Clam worm (b) Lugworm (c) Paddle worm (d) Shipworm
13. Most primitive Annelid is the:
(a) *Polygordius* (b) *Arenicola* (c) *Nereis* (d) *Serpula*

14. Annelids have:
 - (a) Cellular grade of organisation
 - (b) Tissue grade of organisation
 - (c) Organ grade of organisation
 - (d) System grade of organisation
15. Setae and parapodia are the locomotors organ of:
 - (a) Arthropods
 - (b) Annelids
 - (c) Molluscs
 - (d) Echinoderms
16. Setae and parapodia are absent in:
 - (a) Hirudinea
 - (b) Oligochaeta
 - (c) Polychaeta
 - (d) None
17. Suctorial mouth is found in:
 - (a) Earthworms
 - (b) *Neanthes*
 - (c) *Hirudinaria*
 - (d) Starfish
18. Larva of Annelids is:
 - (a) Trochophore
 - (b) Glochidium
 - (c) Auricularia
 - (d) Ephyra
19. Botryoidal tissue is found in:
 - (a) *Neanthes*
 - (b) Earthworms
 - (c) Leeches
 - (d) *Balanoglossus*
20. Clitellum is found in:
 - (a) *Neanthes*
 - (b) Earthworms
 - (c) *Polygordius*
 - (d) *Scolopendra*
21. Chloragogen cells are found in:
 - (a) Earthworms
 - (b) *Pila*
 - (c) *Balanoglossus*
 - (d) *Peripatus*
22. Chloragogen cells are associated with:
 - (a) Digestion
 - (b) Respiration
 - (c) Circulation
 - (d) Excretion
23. Clitellum helps in:
 - (a) Excretion
 - (b) Respiration
 - (c) Copulation
 - (d) Cocoon formation
24. A ventral nerve cord is found in:
 - (a) *Hydra*
 - (b) *Taenia*
 - (c) *Ascaris*
 - (d) Earthworms
25. In earthworms, lymph glands are located in the segments:
 - (a) 7, 8, 9
 - (b) 14, 15, 16
 - (c) 1, 3, 4
 - (d) 26th segment to pygidium
26. Lymph glands are:
 - (a) Defensive in function
 - (b) Excretory in function
 - (c) Respiratory in function
 - (d) Associated with the production of blood corpuscles and haemoglobin
27. Typhlosole:
 - (a) Is excretory in function
 - (b) Helps in digestion
 - (c) Increases the area of absorption
 - (d) Helps in copulation
28. Typhosolar region in earthworms is found in the:
 - (a) Pharynx
 - (b) Oesophagus
 - (c) Gizzard
 - (d) Intestine
29. Which part of alimentary canal in earthworms is lined with cuticle?
 - (a) Gizzard
 - (b) Stomach
 - (c) Intestine
 - (d) Pharynx
30. In earthworms, gizzard is the site of:
 - (a) Digestion of food
 - (b) Absorption of food
 - (c) Crushing of food into finger particles
 - (d) Deamination of amino acids

31. The stomach of earthworms is located in:
 (a) 7–14 segments (b) 9–14 segments (c) 14–16 segments (d) 16–19 segments
32. Chromophil cells of earthworms:
 (a) Secrete mucous and proteolytic enzymes (b) Produce toxins
 (c) Cause deamination of amino acids (d) Helps in respiration
33. The haemoglobin and blood cells of earthworms are produced in:
 (a) Lymph glands (b) Blood glands (c) Salivary glands (d) Calciferous glands
34. Calciferous glands of earthworms are found in the:
 (a) Stomach (b) Intestine (c) Gizzard (d) Pharynx
35. Calciferous glands of earthworms are associated with:
 (a) Digestion (b) Respiration (c) Excretion (d) Absorption
36. In earthworms, the main site of digestion is the:
 (a) Pharynx (b) Stomach (c) Gizzard (d) Intestine
37. In earthworms, blood pigment is the:
 (a) Haemoglobin (b) Haemocyanin (c) Cytochrome (d) Hemerythrin
38. Haemoglobin is dissolved in blood plasma in:
 (a) Snakes (b) Parrot (c) Earthworms (d) *Sepia*
39. The ovaries of earthworms are located in:
 (a) 13th segment (b) 12th segment (c) 11th segment (d) 10th segment
40. The testes of earthworms are located in:
 (a) 10th and 11th segments (b) 12th and 13th segments
 (c) 8th and 9th segments (d) 6th and 7th segments
41. The seminal vesicles of earthworms are located in:
 (a) 12th and 13th segments (b) 13th and 14th segments
 (c) 11th and 12th segments (d) 18th and 19th segments
42. What is correct about 18th segment of earthworms?
 (a) Male genital aperture is located (b) Female genital aperture is located
 (c) Ovaries are present (d) Both male and female genital apertures
43. In 6th, 7th, 8th and 9th segments of an earthworm:
 (a) Accessory glands are present (b) Prostate glands are present
 (c) Seminal vesicles are present (d) Spermathecae are present
44. The 17th and 19th segments of an earthworm possess:
 (a) Testes (b) Ovaries (c) Accessory glands (d) Seminal vesicles
45. Clitellum of earthworms is found in:
 (a) 14th–16th segments (b) 16th–18th segments
 (c) 17th–19th segments (d) 10th–12th segments
46. Spermathecae of earthworms:
 (a) Store sperm after copulation (b) Nourish sperms
 (c) Are the site of formation of sperms (d) None
47. In earthworms, fertilisation takes place in:
 (a) Spermathecae (b) Oviduct (c) Cocoon (d) Ootheca

48. Development is direct in:
(a) Earthworms (b) *Neanthes* (c) *Unio* (d) Starfish
49. In earthworms, fertilisation is:
(a) External (b) Internal (c) External and self (d) External and cross
50. The prostate gland of an earthworm is found in:
(a) 17th–20th segments (b) 6th–9th segments
(c) 14th–16th segments (d) 15th–18th segments
51. The genital papillae of earthworms are located in:
(a) 11th and 12th segments (b) 13th and 14th segments
(c) 15th and 16th segments (d) 17th and 19th segments
52. In earthworms, the female genital pore is located in:
(a) 13th segment (b) 14th segment (c) 15th segment (d) 16th segment
53. In 4th, 5th and 6th segments of earthworms:
(a) Blood glands are found (b) Lymph glands are found
(c) Clitellum is found (d) Blood glands and pharyngeal glands are found
54. Chloragogen cells of earthworms are comparable to:
(a) Spleen of vertebrates (b) Kidney of vertebrates
(c) Liver of vertebrates (d) Pancreas of vertebrates
55. In earthworms, locomotion takes place by:
(a) Setae (b) Parapodia (c) Suckers (d) Tube feet
56. In earthworms, setae are found in:
(a) All segments
(b) All segments except prostomium
(c) All segments except clitellum
(d) All segments except prostomium, peristomium, clitellum and pygidium
57. Nephridia of earthworms are analogous to vertebrates:
(a) Eye (b) Liver (c) Kidney (d) Testis
58. Nephridia of earthworms are:
(a) Ectodermal in origin (b) Endodermal in origin
(c) Mesodermal in origin (d) Both ecto and mesodermal in origin
59. Which one of the following statements is incorrect?
(a) Septal nephridia are the largest nephridium.
(b) Integumentary nephridia are devoid of nephrostomes.
(c) Integumentary nephridia are exonephric.
(d) Pharyngeal nephridia are the smallest nephridia.
60. In earthworms, septal nephridia are found:
(a) In all segments (b) In each segment behind 15th segment
(c) Irregularly distributed (d) In 14th, 15th and 16th segments
61. Nephridia of earthworms are found in:
(a) All body segments (b) All body segments except first two or three
(c) All body segments except 14th, 15th and 16th (d) All body segments except posterior two or three

62. The nephridia which lack nephrostome and is enteronephric type:
(a) Septal nephridia (b) Pharyngeal nephridia
(c) Integumentary nephridia (d) None
63. In earthworms, septal nephridia are absent in:
(a) Anterior 14th segment (b) Posterior 14th segment
(c) 14th, 15th and 16th segments (d) Anterior 2nd and 3rd segments
64. The nitrogenous waste product of earthworms is:
(a) Urea and ammonia (b) Urea and uric acid
(c) Uric acid and ammonia (d) Urea, ammonia and traces of creatinine
65. The nephridia of earthworms extract water and excretory substances from the blood and coelomic fluid by the process of:
(a) Ultra filtration (b) Active transport (c) Diffusion (d) All
66. The correct statement is:
(a) Earthworms have a well-developed nervous system and brain but no head
(b) The ventral nerve cord of earthworms is hollow
(c) Earthworms have a pair of eyes
(d) Gizzard of earthworms contains chromophil cells
67. In earthworms, spermatogenesis is completed in:
(a) Testes (b) Seminal vesicles (c) Testes sacs (d) Vas deferentia
68. The larva of earthworms is:
(a) Trochophore (b) Ammocoete (c) Glochidium (d) No larva
69. Earthworms lack:
(a) Distinct head (b) Eyes (c) Both head and eyes (d) Haemoglobin
70. The coelomic fluid of earthworms is:
(a) Acidic (b) Alkaline (c) Neutral (d) None
71. Which one of the following classes is characterised by the presence of suckers?
(a) Archannelida (b) Polychaeta (c) Oligochaeta (d) Hirudinea
72. Which one of the following is sanguivorous?
(a) *Neanthes* (b) Earthworms (c) Leeches (d) *Polygordius*
73. Which one of the following is an Annelid?
(a) Shipworm (b) Glowworm (c) Paddle worm (d) Pinworm
74. Metamorphosis is absent in:
(a) *Neanthes* (b) Starfish (c) *Unio* (d) Earthworms
75. The setae of earthworms is secreted by:
(a) Epidermis (b) Dermis (c) Cuticle (d) Muscles
76. The first segment of earthworms is known as:
(a) Pygidium (b) Prostomium (c) Peristomium (d) Metamere
77. The posterior most segment of earthworms is called:
(a) Clitellum (b) Proglottid (c) Prostomium (d) Pygidium
78. Bright deep brown colouration of earthworms is due to the presence of:
(a) Haemoglobin (b) Cytochrome (c) Porphyrin (d) Histamine

79. The circulatory system of earthworms does not include:
 (a) Red blood (b) Closed blood vessels (c) Capillaries (d) Bundle of his
80. The red colour of plasma in earthworms is due to:
 (a) Haemoglobin (b) Porphyrin (c) Haemocyanin (d) Cytochrome
81. The blood vessel which is considered as true heart in earthworms is:
 (a) Dorsal blood vessel (b) Ventral blood vessel
 (c) Lateral oesophageal vessel (d) Ventro-intestinal vessel
82. Dorsal blood vessel of earthworms behaves as a distributory vessel in:
 (a) Anterior 13 segments (b) Middle 13 segments
 (c) Posterior 13 segments (d) Anterior 10 segments
83. Dorsal blood vessel of earthworms behaves as a collecting vessel in:
 (a) Anterior 13 segments (b) After 13 segments
 (c) Posterior 13 segments (d) Middle 13 segments
84. Dorsal blood vessel of an earthworm collects blood in the segment 14 onwards from dorso-intestinal and from subneural through:
 (a) Commissural vessels (b) Tegumentary vessels
 (c) Anterior loop (d) Lateral oesophageal vessel
85. The four hearts of earthworms are located in:
 (a) 7th, 9th, 12th and 13th segments (b) 8th, 9th, 12th and 13th segments
 (c) 5th, 6th, 7th and 8th segments (d) 7th, 8th, 9th and 10th segments
86. The smallest longitudinal blood vessel in earthworms is:
 (a) Subneural vessel (b) Supra-oesophageal vessel
 (c) Dorsal blood vessel (d) Ventral blood vessel
87. 7th and 9th segments in earthworms contain:
 (a) Lateral hearts (b) Testes (c) Ovaries (d) Spermathecae
88. The largest blood vessel in earthworms is:
 (a) Ventral vessel (b) Dorsal vessel
 (c) Supra-oesophageal vessel (d) Subneural vessel
89. The presence of earthworms in soil is indicated by:
 (a) Cracks in the soil (b) Conical heaps of dry soil
 (c) Heaps of small pellets of soil (d) Heaps of dry powdery soil
90. In earthworms, valves are absent in:
 (a) Anterior loop (b) Dorsal blood vessel (c) Ventral blood vessel (d) Lateral heart
91. Anterior loops of earthworms are located in:
 (a) 10th and 11th segments (b) 11th and 12th segments
 (c) 7th and 9th segments (d) 13th and 14th segments
92. Which one of the following is absent in earthworms?
 (a) Photoreceptors (b) Tangoreceptors (c) Mechanoreceptors (d) Buccal receptors
93. What is common between earthworms and prawns?
 (a) Dorsal nerve cord (b) Ventral nerve cord (c) Cocoon (d) Larval stage

94. The correct match is:
(a) *Neanthes* – Botryoidal tissue
(b) *Chaetopterus* – Lugworm
(c) Earthworm – Clitellum
(d) *Heteronereis* – A sexual phase of *Nereis*
95. The neurons of earthworms are:
(a) Sensory (b) Motor (c) Adjuster (d) All
96. In earthworms, there are:
(a) One pair of prostate glands
(b) Two pairs of prostate glands
(c) Four pairs of prostate glands
(d) Prostate gland is absent
97. Chloragogen cells are found in:
(a) Blood of earthworms
(b) Lymph of earthworms
(c) Coelomic fluid of earthworms
(d) Body wall of *Hydra*
98. Which one of the following Protozoan parasites is found in the seminal vesicles of earthworms?
(a) *Plasmodium* (b) *Trichonympha* (c) *Monocystis* (d) *Blantidium*
99. Locomotors organ of *Neanthes* is:
(a) Parapodia (b) Setae (c) Pseudopodia (d) Suckers
100. Earthworms are useful for:
(a) Increasing the fertility of the soil
(b) Making bait for fishing
(c) Increasing the power of water retention in soil
(d) None
101. In leeches, suckers are located:
(a) All over the body (b) At the anterior end
(c) At the posterior end (d) At both anterior and posterior ends of the body
102. Hirudin is found in the saliva of:
(a) Earthworms (b) Cockroaches (c) *Pila* (d) Leeches
103. In earthworms, movement takes place by:
(a) Setae (b) Parapodia
(c) Setae, muscles and hydrostatic skeleton (d) Setae and muscles
104. In earthworms, nephridia are:
(a) Scattered (b) Metamerically arranged
(c) Found only in the anterior region (d) Found only in the posterior region
105. If the skin of earthworms dries:
(a) It will become more active (b) It will die due to asphyxia
(c) It will die due to dehydration (d) It will remain alive
106. Respiration in earthworms is performed by:
(a) General body surface (b) Gills
(c) Book lungs (d) Book gills
107. Photoreceptors of earthworms are located in:
(a) Clitellum (b) Dorsal surface (c) Lymph glands (d) Pharyngeal mass
108. Earthworms move in:
(a) Forward direction (b) Backward direction
(c) Both forward and backward direction (d) Burrow only

109. In earthworms, gustor receptors are found in:
(a) Buccal cavity (b) Stomach (c) Gizzard (d) Pharynx
110. Members of the class oligochaeta are provided with:
(a) A distinct head (b) A pair of eyes
(c) A pair of sensory tentacles (d) None
111. The setae of earthworms are:
(a) Siliceous (b) Chitinous (c) Calcareous (d) Proteinous
112. In earthworms, the arrangement of setae in middle line of each segment is known as:
(a) Circum segmental ring (b) Holochaetine
(c) Oligochaetine (d) Perichaetine
113. Which one of the following cells of coelomic fluid of earthworms are nutritive?
(a) Amoebocytes (b) Leucocytes
(c) Chloragogen cells (d) Eleocytes
114. Nephrostomes are found in:
(a) Septal nephridia (b) Pharyngeal nephridia
(c) Integumentary nephridia (d) All
115. In earthworms, porphyrin:
(a) Transports oxygen (b) Prevents infection from germs
(c) Helps in reproduction (d) Prevents from effect of harmful light rays
116. In earthworms, the septal nephridia discharge the excretory products to:
(a) Outside the body (b) Coelom (c) Intestine (d) Gizzard
117. Which is true about *Heteronereis*?
(a) Belongs to class Polychaeta
(b) Sexual phase of *Nereis*
(c) The body is divisible into two parts—anterior sexless part and posterior sexual part
(d) All
118. Botryoidal tissue is found in the members of the class:
(a) Polychaeta (b) Oligochaeta (c) Hirudinea (d) Archianneilida
119. Smooth bloodworm is the common name of:
(a) *Neanthes* (b) *Aphrodite* (c) *Glycera* (d) *Polygordius*
120. Smooth bloodworm belongs to phylum:
(a) Platyhelminthes (b) Annelida (c) Arthropoda (d) Mollusca
121. Parapodia are the locomotors organ in:
(a) Polychaets (b) Oligochaets (c) Asteroidea (d) Hirudinea
122. The arrangement of body wall of earthworms from exterior to anterior is:
(a) Cuticle → epidermis → circular muscle → longitudinal muscle and coelomic epithelium
(b) Epidermis → cuticle → longitudinal muscle → circular muscle and coelomic epithelium
(c) Cuticle-epidermis → longitudinal muscle → coelomic ephitherium → circular muscle
(d) Coelomic epithelium → longitudinal muscle → circular muscle → epidermis → cuticle
123. In earthworms, porphyrin is found in:
(a) Glandular cells (b) Sensory cells (c) Circular muscle (d) Longitudinal muscle

124. Which one of the following cells is not found in the coelomic fluid of earthworms?
 (a) Chloragogen cells (b) Leucocytes
 (c) Eleocytes (d) Erythrocytes
125. In earthworms, coelomic fluid:
 (a) Provides turgidity to the body wall and helps in the maintenance of body shape
 (b) Lubricates the body surface
 (c) Keeps the body moist which is a need for respiration
 (d) All
126. Brain in earthworms is formed by the fusion of:
 (a) Two supra-pharyngeal ganglia
 (b) Two cerebral ganglia
 (c) One supra-pharyngeal and one cerebral ganglia
 (d) Two segmental ganglia
127. In earthworms, fertilisation is:
 (a) External and cross (b) External and self
 (c) Internal and cross (d) Internal and self
128. Which one of the following is known as forest of nephridia?
 (a) Clitellum (b) Buccal mass (c) Typhlosole (d) None
129. From the cocoon of earthworms:
 (a) Only one embryo is hatched at a time
 (b) Two embryos are hatched at a time
 (c) More than two embryos are hatched at a time
 (d) No embryo is hatched
130. Speed of impulse transmission in earthworms is increased by:
 (a) Porphyrin (b) Histamine (c) Giant nerve fibers (d) Ventral nerve cord
131. Which one of the following structures is typically found in each segment of earthworms?
 (a) Nephridia (b) Setae (c) Ganglia (d) Lateral hearts
132. Blood of this animal is red but there are no red blood corpuscles:
 (a) *Obelia* (b) *Pila* (c) Earthworms (d) Prawns
133. Which one of the following is not a function of the body wall of earthworms?
 (a) Respiration (b) Excretion (c) Defence (d) Sensory reception
134. Earthworms help farmers by:
 (a) Increasing nitrogen fixation
 (b) Killing bacteria
 (c) Making soil porous and increasing its fertility
 (d) All
135. In earthworms, setae are absent in:
 (a) First segment (b) Last segment (c) Clitellum (d) All
136. Which one of the following is found in earthworms?
 (a) Spiracles (b) Lateral spiracles (c) Lateral ventricles (d) Lateral hearts
137. Earthworms belong to class:
 (a) Polychaeta (b) Oligochaeta (c) Archiannelida (d) Hirudinea

138. Indian zoologist who wrote a monograph on earthworms:
 (a) Salim Ali (b) K N Bahl (c) J C Bose (d) Maheswari
139. Most famous swarming worm is the:
 (a) Palolo worm (b) Lugworm (c) Paddle worm (d) Sandworm
140. In earthworms, copulation takes place during:
 (a) Summer season (b) Rainy season (c) Winter season (d) Not fixed
141. The coelomic fluid of leeches contains:
 (a) Haemoglobin (b) Haemocyanin (c) Cytochrome (d) Porphyrin
142. *Neanthes* is:
 (a) Herbivorous (b) Carnivorous (c) Sanguivorous (d) Omnivorous
143. The animal popularly known as tillers of the soil:
 (a) Earthworm (b) *Ancylostoma* (c) *Pila* (d) Leech
144. The neuro secretory cells of the cerebral ganglia of earthworms secrete:
 (a) Certain neurohormones (b) Pheromones
 (c) Ectohormones (d) None
145. Which one of the following animals can continue metabolism even when their haemoglobin is immobilised by the presence of carbon dioxide:
 (a) *Arenicola* (b) *Tubifex* (c) Earthworm (d) All
146. What is incorrect about the nervous system of *Owenia*?
 (a) Single nerve cord (b) No ganglia
 (c) Located in epidermis (d) None
147. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|-----------------|------------------------|
| (A) Paddle worm | 1. <i>Polynoe</i> |
| (B) Bloodworm | 2. <i>Clymenella</i> |
| (C) Bamboo worm | 3. <i>Tubifex</i> |
| (D) Scale worm | 4. <i>Chaetopterus</i> |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 4 | 2 | 3 | 1 |
| (b) 4 | 3 | 2 | 1 |
| (c) 2 | 4 | 1 | 3 |
| (d) 3 | 1 | 4 | 2 |
148. Distinct nephridium is lacking in:
 (a) *Pontobdella* (b) *Haemopsis* (c) *Hesione* (d) *Filigrana*
149. Which one of the following is a correct statement?
 (a) Setae are used to hold the animal in a tube.
 (b) During swimming, setae cause an increase in the surface areas of appendages for swimming.
 (c) Setae help in attachment with soil.
 (d) All

150. Which one of the following setae are hollow and are made up of calcium carbonate?
 (a) Fireworm (b) Scale worm (c) Feather duster worm (d) Palolo worm
151. Botryoidal tissues are the site of:
 (a) Synthesis and storage of glycogen (b) Synthesis of fat
 (c) Deamination (d) None
152. In leeches, which one of the following is both, a collecting as well as distributing channel?
 (a) Dorsal channel (b) Ventral channel (c) Lateral channel (d) All
153. *Neanthes* lacks:
 (a) Seminal vesicle (b) Prostate glands (c) Vagina (d) All
154. Teloblastic growth is shown by:
 (a) Coelenterates (b) Platyhelminthes (c) Aschelminthes (d) Annelids
155. Which one of the following is not applicable to leeches?
 (a) Suctorial pharynx (b) Sanguivorous (c) Denticulated jaws (d) Nephrostomes
156. Which one of the following is not found in earthworms?
 (a) Leucocytes (b) Choanocytes (c) Amoebocytes (d) Granulocytes
157. In which one of the following is the blood vascular system lacking?
 (a) *Glycera* (b) *Acanthobdellida* (c) *Arenicola* (d) *Terebella*
158. Consider the following statements about calciferous glands:
 (A) Calciferous glands are characteristic of oligochaetes
 (B) They are located in the oesophageal wall
 (C) Calciferous glands are involved in ionic regulation
 (D) When the level of CO₂ in the blood becomes high, the carbonate ion binds with calcium in the calciferous glands
- The incorrect statements are:
 (a) A and B (b) B and C (c) C and D (d) None
159. Which one of the following is an incorrect about oligochaetes?
 (a) Metamerism is well developed. (b) Parapodia are lacking.
 (c) Prostomium with sensory appendages. (d) Clitellum present.
160. Setae are lacking in leeches except:
 (a) *Haemopsis terrestris* (b) *Placobdella*
 (c) *Acanthobdella peledina* (d) *Philobdella*
161. Which one of the following is an incorrect match?
 (a) Blood glands – *Pheretima*
 (b) Gills – *Nereis*
 (c) Green blood – *Sabella*
 (d) Botryoidal tissue – *Hirudo*
162. Which one of the following is incorrect about polychaeta:
 (a) Sexes are distinct. (b) Clitellum is lacking.
 (c) Parapodia are present. (d) Metamorphosis is absent.
163. Haemoglobin is the respiratory pigment in:
 (a) Naididae (b) Aelosomatidae (c) Enchytraediae (d) None

164. Pack saddle is applicable to:
 (a) Botryoidal tissue (b) Clitellum (c) Chloragogen cells (d) Sea mouse
165. Which one of the following is commonly known as bamboo worm?
 (a) *Clymenella* (b) *Branchiomma* (c) *Brania* (d) *Owenia*
166. Which one of the following is not a feature of Annelida?
 (a) Coelom (b) Open circulatory system
 (c) Nephridia (d) Metamerism
167. Which one of the following is not applicable to earthworms?
 (a) Castings (b) Phaosome
 (c) Ammontelic and ureotelic (d) Hypotonic urine
168. In *Nereis*, which one of the following is lined with cuticle?
 (a) Buccal cavity (b) Pharynx (c) Rectum (d) All
169. Amongst Annelids, the hydrostatic skeleton is highest developed in:
 (a) Polychaetes (b) Oligochaetes (c) Hirudineans (d) Archiannelids
170. Amongst Annelids, the asexual reproduction is common in:
 (a) Polychaetes (b) Oligochaetes (c) Hirudinea (d) All
171. Myzostomia lack:
 (a) Segmentation (b) Setae (c) Trochophore larva (d) Parapodia
172. Consider the following statements:
 (A) Archiannelids are primitive and degenerate
 (B) Blood-sucking leeches attack a variety of hosts
 (C) The nervous system of *Polygordius* is continuous with epidermis
 (D) Oligochaeta is the largest class of Annelida
- The correct statements are:
 (a) All (b) A and B (c) B and C (d) A and D
173. Gonads of which one of the following oligochaetes resemble those of polychaetes?
 (a) *Aelosoma* (b) *Alma* (c) *Lumbriculus* (d) *Pheretima*
174. Consider the following points with reference to *Polygordius*:
 (A) There is a single nerve cord (B) Ganglia are present
 (C) Sexes are separate (D) Reproductive ducts are present
- The incorrect statements are:
 (a) A and D (b) B and C (c) B and D (d) None
175. In which one of the following are parapodia and setae lacking?
 (a) *Chaetogaster* (b) *Polygordius* (c) *Hirudo* (d) *Aphrodite*
176. Which one of the following is commensal in hermit crab shell?
 (a) *Nereis virens* (b) *Nereis longissima* (c) *Nereis fucata* (d) *Nereis pelagica*
177. In which one of the following Annelids are both sperm and ova formed in the same segment?
 (a) *Arenicola marina* (b) *Nereis vexillosa*
 (c) *Branchiomma* (d) *Arenicola cristata*
178. In which one of the following do gonads develop during breeding season?
 (a) *Nereis* (b) *Pheretima* (c) *Hirudinaria* (d) None

179. Exonephric and enteronephric nephridia are found in:
 (a) *Hirudinaria* (b) *Neanthes* (c) *Polygordius* (d) *Pheretima*
180. In which one of the following Annelids are prostate glands lacking?
 (a) *Pheretima* (b) *Hirudinaria* (c) *Nereis* (d) None
181. In *Hirudinaria*, fertilisation occurs in:
 (a) Ovisac (b) Oviduct (c) Uterus (d) Vagina
182. Which one of the following is found in leeches?
 (a) Clitellar glands (b) Cystogenous glands (c) Sucker glands (d) Slime glands
183. Leeches lack:
 (a) Parapodia (b) Setae (c) Clitellum (d) Salivary gland
184. The largest region of alimentary canal of leeches is the:
 (a) Crop (b) Stomach (c) Intestine (d) Oesophagus
185. The pygidium of *Nereis* does not contain:
 (a) Sensory papillae (b) Nuchal organs (c) Anus (d) Anal cirri
186. What is incorrect about *Heteronereis*?
 (a) Sexually mature
 (b) Swims actively
 (c) Causes dispersal of the species
 (d) Intestine of epitoke region, highly functional
187. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|---|------------------------|
| (A) Epitoky | 1. <i>Myxicola</i> |
| (B) Blood contains both haemoglobin and chlorocruorin | 2. <i>Glycera</i> |
| (C) Haemoglobin acts as an oxygen store | 3. <i>Serpula</i> |
| (D) Giant fiber obeys the all or none law | 4. <i>Nereis</i> |
| | 5. <i>Chaetopterus</i> |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 5 | 3 | 4 | 2 |
| (b) 4 | 5 | 2 | 1 |
| (c) 4 | 3 | 2 | 1 |
| (d) 4 | 5 | 1 | 3 |
188. Which one of the following develops its larva within its coelomoducts?
 (a) *Nereis pelagica* (b) *Nereis limnicola* (c) *Branchiomma* (d) *Arenicola cristata*
189. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|-------------------|-----------------------|
| (A) Statocyst | 1. <i>Nereis</i> |
| (B) Viviparous | 2. <i>Ctenodrilus</i> |
| (C) Nuchal organs | 3. <i>Pheretima</i> |
| (D) Clitellum | 4. <i>Arenicola</i> |

Answer codes:

	A	B	C	D
(a)	4	2	1	3
(b)	2	4	3	1
(c)	4	3	1	2
(d)	3	4	1	2

190. The glands of the clitellum secrete:

(a) The wall of the cocoon	(b) Albumin
(c) Mucous	(d) All

191. *Hirudo* can suck the blood of:

(a) Snakes and turtles	(b) Amphibians
(c) Mammals	(d) All

192. What is incorrect about leeches?

(a) Lack external segmentation	(b) Lack setae
(c) Coelom is reduced	(d) None

193. Which one of the following is the connecting link between leeches and oligochaetes?

(a) <i>Acanthobdella</i>	(b) <i>Phytobdella</i>	(c) <i>Macrobdella</i>	(d) <i>Erpobdella</i>

194. Which one of the following is an indicator of polluted water?

(a) <i>Monilgaster</i>	(b) <i>Pontoscolex</i>	(c) <i>Eukerria</i>	(d) <i>Tubifex</i>

195. Metamerism is shown by:

(a) Annelida	(b) Arthropoda	(c) Chordata	(d) All

196. What is incorrect about Annelida?

- (A) The coelomic fluid acts as a hydrostatic skeleton for locomotion.
 (B) Often coelomic fluid is used as storage area for gametes.
 (C) Annelid segments are separated by septum.
 (D) Typhlosole of the earthworm is a large dorsal fold of the intestine and is analogous to villi of higher organisms.

The incorrect statements are:

(a) None	(b) A and C	(c) A and D	(d) B

197. The pharynx of *Nereis* is:

(a) Muscular	(b) Eversible
(c) Equipped with pincer-like jaws	(d) All

198. Radioles are:

- (a) Feather-like head structure of *Sabella*
 (b) Feather-like testes of *Arenicola*
 (c) Specialised sense organs of certain polychaetes
 (d) Specialised parapodia of certain polychaetes

199. Which one of the following is applicable to polychaetes?

(a) Deposit feeding	(b) Carnivore	(c) Scavenging	(d) All

200. In earthworms, pharyngeal nephridia are not located in the segment:

(a) 3rd	(b) 4th	(c) 5th	(d) 6th

201. An earthworm has:
(a) Head (b) Brain (c) Eyes (d) Nuchal lobes
202. What is incorrect about leeches?
(a) Enterocoel (b) Setae (c) Trochophore larva (d) All
203. In which one of the following is a nucleated corpuscle containing haemerythrin present?
(a) *Capitella* (b) *Magelona* (c) *Arenicola* (d) *Myxicola*
204. Which one of the following is an important centre of intermediary metabolism and synthesis of haemoglobin?
(a) Chromophil cells (b) Chloragogen cells (c) Botryoidal tissues (d) Calciferous glands
205. Leeches are found in:
(a) Deserts (b) Tropics (c) Polar oceans (d) All
206. *Myzobdella platensis* (Hirndinida) is a true parasite of:
(a) *Callinectes bocourti* (blue crab) (b) *Balanus*
(c) *Leiobunum* (d) *Asterias tenera*
207. The book entitled *The Formation of Vegetable Mould through the Action of Worms* has been written by:
(a) Robert Koch (1876) (b) T H Macbride (1899)
(c) Charles Darwin (1881) (d) Lankaster (1874)
208. Polychaetes can regenerate:
(a) Palps (b) Head (c) Tentacles (d) All
209. In which family of polychaeta is the chlorocruorin respiratory pigment found?
(a) Ampharetidae (b) Chlorhaemidae
(c) Sabellidae and serpulidae (d) All
210. Respiratory pigment is lacking in:
(a) *Spirobis corrugatus* (b) *Spirobis borealis*
(c) *Spirobis militaris* (d) None
211. What is incorrect about the salivary glands of leeches?
(a) Secrete anticoagulant (b) Secrete anesthetic
(c) Dilate blood vessels of the host (d) None
212. Calciferous glands remove excess:
(a) Calcium (b) Magnesium and phosphate
(c) Strontium (d) All
213. Night crawler is applicable to:
(a) Lugworms (b) Earthworms (c) Paddle worms (d) Bloodworms
214. The only Annelid having fixed number of segments:
(a) Earthworms (b) Leeches (c) *Polygordius* (d) None
215. The smallest known Annelida:
(a) *Chaetogaster michrochaetus* (b) *Chaetogaster annandalai*
(c) *Hesione* (d) *Myxicola*
216. A well-developed head is lacking in:
(a) *Polynoe* (b) *Syllis* (c) *Glycera* (d) None

217. Which one of the following has the largest nerve?
 (a) *Glycera* (b) *Myxicola* (c) *Arenicola* (d) *Autolytus*
218. The nephridia of earthworms carry out:
 (a) Filtration (b) Reabsorption
 (c) Chemical transformation (d) All
219. Sperm transfer by hypodermic impregnation occurs in:
 (a) *Pontobdella* (b) *Philobdella* (c) *Haemopsis* (d) *Hirudo*
220. In hirudinea, the internal metamerism is evident only in:
 (a) Circulatory system (b) Circulatory and nervous systems
 (c) Nervous system (d) Nervous and excretory systems

Answers to Multiple-Choice Questions

1. (a)	2. (c)	3. (b)	4. (d)	5. (d)	6. (b)	7. (a)	8. (d)
9. (b)	10. (a)	11. (b)	12. (d)	13. (a)	14. (d)	15. (b)	16. (a)
17. (c)	18. (a)	19. (c)	20. (b)	21. (a)	22. (b)	23. (d)	24. (d)
25. (d)	26. (a)	27. (c)	28. (d)	29. (c)	30. (c)	31. (b)	32. (a)
33. (a)	34. (a)	35. (c)	36. (d)	37. (a)	38. (c)	39. (a)	40. (a)
41. (c)	42. (d)	43. (d)	44. (c)	45. (a)	46. (a)	47. (c)	48. (a)
49. (b)	50. (a)	51. (d)	52. (b)	53. (d)	54. (c)	55. (a)	56. (d)
57. (c)	58. (a)	59. (d)	60. (b)	61. (b)	62. (b)	63. (a)	64. (d)
65. (a)	66. (a)	67. (b)	68. (d)	69. (c)	70. (b)	71. (d)	72. (c)
73. (c)	74. (d)	75. (c)	76. (c)	77. (d)	78. (c)	79. (d)	80. (a)
81. (a)	82. (a)	83. (b)	84. (a)	85. (a)	86. (b)	87. (a)	88. (b)
89. (c)	90. (a)	91. (a)	92. (c)	93. (b)	94. (c)	95. (d)	96. (a)
97. (c)	98. (c)	99. (a)	100. (a)	101. (d)	102. (d)	103. (c)	104. (b)
105. (b)	106. (a)	107. (b)	108. (c)	109. (a)	110. (d)	111. (b)	112. (d)
113. (d)	114. (a)	115. (d)	116. (c)	117. (d)	118. (c)	119. (c)	120. (b)
121. (a)	122. (a)	123. (c)	124. (d)	125. (d)	126. (a)	127. (c)	128. (a)
129. (a)	130. (c)	131. (c)	132. (c)	133. (b)	134. (c)	135. (d)	136. (d)
137. (b)	138. (b)	139. (c)	140. (b)	141. (a)	142. (b)	143. (a)	144. (a)
145. (d)	146. (d)	147. (b)	148. (a)	149. (d)	150. (a)	151. (d)	152. (c)
153. (d)	154. (d)	155. (d)	156. (b)	157. (a)	158. (d)	159. (c)	160. (c)
161. (b)	162. (d)	163. (d)	164. (b)	165. (a)	166. (b)	167. (d)	168. (d)
169. (c)	170. (a)	171. (a)	172. (c)	173. (a)	174. (c)	175. (d)	176. (c)
177. (c)	178. (a)	179. (d)	180. (c)	181. (d)	182. (b)	183. (a)	184. (a)
185. (b)	186. (d)	187. (c)	188. (b)	189. (a)	190. (d)	191. (d)	192. (d)
193. (a)	194. (d)	195. (d)	196. (a)	197. (d)	198. (d)	199. (d)	200. (a)
201. (b)	202. (d)	203. (b)	204. (b)	205. (d)	206. (a)	207. (c)	208. (d)
209. (d)	210. (c)	211. (d)	212. (d)	213. (b)	214. (b)	215. (b)	216. (d)
217. (b)	218. (d)	219. (a)	220. (d)				

Fill in the Blanks

1. The most distinguish feature of the phylum Annelida is the _____.
2. The term 'Annelida' was coined by _____.
3. In Annelids, the oldest body segments are at the _____ end and the youngest are at the _____ end.
4. The cuticle of Annelids is made up of _____.
5. True coelom first evolved in the members of the phylum _____.
6. The anterior asexual part of *Heteronereis* is called _____ while the posterior sexual part is called _____.
7. The largest class of the phylum Annelida is the _____.
8. All oligochaetes possess a special glandular structure called _____, on attaining sexual maturity.
9. Chloragogen cells are released into coelom as free cells called _____.
10. Gametogenesis in Annelids is under _____ control.
11. In earthworms, seminal vesicles are located in _____ and _____ segments.
12. In earthworms, there are two pairs of accessory glands which are located in _____ and _____ segments.
13. In earthworms, fertilisation occurs inside the _____.
14. _____ are used to remove soluble waste products by Annelids with blood vessels while those without blood vessel use _____.
15. In hirudinea, only _____ has a perivisceral coelom in the anterior region with septa.
16. In *Nereis*, the respiratory pigment is _____.
17. In *Nereis*, fertilisation is _____.
18. The parapodial setae of *Heteronereis* are _____ shaped.
19. The term '*Pheretima*' was first used by _____.
20. In earthworms, setae are present in all segments except the first and last segments, as well as in _____.
21. Trochophore larva was discovered by _____.
22. In leeches, true coelom is represented by spaces enclosing the _____ and _____.
23. *Helodrilus* is a _____ oligochaete.
24. All Annelids have setae except _____.
25. In Annelids, the coelom is partially subdivided by septa except _____.
26. Earthworms lay their eggs in a _____.
27. The only parts of Annelids that are not segmented are _____ and pygidium.
28. _____ is the largest leech in the world.

29. Basically, parapodia consist of the two elements, viz., a _____ notopodium and a _____ notopodium.
30. Some Annelids lack a circulatory system, so that blood and coelomic fluid mix freely, resulting in the formation of _____.
31. In polychaetes, eggs are _____.
32. In oligochaetes, locomotion takes place by _____.
33. *Hirudo* is completely dependent on the bacterium _____ for the digestion of blood.
34. In earthworms, nerves are _____ and _____.
35. In earthworms, nephridia are present in all segments except the _____ and _____ segments.
36. There are _____ lymph glands in earthworms.
37. The pattern of repeated segmentation is called _____.
38. In earthworms, _____ hearts are used to pump blood.
39. The body of a leech becomes extended due to the contraction of _____ muscle.
40. Dorsal blood vessel of an earthworm is a collecting blood vessel in the segments _____ onwards.
41. In the dorsal blood vessel of earthworms, blood flows from _____ region.
42. _____ are the only paired longitudinal blood vessels of earthworms.
43. Botryoidal tissue of a leech is the _____ tissue.
44. Saliva of a leech contains an anticoagulant called _____.
45. *Tubifex* has _____ pair of hearts.
46. Giant nerve fibres are present in oligochaetes, except the _____.
47. Earthworms are not found in _____ and _____ regions.
48. Earthworm castings bring nearly _____ tonnes of soil per acre annually to the surface.
49. Generally leeches have _____ jaws and make a _____-shaped incision.
50. The oldest known fossil of Annelida comes from the early _____ period.
51. The first scientific analysis of earthworm's contribution to soil fertility was given by _____.
52. The body of the trochophore consists of three parts called _____ and _____ and _____.

Answers to Fill in the Blanks

1. Metamerism	2. Lamarck (1802)	3. Anterior, posterior
4. Collagen	5. Annelida	6. Atoke, epitoke
7. Polychaeta	8. Clitellum	9. Eleocytes
10. Neurosecretory	11. 11th and 12th segments	12. 17th, 19th
13. Cocoon	14. Protonephridia	15. <i>Acanthobdella</i>
16. Erythrocytes	17. External	18. Oar

19. Kingberg (1987)	20. Clitellum	21. Loven (1840)
22. Gonads, reproductive ducts	23. Setae	24. Leeches
25. Leeches	26. Cocoon	27. Head
28. <i>Haementeria ghiliani</i>	29. Dorsal, ventral	30. Haemocoel
31. Telolecithal	32. Setae	33. <i>Pseudomonas hirudinis</i>
34. Sensory, motor	35. First three, last	36. 10
37. Metamerism	38. Five	39. Circular
40. 14th	41. Posterior to anterior	42. Lateral oesophageal
43. Connective	44. Hirudin	45. One
46. Aeolosomatids	47. Arctic, arid	48. 7–8
49. Three, 'Y'	50. Cambrian	51. Charles Darwin (1881)
52. Prototroch, metatroch, telotroch		

True or False

- Annelids are the first group of triploblastic and true coelomate animals.
- Earthworms through their burrowing and digestive processes are responsible for mixing and aeration of the soil.
- Oligochaetes lack respiratory organs.
- Setae detect the changes in environment through their basal attachments.
- Calciferous glands contain carbonic anhydrase enzyme.
- Oligochaetes lack the capability of regeneration.
- Many polychaetes brood their eggs.
- The dorsal blood vessel of earthworms is collecting in the first 13 segments and distributory in the rest of the segments.
- Leeches lack copulatory organs.
- In hirudinea, only external segmentation is present.
- Dorsal blood vessel of earthworms lacks valves.
- Peristaltic waves of the body wall are not confined to segmented animals.
- The body wall of *Arenicola* is more firm than that of earthworms.
- Tubifex* is used by aquarist to feed their fish.
- Earthworms form pairs and reciprocally fertilise one another.
- The arrangement of blood vessels in an earthworm is similar in all segments.
- In some polychaetes and leeches, the circulatory system is partially open.
- Parapodia are reduced in sedentary polychaetes.

19. The cuticle of Annelids is shed at regular intervals.
20. Parapodia are the jointed extension of body wall found in polychaetes.
21. Many small polychaetes lack a circulatory system.
22. Polychaetes play a key role in the maintenance of food chain as well as the whole ecological balance of the sea.
23. The blood vessels of polychaetes are thin walled and lack lining of endothelium.
24. Epitoky is shown by many oligochaetes.
25. The body wall of *Nereis* is weaker than that of an earthworm.
26. In *Nereis*, longitudinal muscles form a continuous layer.
27. *Arenicola* swells at reduced salinities.
28. The digestive system of earthworms is metameric.
29. The notopodium of *Chaetopterus* secretes a mucous bag that traps food from the water passing through tubes.
30. Aquatic oligochaetes have larger setae than the terrestrial form.
31. Rotolling the soil can be harmful to earthworms.
32. Annelids have organ system level of organisation.
33. The septa which separate the segments are the main feature that relate tubes within the tube body plan in Annelids.
34. Septal nephridia of earthworms are exonephric.
35. The coelomic fluid of earthworms contain haemoglobin.
36. Most myzostomes are commensals.
37. Parasitism is common among polychaetes.
38. Fanworms lack well-developed nephridial blood supply.
39. In *Arenicola*, all body segments produce gametes.
40. Freshwater oligochaetes lack typhlosole.
41. The haemoglobin of *Tubifex* is saturated with oxygen at very low oxygen tension.
42. Annelids are schizocoelus.
43. In some scale worms, there are luminescent elytra .
44. In polychaetes, the absence of septa limit the number of nephridia.
45. *Tubifex* is well adapted for withstanding oxygen shortage.
46. In polychaetes gonads are formed only during the breeding season.
47. In the nervous system of earthworms, there is ventral brain with ventral solid nerve cord.
48. Annelids are the first segmented animals to evolve.
49. *Aulophorus furcatus* is an Annelid and solely reproduces asexually.
50. Leeches have the ability to regenerate lost body parts.
51. Earthworms act as decomposers.

Answers to True or False

1. True	2. True	3. True	4. True	5. True	6. False	7. True	8. False
9. False	10. True	11. False	12. True	13. False	14. True	15. True	16. False
17. True	18. True	19. False	20. False	21. True	22. True	23. True	24. False
25. True	26. False	27. True	28. False	29. True	30. True	31. True	32. True
33. False	34. False	35. False	36. True	37. True	38. True	39. False	40. True
41. True	42. True	43. True	44. False	45. True	46. True	47. False	48. True
49. True	50. False	51. True					

Give Reasons

- The fossils of Annelids are not common.
 - Because of their soft body.
- If an earthworm is punctured, it is unable to move properly.
 - Because functioning of body muscles is dependent on the fluid volume in the coelom and as a result of puncturing, the fluid volume of coelom becomes disturbed.
- It is difficult to pull an earthworm from its burrow.
 - Because an earthworm remains anchored in its burrow with its setae.
- Setae are used in burrowing.
 - Because they assist in burrowing.
- An earthworm is still able to move off even when cut in half.
 - Because in an earthworm, each segment is an independent compartment.
- The body of leeches functions as a single hydrostatic skeleton.
 - Because in leeches, the internal divisions of the body have been lost.
- Polychaetes are so named.
 - Because of the presence of numerous setae (chaetae).
- The dorsal surface of the skin of an earthworm is brown.
 - Because of the presence of porphyrin.
- In leeches, it is difficult to detect metamerism externally.
 - Because of the presence of secondary annulation.
- Chromophil cells of earthworms behave as salivary glands.
 - Because they lubricate food.
- Trochophore larva is of considerable interest.
 - Because trochophore larva also occurs in Molluscs and provides an evidence relating Annelida and Mollusca.
- Chloragogen cells are analogous to liver cells of vertebrates.
 - Because it helps in excretion and food storage.
- The digestive system of earthworms is not metameric.
 - Because it extends the length of the organism and is differentiated along its length.

ARTHROPODA

Multiple-Choice Questions

1. The biggest phylum with regard to the number of species is:
(a) Echinodermata (b) Mollusca (c) Arthropoda (d) Protozoa
2. Arthropods are characterised by:
(a) Coelom (b) Jointed appendages
(c) Triploblastic body wall (d) All
3. Arthropods are:
(a) Asymmetrical (b) Radially symmetrical
(c) Biradially symmetrical (d) Bilaterally symmetrical
4. Among Arthropods, there is a general tendency of reduction of metamerism through:
(a) Loss of segments (b) Fusion of segments
(c) Differentiation of segments (d) All
5. In Arthropods, the body cavity is:
(a) Pseudocoel (b) Haemocoel (c) Coelenteron (d) Paragastric cavity
6. Which one of the following is absent in Arthropods?
(a) Tail (b) Legs (c) Stigmata (d) Cilia
7. Excretory organ of Arthropods is:
(a) Malpighian tubules (b) Green glands
(c) Coxal glands (d) All
8. Arthropods are:
(a) Terrestrial (b) Aquatic (c) Aerial (d) All
9. Respiration in Arthropoda is performed by:
(a) Tracheae (b) Gills (c) Book lungs (d) All
10. Nervous system of Arthropods resembles with:
(a) Annelids (b) Molluscs (c) Echinoderms (d) None
11. Which one of the following is not applicable to Arthropods?
(a) Exoskeleton (b) High degree of cephalisation
(c) Movement by body deformation (d) Open circulatory system
12. Arthropods are characterised by:
(a) Haemocoel (b) Chitinous exoskeleton (c) Wings (d) Tracheal respiration
13. Joint appendages are a characteristic of:
(a) Echinoderms (b) Molluscs (c) Annelids (d) Arthropods

14. Arthropods are:
 - (a) Bilaterally symmetrical
 - (b) Triploblastic
 - (c) Metamerically segmented
 - (d) All
15. Arthropods exhibit:
 - (a) Protoplasmic grade of organisation
 - (b) Tissue grade of organisation
 - (c) Organ grade of organisation
 - (d) Organ-system grade of organisation
16. The exoskeleton of Arthropods is made up of:
 - (a) Horny plates
 - (b) Calcareous shell
 - (c) Chitinous cuticle
 - (d) Siliceous shell
17. Insects are characterised by:
 - (a) Two pairs of wing and two pairs of legs
 - (b) Two pairs of wings and three pairs of legs
 - (c) Compound eyes
 - (d) Specialised mouth parts
18. Which one of the following is the largest class of Arthropoda?
 - (a) Crustacea
 - (b) Insecta
 - (c) Arachnida
 - (d) Myriapoda
19. Cockroaches belong to class:
 - (a) Insecta
 - (b) Crustacea
 - (c) Arachnida
 - (d) Myriapoda
20. Which one of the following is true about cockroaches?
 - (a) Nocturnal
 - (b) Omnivorous
 - (c) Compound eyes
 - (d) All
21. Functional wing is absent in:
 - (a) Male *Blatta orientalis*
 - (b) Male *Periplaneta americana*
 - (c) Female *Blatta orientalis*
 - (d) Female *Periplaneta americana*
22. Cockroaches are found throughout the world except:
 - (a) Europe
 - (b) Polar regions
 - (c) Africa
 - (d) Thar desert
23. Cockroaches are:
 - (a) Nocturnal and herbivorous
 - (b) Nocturnal and carnivorous
 - (c) Nocturnal and omnivorous
 - (d) Nocturnal and sanguivorous
24. The body of cockroaches is:
 - (a) Asymmetrical and segmented
 - (b) Bilaterally symmetrical and segmented
 - (c) Radially symmetrical and segmented
 - (d) Biradially symmetrical and segmented
25. Which one of the following is not applicable to *Limulus*?
 - (a) Horseshoe crab
 - (b) Salivary glands
 - (c) Coxal glands
 - (d) Centrolecithal eggs
26. In *Limulus*, which pair of walking legs is not chelated?
 - (a) 1st
 - (b) 3rd
 - (c) 4th
 - (d) 5th
27. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Book gill	1. Prawn
(B) Book lung	2. <i>Sacculina</i>
(C) Hastate plate	3. <i>Buthus</i>
(D) Peduncle forms foot-like absorptive processes	4. <i>Limulus</i>

Answer codes:

A	B	C	D
(a) 2	3	1	4
(b) 3	4	2	1

- (c) 2 4 1 3
(d) 4 3 1 2

28. Uniramous appendages are found in:
(a) Insects (b) Centipedes (c) Millipedes (d) All
29. Consider the following statements:
(A) Arthropods first appeared in the sea
(B) All trilobites were marine
(C) Trilobites were dominant group in the early Paleozoic
(D) In Arthropoda, development is direct or indirect or mixed
The correct statements are:
(a) All (b) B, C and D (c) C and D (d) A and D
30. Arthropods are not characterised by:
(a) Jointed appendages (b) Chitinous exoskeleton
(c) Locomotors cilia (d) Segmented body
31. Consider the following statements:
(A) Horseshoe crabs are living fossils (B) They first appeared before dinosaurs
(C) Horseshoe crabs have well-developed jaws (D) Horseshoe crabs lack respiratory pigment
The correct statements are:
(a) All (b) A and B (c) B and C (d) A and D
32. The only chelicerate having a gut designed to handle solid food:
(a) *Limulus* (b) *Pandinus* (c) *Agelena* (d) *Phidippus*
33. The chitinous cuticle of a cockroach:
(a) Prevents the animal from drying (b) Provides definite shape
(c) Prevents infection from bacteria and fungi (d) All
34. Which one of the following statements is incorrect?
(a) Cuticle of a cockroach is an adaptation towards the terrestrial mode of life.
(b) Cuticle of a cockroach helps in locomotion.
(c) Cuticle of a cockroach causes hindrance in growth of body size.
(d) Cuticle of a cockroach prevents the internal soft part of the body from infection by bacteria and fungi.
35. The chitinous exoskeleton of a cockroach is called:
(a) Sclerite (b) Tergum (c) Sternum (d) Pleuron
36. In a cockroach, the sclerites are jointed together by an elastic membrane called:
(a) Pleuron (b) Sternum (c) Sutures (d) None
37. Shedding of cuticle in cockroaches is known as:
(a) Neoteny (b) Apolysis (c) Ecdysis (d) Cuticularisation
38. The head of a cockroach is formed by the fusion of:
(a) Two embryonic segments (b) Four embryonic segments
(c) Six embryonic segments (d) Eight embryonic segments
39. In cockroaches, vertex, frons clypeus, genae and labrum are parts of:
(a) Compound eyes (b) Legs
(c) Head capsule (d) Reproductive organs

40. The posteriormost dorsal top portion of the head capsule of a cockroach is known as:
 (a) Frons (b) Genae (c) Clypeus (d) Vertex
41. The portion of the head capsule of a cockroach lying anterior to vertex is called:
 (a) Pleuron (b) Frons (c) Genae (d) Sclerite
42. The dorsal and ventral sclerites of a cockroach are called:
 (a) Podomere and pedicel (b) Pleura
 (c) Tergum and sternum (d) Frons and genae
43. The head of a cockroach bears:
 (a) A pair of antennae (b) A pair of compound eyes
 (c) A pair of fenestrae (d) All
44. The antenna of a cockroach is made up of many segments called:
 (a) Metameres (b) Myotomes (c) Podomeres (d) Flagellar segments
45. The antenna of a cockroach is:
 (a) State acoustic (b) Thigmotactic (c) Chaemotactic (d) Geotactic
46. The first segment of antenna of a cockroach is the largest and is known as:
 (a) Scape (b) Pedicel (c) Feelers (d) Clypeus
47. Pseudo mouth is found in:
 (a) Earthworms (b) *Pila* (c) Starfish (d) Cockroaches
48. Protopodite, exopodite and endopodite are parts of:
 (a) Maxilla of a cockroach (b) Mandible of a cockroach
 (c) Exoskeleton of a cockroach (d) Thorax of a cockroach
49. The thorax of a cockroach is composed of:
 (a) Two segments (b) Three segments (c) Four segments (d) Six segments
50. The thorax of a cockroach bears:
 (a) Three pairs of legs and two pairs of wings (b) Three pairs of legs only
 (c) Two pairs of wings only (d) Three pairs of wings and two pairs of legs
51. Each leg of a cockroach is basically made up of:
 (a) Two main podomeres (b) Three main podomeres
 (c) Four main podomeres (d) Five main podomeres
52. Plantula is found in:
 (a) Head of a cockroach (b) Wing of a cockroach
 (c) Thorax of a cockroach (d) Abdomen of a cockroach
53. Abdominal segment of a cockroach:
 (a) Lacks legs and wings (b) Bears legs only
 (c) Bears wings only (d) Bears three pairs of legs and two pairs of wings
54. The sensory hair present in the anal cerci of a cockroach are:
 (a) Sensitive to sound (b) Sensitive to temperature
 (c) Sensitive to touch (d) None of the above
55. The epicuticle of a cockroach is formed of:
 (a) Brown fat (b) Brown protein (c) Fatty acids (d) All

56. The main protein of procuticle of a cockroach is:
(a) Brown protein (b) Albumin (c) Prolamine (d) Sclerotinin
57. In cockroaches, trichogen and tormogen cells are found in:
(a) Cuticle (b) Hypodermis (c) Mid gut (d) Compound eyes
58. The hypodermis of a cockroach bears some specialised gland cells which secrete setae, spines and bristles, etc. These cells are called:
(a) Tormogen cells (b) Trichogen cells (c) Tegmina (d) Oenocytes
59. Which one of the following is not found in the alimentary canal of a cockroach?
(a) Oesophagus (b) Stomach (c) Crop (d) Gizzard
60. The main part of the gizzard of a cockroach is called:
(a) Apodemes (b) Pulvilli (c) Armarium (d) Rectal papillae
61. The stomodaeal valve of a cockroach prevents entry of food from:
(a) Gizzard to midgut (b) Midgut to gizzard
(c) Midgut to hindgut (d) Hindgut to midgut
62. In cockroaches, pulville are found in:
(a) Rectum (b) Mid gut (c) Gizzard (d) Crop
63. In cockroaches, malpighian tubules are found:
(a) At the junction of foregut and midgut (b) At the junction of midgut and hindgut
(c) Attached with crop (d) Attached with gizzard
64. In cockroaches, excretion is performed by:
(a) Coxal gland (b) Green gland (c) Malpighian tubules (d) Kidney
65. Which one of the following is associated with excretion in a cockroach?
(a) Cuticle (b) Utricular gland (c) Malpighian tubules (d) All
66. Excretory product of a cockroach is:
(a) Ammonia (b) Urea (c) Uric acid (d) All
67. The number of spiracles in a cockroach is:
(a) Two pairs (b) Four pairs (c) Six pairs (d) Ten pairs
68. In cockroaches, the peritrophic membrane is secreted by:
(a) Cuticle (b) Crop (c) Gizzard (d) Rectum
69. The hepatic caecae in a cockroach are derived from:
(a) Midgut (b) Crop (c) Gizzard (d) Ileum
70. The hepatic caecae of a cockroach are associated with:
(a) Production of digestive enzymes (b) Absorption of nutrients
(c) Storage of food (d) Removal of excretory products
71. The number of hepatic caecae in a cockroach is:
(a) Two (b) Four (c) Six (d) Eight
72. Saliva of a cockroach contains:
(a) Amylase (b) Lipase (c) Pepsin (d) Chitinase
73. In cockroaches, the internal lining of gizzard is of:
(a) Cuticle (b) Peritrophic membrane (c) Endothelium (d) None

74. Cockroach is:
 (a) Herbivorous (b) Carnivorous (c) Omnivorous (d) Coprophagous
75. Rectal papillae of a cockroach:
 (a) Are excretory in function (b) Reabsorb water and salts
 (c) Respiratory in function (d) None
76. The number of salivary glands in a cockroach is:
 (a) One pair (b) Two pairs (c) Three pairs (d) Absent
77. The number of cuticular teeth in the gizzard of a cockroach is:
 (a) Two (b) Four (c) Six (d) Eight
78. Stomodael valve in a cockroaches is located between:
 (a) Gizzard and midgut (b) Midgut and hindgut
 (c) Foregut and midgut (d) Crop and gizzard
79. Which one of the following crustacean group has successfully invaded the land?
 (a) Myodocopa (b) Isopoda (c) Podocopa (d) Cladocopa
80. Which one of the following features has played a key role in the success of Arthropods?
 (a) Musculature and cuticle (b) Circulation
 (c) Tagmatisation (d) All
81. Consider the following statements:
 (A) The exoskeleton (cuticle) of Arthropods is made up of three layers
 (B) The outer layer is of lipoprotein which acts as waterproof
 (C) The middle layer is chitinous and provides protection
 (D) The inner flexible layer helps in movement
 The incorrect statements are:
 (a) None (b) A, C and D (c) B and C (d) B and D
82. Horseshoe crab can:
 (a) Tolerate extreme heat (b) Tolerate extreme salinity
 (c) Go without eating for a year (d) All
83. Scorpions lack:
 (a) Book lungs (b) Pectines (c) Statocysts (d) Centrolecithal eggs

84. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Halteres	1. Bedbug
(B) Pseudotracheae	2. <i>Julus</i>
(C) Organ of Berlese	3. Housefly
(D) Stink glands	4. Mosquito

Answer codes:

A	B	C	D
(a) 3	4	1	2
(b) 4	3	1	2
(c) 4	1	2	3
(d) 4	1	2	3

85. Respiratory and circulatory systems are lacking in the members of class:
(a) Insecta (b) Pycnogonidia (c) Arachnida (d) Crustacea
86. Which one of the following lays eggs in the wounds of mammals?
(a) Screw worm (b) Pinworm (c) Glowworm (d) Bloodworm
87. In cockroaches, a major part of digestion takes place in:
(a) Crop (b) Gizzard (c) Midgut (d) Hindgut
88. Which one of the following enzymes is absent in cockroaches?
(a) Trypsin (b) Amylase (c) Lipase (d) Pepsin
89. Which one of the following is known as the tongue of a cockroach?
(a) Hypo pharynx (b) Labrum (c) Maxilla (d) Mandible
90. The respiratory organ of a cockroach is:
(a) Gill (b) Lung (c) Trachea (d) Book lung
91. In cockroaches, oxygen is carried to different tissues by:
(a) Blood plasma (b) Haemoglobin (c) Tracheal tubes (d) All
92. Blood does not transport oxygen in:
(a) Cockroaches (b) Tadpole larva of frogs (c) *Pila* (d) Embryo of birds
93. The cuticular lining of trachea in a cockroach is called:
(a) Intima (b) Serosa
(c) Peritoneum (d) Peritrophic membrane
94. The respiratory pigment of a cockroach is:
(a) Haemoglobin (b) Haemocyanin (c) Hemerythrin (d) Absent
95. Heart of a cockroach is:
(a) Two chambered (b) Four chambered (c) Seven chambered (d) Thirteen chambered
96. In cockroaches, alary muscles are associated with:
(a) Legs (b) Brain (c) Heart (d) Fore gut
97. Open blood vascular system without haemoglobin is found in:
(a) Earthworms (b) Leeches (c) *Pila* (d) Cockroaches
98. In cockroaches, the pericardial space can be altered by the movement of:
(a) Alary muscle (b) Circular muscle (c) Longitudinal muscle (d) All
99. Transport of oxygen in a cockroaches takes place by:
(a) Haemoglobin (b) Blood (c) Trachea (d) None
100. The heart of a cockroach is:
(a) Neurogenic (b) Myogenic (c) Both (d) Photogenic
101. Open blood vascular system is found in:
(a) Cockroaches (b) Earthworms (c) Frogs (d) Humans
102. Which one of the following is a characteristic of cockroaches?
(a) Presence of haemoglobin in the blood (b) Cocoon formation
(c) 13-chambered heart (d) Presence of larva
103. In the heart of a cockroach, the direction of blood flow is:
(a) Anterior to posterior (b) Posterior to anterior
(c) Both (d) There is no flow

104. The plasma of a cockroach contains:
 (a) Ribose sugar (b) Glucose (c) Trehalose (d) Raffinose
105. The blood of a cockroach does not perform:
 (a) Destruction of bacteria (b) Reservoir of water
 (c) Transport of oxygen (d) Distribution of food to different parts of the body
106. The blood of a cockroach lacks:
 (a) Fibrinogen (b) Plasmocytes (c) Cytocytes (d) Haemocytes
107. The visual units of compound eyes are:
 (a) Ctenidia (b) Trichogen cells (c) Ommatidia (d) Oenocytes
108. The mode of vision in a cockroach is:
 (a) Monocular (b) Binocular (c) Mosaic (d) Stereoscopic
109. Ommatidia are found in the eyes of:
 (a) Insects (b) Annelids (c) Amphibians (d) Aves
110. Ommatidia are units of:
 (a) Compound eyes (b) Kidney (c) Brain (d) Eyes of Annelids
111. Consider the following statements:
 (A) *Sacculina* is a parasitic crustacean
 (B) Its infection results in parasitic castration
 (C) Adult *Sacculina* lacks appendages, segmentation, gonads and nervous system
 (D) In adult *Sacculina* gut is present
 The incorrect statements are:
 (a) None (b) B and C (c) C and D (d) A, C and D
112. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|--------------------|-------------------|
| (A) <i>Apus</i> | 1. Water flea |
| (B) <i>Lepas</i> | 2. Tadpole fish |
| (C) <i>Balanus</i> | 3. Acorn barnacle |
| (D) <i>Daphnia</i> | 4. Goose barnacle |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 4 | 2 | 1 | 3 |
| (b) 3 | 1 | 4 | 2 |
| (c) 1 | 4 | 2 | 3 |
| (d) 2 | 4 | 3 | 1 |
113. The limbs of Arthropods are variously modified for:
 (a) Respiration (b) Locomotion
 (c) Feeding and reproduction (d) All
114. Which one of the following is not applicable to prawns?
 (a) Sexual dimorphism (b) Indirect development
 (c) Open circulatory system (d) Green gland

115. In which one of the following does development take place in the broodpouch?
(a) *Mysis* (b) *Sacculina* (c) *Hippa* (d) *Eupagurus*
116. Which one of the following is a luminescent copepod?
(a) *Oncaea* (b) *Metridia* (c) *Pleuromamma* (d) All
117. In which one of the following are sperms longer than the body size?
(a) Decapods (b) Isopods (c) Ostracods (d) Copepods
118. In insects, development is:
(a) Direct (b) Incomplete (c) Complete (d) All
119. In one of the following, one egg is released every 9–10 days:
(a) Tse-tse fly (b) Sandfly (c) Gallfly (d) Mayfly
120. Rhabdome is found in the eyes of:
(a) Annelids (b) Insects (c) Amphibians (d) Mammals
121. Fat bodies of a cockroaches are similar to:
(a) Kidney of vertebrates (b) Heart of vertebrates
(c) Liver of vertebrates (d) Pancreas of vertebrates
122. The image formed in a cockroach is known as:
(a) Superposition (b) Apposition (c) Both (d) None
123. The number of rhabdome in an ommatidium of a cockroach is:
(a) Eight (b) Seven (c) Five (d) Three
124. The muscles associated with heart in insects are:
(a) Alary muscles (b) Longitudinal muscles
(c) Circular muscles (d) Pericardial muscles
125. The total number of ganglia present in the nerve cord of a cockroach is:
(a) 12 (b) 10 (c) 9 (d) 6
126. A cockroach does not contain haemoglobin because:
(a) It has no blood (b) It is an insect
(c) It respire anaerobically (d) Tissues have direct exchange of gases from air
127. The characteristic feature of the trachea of a cockroach is that:
(a) It is the most simple organ of respiration (b) It has cartilaginous rings
(c) Its walls are noncollapsible (d) It is a tubular structure
128. The peritreme of a cockroach is:
(a) The part of reproductive organ (b) Lining of the trachea
(c) Annular sclerite surrounding the spiracle (d) Cuticular covering of the body
129. Ventral nerve cord is found in:
(a) Earthworms (b) Cockroaches (c) *Unio* (d) All
130. Which one of the following statements is incorrect?
(a) Ventral nerve cord is absent in a cockroach.
(b) A cockroach respire through trachea.
(c) The nitrogenous waste product of cockroaches is uric acid.
(d) In cockroaches, moulting is induced by the secretion from the prothoracic gland.

131. Male and female cockroaches can be distinguished by:
 (a) The presence of sting gland in female (b) Presence of a pair of anal styles in male
 (c) Females are larger than males (d) Presence of alary muscles in males
132. The spermathecae of a cockroach store:
 (a) Eggs (b) Ootheca (c) Sperm (d) Nymph
133. In cockroaches, ootheca is secreted by:
 (a) Phallic gland (b) Spermatheca (c) Collateral gland (d) All
134. The testes of a cockroach are located in:
 (a) 2nd to 4th abdominal segments (b) 4th to 6th abdominal segments
 (c) 6th to 8th abdominal segments (d) First two abdominal segments
135. In cockroaches, the number of ovarioles in each ovary is:
 (a) 6 (b) 8 (c) 10 (d) 12
136. The ootheca of cockroaches contains:
 (a) 16 ova (b) 14 ova (c) 12 ova (d) 8 ova
137. The short style in a male cockroach is found in the:
 (a) 8th segment (b) 9th segment (c) 10th segment (d) 6th segment
138. The secretion of corpora allata is responsible for:
 (a) Reproduction and metamorphosis (b) Development of secondary sexual characters
 (c) Respiration (d) Growth of the body
139. Conglobate gland is found in:
 (a) Earthworms (b) *Pila* (c) Cockroaches (d) Leeches
140. The testis of a cockroach is:
 (a) Bilobed (b) Trilobed
 (c) Tetralobed (d) Trilobed with several follicles
141. In cockroaches, the moulting of nymph is controlled by the secretion of:
 (a) Corpora allata (b) Prothoracic gland (c) Nymph gland (d) Conglobate gland
142. In cockroaches, the pseudo penis is:
 (a) Right phallomere (b) Left phallomere (c) Ventral phallomere (d) None
143. Consider the following statements:
 (A) Copulation is the general rule in crustaceans
 (B) Most crustaceans brood their eggs
 (C) In crustaceans, haemocyanin is found only in the malacostracans
 (D) In crustaceans, haemoglobin is dissolved in the plasma may also occur in muscle, nervous tissue and even in the eggs of some species
- The correct statements are:
 (a) All (b) A, B and C (c) A and C (d) B and C
144. Ecdysone is secreted by:
 (a) Corpora allata (b) Corpora cardiaca (c) Corpus luteum (d) Prothoracic gland
145. Which one of the following is known as a one-eyed animal?
 (a) *Cyclops* (b) *Daphnia* (c) *Apus* (d) *Lepus*

146. Antennae are lacking in the members of class:
(a) Insecta (b) Arachnida (c) Crustacea (d) Chilopoda
147. Which one of the following is incorrect about *Limulus*?
(a) Sexual dimorphism (b) Internal fertilisation
(c) Oviparous (d) Trilobite stage
148. Which one of the following is a terrestrial crustacean?
(a) *Oniscus* (b) *Nebalia* (c) *Caprella* (d) *Hippa*
149. Four pairs of salivary glands are found in:
(a) Diplopoda (b) Chilopoda (c) Pauropoda (d) Symphyla
150. Extensor muscles are lacking in:
(a) Spiders (b) Centipedes (c) Millipedes (d) All
151. In which one of the following, growth and moulting occurs throughout life:
(a) Crayfish (b) Barnacles (c) *Homarus* (d) All
152. Maximum number of abdominal ganglia is found in:
(a) Dictyoptera (b) *Tabanus* (c) *Periplaneta* (d) *Orthetrum*
153. The phallic gland of cockroaches helps in:
(a) Digestion (b) Respiration
(c) Formation of spermatophore (d) Moulting
154. The egg of a cockroach is:
(a) Microlecithal (b) Macrolecithal (c) Centrolecithal (d) Telolecithal
155. In cockroaches, the eggs are fertilised in:
(a) Ootheca (b) Ovary
(c) Oviduct (d) Genital pouch of female
156. Which one of the following glands is found in male cockroaches?
(a) Cawper's gland (b) Conglobate gland (c) Prostate gland (d) Collateral gland
157. Which one of the following glands is found in female cockroaches?
(a) Phallic gland (b) Collateral gland (c) Shell gland (d) Vitelline gland
158. In cockroaches, the ecdysis is related with:
(a) Growth (b) Respiration (c) Excretion (d) Reproduction
159. In cockroaches, the metamorphosis is:
(a) Retrogressive (b) Homometamebolous (c) Paurometabolous (d) Ametabolous
160. The titilator of a cockroaches is located in:
(a) Right phallomere (b) Left phallomere (c) Ventral phallomere (d) Phallic gland
161. A young cockroach is called:
(a) Nymph (b) Planula (c) Maggot (d) Instar
162. The corpora allatum of a cockroach is:
(a) A digestive gland (b) An endocrine gland
(c) A reproductive organ (d) A sense organ
163. The hormone which regulates metamorphosis in insects is the:
(a) Thyroxine (b) Adrenaline (c) Erythropoetin (d) Ecdysone

164. Ecdysone is produced by:
(a) Corpora quadrigemina (b) Corpora albicans
(c) Corpora allata (d) Prothoracic gland
165. The intermediate stage of a cockroach, formed between two moults is known as:
(a) Imago (b) Larva (c) Instar (d) Nymph
166. The young cockroach that develops after last moulting is known as:
(a) Nymph (b) Imago (c) Maggot (d) Pupa
167. The cuticle of a cockroach shedded after moulting is known as:
(a) Exuviae (b) Pronotum (c) Ungues (d) Lingua
168. Which one of the following is an incorrect statement about the nymph of a cockroach?
(a) It is soft, small, transparent and white in colour.
(b) It is devoid of wings.
(c) It possesses mature gonads.
(d) It possesses hard cuticle.
169. A cockroach becomes sexually mature after about:
(a) A week of last moulting (b) Two weeks of last moulting
(c) Three weeks of last moulting (d) None
170. The nymph of a cockroach moults:
(a) Two times (b) Four times (c) Five times (d) Ten times
171. The period of interval between two moults in a cockroach is known as:
(a) Instar (b) Stadium
(c) Developmental period (d) Moulting period
172. The secretion of corpora allata of a cockroach:
(a) Maintains the juvenile features in the larval stage
(b) Helps in the oocyte formation in females
(c) Influences the secretions of secondary sexual organs in both sexes
(d) All
173. Which one of the following is not an endocrine organ of a cockroach?
(a) Cervical gland (b) Corpora allata (c) Prothoracic gland (d) Corpus albicans
174. The secretion of corpora cardiaca in cockroaches:
(a) Affects the contractility of muscles lining the gut, the malpighian tubules and heart
(b) Enhances growth
(c) Stimulates reproduction
(d) None
175. In which one of the following insects is there only one abdominal ganglion?
(a) *Cyrtus* (b) *Conops* (c) *Cimex* (d) *Syrphus*
176. In a termite colony, sound is continuously produced by:
(a) Soldiers (b) Workers (c) Nymphs (d) All
177. Which one of the following is not a larval form of *Sacculina*?
(a) Nauplius (b) Zoea (c) Cypris (d) Kentrogon

178. Which one of the following is commonly known as mole crab?
(a) *Hippa* (b) *Homarus* (c) *Oniscus* (d) *Mysis*
179. Which one of the following is a viral disease in silkworms?
(a) Grassarie (b) Pebrine (c) Flacherie (d) Muscardine
180. Which one of the following is an incorrect match?
(a) Ootheca – Cockroach (b) Appendix masculine – *Limulus*
(c) Moulting occurs in a winged form – Mayfly (d) Phosphorescent organs – Firefly
181. Branchiopods are almost entirely restricted to:
(a) Freshwater (b) Marine (c) Terrestrial (d) All
182. The first crustacean in which luminescence was observed:
(a) Ostracods (b) Copepods (c) Cirripedia (d) Branchiopods
183. In branchiopods, haemoglobin is found in the:
(a) Blood (b) Nervous tissue and muscles
(c) Eggs (d) All
184. Which one of the following is correct about *Lepas*?
(a) Unisexual (b) Sexual dimorphism
(c) Hermaphrodite (d) Egg sacs attached to the abdomen
185. Which one of the following is commonly known as spring tail?
(a) *Collembola* (b) *Gryllus* (c) *Belostoma* (d) *Ixodes*
186. Which one of the following is a living fossil?
(a) *Peripatus* (b) *Sacculina* (c) *Apus* (d) *Julus*
187. Which one of the following is not a crustacean?
(a) Prawn (b) *Sacculina* (c) *Julus* (d) *Squilla*
188. Which one of the following is different?
(a) Malpighian tubules (b) Green glands
(c) Coxal glands (d) Book gills
189. Which one of the following is not a crustacean larva?
(a) Zoea (b) Nauplius (c) Kentrogen (d) Ephyra
190. Haemocyanin pigment is found in the blood of:
(a) Prawns (b) Cockroaches (c) Spiders (d) *Chironomous*
191. Members of one of the following classes of the phylum Arthropoda have red blood due to the presence of haemoglobin in plasma:
(a) Crustacea (b) Insecta (c) Arachnida (d) Myriapoda
192. Dragonfly is popularly known as:
(a) Silverfish (b) Mosquito hawk (c) King crab (d) Leaf insect
193. Which one of the following statements is incorrect about mayflies?
(a) There is no larval form.
(b) Winged adult stage as a life span of one day.
(c) Moulting occurs in a winged form.
(d) The adult aerial form has two pairs of unequal membranous and triangular wings.

194. Lac is produced by:
 (a) *Bombyx mori* (b) *Apis indica* (c) *Laccifer lacca* (d) *Anthrea mylitta*
195. Silk is obtained from:
 (a) Caterpillar (b) Nymph (c) Imago (d) Cocoon
196. Silkworms belong to class:
 (a) Insecta (b) Crustacea (c) Arachnida (d) Myriapoda
197. *Laccifer lacca* belongs to class:
 (a) Crustacea (b) Gastropoda (c) Cephalopoda (d) Insecta
198. Halteres are found in:
 (a) Cockroaches (b) Prawns (c) Mosquitoes (d) *Sepia*
199. Which one of the following is a sanguivorous?
 (a) Cockroach (b) *Pila* (c) Prawn (d) Mosquito
200. The larva of a housefly is known as:
 (a) Tumbler (b) Nymph (c) Grub (d) Gentle
201. Coxal gland is the excretory organ of:
 (a) Prawn (b) *Pila* (c) Scorpion (d) Starfish
202. In Arthropods, the green gland helps in:
 (a) Digestion (b) Respiration (c) Excretion (d) Reproduction
203. Crayfish is a:
 (a) Mollusc (b) Crustacean (c) Arachnida (d) Fish
204. In insects, the juvenile hormone is secreted by:
 (a) Corpora albican (b) Corpora allata (c) Corpora cardiaca (d) Prothoracic gland
205. Parasitic castration is shown by:
 (a) *Sacculina* (b) *Julus* (c) Crayfish (d) *Peripatus*
206. *Limulus* belongs to phylum Arthropoda and class:
 (a) Insecta (b) Crustacea (c) Merostomata (d) Gastropoda
207. Trophallaxis is well marked in:
 (a) Ants (b) Bees (c) Termites (d) All
208. Arthropods are:
 (a) Decomposers (b) Recyclers (c) Pollinate the plants (d) All
209. Consider the following statements about *Icerya purchas*:
 (A) Commonly known as cottony cushion scale
 (B) Hermaphrodite
 (C) Self-fertilisation by hermaphrodite will produce only hermaphrodite
 (D) Only known hermaphrodite insect
 The correct statements are:
 (a) All (b) A and D (c) B and D (d) A and B
210. Members of this order are masters of camouflage:
 (a) Phasmida (b) Orthoptera (c) Odonata (d) Ephemeroptera
211. Stridulation or crepitation are means of sound production in:
 (a) Grasshoppers (b) Crickets (c) Locusts (d) All

212. Members of this order sing for a partner:
 (a) Hemiptera (b) Orthoptera (c) Coleoptera (d) All
213. The body consists of three regions in the members of the class:
 (a) Crustacea (b) Arachnida (c) Myriapoda (d) None
214. True bug belongs to the order:
 (a) Lepidoptera (b) Hemiptera (c) Neuroptera (d) Isoptera
215. Which one of the following hormones helps in hardening and darkening of cuticle in insects?
 (a) Bursicon (b) Eclosion (c) Proctolin (d) Juvenile hormone
216. *Artemia* is found in:
 (a) Soil (b) Salt lakes and ponds (c) Freshwater ponds (d) All
217. In insects, metamorphosis is regulated by:
 (a) Parth hormone (b) Thyroxine (c) Ecdysone (d) Erythropoetin
218. The head of mosquitoes does not bear:
 (a) Antennae (b) Halteres (c) Compound eyes (d) Mouth parts
219. Metathoracic wings are modified into halteres in:
 (a) Cockroaches (b) Honeybees (c) Mosquitoes (d) Silkworms
220. Which one of the following is sanguivorous?
 (a) Locust (b) *Lepisma* (c) *Sacculina* (d) None
221. In male mosquitoes, the antenna is:
 (a) Absent (b) Plumose
 (c) Pilose (d) Both plumose and pilose
222. Halter is a:
 (a) Digestive organ (b) Respiratory organ (c) Balancing organ (d) Reproductive organ
223. The distal most portion of the halter is knob shaped and is designated as:
 (a) Capitellum (b) Pedicel (c) Scabellum (d) Scutellum
224. In mosquitoes, each clasper is provided with one copulatory organ known as:
 (a) Scutellum (b) Aedeagus (c) Scutum (d) Blubber
225. In mosquitoes, the sex differentiation can be done on the bases of:
 (a) Size of wings (b) Antennae
 (c) Antennae and maxillary palps (d) Ocelli
226. The wing is spotted in:
 (a) *Anopheles* (b) *Culex* (c) *Aedes* (d) Cockroach
227. In which one of the following are ocelli absent:
 (a) Adult mosquito (b) Larva of mosquito (c) Cockroach (d) Housefly
228. Haemoglobin is absent in:
 (a) Mosquitoes (b) Frogs (c) Parrots (d) Kangaroos
229. Johnston's organ is found in:
 (a) Antennae of mosquitoes (b) Antennae of cockroaches
 (c) Antennule of prawns (d) Head of *Julus*

230. A male mosquito cannot pierce the human skin as it lacks:
 (a) Mandibles (b) Maxillae (c) Proboscis (d) Hypopharynx
231. Male mosquitoes can be distinguished from female mosquitoes by the presence of:
 (a) Larger head (b) Halteres
 (c) More numerous bristles upon antennae (d) Larger wings
232. Female mosquitoes feed on:
 (a) Fruit juice (b) Honey (c) Blood (d) Leaves
233. In mosquitoes, halteres develop from:
 (a) Head (b) Prothorax (c) Mesothorax (d) Metathorax
234. Male mosquitoes feed on:
 (a) Blood (b) Honey (c) Flower nectar (d) Soft leaves
235. Respiratory siphon is found in:
 (a) Larva of *Anopheles* (b) Larva of *Culex*
 (c) Larva of silkworm (d) Cypris larva
236. What is incorrect about *Cancer*?
 (a) Uropods are present (b) Abdomen is greatly reduced
 (c) Pleopods are much reduced (d) Commonly known as rock crab or true crab
237. Adult male and female *Culex* can be distinguished on the basis of their:
 (a) Length of maxillary palps (b) Length of wings
 (c) Length of body size (d) Sitting posture
238. *Anopheles* and *Culex* mosquitoes can be identified on the basis of their:
 (a) Sitting posture (b) Body of size (c) Length of wings (d) Colour of the body
239. Eggs of *Anopheles* float in water due to the presence of:
 (a) Air floats (b) Yolk (c) Air bubbles (d) Spiracles
240. Tumbler is the pupa of:
 (a) Silkworm (b) Cockroach (c) Mosquito (d) Butterfly
241. Mosquito larva moults:
 (a) Seven times (b) Five times (c) Three times (d) Four times
242. Eggs of *Culex* are:
 (a) Spherical (b) Boat shaped (c) Cigar shaped (d) Oval
243. Tracheal gills are found in:
 (a) Larva of lac insect (b) Larva of mosquito
 (c) Larva of silkworm (d) Larva of honeybee
244. In the life cycle of mosquitoes, paddles are found in:
 (a) Eggs (b) Larvae (c) Pupae (d) Adults
245. The young ones of a mosquito, formed by the metamorphosis of the pupa, are known as:
 (a) Imago (b) Nymph (c) Wiggler (d) Maggot
246. The number of eggs laid at a time by female *Anopheles* is about:
 (a) 400–500 (b) 200–400 (c) 100–200 (d) 40–100

247. The mouth parts of a mosquito are:
 (a) Biting and chewing type (b) Piercing and sucking type
 (c) Sucking and rasping type (d) Sucking and siphoning type
248. Biting and chewing type of mouth parts are found in:
 (a) Cockroaches (b) Houseflies (c) Mosquitoes (d) Honeybees
249. Sponging type of mouth parts are found in:
 (a) Silkworms (b) Houseflies (c) Butterflies (d) Bedbugs
250. Larva of a mosquito is known as:
 (a) Wiggler (b) Caterpillar (c) Maggot (d) Tumbler
251. In mosquitoes, the metamorphosis is of:
 (a) Retrogressive type (b) Homometabolous type
 (c) Paurometabolous type (d) Ametabolous type
252. Mouthparts of honeybees are:
 (a) Chewing and lapping type (b) Piercing and sucking type
 (c) Sucking and siphoning type (d) Biting and chewing type
253. Which one of the following is responsible for spreading filaria?
 (a) Female *Culex* (b) Female *Anopheles* (c) Male *Culex* (d) Male *Anopheles*
254. Carrier of microfilaria is:
 (a) Female *Anopheles* (b) Female *Culex*
 (c) Male *Anopheles* (d) Male *Culex*
255. The correct pairing is:
 (a) *Anopheles* – Malaria (b) Bedbug – Filaria
 (c) Silkworm – Encephalitis (d) Sandfly – Filaria
256. Which one of the following statements is incorrect about mosquitoes?
 (a) They are nocturnal. (b) They possess halteres.
 (c) Their larva is known as maggot. (d) They possess Johnston's organ .
257. Tick the incorrect statement.
 (a) The larva of mosquito is known as wriggler.
 (b) Wriggling movement is shown by the wriggler larva.
 (c) The wriggler possesses a pair of compound eyes and a pair of single eyes.
 (d) Wriggler is sanguivorous.
258. In mosquitoes, the respiratory trumpets are found in:
 (a) Egg (b) Larva (c) Pupa (d) Imago
259. Parthenogenesis is shown by:
 (a) Cockroaches (b) Mosquitoes (c) Silkworms (d) Lac insects
260. The mouth parts of *Pediculus* are:
 (a) Sponging type (b) Biting and chewing type
 (c) Piercing and sucking type (d) Chewing and lapping type
261. Royal jelly is secreted by:
 (a) Worker (b) Drone (c) Queen (d) All

262. Honey secreted by honeybees is:
 (a) Stored in the cells of comb (b) Crop
 (c) Hypodermal glands of worker bee (d) Maxillary glands
263. Bee wax is a secretory product of hypodermal glands of:
 (a) Queen bee (b) Worker bee (c) Drone bee (d) All
264. The sting of honeybee worker is a modified:
 (a) Ovipositor (b) Maxilla (c) Mandible (d) Hypodermal gland
265. Match column I with column II and select the correct answer using answer codes:
- | Column I | | | | Column II |
|--------------------|--|--|--|-------------------------------|
| (a) <i>Lepisma</i> | | | | 1. Complete metamorphosis |
| (b) Leaf insect | | | | 2. Without metamorphosis |
| (c) Butterfly | | | | 3. Certain freshwater insects |
| (d) Chloride cells | | | | 4. Mimicry |
- Answer codes:
- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 2 | 4 | 1 | 3 |
| (b) | 1 | 4 | 2 | 3 |
| (c) | 4 | 3 | 1 | 2 |
| (d) | 1 | 3 | 4 | 2 |
266. In insects, hyperecdysone inhibits synthesis of DNA, except the:
 (a) Blood cells (b) Blood cells and connective tissues
 (c) Epidermal cells and blood cells (d) Internal tissues
267. Abdomen is well developed in:
 (a) Crayfish (b) Shrimps (c) Lobsters (d) All
268. Green glands play a major role in osmotic regulation in:
 (a) Crayfish (b) Certain shrimps
 (c) Land crabs (d) Crayfish and certain shrimps
269. Cockroaches have receptors for:
 (a) Ultraviolet wavelengths (b) Green wavelengths
 (c) Both (a) and (b) (d) None

270. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Filter feeding	1. Many millipedes
(B) Colour discrimination	2. Crab
(C) Autotomy	3. <i>Pagurus</i>
(D) Repugnatorial glands	4. <i>Aora</i>

Answer codes:

	A	B	C	D
(a)	4	1	3	2
(b)	3	2	4	1
(c)	4	3	1	2
(d)	4	3	2	1

271. The muscles of crustaceans are:
 (a) Phasic (b) Tonic (c) Mixed (d) All
272. Deutocerebrum is lacking in:
 (a) Spiders (b) Mites (c) Scorpions (d) All
273. In which one of the following are all the body ganglia fused into a single large thoracic ganglia?
 (a) Houseflies (b) Crickets (c) Crabs (d) Honeybees
274. Bee dances are meant for:
 (a) Communication (b) Instinct (c) Courtship (d) All
275. Males are haploid in:
 (a) Lac insects (b) Honeybees (c) Silkworms (d) Cockroaches
276. In honeybees, the pollen basket is found in:
 (a) Head (b) Prothoracic leg
 (c) Mesothoracic leg (d) Metathoracic leg
277. The members of honeybees recognise each other by:
 (a) Dance (b) Touch (c) Vision (d) Smell
278. Drones of honeybees are produced from:
 (a) Unfertilised egg
 (b) Fertilised egg
 (c) Larvae fed with royal jelly
 (d) Larvae which are given royal jelly as food only for the first two days
279. In honeybees, the queen performs only one function:
 (a) Protection of colony (b) Communication of message
 (c) Laying of eggs (d) Collection of nectar
280. Which one of the following is an important agent of pollination?
 (a) Housefly (b) Honeybee (c) Lac insect (d) Cockroache
281. As sericulture is to silkworm, apiculture is to:
 (a) Lac insect (b) Prawn (c) Pearl (d) Honeybee
282. In the colony of honeybees, the drones are:
 (a) Diploid fertile male (b) Haploid fertile male
 (c) Sterile male (d) Sterile female
283. Which one of the following is a social and polymorphic insect?
 (a) Honeybee (b) Cockroach (c) Mosquito (d) Housefly
284. Which one of the following is used for apiculture?
 (a) Silkworm (b) Lac insect (c) Honeybee (d) Prawn
285. Honeybees are:
 (a) Herbivorous (b) Carnivorous (c) Omnivorous (d) Sanguivorous
286. In honeybees, the sting is found:
 (a) Only in queen (b) Only in worker
 (c) Both queen and worker (d) Only in drone

287. In honeybees, the metamorphosis is:
 (a) Ametabolous (b) Holometabolous (c) Hemimetabolous (d) Paurometabolous
288. In honeybees, the round dance revealed the:
 (a) Distance of food source (b) Direction of food source
 (c) Signal of danger (d) Signal of mating
289. Royal jelly is produced by:
 (a) Queen (b) Workers (c) Drones (d) All
290. Nobel Prize for deciphering the language of honeybees or bee coding was awarded to:
 (a) Carl Von Frisch (b) Charles Darwin
 (c) Lamarck and Treviranus (d) Odum
291. The incorrect statement about honeybees is:
 (a) They are colonial, social and polymorphic
 (b) Queen lays both unfertilised and fertilised eggs
 (c) The sting of honeybees is modified ovipositors
 (d) Pollen basket is only found in drones
292. The correct match is:
 (a) Queen – Haploid fertile female (b) Workers – Diploid sterile female
 (c) Drones – Diploid fertile male (d) Sting apparatus – Drones
293. Which one of the following is a productive insect?
 (a) Termite (b) Mosquito (c) Honeybee (d) Ant
294. Which one of the following reproduces both asexually and sexually?
 (a) Mosquito (b) Lac insect (c) Silkworm (d) Honeybee
295. Royal jelly is secreted by worker. It is:
 (a) Digested honey (b) Pollen
 (c) Secretion of maxillary glands (d) All
296. The larva of the honeybee, which receives royal jelly throughout the larval period develops into:
 (a) Queen (b) Worker
 (c) Both queen and worker (d) Drone
297. Which one of the following is applicable to insects?
 (a) Polymorphism (b) Parthenogenesis
 (c) Haplodiploidy and paedomorphosis (d) All
298. Dance language is applicable to:
 (a) Termites (b) Ants (c) Honeybees (d) Wasps
299. Chelicerates are characterised by the:
 (a) Presence of feeding structure (b) Absence of jaws
 (c) Absence of antennae (d) All
300. Which one of the following is a filter feeder?
 (a) Pea crab (b) Mole crab (c) King crab (d) Brachyuran crab
301. In woodlice, the major role in the digestive process is played by:
 (a) Foregut (b) Midgut (c) Hindgut (d) Foregut and hindgut

302. In which types of mouth parts are mandibles entirely absent?

- (a) Siphoning type (b) Chewing and lapping type
(c) Biting and chewing type (d) Sponging type

303. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Piercing and sucking	1. Honeybee
(B) Sponging type	2. Cockroach
(C) Chewing and lapping type	3. Housefly
(D) Biting and chewing type	4. Mosquito

Answer codes:

	A	B	C	D
(a)	4	1	2	3
(b)	4	3	1	2
(c)	2	4	1	3
(d)	3	1	4	2

Answers to Multiple-Choice Questions

1. (c)	2. (d)	3. (d)	4. (d)	5. (b)	6. (d)	7. (d)	8. (d)
9. (d)	10. (a)	11. (c)	12. (b)	13. (d)	14. (d)	15. (d)	16. (c)
17. (b)	18. (b)	19. (a)	20. (d)	21. (c)	22. (b)	23. (c)	24. (b)
25. (b)	26. (d)	27. (d)	28. (d)	29. (a)	30. (c)	31. (b)	32. (a)
33. (d)	34. (b)	35. (a)	36. (c)	37. (d)	38. (c)	39. (c)	40. (d)
41. (b)	42. (c)	43. (d)	44. (c)	45. (b)	46. (a)	47. (d)	48. (a)
49. (b)	50. (a)	51. (d)	52. (c)	53. (a)	54. (a)	55. (b)	56. (d)
57. (b)	58. (b)	59. (b)	60. (c)	61. (b)	62. (c)	63. (b)	64. (c)
65. (d)	66. (c)	67. (d)	68. (c)	69. (a)	70. (a)	71. (d)	72. (a)
73. (a)	74. (c)	75. (b)	76. (a)	77. (c)	78. (a)	79. (b)	80. (d)
81. (a)	82. (d)	83. (c)	84. (b)	85. (b)	86. (a)	87. (c)	88. (d)
89. (a)	90. (c)	91. (c)	92. (a)	93. (a)	94. (d)	95. (d)	96. (c)
97. (d)	98. (a)	99. (c)	100. (a)	101. (a)	102. (c)	103. (b)	104. (c)
105. (c)	106. (a)	107. (c)	108. (c)	109. (a)	110. (a)	111. (c)	112. (d)
113. (d)	114. (b)	115. (a)	116. (d)	117. (c)	118. (d)	119. (a)	120. (b)
121. (a)	122. (b)	123. (b)	124. (a)	125. (c)	126. (d)	127. (c)	128. (c)
129. (d)	130. (a)	131. (b)	132. (c)	133. (c)	134. (b)	135. (b)	136. (a)
137. (b)	138. (a)	139. (c)	140. (d)	141. (b)	142. (b)	143. (a)	144. (d)
145. (a)	146. (b)	147. (b)	148. (a)	149. (b)	150. (d)	151. (d)	152. (a)
153. (c)	154. (c)	155. (d)	156. (b)	157. (b)	158. (a)	159. (a)	160. (b)
161. (a)	162. (b)	163. (d)	164. (d)	165. (c)	166. (b)	167. (a)	168. (c)
169. (a)	170. (d)	171. (b)	172. (d)	173. (d)	174. (a)	175. (b)	176. (d)

177. (b)	178. (a)	179. (a)	180. (b)	181. (a)	182. (a)	183. (d)	184. (c)
185. (a)	186. (a)	187. (c)	188. (d)	189. (d)	190. (a)	191. (c)	192. (b)
193. (a)	194. (c)	195. (d)	196. (a)	197. (d)	198. (c)	199. (d)	200. (d)
201. (c)	202. (c)	203. (b)	204. (b)	205. (a)	206. (c)	207. (d)	208. (d)
209. (a)	210. (a)	211. (a)	212. (d)	213. (d)	214. (b)	215. (a)	216. (b)
217. (c)	218. (b)	219. (c)	220. (d)	221. (b)	222. (c)	223. (a)	224. (b)
225. (c)	226. (a)	227. (a)	228. (a)	229. (a)	230. (a)	231. (c)	232. (c)
233. (d)	234. (c)	235. (b)	236. (a)	237. (a)	238. (a)	239. (a)	240. (c)
241. (d)	242. (c)	243. (b)	244. (c)	245. (a)	246. (d)	247. (b)	248. (a)
249. (b)	250. (a)	251. (b)	252. (a)	253. (a)	254. (b)	255. (a)	256. (c)
257. (d)	258. (c)	259. (b)	260. (c)	261. (a)	262. (a)	263. (b)	264. (a)
265. (a)	266. (b)	267. (d)	268. (d)	269. (c)	270. (d)	271. (d)	272. (d)
273. (a)	274. (a)	275. (b)	276. (d)	277. (d)	278. (a)	279. (c)	280. (b)
281. (d)	282. (b)	283. (a)	284. (c)	285. (a)	286. (c)	287. (b)	288. (a)
289. (b)	290. (a)	291. (d)	292. (b)	293. (c)	294. (d)	295. (d)	296. (a)
297. (d)	298. (c)	299. (d)	300. (b)	301. (c)	302. (a)	303. (b)	

Fill in the Blanks

- The term 'Arthropoda' was coined by _____.
- The main body cavity of Arthropods is a _____.
- The nervous system of Arthropods is _____-like having paired ventral nerve cords.
- All Arthropods are oviparous except _____.
- The _____ of all Arthropods are segmented.
- The exoskeleton of Arthropoda is made up of _____.
- Arthropods are _____ symmetrical animals.
- In Arthropods, sperms are usually passed to a female in a sealed package called _____.
- _____ are the only Arthropods lacking antennae.
- The size of Arthropods is limited by the _____ relationship.
- Arachnids have _____ pairs of walking legs.
- The order of insecta having highest number of species is the _____.
- The oldest known Arthropods are the _____.
- In Arthropods, the functional autonomy to each segment is provided by the _____.

15. Arthropods have _____ muscles.
16. In Arthropods, locomotion is brought about by the contraction and relaxation of _____.
17. The opisthosome of *Limulus* contains muscles mainly for the operation of _____ and the _____.
18. The largest group of Arthropods is the _____.
19. There are _____ ostia in the dorsal tubular heart of the *Limulus*.
20. In insects, the interval between two ecdysis is called _____.
21. The only class of Arthropoda which is primarily aquatic is the _____.
22. _____ is the main nitrogenous product of crustaceans.
23. The earliest hatching stage in crustaceans is a _____ larva.
24. In Arthropods, the most common respiratory pigment is the _____.
25. _____ is a good example of tagmatisation.
26. _____ are the chemicals of insect communication.
27. The pincers of scorpion are the modified _____.
28. _____ is a connecting link between Annelida and Arthropoda.
29. All termites depend on cellulose as food source except the _____ growing species.
30. The nitrogenous waste product of insects is the _____.
31. The smallest subdivisions of trachea are the _____.
32. _____ mouth parts are a characteristic of herbivorous insects.
33. The heart of a cockroach is _____ chambered.
34. In the absence of _____, termite is unable to digest cellulose.
35. In cockroaches, there are _____ pairs of spiracles.
36. The brain of a cockroach is formed by the fusion _____ pairs of ganglia.
37. Eggs of *Pediculus* are called _____.
38. In crustaceans, the head is formed by the fusion of _____ segments.
39. In crustaceans, the most important digestive gland is the _____.
40. Each book lung opens to the outside by a _____.
41. The eyes of amphipods lack corneal facets, except the _____.
42. The 'Y' organs of crustaceans are analogous to the _____ of insects.
43. _____ is the biggest order in the entire animal kingdom.
44. The largest horseshoe crab is _____.
45. In prawns, there are _____ pairs of walking legs.
46. In prawns, all appendages are biramous except the _____ pair, which is uniramous.
47. The 6th abdominal appendages of a prawn are called _____.
48. The study of crustaceans is known as _____.

49. _____ males are the best-known singing insects.
50. Most hearing insects have a pair of _____.
51. Mosquitoes and fruitflies hear using the _____.
52. During daytime, the image formed in the compound eye of a cockroach is a _____ image.
53. Bubonic plague is spread by _____.
54. The endocrine nature of corpora allata was recognised by _____.
55. Spiders bite their prey with the _____.
56. The four different stages of moult cycle are _____, _____, _____ and _____.
57. The most important commercial shrimp throughout the world is the species of _____.
58. In bright light, the compound eye produces an _____ image.
59. The basal end of ommatidium is formed by the _____.
60. The stages between moults are known as _____.
61. Foregut is separated from the midgut by a _____ valve.
62. The thorax of insects bear _____ segmented legs.
63. Among insects _____ have the loudest sound.
64. _____ are the only group of invertebrates that have developed flight ability.
65. The largest class of chelicerata is the _____.
66. Horseshoe crabs first appeared in the _____ period.
67. Trilobites were abundant in the _____ era.
68. The abdomen is _____ segmented in free-swimming copepods and bears a pair of caudal styles.
69. Green gland is found in all malacostraca except _____.
70. Shellac is produced by _____.
71. In insects, pheromone is secreted by _____.

Answers to Fill in the Blanks

1. von Siebold (1845)	2. Haemocoel	3. Ladder
4. Scorpions	5. Embryos	6. Cuticle
7. Bilaterally	8. Spermatophore	9. Chelicerates
10. Surface-volume	11. Four	12. Coleoptera
13. Trilobites	14. Segmental ganglia	15. Striated
16. Striated muscles	17. Book gills, telson	18. Insecta
19. Eight	20. Stadium	21. Crustacea
22. Ammonia	23. Nauplius	24. Haemocyanin
25. Cephalothorax	26. Pheromones	27. Pedipalps

28. <i>Peripatus</i>	29. Fungus	30. Uric acid
31. Tracheoles	32. Piercing	33. 13
34. <i>Trichonympha</i>	35. 10	36. Three
37. Nits	38. Six	39. Hepatopancreas
40. Stigmata	41. <i>Phronima</i>	42. Prothoracic glands
43. Coleoptera	44. <i>Limulus polyphemus</i>	45. Five
46. First	47. Uropod	48. Carcinology
49. Periodical cicadas	50. Tympanol organ	51. Johnston's organ
52. Mosaic	53. Rat flea (<i>Xenospylla</i>)	54. Wigglesworth (1934)
55. Chelicerae	56. Pro ecdysis, ecdysis, post ecdysis, intermolt	57. <i>Panaeus</i>
58. Apposition	59. Retinula (receptor element)	60. Instars
61. Stomodaeal	62. Six	63. Cicadas
64. Insects	65. Arachnida	66. Upper Silurian
67. Paleozoic	68. Four	69. Isopods
70. <i>Laceifer lacca</i>	71. Corpora allata	

True or False

1. In Arthropods, muscles contain a few fibres and are innervated by a large number of neurons.
2. The colour of Arthropods is due to the deposition of pigments within the cuticle.
3. Guanine is the most important nitrogenous waste product in Arachnids.
4. Butterflies exhibit complete metamorphosis.
5. Blood-sucking insects can detect infrared emissions.
6. The abdomen of insects consists of 12 segments.
7. Parasitic wasps show polyembryony.
8. Temperature has no effect on stridulations in insects.
9. In Arthropods, during ontogeny, segments are added from a posterior growth zone.
10. The cuticle of crustaceans contains calcium deposits.
11. Superposition eyes are found in nocturnal species.
12. All Arthropods have intralecithal cleavage.
13. All spiracles of insects are involved in inspiratory or expiratory phases.
14. The carpet beetle (*Attagenus megatoma*) can digest wool.
15. Exogenous ecdysone may be used as insecticides.
16. Most spiders produce only one type of silk.
17. Many mites are parasitic only as larvae.

18. In Arthropods, the genital openings differ in position in different groups but are always on the same body segments in two sexes.
19. In Arachnids, the digestion of the prey starts outside the body.
20. In prawns, the second walking leg is the largest.
21. In crabs, the walking legs are biramous
22. Parthenogenesis is common in branchiopods.
23. In cladocerans, parthenogenetic eggs hatch into females for several generations.
24. In prawns, all gills are phyllobranch.
25. Anal styles are lacking in male cockroaches.
26. Spiders have well-developed balanced sensor acceleration.
27. In spiders, chelicerae are modified into fangs.
28. In ants and bees, trophallaxis is a means of communication.
29. The workers of termites are blind due to undeveloped eyes.
30. Ants have two pairs of wings which are of equal size.
31. Stick insects are the longest insects in the world.
32. Grasshoppers have auditory organs on the abdomen.
33. Crickets used their front legs for hearing only crickets chirp.
34. Periodical cicadas are locusts.
35. Johnston's organ collects auditory vibrations of sounds.
36. Wood lice is an insect.
37. The simplest insects lack wings.
38. A prawn has a shrimp-like appearance but it can be distinguished by its gill structure.
39. Small Arthropods have a relatively larger surface area.
40. 40 to 50 per cent of all insect species are beetles.
41. The cuticle of Arthropods is insensitive.
42. The cuticle of Arthropods grows regularly.
43. The mandibulata are characterised by modified appendages.
44. The wolf spider does not make a web.
45. The blood of a horseshoe crab is blue.
46. Protein extracted from *Limulus polyphemus* suppresses the proliferation of HIV virus.
47. Many malacostracans have the ability of autotomy of limbs.
48. Planktonic copepods are mainly filter feeders.
49. In aquatic Arthropods, fertilisation is either external or internal.
50. Certain species of insects and crustaceans reproduce by parthenogenesis.
51. Chilopoda is an aquatic mandibulate.
52. Flies have only two wings.
53. Baranicles have two pairs of uniramous appendages per body segment.

54. Beetles have uniramous mandibles.
55. Crustaceans lack antennae.
56. Arachnids have one pair of antennae.
57. Nymphs are larvae of hemimetabolic insects.
58. In a few crustaceans and insects, the respiratory pigment is haemoglobin.
59. Insects are not capable of producing hyperosmotic urine.
60. The blood of insects is generally colourless or green.
61. Horseshoe crabs lack jaws.
62. Water loss by evaporation is much more in terrestrial crabs than any other terrestrial Arthropods.
63. Arthropods are protostomes.
64. During moulting period, an Arthropod is vulnerable.
65. The blood of cockroaches transports oxygen.
66. In cockroaches, the heart is ventral in position.
67. In comparison to male, female copepods are more modified for a parasitic mode of life.
68. *Monstrilloida* shows larval parasitism.
69. In crustaceans, metamorphosis is incomplete.
70. In *Limulus*, there is a single genital opening.
71. The nymphs of mayfly and dragonfly are aquatic.
72. Insects have flight control centre in the nervous system.
73. Workers of termites lack wings.
74. Chilopods have well-developed intromittent organs.
75. Ovipositors are of universal occurrence in all insects.
76. In bees and wasps, ovipositors are modified to form sting.
77. In ants and termites, wings are found only in females.
78. Loss of limbs is a common event in the life of many crustaceans.
79. Insects are the only poikilothermic fliers.
80. In terrestrial Arthropods, insects are best adapted for the prevention of water loss.
81. Crustaceans larvae lack shell glands.

Answers to True or False

1. False	2. True	3. True	4. True	5. True	6. False	7. True	8. False
9. True	10. True	11. True	12. False	13. False	14. True	15. True	16. False
17. True	18. False	19. True	20. True	21. False	22. True	23. True	24. True
25. False	26. False	27. True	28. True	29. True	30. False	31. True	32. True
33. True	34. False	35. True	36. False	37. True	38. True	39. True	40. True
41. True	42. False	43. True	44. True	45. True.	46. True	47. True	48. True

49. True	50. True	51. False	52. True	53. True	54. True	55. False	56. False
57. True	58. True	59. False	60. True	61. True	62. True	63. True	64. True
65. False	66. False	67. True	68. True	69. False	70. False	71. True	72. False
73. True	74. False	75. False	76. True	77. False	78. True	79. True	80. True
81. False							

Give Reasons

- Large Arthropods are relatively weaker.
 - Because the power of muscle fibres is proportional to their cross-sectional area.
- Arthropods can move appendages.
 - Due to lack of exocuticle in joints.
- Larger Arthropods have trouble breathing.
 - Because gaseous exchange occurs mostly by simple diffusion.
- Members of the class xiphosura are called horseshoe crabs.
 - Because the cephalothorax is covered by horseshoe-shaped carapace.
- Arthropods cannot bend.
 - Because of their hard exoskeleton.
- Arthropods require comparatively small muscles.
 - Because in Arthropods, some support is provided by their rigid cuticle, as well as restricted articulation requires little muscular control.
- Arthropods regularly shed their exoskeleton.
 - Because it blocks growth.
- Limulus* is a living fossil.
 - Because there is some change in it as compared to its fossilised relatives.
- Metamorphosis is necessary for insect growth.
 - Because their exoskeleton is hard and does not stretch.
- Insects lack respiratory pigments.
 - Because in insects, blood does not carry oxygen. The oxygen is transported to various parts of the body through tracheal structures.
- Uniramians are linked with crustaceans in the subphylum mandibulata.
 - Because of similar head structures.
- Horseshoe crab is not a true crab.
 - Because true crabs have two pairs of antennae and one pair of mandibles (or jaws), which are lacking in horseshoe crab. Further, true crabs have five pairs of limbs, while horseshoe crabs have seven pairs of limbs.

13. The thoracic region of *Astacus* is immovable.
 - Because of the presence of carapace.
14. *Daphnia* is colourless in well-aerated water and pink in stagnant water.
 - Because, haemoglobin is lost when it is in well-aerated water (stored in ovary or eggs) and the animal becomes colourless.
15. Marine copepods are the principal link between phytoplankton and higher trophic levels in many marine food chains.
 - Because they form food of many phytoplanktonic species.
16. Arthropods with antennae have been grouped in the subphylum mandibulata.
 - Because the first post oral appendages are mandibles.
17. Compound eye lacks mechanism of accommodation.
 - Because in crystalline cone, there is provision for a fixed focus.
18. In colder days, butterflies remain stationary in a place and move their wings up and down.
 - To generate internal heat required to permit stroke rate necessary for flight.
19. In insects, stridulations may vary in pitch, depending on the temperature.
 - Because insects are cold blooded.
20. Trilobite has been well-preserved in fossil form.
 - Because in them dorsal (upper) shell was thicker than the under shell.

MOLLUSCA

Multiple-Choice Questions

1. The study of Mollusca is known as:
(a) Mycology (b) Malacology (c) Conchology (d) Gerontology
2. The branch of science dealing with the study of shell of Mollusca is known as:
(a) Conchology (b) Kalology (c) Cryobiology (d) Criminology
3. Members of the phylum Mollusca are:
(a) Asymmetrical (b) Bilaterally symmetrical
(c) Radially symmetrical (d) Biradially symmetrical
4. The body of Mollusca is devoid of:
(a) Head (b) Shell (c) Eyes (d) Segmentation
5. The shell found in majority of Mollusca is secreted by:
(a) Foot (b) Head (c) Visceral mass (d) Mantle
6. Which one of the following is a living fossil?
(a) *Octopus* (b) *Chaetoderma* (c) *Dentalium* (d) *Neopilina*
7. The foot of the Mollusca is modified:
(a) Visceral mass (b) Shell (c) Body wall (d) Head
8. Respiratory pigment in Mollusca is:
(a) Haemoglobin (b) Haemocyanin (c) Hemerythrin (d) Absent
9. The shell of Mollusca is made up of:
(a) Glycoprotein (b) Glycolipid (c) Calcium carbonate (d) Silica
10. The shell present in Mollusca is secreted by:
(a) Visceral mass (b) Specialised gland (c) Mantle (d) Head
11. The blood of Mollusca contains:
(a) Copper (b) Iron (c) Magnesium (d) Potassium
12. Pearl is obtained from:
(a) *Dentalium* (b) *Sepia* (c) Oyster (d) *Neopilina*
13. Pearl culture was first introduced in:
(a) India (b) China (c) Japan (d) Australia
14. Elephant's tusk shell is the common name of:
(a) *Octopus* (b) *Sepia* (c) *Aplysia* (d) *Dentalium*
15. A wood boring Mollusc is:
(a) *Teredo* (b) *Chiton* (c) *Chaetoderma* (d) *Dentalium*

16. Shipworm is the common name of:
 (a) *Doris* (b) *Limax* (c) *Teredo* (d) *Mytilus*
17. Shell is absent in:
 (a) *Dentalium* (b) *Chiton* (c) *Chaetoderma* (d) *Neopilina*
18. Generally Molluscs are:
 (a) Terrestrial (b) Freshwater (c) Marine (d) Estuarine
19. *Aplysia* is commonly known as:
 (a) Sea hare (b) Sea mouse (c) Sea squirt (d) Sea cow
20. The blood of Molluscs is:
 (a) Red (b) Green (c) Blue (d) Yellow
21. Locomotion by jet propulsion is found in:
 (a) *Sepia* (b) *Pila* (c) *Aplysia* (d) *Unio*
22. Which one of the following is a Mollusc?
 (a) Dogfish (b) Catfish (c) Jellyfish (d) Cuttlefish
23. Organ of Bojanus helps in:
 (a) Blood circulation (b) Reproduction (c) Respiration (d) Excretion
24. Which one of the following is an amphibious Mollusc?
 (a) *Dentalium* (b) *Unio* (c) *Pila* (d) *Octopus*
25. The oldest living fossil is:
 (a) *Neopilina* (b) *Nautilus* (c) *Octopus* (d) *Dentalium*
26. Radula is found in the members of the phylum:
 (a) Echinodermata (b) Mollusca (c) Arthropoda (d) Annelida
27. Devil fish belongs to the phylum:
 (a) Coelenterata (b) Arthropoda (c) Mollusca (d) Chordata
28. Osphradium is:
 (a) Chemoreceptor (b) Photoreceptor (c) Mechanoreceptor (d) Balancing organ
29. Which one of the following is true about cephalopods?
 (a) Head large with eyes (b) Shell external or internal
 (c) Locomotion with jet propulsion (d) All
30. Cuttlefish belongs to the phylum:
 (a) Arthropoda (b) Mollusca (c) Echinodermata (d) Annelida
31. Which one of the following is incorrect about Mollusca?
 (a) Metamerically segmented
 (b) They are unsegmented
 (c) The respiratory pigment in them is haemocyanin
 (d) The shell present in them is secreted by mantle
32. Glochidium is the larval form of:
 (a) *Unio* (b) *Pila* (c) *Octopus* (d) *Limax*
33. Foot is located on the head in:
 (a) Gastropods (b) Scaphopods (c) Cephalopods (d) Cephalochordates

34. Torsion is found in the members of the class:
 (a) Aplacophora (b) Monoplacophora (c) Cephalopoda (d) Gastropoda
35. Which one of the following is a Mollusca?
 (a) Jellyfish (b) Silverfish (c) Crayfish (d) Cuttlefish
36. Which one of the following is a balancing organ in Mollusca?
 (a) Statocyst (b) Osphradium (c) Tentaculocyst (d) All
37. *Neopilina* is a connecting link between:
 (a) Annelida and Arthropoda (b) Arthropoda and Mollusca
 (c) Annelida and Mollusca (d) Annelida and Echinodermata
38. The largest class of Mollusca is:
 (a) Cephalopoda (b) Scaphopoda (c) Gastropoda (d) Pelecypoda
39. Who is known as Father of Pearl Industry?
 (a) Taylor (b) Hafeez (c) Mikimoto (d) Klein
40. Which one of the following sequences is correct?
 (a) Porifera – *Sycon*, *Spongilla*, *Obelia* (b) Echinodermata – Starfish, brittle star, jellyfish
 (c) Arthropoda – Silverfish, crayfish, devil fish (d) Mollusca – Cuttlefish, sea hare, shipworm
41. Which one of the following statements is correct?
 (a) *Sepia* belongs to class gastropoda. (b) In *Sepia*, the shell is absent.
 (c) *Sepia* has 10 arms. (d) Larva of *sepio* is glochidium.
42. Respiration both by lungs and gills takes place in:
 (a) *Sepia* (b) *Unio* (c) *Pila* (d) *Neopilina*
43. The incorrect match is:
 (a) *Sepia* – 10 arms (b) *Octopus* – 8 arms
 (c) *Unio* – Glochidium larva (d) *Dentalium* – Osphradium
44. Open type circulatory system is found in:
 (a) *Pila* (b) Earthworms (c) Snakes (d) Fishes
45. Ink gland is found in the members of class:
 (a) Gastropoda (b) Cephalopoda (c) Scaphopoda (d) Aplacophora
46. The largest invertebrate is:
 (a) *Octopus* (b) *Sepia* (c) *Squid* (d) *Dentalium*
47. The phylum which includes the second largest number of species after Arthropoda is:
 (a) Annelida (b) Arthropoda (c) Mollusca (d) Echinodermata
48. The body is asymmetrical due to torsion in:
 (a) *Sepia* (b) *Pila* (c) *Unio* (d) *Chaetoderma*
49. Squids, octopods, cuttlefish and nautiloids have been grouped in phylum Mollusca and class:
 (a) Cephalopoda (b) Gastropoda (c) Polyplacophora (d) Scaphopoda
50. Which one of the following is not a larval form of Mollusca?
 (a) Trochophores (b) Glochidium (c) Veliger (d) Rhabditiform
51. Eye of one of the following Mollusca resembles vertebrate eyes:
 (a) *Unio* (b) *Octopus* (c) *Dentalium* (d) *Chiton*

52. A freshwater Mollusc is:
(a) *Dentalium* (b) *Chiton* (c) *Octopus* (d) None
53. In Mollusca, the respiratory organ is:
(a) Ctenidia (b) Lungs
(c) Shell (d) Both ctenidia and gills
54. Ink gland is found in:
(a) *Dentalium* (b) *Teredo* (c) *Sepia* (d) Oyster
55. In *Sepia*, the number of arms is:
(a) 6 (b) 8 (c) 10 (d) 12
56. Mollusca show an advancement over Annelids in having:
(a) A distinct head in most species
(b) Much better sense and respiratory organs
(c) Muscles arranged in bundles for moving specific parts
(d) All
57. In *Octopus*:
(a) The number of arms is eight (b) Shell and fins are absent
(c) Ink gland is present (d) All
58. In *Dentalium* respiration takes place through:
(a) Mantle (b) Gills (c) Lungs (d) Shell
59. The visceral mass is segmented in:
(a) *Pila* (b) *Unio* (c) *Neopilina* (d) *Octopus*
60. The teeth present in radula are:
(a) Horny (b) Chitinous (c) Cartilaginous (d) Bony
61. The circulatory system of Mollusca is of:
(a) Open type (b) Closed type
(c) Both open and closed type (d) None
62. In Molluscs, the general body cavity is:
(a) Blastocoel (b) Hydrocoel (c) Haemocoel (d) Pseudocoel
63. The shell of bivalvia is composed of:
(a) One unit (b) Two units (c) Four units (d) Eight units
64. Torsion and detorsion is shown by the members of class:
(a) Cephalopoda (b) Gastropoda (c) Scaphopoda (d) Pelecypoda
65. The calcareous shell present in the dorsal surface of chiton is made up of:
(a) One unit (b) Two units (c) Four units (d) Eight units
66. Larval forms of Mollusca are:
(a) Trochophore (b) Glochidium (c) Veliger (d) All
67. Heatocotylised arm is found in:
(a) *Sepia* (b) *Octopus*
(c) Both *Sepia* and *Octopus* (d) *Teredo*
68. Razor calm is the common name of:
(a) *Doris* (b) *Aplysia* (c) *Mytilus* (d) *Ensis*

69. Which one of the following is a Mollusca?
(a) Sea pen (b) Sea fan (c) Sea cow (d) Sea hare
70. Sea foam is:
(a) A Mollusca (b) Excretory product of Mollusca
(c) Cuttle bones of cuttlefish drift to shores (d) Dead exoskeleton of Echinoderms
71. Cephalopods may be regarded as the apex of invertebrate evolution in terms of the:
(a) Learned behaviour they exhibit
(b) Well-developed head and eyes
(c) Movement by a kind of jet propulsion
(d) Yolk eggs
72. Camouflage is shown by some:
(a) Gastropods (b) Scaphopods (c) Cephalopods (d) Pelecypods
73. Molluscs have:
(a) Cellular grade of organisation (b) Tissue grade of organisation
(c) Organ grade of organisation (d) System grade of organisation
74. Which is true about Molluscs?
(a) Soft-bodied coelomate and metamerically segmented animals
(b) Soft-bodied coelomate, unsegmented animals having system grade of organisation
(c) Soft-bodied coelomate, unsegmented animals having organ grade of organisation
(d) None
75. The Mollusc which is known for causing tremendous damage to the ships and docks:
(a) *Aplysia* (b) *Aeolis* (c) *Mytilus* (d) *Teredo*
76. Pearl is secreted by:
(a) Foot (b) Shell (c) Mantle (d) Visceral mass
77. Scallop is the common name of:
(a) *Pecten* (b) *Solen* (c) *Aeolis* (d) *Mytilus*
78. Keber's organ is found in:
(a) *Sepia* (b) *Octopus* (c) *Pila* (d) *Unio*
79. Most primitive Mollusc is:
(a) *Teredo* (b) *Neomenia* (c) *Neopilina* (d) *Chaetoderma*
80. Sperms are of two types—eupyrene and oligopyrene in:
(a) *Sepia* (b) *Octopus* (c) *Pila* (d) *Unio*
81. In *Unio*, the respiratory organ is:
(a) Ctenidium (b) Mantle (c) Pulmonary sac (d) All
82. Oysters, clams and mussel belong to class:
(a) Cephalopoda (b) Gastropoda (c) Scaphopoda (d) Pelecypoda
83. Filter feeding is found in:
(a) *Pila* (b) *Sepia* (c) *Dentalium* (d) *Unio*
84. Pearl oysters belong to class:
(a) Cephalopoda (b) Gastropoda (c) Pelecypoda (d) Scaphopoda

85. In oysters, formation of pearl takes place around the:
 (a) Eggs
 (b) Fertilised egg
 (c) Visceral mass
 (d) Some foreign objects which becomes embedded in the skin of oyster
86. Which one of the following is different?
 (a) Cuttlefish (b) Devil fish (c) Shipworm (d) Glowworm
87. Tick the correct match:
 (a) Ovo testes – Bisexual snails (b) Ink gland – *Pila*
 (c) Radula – *Unio* (d) Osphradium – *Sepia*
88. The free-swimming trochophore larva is found only in:
 (a) Primitive archaeogastropoda (b) Marine gastropods
 (c) *Mya*, *Ensis* and *Tagelus* (d) All gastropods
89. Scaphopods appear to be most closely related to:
 (a) Gastropods (b) Cephalopods (c) Bivalves (d) Monoplacophorans
90. The nervous system of *Unio* lacks:
 (a) Commissures (b) Visceral ganglia (c) Pleural ganglia (d) Unpaired ganglia
91. *Pila* lacks:
 (a) Crystalline style (b) Typhlosole
 (c) Supra branchial chamber (d) All
92. Ectoparasitic life is shown by:
 (a) Tornaria larva (b) Glochidium larva (c) Bipinnaria larva (d) Veliger larva
93. Crystalline style is associated with:
 (a) Digestion (b) Respiration (c) Excretion (d) Circulation
94. *Unio* lacks:
 (a) Myogenic heart (b) Osphradium (c) Aestivation (d) All
95. Which one of the following is not applicable to Mollusca?
 (a) Soft bodied (b) Second largest phylum of the invertebrates
 (c) Bilaterally symmetrical (d) Metamerically segmented coelomate animals.

96. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(a) <i>Chiton</i>	1. Shell in female is used for protection of eggs
(b) <i>Doris</i>	2. Edible oyster
(c) <i>Ostrea</i>	3. Complete detorsion
(d) <i>Argonauta</i>	4. Eight overlapping plates

Answer codes:

A	B	C	D
(a) 4	3	2	1
(b) 3	2	4	1
(c) 2	4	1	3
(d) 3	1	4	2

97. In which one of the following animals is the shell present only in females?
 (a) *Haliotis* (b) *Agronauta* (c) *Octopus* (d) *Spirula*
98. Individuals function alternately as males and females in:
 (a) *Ostrea* (b) *Teredo* (c) *Eolis* (d) *Fissurella*
99. Nidamental glands are lacking in:
 (a) *Sepia* (b) *Octopus* (c) *Loligo* (d) None
100. *Dentalium* lacks:
 (a) Captacula (b) Otocyst (c) Nidamental glands (d) Veliger larva
101. In which one of the following Molluscs do blood corpuscles contain haemoglobin?
 (a) *Solen* (b) *Argonauta* (c) *Eolis* (d) *Ammonites*
102. Consider the following statements with reference to cephalopods:
 (A) Cephalopods have a closed vascular system and have haemocyanin as respiratory pigment
 (B) Ink gland and chromatophores are present
 (C) They exhibit head-on copulation
 (D) Larva is veliger
 The correct statements are:
 (a) All (b) A, B and C (c) B and C (d) B, C and D
103. The evolution of class gastropoda involved:
 (a) Greater cephalisation (b) Development of an asymmetrical spiral shell
 (c) Torsion (d) All
104. What is incorrect about bivalvia?
 (a) Rudimentary head (b) No terrestrial forms
 (c) Presence of radula (d) Presence of trochophore and veliger larva
105. In *Sepia* and *Spirula*, spaces between the thin septa contain fluid and gas which is mainly:
 (a) Oxygen (b) Nitrogen (c) Hydrogen (d) Carbon dioxide
106. Intracellular or extracellular haemoglobin is present in the blood of:
 (a) *Arca* and *Lima* (b) *Anadara* (c) *Noetia* (d) All
107. Consider the following statements:
 (A) Scaphopods appear to be most closely related to bivalves
 (B) Scaphopods are dioecious
 (C) In scaphopods, fertilisation is internal
 (D) In scaphopods, development is direct
 The incorrect statements are:
 (a) A, B and C (b) B, C and D (c) A and B (d) C and D
108. Gas-filled shells to maintain neutral buoyancy is used by:
 (a) *Sepia* (b) *Nautilus* (c) *Spirula* (d) All
109. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|----------------------|-------------------|
| (A) <i>Argonauta</i> | 1. Sea slug |
| (B) <i>Solen</i> | 2. Razor clam |
| (C) <i>Mytilus</i> | 3. Paper nautilus |
| (D) <i>Eolis</i> | 4. Sea mussel |

Answer codes:

	A	B	C	D
(a)	4	3	1	2
(b)	3	2	4	1
(c)	2	4	1	3
(d)	3	4	2	1

110. Consider the following characteristics:

- (a) Starts life as a male
- (b) Passes through hermaphrodite stage
- (c) Finally attains the stage of pure female
- (d) In the beginning gonad has both spermatogonia and oogonia but in male phase oogonial development is suppressed

The above mentioned characteristics are applicable to:

- (a) *Bonellia*
- (b) *Crepidula*
- (c) *Patella*
- (d) *Trivia*

111. In Molluscs, all ganglia are concentrated near and below the cerebral ganglia, except the:

- (a) Visceral ganglion
- (b) Buccal ganglion
- (c) Pleural ganglion
- (d) Supra-oesophageal

112. Moderate amount of sulphuric acid is present in the saliva of:

- (a) *Buccinum*
- (b) *Tonna*
- (c) *Conus*
- (d) *Odostomia*

113. What is incorrect about *Teredo*?

- (a) Shipworm
- (b) Reduced shell
- (c) Reduced foot
- (d) Sexual dimorphism

114. *Entovalva*, a bivalve, is a parasite in the gut of:

- (a) Holothurians
- (b) Hemichordates
- (c) Earthworms
- (d) Echinoids

115. The eyes of cephalopods and vertebrates have evolved on separate evolutionary lines, though they show many similarities. This shows:

- (a) Convergent evolution
- (b) Parallel evolution
- (c) Divergent evolution
- (d) Adaptive radiation

116. Molluscs are highly diverse groups in:

- (a) Habitat and behaviour
- (b) Size
- (c) Anatomical structure
- (d) All

117. Most intelligent Mollusca is the:

- (a) *Sepia*
- (b) *Octopus*
- (c) *Loligo*
- (d) *Nautilus*

118. Solenogasters lack:

- (a) Shell
- (b) Eyes
- (c) Tentacles
- (d) All

119. Nitrogenous waste product is ammonia in:

- (a) Opisthobranchs
- (b) Lamellibranchs
- (c) Cephalopods
- (d) None

120. *Unio* lacks:

- (a) Intestinal ganglion
- (b) Buccal ganglion
- (c) Pedal commissure
- (d) All

121. Which one of the following is lacking due to detorsion in *Doris*?
(a) Shell (b) Ctenidium (c) Mantle (d) All
122. Except in _____ the shells of Molluscs are basically similar:
(a) *Chiton* (b) *Unio* (c) *Pila* (d) None
123. Molluscs are:
(a) Carnivores and herbivores (b) Deposit feeders
(c) Filter feeders (d) All
124. Which one of the following is not a gastropod?
(a) Bubble shell (b) Cone shell (c) Worm shell (d) Mud shell
125. Sea arrow is a:
(a) Gastropoda (b) Cephalopoda (c) Pelecypoda (d) Scaphopoda
126. Complete detorsion is shown by:
(a) *Bulla* (b) *Aceton* (c) *Aplysia* (d) All
127. In which one of the following does the left kidney open into the pericardium, while the right one lacks the pericardial opening?
(a) *Haliothis* (b) *Trochus* (c) *Turbo* (d) All
128. In bivalves, the nerve connection of statocyst is with:
(a) Pedal ganglia (b) Cerebral ganglia
(c) Cerebro-pleural ganglia (d) Visceral ganglia
129. Modifications of the foot pattern are shown by those gastropods which:
(a) Burrow (b) Swim
(c) Are sedentary and in some which are parasitic (d) All
130. Which one of the following is an eyeless cephalopod?
(a) *Argonauta* (b) *Idiosepius* (c) *Cirrothauma* (d) *Spirula*
131. *Chiton* lacks:
(a) Tentacles (b) Statocysts (c) Cephalic eyes (d) All
132. The repetition of external and internal structures is a distinctive feature of class:
(a) Monoplacophora (b) Polyplacophora (c) Scaphopoda (d) Gastropoda
133. Which one of the following changes is not involved in the evolution of gastropods from the ancestral Molluscs?
(a) Development of a head (b) Excretion pattern
(c) Torsion (d) Conversion of the shell from a shield to a protective retreat
134. *Simpsoniconcha* parasitises the:
(a) Earthworm (b) *Echinus* (c) *Necturus* (d) *Pipa*
135. Osphradium is lost in those gastropods which have:
(a) Become pelagic (b) A reduced mantle cavity
(c) Lost the ctenidia (d) All
136. Shell of which animal is used for the preparation of buttons, buckles etc., and the flesh is eaten in Japan?
(a) *Patella* (b) *Haliothis* (c) *Aplysia* (d) *Limax*

137. In Mollusca, the cleavage is not:
 (a) Holoblastic (b) Equal (c) Unequal (d) Determinate
138. Pearl is secreted by:
 (a) Visceral mass (b) Shell (c) Mantle (d) Digestive glands
139. Modern cephalopods differ from all other Mollusca in:
 (a) Nervous organisation (b) Sensory organisation
 (c) Muscular organisation (d) All
140. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|------------------------------------|--------------------|
| (A) Cerata | 1. <i>Cypraea</i> |
| (B) Coloured liquid for camouflage | 2. <i>Nautilus</i> |
| (C) Siphuncle | 3. <i>Aplysia</i> |
| (D) Previously used as currency | 4. <i>Doris</i> |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 3 | 1 | 4 | 2 |
| (b) 4 | 3 | 2 | 1 |
| (c) 4 | 2 | 1 | 3 |
| (d) 2 | 4 | 1 | 3 |
141. Which one of the following is not applicable to *Nautilus*?
 (a) Spirally coiled external shell (b) Siphuncle
 (c) Blochmann's glands (d) Nocturnal and gregarious
142. In which one of the following gastropods is the shell internal, thin and rudimentary?
 (a) *Limax* (b) *Turbo* (c) *Conus* (d) *Odostomia*
143. In which one of the following phyla is the arrangement of ganglia similar to those of vertebrates?
 (a) Annelida (b) Mollusca (c) Arthropoda (d) None
144. In which one of the following Molluscs is development direct?
 (a) *Teredo* (b) *Octopus* (c) *Solemya* (d) *Nuculana*
145. In which one of the following Molluscs is the shell secreted by the arms and not by the mantle?
 (a) *Cypraea* (b) *Argonauta* (c) *Spiratella* (d) *Onchidium*
146. Which one of the following is not applicable to *Aplysia*?
 (a) Parapodia (b) Blochmann's glands
 (c) Ethynergous type of nervous system (d) Unisexual
147. *Neoplina* differs from *Chiton* by having:
 (a) A single shell (b) Nephropores functioning as the gonoducts
 (c) Statocysts (d) All
148. A distinct heart is lacking in the members of class:
 (a) Scaphopoda (b) Monoplacophora (c) Polyplacophora (d) Bivalvia
149. Which one of the following is not found in bivalves?
 (a) Indistinct head (b) No terrestrial forms
 (c) Ciliary feeder (d) Siphuncle

150. Which one of the following statements is incorrect?
- In most gastropods, the coiling of shell is right handed.
 - In a few species of gastropods, coiling of shell is left handed.
 - Some species of gastropods have both right-handed and left-handed coiling of the shell.
 - None
151. Scaphopods lack:
- Heart
 - Gills
 - Eyes, tentacles and osphradia
 - All
152. Consider the following statements:
- Cephalopods have achieved the largest size among invertebrates
 - Among living cephalopods, completely developed shell is found in a few species of *Nautilus*
 - The smallest cuttlefish are species of the genus *Idiosepius*
 - Nautilus* swims backward, except when feeding
- The incorrect statements are:
- A, B and C
 - B and D
 - C and D
 - None
153. In cephalopods, the shell is:
- External
 - Internal
 - Absent
 - All
154. Which one of the following is a larval form of pelecypoda?
- Trochophore
 - Veliger
 - Glochidium
 - All
155. Which one of the following is known as mother of pearl?
- Shell
 - Mantle
 - Pallium
 - Viscera
156. Which one of the following is never used by Molluscs to construct their hard parts?
- Conchiolin
 - Calcium carbonate
 - Phosphate
 - Chitin
157. Consider the following statements:
- Generally Molluscs have two pairs of nerve cords
 - Both pairs run below the level of the gut
 - The only ganglia above the gut are the cerebral ganglia
 - The visceral cords serve the internal organs while pedal cords serve the foot
- The correct statements are:
- All
 - B, C and D
 - C and D
 - A, B and D
158. The shell-less coleoidae include:
- Sepia*
 - Octopus*
 - Squid*
 - All
159. Tyrian purple is made from the:
- Blochmann's gland of *Aplysia*
 - Ink glands of *Loligo*
 - Ink glands of murex shells
 - Shell of *Turbo*
160. Which one of the following is an incorrect statement?
- The California sea hare (*Aplysia californica*) is the world's largest gastropods.
 - The arms of *Octopus* are really its foot.
 - Octopi are not capable of jet propulsion.
 - An *Octopus* has three hearts, in which two are used to pump blood to lungs and third pumps blood throughout the body.

161. Which arm of male *Octopus* is hectocotylied?
 (a) First (b) Second (c) Third (d) Fifth
162. Sea-silk is a valuable fabric secreted by many bivalve Molluscs, particularly by:
 (a) *Cardium edule* (b) *Pinna nobilis*
 (c) *Crepidula fornicata* (d) *Haplochlama lunulata*
163. A structure found only in Molluscs is the:
 (a) Foot (b) Shell (c) Mantle (d) Anal gill
164. Consider the following statements with reference to oysters:
 (A) Oysters are Molluscs and some are edible
 (B) Oysters have ability to change their sex
 (C) Oysters are rich source of vitamin C, D, B₁, B₂ and B₃
 (D) The colour of an oyster's meat depends on what they eat
 The incorrect statements are:
 (a) B and C (b) C and D (c) D (d) None
165. The entire process of torsion generally takes a few:
 (a) Seconds (b) Minutes (c) Days (d) Months or years
166. In which one of the following classes of Mollusca is the cleavage meroblastic?
 (a) Cephalopoda (b) Gastropoda (c) Scaphopoda (d) Monoplacophora
167. Oysters are rich source of:
 (a) Zinc (b) Iron (c) Copper (d) Calcium
168. In which class of the phylum Mollusca is the radula lacking?
 (a) Bivalvia (b) Scaphopoda (c) Cephalopoda (d) Monoplacophora
169. Cat's eyes are applicable to the:
 (a) Opercula of turban shells (b) Pedicellariae of starfish
 (c) Ink glands of cephalopods (d) Radula of gastropod
170. Most known primitive opisthobranch is the:
 (a) *Bulla* (b) *Acteon* (c) *Hydatina* (d) *Valvata*
171. Aesthetes are the characteristic of:
 (a) *Chiton* (b) *Unio* (c) *Acteon* (d) *Echinus*
172. Which one of the following is a viviparous bivalve?
 (a) *Mercenaria* (b) *Xylophaga* (c) *Sphaerium* (d) *Ostrea*
173. In which one of the following Molluscs does neurosecretion play a part in reproduction?
 (a) *Lymnaea* (b) *Arion* (c) *Onchidium* (d) *Buccinum*
174. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Glochidium	1. <i>Amphitretus</i>
(B) Ovotestis	2. <i>Argonauta</i>
(C) Sexual dimorphism	3. Freshwater snails
(D) Arms are united by web	4. Byssus gland

Answer codes:

	A	B	C	D
(a)	4	1	2	3
(b)	3	2	4	3
(c)	2	4	3	1
(d)	4	3	2	1

175. Which one of the following is a correct match?

(a) <i>Octopus</i> – Veliger larva	(b) Crystalline style – <i>Unio</i>
(c) Sunfish – Mollusc	(d) Blochmann's gland – <i>Teredo</i>

176. A freshwater, pearl-producing bivalve is:

(a) <i>Cardium edule</i>	(b) <i>Cypraea moneta</i>
(c) <i>Margaritifera margaritifera</i>	(d) <i>Midorigal australis</i>

177. Consider the following statements:

- (A) Ureotelism is common in gastropods
 (B) Gastropods have well-defined orinithine cycle
 (C) *Sepia* moves by jet propulsion
 (D) Shell growth involves both increase in area and thickness

The correct statements are:

(a) All	(b) A and C	(c) B and C	(d) C and D

Answers to Multiple-Choice Questions

1. (b)	2. (a)	3. (b)	4. (d)	5. (d)	6. (d)	7. (a)	8. (b)
9. (c)	10. (c)	11. (a)	12. (c)	13. (c)	14. (d)	15. (a)	16. (c)
17. (c)	18. (c)	19. (a)	20. (c)	21. (a)	22. (d)	23. (d)	24. (c)
25. (b)	26. (b)	27. (c)	28. (a)	29. (d)	30. (b)	31. (a)	32. (a)
33. (c)	34. (d)	35. (d)	36. (a)	37. (c)	38. (c)	39. (c)	40. (d)
41. (c)	42. (c)	43. (d)	44. (a)	45. (b)	46. (c)	47. (c)	48. (b)
49. (a)	50. (d)	51. (b)	52. (d)	53. (d)	54. (c)	55. (c)	56. (d)
57. (d)	58. (a)	59. (c)	60. (a)	61. (c)	62. (c)	63. (b)	64. (b)
65. (d)	66. (d)	67. (c)	68. (d)	69. (d)	70. (c)	71. (a)	72. (c)
73. (d)	74. (b)	75. (d)	76. (c)	77. (a)	78. (d)	79. (c)	80. (c)
81. (a)	82. (d)	83. (d)	84. (c)	85. (d)	86. (d)	87. (a)	88. (a)
89. (c)	90. (d)	91. (d)	92. (b)	93. (a)	94. (d)	95. (d)	96. (a)
97. (b)	98. (a)	99. (b)	100. (c)	101. (a)	102. (b)	103. (d)	104. (c)
105. (b)	106. (d)	107. (d)	108. (d)	109. (b)	110. (b)	111. (a)	112. (b)
113. (d)	114. (a)	115. (a)	116. (d)	117. (b)	118. (d)	119. (d)	120. (d)
121. (d)	122. (a)	123. (d)	124. (a)	125. (b)	126. (c)	127. (d)	128. (c)
129. (d)	130. (c)	131. (d)	132. (a)	133. (b)	134. (c)	135. (d)	136. (b)
137. (b)	138. (c)	139. (d)	140. (b)	141. (c)	142. (a)	143. (d)	144. (b)
145. (b)	146. (d)	147. (d)	148. (a)	149. (d)	150. (d)	151. (d)	152. (d)
153. (d)	154. (d)	155. (b)	156. (c)	157. (a)	158. (d)	159. (c)	160. (c)
161. (c)	162. (b)	163. (c)	164. (d)	165. (b)	166. (a)	167. (a)	168. (a)
169. (a)	170. (b)	171. (a)	172. (c)	173. (b)	174. (d)	175. (b)	176. (c)
177. (d)							

Fill in the Blanks

1. The term 'Mollusca' was coined by_____.
2. _____ is the largest class of the phylum Mollusca.
3. Mollusca constitute about _____ of all known marine animals.
4. All cephalopods with external shell became extinct by the end of the Cretaceous period, except the _____.
5. The best natural pearls are produced by the pearl oyster _____ and _____.
6. Snails have a rough-edged tongue called _____.
7. _____ is the largest species of *Octopus* in the world.
8. *Dentalium* contains filaments having suckers called_____.
9. In Molluscs, the head is fused with the foot in _____.
10. Cephalopods with internal shells or without shells are placed in the subclass _____.
11. Fossil evidence indicates that the first gastropod shells were _____.
12. A gastropod shell typically consists of _____ layers.
13. In a gastropod, the first shell is laid down by the larva and is called the_____.
14. In a majority of prosobranch gastropods, the foot bears a horny disc called _____.
15. The first fossil pulmonate land snails appeared in the _____ period.
16. Opisthobranchs exhibit _____ of detorsion.
17. There are no capillaries in the Molluscs, except in _____.
18. The margin of mouth of *Pila* is called _____.
19. The unpaired ganglia of *Pila* are _____ and _____.
20. The only digestive gland of *Unio* is the _____.
21. *Xylophaga* is a _____ bivalve.
22. The most prominent muscles in bivalves are the _____.
23. In *Pecten*, there is a well-developed inner fold of the mantle edge, known as _____.
24. The nervous system of *Chiton* is primitive and is devoid of ganglia except for some _____.
25. The blue-ringed *Octopus* _____ is extremely venomous and its bite is fatal to humans.
26. The most specialised lamellibranch gill is known as _____ gill.
27. Aesthetes are _____ cells.
28. *Chiton* belongs to class _____.

29. During aquatic phase, snail excretes _____ compound and during terrestrial phase it excretes _____.
30. The ancestral Mollusc was an inhabitant of _____ oceans.
31. The development of free-swimming trochophore larva succeeded by veliger larva is the characteristic of _____.
32. The statocyst of *Pila* receives nerves from _____ and _____ ganglia.
33. _____ (Apple snail) is the largest freshwater Mollusc.
34. In *Aplysia*, a complete reversal of torsion occurs, known as _____.
35. The shining part of a shell is called _____.
36. _____ is a segmented Mollusc.
37. In a pearl oyster, the two valves are _____.
38. *Unio* is a _____ feeder.
39. Larva of *Unio* is the _____.
40. Development is direct in members of the class _____ of the phylum Mollusca.
41. *Octopus* ink contains _____ pigment.
42. The bilateral symmetry of gastropoda is disturbed due to _____.
43. _____ is regarded as the connecting link between Annelida and Mollusca.
44. Radula is a _____ organ.
45. The number of arm in *Sepia* is _____ while in *Octopus* the number of arms is _____.
46. The two valves of *Unio* are hinged _____.
47. Sea foam is the internal shell of _____.
48. The most primitive Mollusc is the _____.
49. The larvae of class _____ are bilaterally symmetrical, while adults are asymmetrical.
50. *Nautilus* occurs in its shell in the _____ chamber.
51. In *Pila*, the coiling of shell is either _____ or _____.
52. As a result of torsion, the visceral mass of gastropods is twisted into a figure of _____.
53. The _____ are considered to be the most primitive of existing bivalves.
54. The genus *Neoplina* was collected from western coast of _____.
55. Internal shell occurs in most _____ and in some _____.
56. Cephalopods have _____ auricles.
57. In Molluscs, development is indirect except in _____.
58. In Molluscs, the soft body is covered by a covering called the _____.
59. *Neoplina* belongs to class _____ of the phylum Mollusca.
60. The segmentation of Annelida differs from that of *Neoplina* because segmentation is visible _____.
61. The process of _____ is the most significant change from the hypothetical ancestral Mollusc that the gastropods have undergone during their phylogeny.

62. The space between the mantle and the visceral mass is called _____.
63. Radula is primarily composed of _____.
64. _____ is the only modern-shelled cephalopod.
65. Shelled gastropods are generally called _____ while forms without shells are called _____.
66. Living members of class the monoplacophora were discovered in the year _____.
67. The one feature common to all Molluscs is the presence of _____.
68. Members of all classes of the phylum Mollusca possess radula except the class _____.
69. In the largest family of Molluscs _____, the radula is specialised into a form of miniature harpoon.
70. The body of Molluscs is divided into three regions, viz., _____, _____ and _____.
71. The polyplacophorans are commonly known as _____.
72. The fleshy mantle does not produce a shell in _____.
73. The _____ retained the post torsion anterior position of the anus and mantle cavity.
74. Gastropods are able to withdraw into their shells by means of a _____ muscle.
75. In all opisthobranch, operculum is absent, except _____.
76. In *Haliotis*, distinct _____ and _____ ganglia are absent.
77. _____ are thick lines of growth on Molluscan shells.
78. Pericardial gland of *Unio* is called _____.
79. Veliger larva is modified _____ larva.
80. In Molluscs, the eye is present over a stalk called _____.
81. The oldest known cephalopod is a nautiloid, the _____.
82. The only commissure found in *Unio* is the _____ commissure.
83. _____ is the Indian pearl oyster.
84. Before the discovery of living specimens of *Neoplina*, the monoplacophorans had been known only from _____ fossil shells.
85. In *Pila*, most of the ganglia are concentrated near the buccal mass except _____ ganglion.

Answers to Fill in the Blanks

1. Johnston (1650)	2. Gastropoda	3. 23 per cent
4. Nautiloids	5. <i>Pinctada margaritifera</i> , <i>Pinctada mertensis</i>	6. Radula
7. <i>Enteroctopus dofleini</i>	8. Captacula	9. Cephalopoda
10. Coleoidae	11. Planospirods	12. Four
13. Protoconch	14. Operculum	15. Carboniferous

16. 90 per cent	17. Cephalopods	18. Peristome
19. Supra-intestinal, infra-intestinal	20. Liver	21. Boring
22. Adductor muscles	23. Velum	24. Ganglionic swellings
25. <i>Haplochlæna maculosa</i>	26. Eulamellibranch	27. Mantle
28. Polyplacophora	29. Ammonium, uric acid	30. Precambrian
31. Marine bivalves	32. Pedal, cerebral	33. <i>Pila globosa</i>
34. Detorsion	35. Nacre	36. <i>Neoplina</i>
37. Unequal	38. Filter	39. Glochidium
40. Cephalopoda	41. Melanin	42. Torsion and detorsion
43. <i>Neoplina galathea</i>	44. Rasping	45. 10, 8
46. Dorsally	47. Cuttlefish	48. Neoplina
49. Gastropoda	50. Last	51. Dextral, sinistral
52. Eight	53. Protobranchs	54. Mexico
55. Cephalopods, gastropods	56. Four	57. Cephalopods
58. Mantle	59. Monoplacophora	60. Externally
61. Torsion	62. Mantle cavity	63. Chitin
64. <i>Nautilus</i>	65. Snails, slugs	66. 1952
67. Mantle	68. Bivalvia	69. Turridae
70. Head, foot, visceral mass	71. Chitons	72. Aplacophorans
73. Pulmonates	74. Retractor	75. <i>Acteon</i>
76. Intestinal, pleural	77. Varices	78. Keber's organ
79. Trochophore	80. Ommatophore	81. <i>Plectonoceras</i>
82. Cerebral	83. <i>Pinctada vulgaris</i>	84. Cambrian
85. Visceral		

True or False

1. Molluscs were first studied by Aristotle.
2. Visceral mass is the characteristic of Mollusca.
3. Molluscs are schizocoelous.
4. Molluscs lack capillaries.
5. Visceral mass of Molluscs is ventral in position.
6. In bivalvia, the respiratory pigment is haemocyanin.
7. Gastropoda is the most important class of living Molluscs.
8. Gastropoda comprises more than 80 per cent of the living Molluscs.
9. In Molluscs, the coelom is limited to the area around the heart.

10. In opisthobranchs, the shell is poorly developed or lacking.
11. Torsion improves the ventilation of gills.
12. Bivalves lack radula and odontophore.
13. Some bivalves are epifaunal some are infaunal.
14. Scallops cannot swim.
15. The eyes of giant squids are largest in the animal kingdom.
16. Majority of bivalves lack oxygen-binding protein pigment.
17. About 600 million years ago, the first Molluscs have made their appearance.
18. For survival, all Molluscs must have moisture.
19. In *Unio*, cerebral commissure is thick and band-like.
20. In *Nautilus*, a large ink sac is present.
21. Liver is the site of absorption in *Octopus* and *Sepia*.
22. The shell of cuttlefish helps in providing buoyancy.
23. Scaphopods lack heart, except *Dentalium*.
24. The suckers of *Octopus* are sessile, having horny rings and hooks.
25. In *Loligo*, absorption takes place in the caecal walls.
26. The eye of *Nautilus* lacks lens.
27. Osphradium is lacking in *Nautilus*.
28. Pulmonatas are amphibious.
29. Most spiral shells are dextral.
30. *Aplysia* is an opisthobranch.
31. *Octopus* can change body colour.
32. *Argonauta* shows distinct sexual dimorphism.
33. All opisthobranchs are unisexual.
34. Molluscs are not found at high mountains.
35. Scallops and clams constitute important food staples.
36. Generally, the epidermis of Mollusca contains gland cells that secrete mucous.
37. Veliger larva is a characteristic of Mollusca.
38. In Mollusca, the heart and nephridia are the important parts of the circulatory, excretory and reproductive systems.
39. There are two pairs of nerve cords in bivalvia.
40. There is evidence that shell existed in aplacophorans.
41. Byssus is secreted by mantle.
42. Scallops swim by clapping their shells together.

43. Pipsis are shellfish.
44. Mantle and radula are only found in Mollusca.
45. In gastropods, mouth and anus lie on the opposite ends.
46. Mussels use two sets of genes to respond to heat stress.
47. According to a recent finding, hard Molluscs alternate between expressing genes associated with eating and genes associated with growing.
48. Structurally, Molluscs are quite distinct from all other animals.
49. Molluscs are multicellular animals having simple body structure.
50. Molluscs lack symmetry.
51. Entoprocta is a class of the phylum Mollusca.
52. Diversity among Mollusca is related to their adaptations to different habitats.
53. Operculum is an opening of the shell of gastropods.
54. *Nautilus* eggs are largest among invertebrates.
55. Mollusc is another name of the shellfish.
56. The typical Molluscan body plan is greatly modified in some members.
57. Subradular organ is regarded as photoreceptor.
58. The stomach of *Neoplina* lacks crystalline cone.
59. *Teredo* feeds on sawdust and small plankton.
60. In *Argonauta*, males are larger than the females.
61. The shell of female *Argonauta* is coiled and chambered.
62. In cephalopods, arms act as an intermittent organ.
63. Torsion is the characteristic of larval gastropods.
64. In *Planorbis*, the respiratory pigment is haemocyanin.
65. Streptoneury is shown by Molluscs as well as Annelids.
66. *Unio* lacks chiasstoneury.
67. *Neoplina* is a living fossil.
68. *Doris* is commonly known as sea pen.
69. In Molluscs, the digestive system is incomplete.
70. The opisthobranchia manifest greatest tendency of shell reduction.
71. The metamerism of *Neoplina* is very regular.
72. *Xylophaga* is protandric and undergoes a sex change.
73. The male *Sepia* uses its chromatophores for sexual display.
74. *Unio* lacks osphradium.
75. In *Unio*, umbo is the newest part of the shell.

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76. In *Pila*, the collumellar muscle arises from columella.
77. *Haliotis* is commonly called ear shell.
78. *Enderoxenos* lacks digestive tract and absorbs food through the body wall.
79. First gastropod shells were planospirals.
80. In gastropods, shell may be present or absent.
81. In *Unio*, gill is monopectinate.
82. Shipworm is an unsegmented animal.
83. Pearl is secreted by ciliated epithelial cells of mantle.
84. Pearl industry was first introduced in Japan.
85. Clams are sedentary filter-feeding Molluscs.
86. *Chalina* is detrimental to pearl industry.
87. *Unio* lacks connection between pedal and visceral ganglia.

Answers to True or False

1. True	2. True	3. True	4. True	5. False	6. False	7. True	8. True
9. True	10. True	11. True	12. True	13. True	14. False	15. True	16. True
17. True	18. True	19. False	20. False	21. True	22. True	23. False	24. False
25. True	26. True	27. False	28. False	29. True	30. True	31. True	32. True
33. False	34. False	35. True	36. True	37. True	38. True	39. False	40. False
41. False	42. True	43. True	44. True	45. False	46. True	47. True	48. True
49. False	50. False	51. False	52. True	53. False	54. True	55. True	56. True
57. False	58. False	59. True	60. False	61. False	62. True	63. True	64. False
65. False	66. True	67. True	68. False	69. False	70. True	71. False	72. True
73. True	74. False	75. False	76. False	77. True	78. True	79. True	80. True
81. False	82. True	83. False	84. True	85. True	86. False	87. True	

Give Reasons

1. Molluscs have played an important cultural and economic role in human history.
 - Because of their importance as food, as a source of dyes, producers of pearls as well as vectors of many diseases.
2. Molluscs have left rich fossil records.
 - Because of their shelled forms.

3. Cephalopods have a closed circulatory system while other Molluscs have an open circulatory system.
 - Because of an active lifestyle of cephalopods in comparison to other Molluscs.
4. There are no land bivalves.
 - Because their basic functional organisation is as filter feeders.
5. Bivalves are analysed as a means of monitoring water pollution.
 - Because they are filter feeders and they tend to accumulate pollutants.
6. Nautiluses are described as living fossils.
 - Because they have remained virtually unchanged for millions of years.
7. The nervous system of *Unio* is reduced to a great extent.
 - Due to its sedentary and sluggish mode of life.
8. Digestive gland plays a role in excretion in most of the gastropods.
 - Because in gastropods, the digestive gland contains some excretory cells that accumulate wastes.
9. *Octopus* can blend into its background.
 - Because chromatophores present in the skin enable an *Octopus* to camouflage itself in its surroundings by changing the appearance of the epidermis.
10. Oysters in their raw state should not be eaten.
 - Because they may contain harmful bacteria.
11. In *Pila*, chiasstoneury is diffused.
 - Because the infra-intestinal ganglion fuses with the right pleuro-pedal ganglionic mass.
12. In gastropods, pleural ganglia are not affected by torsion.
 - Because of their anterior position.
13. Octopuses can fit into small cervaces.
 - Because Octopuses lack external or internal shell, so they can manipulate their body to adjust into even small spaces.
14. *Unio* does not go deep in the burrow.
 - Because the posterior ends remains exposed for the incoming and outgoing of the respiratory water current.
15. In gastropods, ureotelism is uncommon.
 - Because they lack orinithine cycle and the only source of urea is the dietary arginine.

ECHINODERMATA

Multiple-Choice Questions

1. Which one of the following is correct about Echinoderms?
(a) Exclusively marine (b) Mainly bottom dwellers
(c) Relatively large animals (d) All
2. The only living Echinoderms that are attached are:
(a) Crinoids (b) Holothuroids (c) Ophiuroids (d) Echinoids
3. The Echinoderms closely related to radiate phylum are:
(a) Ctenophora (b) Cnidarian (c) Sponges (d) None
4. Water vascular system is a characteristic feature of members of the phylum:
(a) Porifera (b) Coelentrata (c) Mollusca (d) Echinodermata
5. Echinoderms lack:
(a) Tube feet (b) Pedicellariae (c) Choanocytes (d) Radial symmetry
6. Consider the following statements:
(A) Crinoids are suspension feeders
(B) Crinoids lack madreporite
(C) Feather stars are nonsessile and free-swimming crinoids
(D) Crinoids are dioecious and lack distinct gonads
The correct statements are:
(a) All (b) A, B and C (c) B, C and D (d) C and D
7. Echinoderms first appeared in:
(a) Middle Ordovician (b) Lower Permian
(c) Lower Cambrian (d) Triassic period
8. The oldest group of extinct Echinoderm is the:
(a) Eocrinoidea (b) Cystoidea (c) Blastoidea (d) Edrioasteroidea
9. Sea lilies without cirri:
(a) *Hyocrinus* (b) *Metacrinus* (c) *Cenocrinus* (d) All
10. In which one of the following is the cloacal region the centre of regeneration?
(a) *Cucumaria* (b) *Thyone* (c) *Holothuria* (d) All
11. Aristotle's lantern is lacking in:
(a) Heart urchins (b) Cake urchins (c) Sand dollars (d) None
12. Which one of the following is not applicable to echinoids?
(a) Free moving (b) Arms (c) Radial symmetry (d) Test

13. In which one of the following sea stars is development viviparous?
 - (a) *Ophionotus hexactis*
 - (b) *Amphipholis squamata*
 - (c) *Ophiothrix fragilis*
 - (d) *Ophiocoma nigra*
14. Predators of sea urchins are:
 - (a) Sea stars
 - (b) Sea otters
 - (c) Certain gastropods
 - (d) All
15. Echinoderms lack:
 - (a) Head
 - (b) Definite blood vascular system
 - (c) Copulation
 - (d) All
16. Which one of the following is not applicable to *Asterias*?
 - (a) Benthonic
 - (b) Nocturnal
 - (c) Autotomy
 - (d) Hastate plate
17. Regeneration does not occur in:
 - (a) Ophiuroids
 - (b) Holothurians
 - (c) Echinoids
 - (d) Asteroids
18. Members of class crinoidea lack:
 - (a) Madreporite
 - (b) Pedicellariae
 - (c) Spines
 - (d) None
19. Which one of the following is incorrect about holothuria?
 - (a) Bilateral symmetry
 - (b) Presence of respiratory trees
 - (c) Radial symmetry
 - (d) Presence of cuverian tubules.
20. Larvae are bilaterally symmetrical, but adults are radial symmetrical in the members of phylum:
 - (a) Mollusca
 - (b) Arthropoda
 - (c) Annelida
 - (d) Echinodermata
21. Which one of the following is incorrect?
 - (a) Cloacal respiration – Sea cucumber
 - (b) External digestion – *Echinus*
 - (c) Aristotle's lantern – Mastication
 - (d) Tube feet – Starfish
22. Which one of the following is not found in Echinoderms?
 - (a) Pedicellariae
 - (b) Tube feet
 - (c) Osphradium
 - (d) Ciliated larva
23. Which one of the following is a characteristic feature of Echinoderms?
 - (a) Metamerism
 - (b) Schizocoel
 - (c) Pseudocoel
 - (d) None
24. Stone canal is found in the members of the phylum:
 - (a) Coelenterata
 - (b) Arthropoda
 - (c) Mollusca
 - (d) Echinodermata
25. Members of class holothuroidea lack:
 - (a) Arms
 - (b) Pedicellariae
 - (c) Spines
 - (d) All
26. Evisceration is shown by:
 - (a) *Antedon*
 - (b) *Echinus*
 - (c) *Cucumaria*
 - (d) None
27. Consider the following statements:
 - (A) Ophiuroids are used as food by humans
 - (B) Some ophiuroids are venomous
 - (C) Some ophiuroids are luminescent
 - (D) Ophiuroids are found in all oceans
 The incorrect statements are:
 - (a) All
 - (b) A and B
 - (c) C and D
 - (d) A and D
28. Arginine phosphate is not found in:
 - (a) Ophiuroids
 - (b) Crinoids
 - (c) Asteroids
 - (d) Holothurians

29. Both arginine phosphate and creatinine phosphate are found in:
 - (a) Starfish
 - (b) Sea urchins
 - (c) Sea cucumbers
 - (d) Crinoids
30. Which one of the following is found in Echinoderms, Hemichordates and Vertebrates?
 - (a) Bilateral symmetry
 - (b) Arginine phosphate
 - (c) Creatinine phosphate
 - (d) Schizocoel
31. Arginine phosphate is not found in:
 - (a) Arthropods
 - (b) Molluscs
 - (c) Echinoderms
 - (d) Hemichordates
32. Pedicellariae are only found in:
 - (a) Asteroids
 - (b) Asteroids and echinoids
 - (c) Echinoids and ophiuroids
 - (d) Ophiuroids and holothuroids
33. Oesophagus is lacking in:
 - (a) *Cucumaria*
 - (b) *Thyone*
 - (c) *Asterias*
 - (d) *Ophiothrix*
34. The only commensal Echinoderms are:
 - (a) Asteroids
 - (b) Ophiuroids
 - (c) Echinoids
 - (d) Crinoids
35. Ophiuroids are:
 - (a) Filter feeders
 - (b) Deposit feeders
 - (c) Scavengers
 - (d) All
36. Consider the following statements:
 - (A) Holothuroids differ from all other living Echinoderms in having a single gonad
 - (B) Crinoids lack madreporite
 - (C) Echinoids are in general negatively phototropic
 - (D) A muscle layer is lacking in echinoids
 The correct statements are:
 - (a) All
 - (b) A, B and D
 - (c) B and C
 - (d) C and D
37. Respiratory trees are absent in:
 - (a) *Molpadia*
 - (b) *Synapta*
 - (c) *Deima*
 - (d) *Thyone*
38. Power of regeneration is well marked in:
 - (a) Asteroids
 - (b) Echinoids
 - (c) Ophiuroids
 - (d) Crinoids
39. Stewart's organs are found in:
 - (a) *Antedon*
 - (b) *Holothuria*
 - (c) *Chiridoata*
 - (d) *Cidaris*
40. Ophiuroids lack:
 - (a) Ambulacral grooves
 - (b) Intestine
 - (c) Anus
 - (d) All
41. In which one of the following are young ones nourished with albumin secreted by the marsupium?
 - (a) *Notocrinus*
 - (b) *Isometra vivipara*
 - (c) *Luidea*
 - (d) *Astrostele*
42. Tube feet are absent in:
 - (a) *Synapta*
 - (b) *Pracaudina*
 - (c) *Molpadia*
 - (d) All
43. In which one of the following small or young individuals are males, but as they become older and increase in size, they develop into females?
 - (a) *Asterina gibbosa*
 - (b) *Asterias rubens*
 - (c) *Asterias vulgaris*
 - (d) *Astropecten*

44. Brachiolaria larva never forms in:
(a) *Astropecten* (b) *Asterina* (c) *Luidia* (d) All
45. Evisceration, which involves the rupture of the cloaca, expulsion of one or both respiratory trees, digestive tracts and the gonads is shown by:
(a) *Actinopyga* (b) *Holothuria* (c) *Stichopus* (d) All
46. The only living Echinoderm that remains attached:
(a) Asterooids (b) Echinoids (c) Holothuroids (d) Crinoids
47. Which one of the following statements is incorrect about crinoids?
(a) Possess the richest fossil record of all the Echinoderms.
(b) Typical crinoids first appeared in Triassic period.
(c) Pedicellariae are absent.
(d) Doliolaria and pentacrinoid are larval forms.
48. Which one of the following functions is not performed by the water vascular system?
(a) Locomotion (b) Respiration (c) Sensory (d) Excretion
49. Which one of the following is a brakish water Echinoderm?
(a) *Synapta similis* (b) *Dendraster exocentricus*
(c) *Asterina gibbosa* (d) *Solaster dawsoni*
50. Which one of the following is applicable to coelom in Echinoderms?
(a) Haemocoelic (b) Schizocoelic (c) Pseudocoelic (d) Enterocoelic
51. Autotomy is shown by the members of the phylum:
(a) Arthropoda (b) Mollusca (c) Echinodermata (d) Annelida
52. Stomach is protrusible in:
(a) Sea lion (b) Starfish (c) Sea anemone (d) Sea otter
53. Which one of the following is applicable to Echinoderms?
(a) Apolysis (b) Autotomy (c) Autogamy (d) Autoregulation
54. Which one of the following is an incorrect match?
(a) Heart urchin – *Echinocardium* (b) Serpent star – *Clypeaster*
(c) Sea urchin – *Echinus* (d) Sea pentagon – *Pentaceros*
55. In Echinoderms, the endoskeleton is:
(a) Ectodermal (b) Mesodermal (c) Endodermal (d) Lacking
56. Which one of the following is incorrect about stone canal?
(a) Also called madreporic canal (b) S-shaped canal
(c) Wall is supported by calcareous rings (d) A part of canal system
57. Which one of the following is not a part of the water vascular system?
(a) Madreporite (b) Radial canal (c) Ring canal (d) In-current canal
58. In Echinoderms, respiration occurs through:
(a) Respiratory trees (b) Tube feet (c) Dermal papulae (d) All
59. Which one of the following is different?
(a) Sea pen (b) Sea star (c) Sea cucumber (d) Sea urchin
60. Aristotle's lantern is found in the members of class:
(a) Asteroidea (b) Echinoidea (c) Holochuroidea (d) None

61. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Madreporite is aboral	1. Crinoidea
(B) Madreporite is oval	2. Asteroidea
(C) Madreporite do not open to the exterior	3. Ophiuroidea
(D) Madreporite is lacking	4. Holothuroidea

Answer codes:

	A	B	C	D
(a)	3	2	1	3
(b)	2	3	4	1
(c)	4	3	1	4
(d)	2	4	3	1

62. Tube feet without suckers are found in members of the class:

(a) Asteroidea	(b) Echinoidea
(c) Holothuroidea and crinoidea	(d) Ophiuroidea

63. Which one of the following classes includes sedentary Echinoderms?

(a) Crinoidea	(b) Asteroidea	(c) Echinoidea	(d) Ophiuroidea

64. The most striking feature of Echinoderm larvae is the:

(a) Ciliated body	(b) Bilateral symmetry
(c) Development of anus from blastopore	(d) Mesodermal endoskeleton

65. Tridentate pedicellariae are found in:

(a) Asteroidea	(b) Ophiuroidea	(c) Echinoidea	(d) Holothuroidea

66. Holothuroids having protective armour of calcareous plates are:

(a) <i>Leptosynapta</i> and <i>Xpsilothuria</i>	(b) <i>Cucumaria</i> and <i>Psolus</i>
(c) <i>Thyone</i> and <i>Ceto</i>	(d) <i>Psolus</i> and <i>Ceto</i>

67. The most primitive class of living Echinoderms is the:

(a) Crinoidea	(b) Ophiuroidea	(c) Echinoidea	(d) Holothuroidea

68. The body is prolonged into arms in the members of the class:

(a) Asteroidea	(b) Ophiuroidea	(c) Crinoidea	(d) All

69. *Echinarachinus* is commonly known as:

(a) Heart urchin	(b) Cake urchin	(c) Feather star	(d) Sand dollar

70. Which one of the following is not applicable to Echinoderms?

(a) Triploblastic	(b) Oral and aboral surfaces
(c) Cephalisation	(d) Deuterostomes

71. What is incorrect about Aristotle's lantern?

(a) Pentamerous pyramid-like structure	(b) It surrounds the pharynx
(c) It contains eleven teeth	(d) It is the characteristic of echinoids

72. Which one of the following contains five madreporites?

(a) <i>Gorgonocephalus</i>	(b) <i>Ophiactis virens</i>	(c) <i>Ophiacten sericeum</i>	(d) <i>Antedon</i>

73. Tube feet do not take part in locomotion in the:

(a) <i>Antedon</i>	(b) <i>Echinus</i>	(c) <i>Asterina gibbosa</i>	(d) <i>Thyone</i>

74. Which one of the following is photonegative?
(a) *Asterias panceri* (b) *Asterias gibbosa* (c) *Asterias rubens* (d) None
75. Ophiopluteus larva lacks:
(a) Unpaired posterior arm (b) Ciliated lobes
(c) Preoral and anterodorsal arms (d) All
76. A free-swimming larval stage is lacking in:
(a) *Asterina gibbosa* (b) *A. rubens* (c) *A. panceri* (d) *A. forbesi*
77. In which one of the following classes of Echinoderms are both larval mouth and anus absent?
(a) Asteroidea (b) Echinoidea (c) Holothuroidea (d) Crinoidea
78. In this class, larval mouth persists, but anus is lacking in adults:
(a) Crinoidea (b) Ophiuroidea (c) Echinoidea (d) Asteroidea
79. The gonads are contained in pinnules, lacking an opening to the exterior in class:
(a) Ophiuroidea (b) Holothuroidea (c) Echinoidea (d) Crinoidea
80. Genital bursae act as respiratory organ in:
(a) Annelida (b) Arthropoda (c) Mollusca (d) Echinodermata
81. Polian vesicles are totally lacking in:
(a) *Asterias rubens* (b) *A. rubens* and *A. glacialis*
(c) *A. panceri* (d) *A. panceri* and *A. forbesi*
82. In which one of the following is the mouth not directed downward?
(a) Crinoids (b) Asteroids (c) Echinoids (d) Ophiuroids
83. Most active Echinoderms are:
(a) Holothuroids (b) Ophiuroids (c) Asteroids (d) Echinoids
84. Which one of the following is not applicable to the water vascular system?
(a) Enterocoelic origin (b) Exhibits radial symmetry
(c) Lies just below the haemal system (d) Equally developed in all Echinoderms
85. Which one of the following is an incorrect match?
(a) *Asterias* – One S-shaped stone canal
(b) Crinoidea – Stone canal is lacking
(c) Ophiuroidea – Stone canal lacks calcareous deposition
(d) *Astropecten* – Stone canal is branched
86. Crinoids lack:
(a) Polian vesicle (b) Tiedmann's bodies and stone canal
(c) Both polian vesicle and Tiedmann's bodies (d) Polian vesicle and stone canal
87. Which one of the following is a hermaphrodite Echinoderm?
(a) *Asterina gibbosa* (b) *Amphiura squamata*
(c) *Cucumaria frondosa* (d) All
88. Echinoderms are generally not found in colder area except:
(a) Asteroids (b) Crinoids (c) Echinoids (d) Ophiuroids
89. What is incorrect about ophiuroids?
(a) Anus is lacking (b) Pedicellariae are absent
(c) Tube feet without suckers (d) Arms with pinnules

90. In Echinoderms, the skeleton is:
(a) Cartilaginous (b) Siliceous (c) Chitinous (d) Calcareous
91. Ambulacral grooves are lacking in:
(a) Crinoids (b) Ophiuroids (c) Asterooids (d) Echinoids
92. The oldest known echinoid is:
(a) *Eothuria* (b) *Helicoplacus* (c) *Miocidaris* (d) *Goniocidaris*
93. *Myzostomum* is a parasite on:
(a) Asterooids (b) Echinoid (c) Crinoids (d) Ophiuroids
94. During unfavourable conditions, arms, alimentary canal and tegmen are cast off and again regenerated in the members of class:
(a) Asteroidea (b) Echinoidea (c) Holothuroidea (d) Crinoidea
95. Bipinnaria is the larva of:
(a) *Asterias* (b) *Echinus* (c) *Antedon* (d) *Clypeaster*
96. Bipinnaria larva lacks:
(a) Bilateral symmetry (b) Preoral and postoral ciliated bands
(c) Suckers or fixation disc (d) Clockwise rotation
97. Which one of the following is not a larval form of Echinodermata?
(a) Brachiolaria (b) Glochidium (c) Auricularia (d) Echinopluteus
98. Echinopluteus is the larva of:
(a) *Antedon* (b) *Thyone* (c) Starfish (d) Sea urchin
99. Feather star belongs to class:
(a) Asteroidea (b) Crinoidea (c) Ophiuroidea (d) Echinoidea
100. Main nervous system is aboral in:
(a) Asteroidea (b) Echinoidea (c) Ophiuroidea (d) Crinoidea
101. Main nervous system is oral in:
(a) Holothuroidea (b) Ophiuroidea and echinoidea
(c) Asteroidea (d) All
102. The only living class of subphylum pelmatozoa is:
(a) Crinoidea (b) Asteroidea (c) Ophiuroidea (d) Holothuroidea
103. *Luidia* lacks:
(a) Anus (b) Suckers (c) Both anus and suckers (d) Arms
104. In which one of the following is the brachiolarial stage absent?
(a) *Asterias gibbosa* (b) *A. vulgaris* (c) *A. glacialis* (d) All
105. Which one of the following is not applicable to tube feet?
(a) Sensory structures (b) Help in food capturing and adhesion
(c) Help in locomotion and respiration (d) Eliminate excretory product
106. Crinoids lack:
(a) Madreporite (b) Pedicellariae (c) Suckers and spines (d) All
107. What is wrong about holothuroids?
(a) Presence of respiratory trees (b) Evisceration
(c) Tube feet without suckers (d) Pedicellariae and spines absent

108. Which one of the following is not applicable to Echinoderms?
 (a) Autotomy (b) Cephalisation (c) Regeneration (d) Evisceration
109. During metamorphosis of Echinoderms larvae:
 (a) The left side of the body becomes the aboral surface while the right side becomes the oral surface
 (b) Only the right side of the body becomes differentiated into oral and aboral surfaces
 (c) The right side of the body becomes the aboral surface while the left side of the body becomes the oral surface
 (d) The right axohydrocoel forms the water vascular system
110. In which one of the following Echinoderms does development occur in the stomach of the mother?
 (a) *Stichaster nutrix*
 (b) *Asterina gibbosa*
 (c) *Chiridota contorta*
 (d) *Linckia*
111. Which one of the following is a correct match?
 (a) Tiedmann's bodies – Echinodermata
 (b) Enterocoelic coelom – Mollusca
 (c) *Antedon* – Ophiuroidea
 (d) Respiratory trees – *Metacrinus*
112. Which one of the following is a larval form of Echinodermata?
 (a) Tornaria (b) Parenchymula (c) Pluteus (d) Veliger
113. Polian vesicle and Tiedmann's bodies are absent in:
 (a) Crinoidea (b) Ophiuroidea (c) Echinoidea (d) None
114. Canal of Simroth is applicable to:
 (a) Crinoidea (b) *Ophiactis virens* (c) *Astropecten* (d) *Asterias glacialis*
115. Echinoderms lack:
 (a) Heart (b) Brain (c) Excretory organ (d) All
116. Consider the following statements:
 (A) Echinoderms have enterocoelic coelom
 (B) Echinoderms, the are deuterostomes
 (C) In Echinoderms, the endoskeleton is mesodermal
 (D) In Echinoderms cleavage is radial and intermediate and gastrulation occurs by invagination
- In the above mentioned characters, which are similar to those of Chordates?
 (a) All (b) A, B and C (c) B, C and D (d) A and D

Answers to Multiple-Choice Questions

1. (d)	2. (a)	3. (d)	4. (d)	5. (c)	6. (a)	7. (c)	8. (a)
9. (d)	10. (d)	11. (a)	12. (b)	13. (b)	14. (d)	15. (d)	16. (d)
17. (c)	18. (d)	19. (c)	20. (d)	21. (b)	22. (c)	23. (d)	24. (d)
25. (d)	26. (c)	27. (b)	28. (a)	29. (b)	30. (c)	31. (d)	32. (b)
33. (a)	34. (b)	35. (d)	36. (a)	37. (b)	38. (c)	39. (d)	40. (d)

41. (a)	42. (d)	43. (a)	44. (d)	45. (d)	46. (d)	47. (b)	48. (c)
49. (a)	50. (d)	51. (c)	52. (b)	53. (b)	54. (b)	55. (b)	56. (d)
57. (d)	58. (d)	59. (a)	60. (b)	61. (b)	62. (d)	63. (a)	64. (b)
65. (c)	66. (d)	67. (a)	68. (d)	69. (d)	70. (c)	71. (c)	72. (b)
73. (a)	74. (d)	75. (d)	76. (a)	77. (d)	78. (b)	79. (d)	80. (d)
81. (b)	82. (a)	83. (b)	84. (c)	85. (d)	86. (c)	87. (d)	88. (b)
89. (d)	90. (d)	91. (b)	92. (b)	93. (c)	94. (d)	95. (a)	96. (c)
97. (b)	98. (d)	99. (b)	100. (d)	101. (d)	102. (a)	103. (c)	104. (a)
105. (d)	106. (d)	107. (c)	108. (b)	109. (c)	110. (a)	111. (a)	112. (c)
113. (a)	114. (b)	115. (d)	116. (a)				

Fill in the Blanks

- Microscopic pincer-like structures found in Echinoderms are called _____.
- Water vascular system is a characteristic feature of the members of the phylum _____.
- Water vascular system opens to the outside through _____.
- _____ are the attaching structures of a sea lily.
- An enterocoelic invertebrate phylum is the _____.
- Sea lily belongs to class _____.
- Aristotle's lantern is present in members of the class _____.
- _____ is the largest starfish.
- Respiratory trees are found in the members of class _____.
- Cloacal respiration occurs in _____, which belongs to phylum Echinodermata and class holothuroidea.
- Starfish crawls over substratum by means of _____.
- _____ is an Echinoderm in which mouth is used both for ingestion and egestion of food.
- Evisceration is shown in the members of the phylum _____.
- Larval form of starfish are _____ and _____.
- Heart urchin belongs to class _____.
- Stone canal of starfish is _____ shaped.
- An Echinoderm showing eversion of the stomach during feeding is _____.
- There are _____ ambulacral areas in a sea cucumber.
- _____ is an Echinoderm in which development occurs in genital tubes.
- The tube feet without suckers are _____ in nature but with suckers and calcareous rings are _____ in function.

21. In starfish, the two arms having madreporite between their bases are collectively called _____ and those having three arms as _____.
22. Pedicellariae having three calcareous pieces and a stalk are called _____ pedicellariae.
23. *Asterias* contains two types of forcipulate pedunculate pedicellariae, viz., _____ type and _____ type.
24. The water vascular system is formed from the _____ hydrocoel.
25. *Echinocardium* is commonly known as _____.
26. In all echinoids, plates are arranged in rows running from _____ pole to _____ pole.
27. Globiferous pedicellariae contain _____ glands.
28. With the exception of _____, the epidermis of the ophiuroids is a reduced syncytium.
29. The bipinnaria larva becomes a brachiolaria larva with the appearance of _____ additional arms at the anterior end.
30. In Echinoderms, bilateral symmetry is found only during _____ stage.
31. _____ is the larva of echinoidea.
32. _____ is the larva of ophiuroidea.
33. There are _____ pairs of tube feet in starfish.
34. _____ is the common ancestral larval form of Echinoderms, Hemichordates and Chordates.
35. In ophiuroidea, madreporite is _____ in position.
36. In starfish, autotomy is followed by _____.
37. The ambulacral system of Echinoderms is primarily related with _____.
38. Brittle star belongs to class _____ and phylum _____.
39. Tube feet are locomotor organ of the members belonging to phylum _____.
40. The phenomenon of shedding of arms by the members of the phylum Echinodermata is called _____.
41. _____ is the oldest known echinoid.
42. There are _____ Tiedmann's bodies in echinoidea.
43. Each pedicellaria consists of a _____ a basilar _____ and two _____.
44. In Echinoderms, body plan is a tube within a tube but in class _____, it is of blind sac nature.
45. In Echinoderms, the digestive system is complete, except in class _____.
46. There are _____ ambulacral grooves in *Antedon*.
47. In majority of ophiuriids, one oral shield is modified forming a _____.
48. The cuverian tubules of some species are not adhesive, they secrete a toxic substance called _____.
49. Animals having unsegmented coelom, bilaterally symmetrical larvae and radially symmetrical adults belong to phylum _____.
50. An Echinoderm showing cloacal respiration is _____.
51. Coelomic fluid of Echinoderms contains _____.
52. Attached Echinoderms belong to class _____.

53. Madreporite is connected to the ring canal through _____.
54. The jointed parts of arms in brittle star are called _____.
55. In Echinoderms, ossicles are _____ plates.

Answers to Fill in the Blanks

1. Pedicellariae	2. Echinodermata	3. Madreporite
4. Cirri	5. Echinodermata	6. Crinoidea
7. Echinoidea	8. <i>Pyenopodia hellianthoides</i>	9. Holothuroidea
10. Sea cucumber	11. Tube feet	12. <i>Ophiothrix</i>
13. Echinodermata	14. Bipinnaria, brachiolaria	15. Echinoidea
16. S	17. <i>Asterias</i>	18. Five
19. <i>Chiridota contorta</i>	20. Respiratory, locomotors	21. Bivium, trivium
22. Forcipulate pedunculate	23. Straight, crossed	24. Left
25. Heart urchin	26. Oral, aboral	27. Poison
28. Basket stars	29. Three	30. Larval
31. Echinopluteus	32. Ophiopluteus	33. Many
34. Dipleurula	35. Oral	36. Regeneration
37. Circulation	38. Echinodermata	39. Echinodermata
40. Autotomy	41. <i>Helicoplascus</i>	42. Five
43. Stalk, plate, toothed jaws	44. Ophiuroidea	45. Ophiuroidea
46. Five	47. Madreporite	48. Holothurin
49. Echinodermata	50. Sea cucumber	51. Coelomocytes
52. Crinoidea	53. Stone canal	54. Vertebrae
55. Endoskeletal		

True or False

1. The term 'Echinodermata' was coined by Jacob Klein (1936).
2. Members of the phylum Echinodermata are radially symmetrical while larvae are bilaterally symmetrical.
3. Echinoderms are triploblastic, coelomate and metameric animals.
4. Echinoderms have no parasitic forms.
5. A true blood vascular system is lacking in *Asterias*.
6. Holothuria lacks madreporite.

7. Feather stars are nonsessile free-swimming crinoids.
8. Pedicellariae are a characteristic of all crinoids.
9. Echinoids lack arms.
10. Ophiuroids are able to detect food without contact.
11. *Metacrinus* can swim actively.
12. Starfish can see.
13. Starfish can detect variations in light intensity.
14. Crinoids are restricted to black sea and inner Baltic.
15. In *Thyone*, stone canal is branched.
16. *Asterias rubens* lacks stone canal.
17. Ring canal is a constant structure in all Echinoderms.
18. The water vascular system is enterocoelic in origin.
19. Cuvierian tubules are well-developed in *Thyone*.
20. In *Asterias*, polian vesicles are lacking.
21. In *Astropecten*, the brachiolaria stage is absent and bipinnaria larva metamorphoses directly into an adult.
22. *Antedon* resembles a small herbaceous plant.
23. Madreporite is a solid plate-like structure of water vascular system.
24. In *Asterias*, digestion is external.
25. Starfish is a predator of oysters.
26. Arms of *Ophiothrix* are highly fragile.
27. Muscular system is lacking in Echinoderms.
28. Circulatory system of Echinoderms is closed.
29. In *Holothuria*, the tentacles are branched and retractile.
30. Cirri are the attaching structures of sea lily.
31. Echinoderms lack organ system level of organisation.
32. In starfish, the upper side contains anus and madreporite.
33. In Echinoderms, nervous system is devoid of brain.
34. Arms of sand dollar are branched.
35. In crinoidea, both the mouth and anus are present on the same side.
36. Ophiuroids lack distinct anus.
37. In most ophiuroids, one oral shield is modified forming a madreporite.
38. The echinopluteus becomes attached with the substratum and undergoes the process of metamorphosis.
39. In Echinoderms, the origin of mouth in relation to the blastopore is similar to that in protostomes.
40. Radial symmetry of Echinoderms is primary.

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41. Echinoderm as a distinct group was established by Leuckert (1847).
42. Pedicellariae respond to chemical stimuli.
43. In ophiuroidea, tube feet are locomotory and bear suckers.
44. Echinoderms are marine colonial coelomates.
45. There are conspicuous external calcareous plates in a sea cucumber.
46. Echinoderms lack respiratory pigment.
47. In Echinoderms, the cleavage is radial and indeterminate type.
48. In *Ophiothrix*, arms are not sharply demarcated from the central disc.
49. Crinoids lack spines, pedicellariae and madreporite.
50. In Echinoderms, gastrulation occurs by invagination.
51. Pedicellariae help in locomotion.
52. Echinoderms are ammontelic and aminotelic.
53. In crinoidea, both the mouth and anus are located on the same side.
54. In *Holothuria*, the tentacles are branched.
55. Pedicellariae help in removing debris.

Answers to True or False

1. True	2. True	3. False	4. True	5. True	6. False	7. True	8. False
9. True	10. True	11. True	12. False	13. True	14. False	15. True	16. False
17. True	18. True	19. False	20. True	21. True	22. True	23. False	24. True
25. True	26. True	27. False	28. False	29. False	30. True	31. False	32. False
33. True	34. False	35. True	36. True	37. True	38. False	39. False	40. False
41. True	42. True	43. False	44. False	45. False	46. True	47. True	48. False
49. True	50. True	51. False	52. True	53. True	54. False	55. True	

Give Reasons

1. Echinoderms are considered to be the highly evolved invertebrates.
 - Because of the presence of enterocoelic coelom.
2. In sea urchins, tube feet become greatly extended towards the direction of movement.
 - Because in sea urchins arms are lacking.
3. Echinoderms show close similarities to Hemichordates.
 - Due to the following reasons:

- (a) Echinoderms have an enterocoelic coelom
 - (b) Mesodermal endoskeleton
 - (c) Blastopore forms the anus in adults
 - (d) Presence of creatine phosphate
4. Presence of creatine and creatinine in *Asterias* is of much significance.
 - Because they are not found in any other invertebrates.
 5. Echinoderms are so named.
 - Because of the presence of spine-like structures in their skin.
 6. In *Asterias*, the major part of digestion is external.
 - Because during feeding, the stomach is everted and digestive juices are poured over the food and then the semidigested food is taken in.
 7. In ophiuroids, the arms characteristically appear jointed.
 - Because of the presence of four longitudinal rows of shields.
 8. Ophiuroids are considered to be the most successful groups of the Echinoderms.
 - Because of the following reasons:
 - (a) They are of small size, which enables them to exploit habitats unavailable to a majority of the other Echinoderms
 - (b) They have diverse of feeding habits
 - (c) Their mutability ability

CHORDATA

Multiple-Choice Questions

1. Most important feature of chordates is the presence of:
(a) Notochord (b) Coelom (c) Vertebral column (d) Post-anal tail
2. Notochord is made up of:
(a) Bone (b) Cartilage (c) Vacuolated cells (d) Muscle fibres
3. Which one of the following is an incorrect statement regarding chordates?
(a) Chordates have notochord (b) Chordates possess dorsal tubular nerve cord
(c) Chordates possess ventral nerve cord (d) Chordates have pharyngeal gill slits
4. An example of a typical chordate is:
(a) *Herdmania* (b) *Amphioxus* (c) *Balanoglossus* (d) *Salpa*
5. In which one of the following, is notochord present in the tail region?
(a) *Amphioxus* (b) *Petromyzon* (c) *Herdmania* (d) *Balanoglossus*
6. Notochord is located in the anterior part of the body in:
(a) Cephalochordates (b) Hemichordates
(c) Urochordates (d) Cyclostomata
7. All chordate characters are present in the larva but are absent in the adult of:
(a) *Herdmania* (b) *Petromyzon* (c) *Amphioxus* (d) *Oikopleura*
8. Which one of the following retains larval characters throughout life?
(a) *Myxine* (b) *Oikopleura* (c) *Salpa* (d) *Herdmania*
9. Retrogressive metamorphosis is shown by:
(a) Vertebrates (b) Cephalochordates (c) Hemichordates (d) Urochordates
10. Which one of the following is applicable to Chordates?
(a) Mammary glands, hair and gill slits
(b) Vertebral column, scales and dorsal tubular nerve cord
(c) Notochord, dorsal tubular nerve cord and pharyngeal gill slits
(d) Notochord, vertebral column and pharyngeal gill slits
11. Vertebral column is derived from:
(a) Ventral nerve cord (b) Dorsal tubular nerve cord
(c) Notochord (d) Pharyngeal gill slits
12. Which one of the following structures is present in all adult vertebrates?
(a) Pharyngeal gill slits (b) Notochord
(c) Dorsal tubular nerve cord (d) All

13. Vertebrates possess:
 - (a) Notochord
 - (b) Well-developed skull
 - (c) Exoskeleton
 - (d) Two pairs of appendages
14. Which one of the following is an incorrect statement?
 - (a) All vertebrates are chordates
 - (b) All chordates are vertebrates
 - (c) *Amphioxus* is a typical chordate
 - (d) All vertebrates have dorsal tubular nerve cord
15. All protochordates are:
 - (a) Terrestrial
 - (b) Freshwater
 - (c) Marine
 - (d) Amphibious
16. Which one of the following is applicable to *Herdmania*?
 - (a) Cephalochordata
 - (b) Urochordata
 - (c) Agnatha
 - (d) Gnathostomata
17. Agnatha includes:
 - (a) All protochordates
 - (b) Cyclostomes
 - (c) Cyclostomes and amphibian
 - (d) Cyclostomes and pisces
18. Which one of the following is different?
 - (a) Humans
 - (b) Bats
 - (c) *Scoliodon*
 - (d) *Myxine*
19. In urochordates, the basic chordate characters are:
 - (a) Seen throughout life
 - (b) Seen only in adult
 - (c) Seen only in larva
 - (d) Absent
20. The circulatory system of *Amphioxus* is unique because:
 - (a) Blood corpuscles are absent
 - (b) Blood is colourless
 - (c) Heart is absent
 - (d) All
21. What is incorrect about chordates?
 - (a) Bilateral symmetry
 - (b) Segmented body with segmental muscles
 - (c) Single dorsal and hollow nerve cord
 - (d) None
22. The pharynx of lancelet bears:
 - (a) Gill slits
 - (b) An endostyle
 - (c) An atrium
 - (d) All
23. Consider the following statements:
 - (A) Chordates possess pharyngeal gill slits but invertebrates lack pharyngeal gill slits
 - (B) In vertebrates, blood flows anteriorly in the dorsal blood vessel while posteriorly in invertebrates
 - (C) In vertebrates, blastopore develops in the anus while in invertebrates, blastopore becomes mouth
 - (D) In both invertebrates and vertebrates, the anus is located in the posterior part of the body
 The incorrect statements are:
 - (a) A and B
 - (b) B and C
 - (c) B and D
 - (d) None
24. Ascidiacea, larvacea and thaliacea can be differentiated on the basis of:
 - (a) Solitary or colonial habit
 - (b) Number of pharyngeal gill slits
 - (c) Nature of metamorphosis and organisation of tunic
 - (d) All
25. Consider the following statements:
 - (A) Animals having notochord are called chordates
 - (B) Notochord is a rod-like structure

- (C) Notochord lies dorsal to the gut but ventral to the central nervous system
(D) Notochord acts as support during locomotion

The correct statements are:

- (a) All (b) B, C and D (c) A, B and D (d) A and D

26. Which one of the following is not an ascidicean?

- (a) *Herdmania* (b) *Ciona* (c) *Pyrosoma* (d) *Molgula*

27. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Pit of Hatschek	1. <i>Pyrosoma</i>
(B) Neural gland	2. <i>Doliolum</i>
(C) Alternation of generation	3. <i>Amphioxus</i>
(D) Larval stage is lacking	4. <i>Herdmania</i>

Answer codes:

	A	B	C	D
(a)	3	4	2	1
(b)	4	3	1	2
(c)	2	4	1	3
(d)	3	4	1	2

28. Ascidiceans lack:

- (a) Liver (b) Endostyle (c) Typhlosole (d) Pyloric gland

29. Invertebrate chordate is applicable to:

- (a) Cephalochordates (b) Hemichordates (c) Urochordates (d) All

30. Which one of the following is lacking in hagfishes?

- (a) Pineal eye (b) Urogenital sinus (c) Choroid plexus (d) All

31. Thread cells are found in:

- (a) *Petromyzon* (b) *Myxine* (c) *Oikopleura* (d) *Pyrosoma*

32. Cranial nerves lacking in *Myxine* are:

- (a) Oculomotor, trochlear and abducens (b) Oculomotor, glossopharyngeal and vagus
(c) Olfactory, trochlear and abducens (d) Trochlear, abducens and facial

33. Echinoderms differ from chordates in having:

- (a) Radial symmetry (b) Water vascular system
(c) Skeletons made up of calcite (d) All

34. In tunicates, all organs are enclosed in a membrane, except:

- (a) Heart (b) Gonads (c) Pharynx (d) All

35. The digestive system of agnatha lacks:

- (a) Mouth (b) Pharynx (c) Stomach (d) Intestine

36. Which one of the following is a neotenous form?

- (a) *Oikopleura* (b) *Applendicularia* (c) *Kowalevskia* (d) All

37. Two sense organs are present in the larva of:

- (a) *Botryllus* (b) *Herdmania* (c) *Ciona* (d) *Styela*

38. Tunicin is lacking in:
(a) *Oikopleura* (b) *Salpa* (c) *Ciona* (d) *Botryllus*
39. The body of *Petromyzon* is covered with:
(a) Placoid scales (b) Cycloid scales (c) Ctenoid scales (d) Scales are absent
40. Gills are pouch-like in:
(a) Dipnoi (b) Cyclostomes (c) Cartilaginous fishes (d) Bony fishes
41. Which one of the following is incorrect about cyclostomes?
(a) Median fin is present
(b) Respiratory organs consist of gill pouches
(c) Conus arteriosus and renal portal system are present
(d) Gonad is unpaired and is devoid of gonoduct
42. Larva is freshwater while adult is marine in:
(a) *Herdmania* (b) *Oikoplura* (c) Lamprey (d) Dipnoi
43. The larva of *Petromyzon* is:
(a) Tornaria (b) Glochidium (c) Axolotl (d) Ammocoetus
44. *Petromyzon* is:
(a) Anadromous (b) Catadromous (c) Both (d) None
45. Branchial basket is found in:
(a) *Amphioxus* (b) *Balanoglossus* (c) *Petromyzon* (d) None
46. Cyclostomes are:
(a) Degenerated descendants of some forms of ostracoderms
(b) Degenerated descendants of urochordates
(c) Descendants of cephalochordates
(d) Descendants of Echinoderms
47. The number of nostrils in *Petromyzon* is:
(a) One (b) Two (c) Four (d) No nostril
48. Which one of the following leads an ectoparasitic life?
(a) *Herdmania* (b) *Petromyzon* (c) Dipnoi (d) Dogfish
49. Vertebrates have:
(a) Well-developed cranium (b) Vertebral column
(c) Special sense organs (d) All
50. Ostracodermi is:
(a) An extinct primitive class of vertebrates (b) A living class of primitive vertebrates
(c) A primitive pisces (d) A jawless group of vertebrates
51. Chordates with a backbone are called:
(a) Agnatha (b) Gnathostomata (c) Protochordates (d) Vertebrates
52. Amniota includes:
(a) Pisces and amphibian (b) Reptiles, birds and mammals
(c) Amphibia and reptilian (d) Birds and mammals
53. Number of cranial nerves in amniotes is:
(a) 8 pairs (b) 10 pairs (c) 12 pairs (d) 14 pairs

54. Number of cranial nerves in anamniotes is:
 (a) 5 pairs (b) 7 pairs (c) 10 pairs (d) 12 pairs
55. Cold-blooded groups of vertebrates are:
 (a) Pisces and amphibian (b) Pisces, amphibians and reptiles
 (c) Reptiles, birds and mammalian (d) Reptiles and birds
56. Which one of the following is a cold-blooded animal?
 (a) Lizard (b) Parrot (c) Human being (d) Rabbit
57. Which one of the following is different?
 (a) Frog, snake and lizard (b) *Scoliodon*, rohu and *Icthyophis*
 (c) Pigeon, cow and bat (d) Snake, crocodile and toad
58. In which one of the following does the body temperature remain constant?
 (a) Crocodile (b) Frog (c) Rohu (d) Bat
59. Agnathans are animals:
 (a) With jaws (b) Without jaws
 (c) Without well-organised organs (d) Without teeth
60. Specialised heart is absent in:
 (a) *Amphioxus* (b) *Scoliodon* (c) Snakes (d) *Icthyophis*
61. The connecting link between Echinoderms and Chordates is:
 (a) *Oikopleura* (b) *Archaeopteryx* (c) *Balanoglossus* (d) *Antedon*
62. The group that lacks flying and gliding animals is:
 (a) Cyclostomes (b) Pisces (c) Reptiles (d) Mammals
63. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|-----------------------|--------------------------------------|
| (A) Atrium is present | 1. Larva of <i>Herdmania</i> |
| (B) Bioluminescent | 2. <i>Amphioxus</i> |
| (C) Adhesive papillae | 3. <i>Pyrosoma</i> |
| (D) Wheel organ | 4. Urochordates and cephalochordates |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 2 | 3 | 1 | 4 |
| (b) 2 | 1 | 2 | 4 |
| (c) 3 | 4 | 1 | 2 |
| (d) 4 | 3 | 1 | 2 |
64. What is incorrect about thaliaeca?
 (a) Neotenous forms (b) Adults are devoid of notochord and tail
 (c) Distinct alternation of generation (d) Tunic bears muscle bands
65. Ascidians lack:
 (a) Red blood corpuscles (b) Capillaries
 (c) Ciliated wall of alimentary canal (d) All
66. In which one of the following animals does the direction of flow of blood in the heart change periodically?
 (a) *Myxine* (b) *Ascidia* (c) *Branchiostoma* (d) *Asymmetron*

67. Consider the following statements with reference to *Branchiostoma*:
- (A) Blood lacks cells
 - (B) Blood is colourless
 - (C) Respiratory pigment is absent
 - (D) Blood vessels are without any lining except the dorsal aorta
- The incorrect statements are:
- (a) A and B
 - (b) B and C
 - (c) B and D
 - (d) None
68. In which one of the following is the heart lacking?
- (a) *Appendicularia*
 - (b) *Kowalevskia*
 - (c) *Oikopleura*
 - (d) *Fritillaria*
69. Consider the following statements with reference to *Amphioxus*:
- (A) Transparent free-swimming oceanic animals with permanent tail
 - (B) Atrial cavity is present
 - (C) Budding takes place
 - (D) Development without metamorphosis
- The correct statements are:
- (a) All
 - (b) A, B and C
 - (c) B and D
 - (d) A and D
70. *Amphioxus* lacks:
- (a) Heart
 - (b) Liver
 - (c) Solenocytes
 - (d) Atrium
71. In which one of the following are amnion and allantois absent:
- (a) Amphibia
 - (b) Reptiles
 - (c) Birds
 - (d) Mammals
72. In vertebrates, the paired appendages are used for:
- (a) Swimming and walking
 - (b) Running and flying
 - (c) Grasping
 - (d) All
73. Which one of the following has a monocondylic skull?
- (a) Amphibia
 - (b) Reptilia
 - (c) Mammalia
 - (d) All
74. Dicondylic skull is found in:
- (a) Amphibians and reptiles
 - (b) Reptiles and birds
 - (c) Birds and mammals
 - (d) Amphibians and mammals
75. Kidney of amniotes is:
- (a) Archinephrous
 - (b) Mesonephrous
 - (c) Pronephrous
 - (d) Metanephrous
76. Kidney of *Petromyzon* is:
- (a) Archinephrous
 - (b) Pronephrous
 - (c) Mesonephrous
 - (d) Metanephrous
77. In which one of the following is there no regulatory system for body temperature?
- (a) Reptiles, amphibians and pisces
 - (b) Reptiles, birds and mammals
 - (c) Amphibians, reptiles and mammals
 - (d) Pisces and amphibians
78. Which one of the following statements is not true about *Petromyzon*?
- (a) They are also known as lampreys.
 - (b) They retain notochord throughout their lives.
 - (c) They are jawless.
 - (d) They possess bony skeleton.
79. In which one of the following groups is notochord only present during embryonic development?
- (a) Cephalochordata
 - (b) Hemichordata
 - (c) Agnatha
 - (d) Gnathostomata

80. Suctorial mouth is present in:
(a) *Amphioxus* (b) *Petromyzon* (c) Flying fish (d) Dipnoi
81. In *Myxine*:
(a) Buccal funnel is present (b) Dorsal fin is present
(c) Pineal eye is present (d) None
82. A tailed larva is lacking in:
(a) *Pyrosoma* (b) *Clavellina* (c) *Doliolum* (d) *Ascidia*
83. Which one of the following is not applicable to urochordates?
(a) Ciliary feeders (b) Vandocytes
(c) Closed blood vascular system (d) Retrogressive metamorphosis
84. Urochordates lack:
(a) Cephalisation (b) Appendages (c) Segmentation (d) All
85. In which one of the following is the heart absent, but the circulatory system present?
(a) *Doliolum* (b) *Herdmania* (c) *Amphioxus* (d) None
86. Adult *Herdmania* lacks:
(a) Notochord (b) Dorsal tubular nerve cord
(c) Tail (d) All
87. Which one of the following is different?
(a) Crayfish (b) Devil fish (c) Hagfish (d) Silverfish
88. Metamerism is exhibited by:
(a) Annelida (b) Arthropoda (c) Chordata (d) All
89. Which one of the following is not applicable to *Petromyzoan*?
(a) Buccal funnel (b) Slime glands (c) Pancreas (d) Branchial basket
90. Endostyle is lacking in:
(a) *Kowalevskia* (b) *Appendicularia* (c) *Fritillaria* (d) *Oikopleura*
91. In which one of the following is the free-swimming period 90 to 180 seconds?
(a) *Molgula* (b) *Botryllus* (c) *Pelonaia* (d) *Clavellina*
92. Tunic is lacking in:
(a) *Doliolum* (b) *Pyrosoma* (c) *Botryllus* (d) None
93. The feeding current in *Branchiostoma* is:
(a) Mouth → pharyngeal gill slits → pharynx → atrium → atriopore → exterior
(b) Mouth → pharynx → atriopore → pharyngeal gill slits → atrium → exterior
(c) Mouth → pharynx → pharyngeal gill slits → atrium → atriopore → exterior
(d) Mouth → atrium → pharyngeal gill slits → pharynx → atriopore → exterior
94. What is incorrect about *Myxine*?
(a) Metamorphosis is absent
(b) Ill-developed branchial basket
(c) Only one semicircular is present
(d) Dorsal and ventral roots of the spinal nerves remain separate.

95. In lampreys, which of the following nerves are post cranial?
 (a) Oculomotor and trochlear (b) Trochlear and abducens
 (c) Trochlear and glossopharyngeal (d) Glossopharyngeal and vagus
96. Which one of the following is not a hagfish?
 (a) *Myxine* (b) *Lampricide* (c) *Eptatretus* (d) *Bdellostoma*
97. Which one of the following is not applicable to *Amphioxus*?
 (a) Enterocoelous coelom (b) Unisexual
 (c) Sexual dimorphism (d) Hepatic portal system
98. Agnathans possess:
 (a) Hepatic portal system (b) Renal portal system
 (c) Conus arteriosus (d) All
99. Gnathostomes have:
 (a) Jaws (b) Paired appendages (c) Skull (d) All
100. What is incorrect about thaliacea?
 (a) Free-swimming tunicates
 (b) Caudal appendages are present in the adult
 (c) Mouth and atriopore are located on the opposite ends of the body
 (d) Life cycle involves alternation of generation
101. Which one of the following is not applicable to *Doliolum*?
 (a) Polymorphism (b) Alternation of generation
 (c) Cladophore (d) Viviparous
102. The only animal with an exoskeleton that does not moult:
 (a) *Eptatretus* (b) Tunicates (c) Cephalochordates (d) None
103. Which one of the following is lacking in urochordates but present in cephalochordates?
 (a) Segmentation (b) Nephridia (c) Heart (d) All
104. Consider the following statements about larvacea:
 (A) Have a house they live in
 (B) House is regrown and shed regularly, generally in four hours or less
 (C) 4–16 houses are produced per day
 (D) One larvacean can remove 250,000 phytoplankton daily
 The incorrect statements are:
 (a) All (b) B and C (c) B and D (d) None
105. Atrium and atrial aperture are lacking in:
 (a) Ascidiacea (b) Larvacea (c) Thaliacea (d) Cephalochordata
106. What is incorrect about oozoid of *Doliolum*?
 (a) Barrel shaped (b) Gonads are present
 (c) Few large gill slits are present (d) There are 9 muscle bands
107. Which one of the following is viviparous?
 (a) *Clavellina* (b) *Phrynosoma* (c) *Phyllobates* (d) *Chelone*

108. What is incorrect about ascidiacea?

- (a) Solitary or colonial
- (b) Heart can pump blood in two directions
- (c) Have the ability to regenerate the entire body from a fragment
- (d) Reproduction is only sexual

109. Which one of the following is present only in *Amphioxus* and not in any other chordates?

- (a) Atriopore
- (b) Nephridium
- (c) Velum
- (d) None

Answers to Multiple-Choice Questions

1. (a)	2. (c)	3. (c)	4. (b)	5. (c)	6. (a)	7. (a)	8. (b)
9. (c)	10. (c)	11. (c)	12. (c)	13. (d)	14. (b)	15. (c)	16. (b)
17. (b)	18. (d)	19. (c)	20. (d)	21. (d)	22. (d)	23. (c)	24. (d)
25. (a)	26. (c)	27. (a)	28. (a)	29. (d)	30. (d)	31. (b)	32. (a)
33. (d)	34. (d)	35. (c)	36. (d)	37. (c)	38. (a)	39. (d)	40. (b)
41. (c)	42. (c)	43. (d)	44. (a)	45. (c)	46. (a)	47. (a)	48. (b)
49. (d)	50. (a)	51. (d)	52. (b)	53. (c)	54. (c)	55. (b)	56. (a)
57. (b)	58. (d)	59. (b)	60. (a)	61. (a)	62. (a)	63. (d)	64. (a)
65. (d)	66. (b)	67. (d)	68. (b)	69. (d)	70. (a)	71. (a)	72. (d)
73. (b)	74. (d)	75. (d)	76. (b)	77. (a)	78. (d)	79. (d)	80. (b)
81. (d)	82. (a)	83. (c)	84. (d)	85. (c)	86. (d)	87. (c)	88. (d)
89. (c)	90. (a)	91. (b)	92. (d)	93. (c)	94. (d)	95. (d)	96. (b)
97. (c)	98. (a)	99. (d)	100. (b)	101. (d)	102. (b)	103. (d)	104. (d)
105. (b)	106. (b)	107. (a)	108. (d)	109. (c)			

Fill in the Blanks

1. Notochord is limited only to the anterior part of the body in _____.
2. In _____, notochord is lost in adults.
3. In _____, notochord is present in the embryos but in later stages it is replaced by the backbone.
4. All chordates have _____ tail.
5. In chordates, the anterior end of nerves cord is often enlarged into a _____.
6. Urochordates are commonly known as _____.
7. *Yunnanozoon* is a fossil of _____.
8. An endostyle is a groove in the ventral wall of the _____.
9. Craniates have a distinct _____.

10. *Salpa* feeds on _____.
11. _____ are the only animals having the ability to create cellulose.
12. The oldest fossil chordates are of the _____ age.
13. Agnathan fishes appeared and diversified during the _____ period.
14. Fishes, amphibians, reptiles, birds and mammals are collectively known as the _____.
15. In lampreys, there are _____ pairs of gills and agnatha differs from fishes in lack of _____ and true _____.
16. Myotomes of *Amphioxus* are _____ shaped.
17. In *Amphioxus*, fertilisation is _____.
18. Ostracoderms lived during _____ and _____ periods.
19. Vandocyte cells are present in all urochordates, except _____.
20. Larva of *Petromyzon* is called _____.
21. In Agnatha, the internal ear contains _____ or _____ semicircular canals.
22. Gnathostomata includes _____ and tetrapoda.
23. In all craniata, the mandibular arch becomes modified into jaws except the _____.
24. In ascidiacea, a tailed larva is present, except _____ and _____.
25. In *Doliolum*, three types of zooids found are called _____, _____ and _____.
26. In cephalochordate and urochordata, the pharynx is highly specialised for performing _____ and _____.
27. In *Herdmania*, spicules are of two types, viz., _____ and _____.
28. Atrium is present in all invertebrate chordates, except _____.
29. In lampreys, there are _____ pairs of cranial nerves.
30. Kolliker's pit is found in _____.
31. In *Asymmetron*, gonads are located on the _____ side of the body.
32. The three classes of urochordata are _____, _____ and _____.
33. In lampreys, the heart is _____ shaped.
34. The only surviving agnathans are _____ and _____.
35. *Salpa* is found in two forms called _____ form and _____ form.
36. In *Doliolum*, the solitary phase is _____ gonozooid while gregaria phase is asexually _____.
37. The term 'chordate' was coined by _____.
38. In chordates, _____ provides energy for muscle contraction.
39. _____ is the largest subphylum of Chordata.
40. *Clavellina* is a connecting link between _____ and _____ ascidians.
41. Chordates are entirely aquatic, other than _____.
42. Agnatha differs from fishes in lack of _____ and true _____.

Answers to Fill in the Blanks

1. Cephalochordates	2. Tunicates	3. Vertebrates
4. Post-anal	5. Brain	6. Sea squirts
7. Cephalochordate	8. Pharynx	9. Skulls
10. Planktons	11. Tunicates	12. Cambrian
13. Ordovician	14. Vertebrates	15. Seven
16. V	17. External	18. Silurian, Devonian,
19. <i>Herdmania</i>	20. Ammocoetes	21. One, two
22. Pisces	23. Agnatha	24. <i>Molgula</i> , <i>Pelonaia</i>
25. Trphozooids, phorozoids	26. Food collection, respiration and gonozooids	27. Microscleres, megascleres
28. Hemichordates	29. 10	30. <i>Branchiostoma</i>
31. Right	32. Ascidiacea, larvacea, thaliacea	33. S
34. Lampreys, hagfishes	35. Oozoid (Solitary), Blastozoid (aggregate)	36. Sexual, oozoid
37. Balfour (1880)	38. Creatine phosphate	39. Vertebrata
40. Simple, compound	41. Craniates	42. Paired fins

True or False

1. Notochord is a solid structure.
2. All chordates are deuterostome.
3. *Amphioxus* is eaten by humans in some parts of the world.
4. Most chordates are vertebrates.
5. All tunicates are marines and filter-feeding animals.
6. Tunicates have myomeric segmentation.
7. Tunicates start their life cycle in a mobile larval stage.
8. Usually tunicates are hermaphrodites.
9. Chordates have an exoskeleton.
10. The smallest chordates, like some of the tunicates and gobioid fishes, mature at a length of about 1 cm.
11. Agnatha are the oldest known vertebrates.
12. In hagfishes, the circulatory system is closed.
13. Blood of hagfishes is isotonic to seawater.
14. Sea squirts are hermaphrodite and fertilisation is external.

15. Some thaliaceans are luminescent.
16. *Clavellina* lacks tadpole-like larval form.
17. *Salpa* shows alternation of generation.
18. In *Salpa*, muscle bands are in the form of complete rings.
19. A tailed larval stage is present in the life cycle of *Doliolum*.
20. *Pyrosoma* reproduces by budding.
21. *Herdmania* is a colonial tunicate.
22. The tadpole larva of *Ascidia* is highly motile and a voracious eater.
23. In *Ascidia mentula*, self-fertilisation takes place.
24. *Petromyzon* and *Myxine* are hermaphrodite.
25. The blastozooids of *Salpa* are gregarious.
26. *Amphioxus* is a sand-burrowing creature.
27. In cephalochordates, the coelom is reduced.
28. Nostrils are paired in *Petromyzon*.
29. Gonoducts are lacking in *Amphioxus*.
30. Jaws and paired appendages are present in gnathostomata.
31. In protochordates, the coelom is schizocoelous.
32. *Pyrosoma* is a colonial tunicate.
33. In *Pyrosoma*, development is direct.
34. Multiplication by budding is common in tunicates.
35. In *Herdmania*, test acts as an accessory respiratory structure.
36. Neural crest cells are present in invertebrate chordates.
37. All nerve fibres in lampreys are devoid of the myelin sheath.
38. In adult lampreys, the gall bladder and bile ducts disappear.
39. Lampreys lack lateral line sense organs.
40. Lateral line branch of vague is lacking in hagfishes.
41. In hagfishes, blood vessels are present within the spinal cord.
42. A spiral valve is present in the intestine of *Myxine*.
43. In *Herdmania*, the neural gland is located ventral to the nerve ganglion.
44. In *Branchiostoma*, digestion is both intracellular and extracellular .
45. In *Branchiostoma*, the cleavage is holoblastic, which may be equal or unequal.

Answers to True or False

1. True	2. True	3. True	4. True	5. True	6. False	7. True	8. True
9. False	10. True	11. True	12. False	13. True	14. False	15. True	16. False
17. True	18. False	19. True	20. True	21. False	22. False	23. True	24. False
25. True	26. True	27. True	28. False	29. True	30. True	31. False	32. True
33. False	34. True	35. True	36. False	37. True	38. True	39. False	40. True
41. True	42. False	43. False	44. True	45. True			

Give Reasons

- In ascidiacea, there is no differentiation between blood and tissue fluids.
 - Because they lack capillaries but sinuses are present so there is free intermixing of blood and tissue fluids.
- Herdmania* is known as sea squirt.
 - Because when disturbed, it emits a jet of water through both of its apertures – the branchial aperture and atrial aperture.
- Taxonomically, the tadpole larva of ascidians is very important.
 - Because it is the tadpole larva which provides the basis of inclusion of ascidians under the phylum Chordata as they possess well-developed chordate characters, which are lacking in adult ascidians.
- In ascidians, the direction of flow of blood through the heart changes periodically.
 - Because of the reversal of peristalsis of heart muscles.
- Urochordates are also called tunicates.
 - Because they possess a tough nonliving test or tunic that surrounds the animals.
- Echinoderms are close to chordates.
 - Because of the following similarities:
 - Enterocoelous origin of coelom
 - Presence of chordate features in fossil Echinoderms (*Cotylelocystis*)
 - Presence of phosphogens in Echinoderms and *Branchiostoma*
 - Indeterminate cleavage
 - Deuterostome development
- Hagfishes are not regarded as vertebrates.
 - Because in all vertebrates, the dorsal hollow tubular nerve cord is surrounded by cartilaginous or bony vertebrae but in hagfishes, the notochord is reduced.
- Amphioxus* is commonly called lancelet.
 - Because of its short and tapered body.
- Chordates can grow continuously without moulting.
 - Because they have an endoskeleton.

10. The body of lampreys is soft.
 - Because scales are absent and mucous glands are present in the skin.
11. Agathans differ from fishes.
 - Because they lack jaws and paired fins.
12. Hagfishes are called scavengers of the sea.
 - Because they feed on dead or dying animals like Annelids, Molluscs, crustaceans and fish.

FISHES

Multiple-Choice Questions

1. Which one of the following is applicable to fishes?
(a) Jawed vertebrates (b) Ectothermic (c) Paired fins (d) All
2. Fishes originated during the:
(a) Ordovician period of the Palaeozoic era (b) Devonian period of the Palaeozoic era
(c) Carboniferous period of the Palaeozoic era (d) Jurassic period of the Mesozoic era
3. Which one of the following is known as a living fossil?
(a) *Latimeria* (b) Dipnoi (c) *Ostracoderm* (d) *Remora*
4. The common name of *Scoliodon* is:
(a) Flying fish (b) Cuttlefish (c) Dogfish (d) Devil fish
5. Which one of the following is correct about catfish?
(a) Placoid scales are present (b) Cycloid scales are present
(c) Ctenoid scales are present (d) Scales are absent
6. Pharyngeal gill slits are present in:
(a) Dogfish (b) Devil fish (c) Jellyfish (d) Silverfish
7. Which one of the following is a true fish?
(a) Silverfish (b) Crayfish (c) Flying fish (d) Devil fish
8. Dogfish is :
(a) A freshwater bony fish (b) A marine cartilaginous fish
(c) A marine bony fish (d) An extinct fish
9. Ampulla of Lorenzini is a:
(a) Thermoreceptor (b) Mechanoreceptor (c) Chemoreceptor (d) Photoreceptor
10. Dipnoans are:
(a) Marine lobed finned fish (b) Freshwater lobed finned fish
(c) Freshwater cartilaginous lobed finned fish (d) Freshwater primitive fish
11. Which one of the following is different?
(a) *Protopterus* (b) *Neoceratodus* (c) *Lepidosiren* (d) *Latimeria*
12. Which one of the following is absent in a cartilaginous fish?
(a) Operculum (b) Pelvic fin (c) Pectoral fin (d) Placoid scale
13. Consider the following statements about *Hexanchus*:
(A) Most primitive living shark (B) Inhabits warm water
(C) Jaw suspension is amphistylic (D) Viviparous and placenta present

The incorrect statements are:

- (a) A and D (b) B and C (c) B and D (d) D
14. All tissues of elasmobranchs can synthesise urea, except:
(a) Brain (b) Kidney and liver (c) Brain and blood (d) Blood and kidney
15. Bull shark (*Carcharhinus leucas*) is found in:
(a) Seawater (b) Freshwater (c) Deltas (d) All
16. Which one of the following fishes can extract oxygen from water as well as from air?
(a) Lungfish (b) Bombay duck (c) Clownfish (d) Flute fish
17. Lungfish lack:
(a) Symmetrical diphyccercal tail (b) Separate dorsal fin
(c) Renal portal system (d) Spiral valve in the intestine
18. Which one of the following is an incorrect match?
(a) *Amia* – Amphicoelous centra (b) *Polypterus* – Ganoid rhombic scales
(c) *Polyodon* – Bony scutes and barbels (d) *Lophius* – Phosphorescent organs
19. Stomach is lacking in:
(a) *Gambusia* (b) *Fundulus* (c) *Labrus* (d) All
20. Fishes are cold-blooded, except:
(a) Tuna (b) Swordfish (c) Both a and b (d) None
21. Which one of the following is applicable to teleosts?
(a) Sucking jaw action (b) Air bladder
(c) Clasper (d) Heterocercal tail
22. Holocephali lacks:
(a) Spiracle opening (b) Cloaca (c) Ribs (d) All
23. The fish known to have evolved first was:
(a) *Ostracoderm* (b) *Latimeria* (c) *Gambusia* (d) *Polypterus*
24. Air bladder is a:
(a) Hydrostatic organ of a cartilaginous fish (b) Hydrostatic organ of a bony fish
(c) Hydrostatic organ of a lamprey (d) Hydrostatic organ of a whale
25. In which one of the following is the spiral valve lacking in the conus arteriosus?
(a) *Protopterus* (b) *Neoceratodus* (c) *Lepidosiren* (d) All
26. Catadromous fish migrates from:
(a) River to sea (b) Sea to river (c) River to estuary (d) Estuary to sea
27. Anadromous fish migrates from:
(a) Estuary to river (b) Sea to estuary (c) River to sea (d) Sea to river
28. Heart of a fish is:
(a) One chambered (b) Two chambered (c) Three chambered (d) Four chambered
29. Which one of the following is a correct statement?
(a) The skeleton of *Scoliodon* is bony. (b) Clasper is present in bony fishes.
(c) The heart of a fish is venous type. (d) In sharks, the scales are cycloid.
30. An incorrect statement regarding *Scoliodon* is:
(a) It is a marine cartilaginous fish (b) It has clasper
(c) Operculum is present in it (d) Scroll valve is present in its intestine

31. Fishes without scales and having sensory barbels around the mouth are called:
 (a) Dogfish (b) Catfish (c) Dipnoi (d) Flying fish
32. Teleosts are characterised by the presence of:
 (a) Operculum (b) Air bladder (c) Both a and b (d) Clasper
33. Air bladder is not associated with:
 (a) Respiration (b) Excretion (c) Movement (d) Sound production
34. Electric fish is the common name of:
 (a) *Labeo* (b) *Pristis* (c) *Torpedo* (d) *Scoliodon*
35. Which one of the following is found both in elasmobranchs and holocephali?
 (a) Conus arteriosus (b) Rectal glands
 (c) Separate urinary and spermatid ducts (d) All

36. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Scale-less fish	1. Salmon
(B) Lobed fins	2. <i>Hippocampus</i>
(C) Prehensile tail	3. <i>Latimeria</i>
(D) Migratory fish	4. Catfish

Answer codes:

A	B	C	D
(a) 3	4	1	2
(b) 4	3	2	1
(c) 2	4	1	2
(d) 4	3	2	1

37. What is incorrect about *Latimeria*?
 (a) Single representative of the coelacanthus (b) Living fossil
 (c) Rostral sense organ present (d) The rostral sense organ is connected with olfactory organ
38. *Scoliodon* lacks:
 (a) Ampulla of Lorenzini (b) Mermaid's purse
 (c) Maltase cross (d) Homocercal caudal fin

39. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Shagreen	1. <i>Pleuronectes</i>
(B) Tongue is lacking	2. <i>Echeneis</i>
(C) Adhesive disc	3. Rohu
(D) Air bladder is lacking in adults	4. <i>Scoliodon</i>

Answer codes:

A	B	C	D
(a) 4	1	2	3
(b) 3	4	1	2
(c) 2	3	1	4
(d) 4	3	2	1

40. Consider the following statements:
 (A) Fishes are the first jawed vertebrates
 (C) Fishes are anamniotes
 The incorrect statements are:
 (a) A and C (b) B and C (c) A, C and D (d) None
 (B) Devonian is regarded as the golden age of fishes
 (D) Fishes lack urinary bladder
41. Electric organ of *Torpedo* is modified:
 (a) Muscle cells (b) Nerve cells (c) Scales (d) Neuromast cells
42. Which one of the following fishes contains high levels of mercury?
 (a) Swordfish (b) Tuna (c) Salmon (d) Catfish
43. Brood pouch is the characteristic of:
 (a) *Scoliodon* (b) *Hippocampus* (c) *Gambusia* (d) *Anabas*
44. Elasmobranchs include:
 (a) Sharks, rays and skates (b) Sharks, *Polypterus* and *Gadus*
 (c) Sharks, rays, skates and *Chimaera* (d) Sharks, skates and *Latimeria*
45. Parental care is shown by:
 (a) Male *Hippocampus* (b) Female *Hippocampus*
 (c) Male *Scoliodon* (d) Male *Mugil*
46. Which one of the following is a true fish?
 (a) Sea cow (b) Sea pen (c) Sea horse (d) Sea cucumber
47. Liver oil is a rich source of:
 (a) Vitamin A (b) Vitamin D (c) Vitamin B₁₂ (d) Calcium
48. A fish found in deep sea:
 (a) *Pleuronectes* (b) *Protopterus* (c) *Pristis* (d) *Syngnathus*
49. The unique feature of a fish's heart is that it has:
 (a) Only venous blood (b) Only arterial blood
 (c) No blood at all (d) Mixed blood
50. The important features of fishes are:
 (a) Presence of paired fins with fin rays (b) Presence of gills borne on gill arches
 (c) Venous heart (d) All
51. Which one of the following is viviparous?
 (a) *Anguilla* (b) *Syngnathus* (c) *Hippocampus* (d) *Scoliodon*
52. The nitrogenous waste product of fishes are:
 (a) Ammonia (b) Urea
 (c) Both ammonia and urea (d) Uric acid
53. *Anguilla* migrates from:
 (a) River to sea (b) Sea to river (c) Estuary to sea (d) Sea to estuary
54. *Leptocephalus* is the larval form of:
 (a) *Anguilla* (b) *Polypterus* (c) *Salmon* (d) *Pristis*
55. Consider the following statements about *Lepisosteus*:
 (A) Presence of long jaws (B) Presence of spiral valve in the intestine
 (C) Swim bladder is lacking (D) Spiracle is lacking

The correct statements are:

- (a) All (b) A, B and C (c) A and B (d) A, B and D

56. Fertilisation is internal and occurs through copulatory organs in:

- (a) Elasmobranchs (b) Holocephali (c) A few teleosts (d) All

57. The scales become modified into protective spines in:

- (a) *Hippocampus* (b) *Tetradon* (c) *Syngnathus* (d) *Acanthurus*

58. Which one of the following is lacking in elasmobranchs?

- (a) Operculum (b) Pectoral fin (c) Scales (d) Neuromast organ

59. Fishes lack:

- (a) Neck (b) Tympanum (c) Eyelids (d) All

60. Match the column I with column II and select the correct answer using answer codes:

Column I

- (A) *Scoliodon*
(B) *Carcharodon*
(C) *Pristiophorus*
(D) *Rhinobatis*

Column II

1. Found only in cold and deep water
2. In males pelvic fins are modified into claspers
3. Man-eating shark
4. Enlarged pectoral fin

Answer codes:

	A	B	C	D
(a)	4	2	1	3
(b)	2	3	1	4
(c)	3	4	2	1
(d)	4	3	2	1

61. Chondrichthyes lack:

- (a) Air bladder (b) Ampulla of Lorenzini
(c) Rectal gland (d) Conus arteriosus

62. Which one of the following statements is incorrect?

- (a) The teeth of sharks are modified large placoid scales.
(b) The teeth of sawfish are formed by placoid scales.
(c) The sting of stingray is a modified placoid scale.
(d) None

63. Which one of the following is found in India?

- (a) *Protopterus* (b) *Neoceratodus* (c) *Lepidosiren* (d) None

64. What is incorrect about *Amphipnous*?

- (a) Eel-like body (b) Paired fins are lacking
(c) Swim bladder and pyloric caeca are absent (d) None

65. Which one of the following undergoes aestivation during unfavourable condition?

- (a) *Protopterus* (b) *Anguilla* (c) *Scoliodon* (d) *Hippocampus*

66. The sucker of *Remora* is a modified:

- (a) Pectoral fin (b) Pelvic fin (c) Dorsal fin (d) Caudal fin

67. Mermaid's purse is found in:

- (a) Sharks (b) Skates (c) Both sharks and skates (d) Dipnoi

68. *Gambusia* is popularly known as:
 (a) Ratfish (b) Pipefish (c) Mosquitofish (d) Porcupinefish
69. Lungfish includes:
 (a) *Protopterus*, *Neoceratodus* and *Lepidosiren* (b) *Protopterus* and *Latimeria*
 (c) *Neoceratodus* and *Pristis* (d) *Protopterus*, *Neoceratodus*, *Lepidosiren* and *Sphyrna*.
70. Caviar is obtained from:
 (a) *Acipenser* (b) *Amia* (c) *Polypterus* (d) *Birgeria*
71. The correct match is:
 (a) Operculum – Bony fish (b) Clasper – Rohu
 (c) Electric organ – Sawfish (d) Brood pouch – Dipnoi
72. Dipnoans are:
 (a) Not found in India (b) Represented by three genera
 (c) Devoid of operculum (d) All
73. Which one of the following is popularly known as a climbing perch?
 (a) *Anabas* (b) *Clarius* (c) *Heteropneustes* (d) *Amia*
74. Accessory respiratory organ is found in:
 (a) *Anabas* (b) *Clarius* (c) *Heteropneustes* (d) All
75. Brood pouch is found in:
 (a) Male sea horse (b) Female sea horse (c) Female *Scoliodon* (d) Suckerfish
76. Pisces are:
 (a) Largest class of vertebrates (b) Smallest class of vertebrates
 (c) First group of vertebrates (d) First group of amniotes
77. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Agglomerular kidneys	1. <i>Hepttranchus</i>
(B) Predator of mosquito larvae	2. <i>Chimaera</i>
(C) Viviparous	3. <i>Gambusia</i>
(D) Cephalic clasper	4. Pipefish
- Answer codes:

A	B	C	D
(a) 4	3	1	2
(b) 2	3	4	1
(c) 3	4	1	2
(d) 2	3	4	1
78. In which one of the following is the blood colourless?
 (a) *Champscephalus* (b) *Chanocephalus*
 (c) *Pseudochanichthys* (d) All
79. Among sharks, the longest gestation period is found in:
 (a) Dogfish (b) Bull shark (c) Horn shark (d) Whale shark
80. *Lophius piscatorius* is commonly known as:
 (a) Frogfish (b) Devil fish (c) Angler fish (d) All

81. In which one of the following fishes is the swim bladder neither a hydrostatic, nor a respiratory organ?
(a) *Latimeria* (b) *Neoceratodus* (c) *Polypterus* (d) None
82. Which one is a freshwater aglomerular fish?
(a) *Microphis boaja* (Pipefish) (b) *Labeo kalbasu* (Kalbosh fish)
(c) *Notopterus chitala* (Chital fish) (d) *Channa striatus* (Shole fish)
83. Weberian apparatus is lacking in:
(a) Goldfish (b) Scorpionfish (c) Pipefish (d) Flying fish
84. Which one of the following fishes bear an admixture of primitive and specialised characters?
(a) *Polypterus* (b) *Anabas* (c) *Amia* (d) *Rhizodus*
85. There is a single dorsal fin in:
(a) *Hexanchus* (b) *Chlamydoselanchus*
(c) *Heptranchias* (d) All
86. In fishes, fins help in:
(a) Swimming
(b) Stabilising the body during stationary condition
(c) Stabilising the body in water during swimming
(d) All
87. Neotenuous condition is shown by:
(a) *Gadusia chapra* (b) *Mugil parsia* (c) *Clariallabes* (d) *Polynemus*
88. Which one of the following is known as Indian carp?
(a) *Torpedo* (b) Salmon (c) *Labeo* (d) *Sphyrna*
89. Commensalism is shown by:
(a) *Remora* (b) Dipnoi (c) *Syngnathus* (d) *Exocoetus*
90. Lateral line system is present in:
(a) Marine fishes (b) Freshwater fishes (c) Larvae of fishes (d) All
91. Tail is prehensile in:
(a) *Hippocampus* (b) *Exocoetus* (c) *Syngnathus* (d) *Sphyrna*
92. Parental care is highly developed in:
(a) Dipnoi (b) *Tilapia* (c) Cartilaginous fishes (d) *Harpodon*
93. The age of a fish can be determined:
(a) With the help of scales
(b) Measuring the size of the body
(c) With the help of the amount of food consumed
(d) By the type of the tail
94. Which one of the following is not a protective device in fishes?
(a) Electric organ and phosphorescent organ (b) Poison gland
(c) Colouration (d) Maltase cross
95. Organs of Fahrenholz are found in:
(a) Larval dipnoi (b) Larval bony fishes (c) Skates (d) Sharks
96. Neuromast organs are:
(a) Thermoreceptor (b) Rheoreceptor (c) Photoreceptor (d) Auditory organ

97. The air bladder is modified into lungs in:
 (a) *Neoceratodus* (b) *Protopterus* (c) *Lepidosiren* (d) All
98. Maltase cross is found in:
 (a) Vertebrae of shark (b) Brain of shark
 (c) Clasper of shark (d) Alimentary canal of shark
99. A fish lacks:
 (a) Head (b) Neck (c) Trunk (d) Tail
100. Consider the following statements:
 (A) Scale size vary in different fish species
 (B) Some species of flatfish have ctenoid scales on the eyed side of the body while cycloid scale on the opposite of the eyed side
 (C) Scale type may vary with the sex
 (D) In some species of flatfish, males have ctenoid scales while females have cycloid scales
 The incorrect statements are:
 (a) A and B (b) B, C and D (c) C and D (d) None
101. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Oophagy	1. <i>Clariallabes petricola</i>
(B) Stomach is lacking	2. <i>Holocephali</i>
(C) Neoteny	3. <i>Anableps tetrophthalmus</i>
(D) Four-eyed fish	4. Pelagic thresher

 Answer codes:

A	B	C	D
(a) 4	1	3	2
(b) 3	4	2	1
(c) 2	3	4	1
(d) 4	2	1	3
102. In which one of the following are external gills present?
 (a) Juvenile bichirs (b) *Lepidosiren* (c) *Carcharodon* (d) *Pristiophours*
103. Members of this family are able to absorb oxygen through the digestive tract:
 (a) *Callichthyidae* (b) *Loricaridae* (c) *Scoloplacidae* (d) All
104. Which one of the following is used for purification of wine and beer?
 (a) Fish emulsion (b) Fish glue (c) Isinglass (d) All
105. Match column I with column II and select the correct answer using answer codes:

Column I (Mating system)	Column II (Fish)
(A) Monogamy	1. Herrings
(B) Polygamy	2. Hawkfish
(C) Polyandry	3. Sunfish
(D) Polygynandry	4. Anemone fish

 Answer codes:

A	B	C	D
(a) 2	3	4	1

- (b) 4 2 1 3
(c) 3 4 2 1
(d) 2 4 1 3

106. Pelvic, ventral and caudal fins are lacking in:

- (a) *Anguilla* (b) *Neoceratodus* (c) *Hippocampus* (d) *Anabas*

107. Which one of the following scales is absent in bony fishes?

- (a) Placoid (b) Cycloid (c) Ctenoid (d) Ganoid

108. Tympanum, tympanic cavity and ear ossicles are:

- (a) Present in fishes (b) Absent in fishes
(c) Present only in dipnoi (d) Present only in larval forms of fishes

109. Which one of the following types of fishes is used in biological control of mosquitoes?

- (a) Salmon (b) *Anguilla* (c) *Gambusia* (d) *Pristis*

110. Commensalism is shown by:

- (a) *Echeneis* (b) *Pristis* (c) *Latimeria* (d) *Syngnathus*

111. Isinglass is obtained from:

- (a) Liver of fishes (b) Intestine of fishes
(c) Air bladder of certain fishes (d) Scales of certain fishes

112. Fishes are a good source of:

- (a) Protein (b) Carbohydrate (c) Fat (d) Vitamin E

113. Erythrocytes are absent in:

- (a) *Latimeria* (b) *Gambusia* (c) *Leptocephalus* (d) *Diodon*

114. Which one of the following is a bony fish?

- (a) Sawfish (b) Ratfish (c) Guitarfish (d) Suckerfish

115. Migration in fishes is mainly associated with:

- (a) Breeding (b) Feeding (c) Protection (d) None

116. If a fish like rohu is taken out of water, it will soon die, but at the same time, a fish like *Anabas*, if taken out of water, will survive for some time because:

- (a) It has stored oxygen
(b) It can use atmospheric oxygen as it has accessory respiratory organ
(c) Its gill is of a special type and can use atmospheric oxygen
(d) None

117. Which one of the following is known as Australian lungfish?

- (a) *Neoceratodus* (b) *Protopterus* (c) *Lepidosiren* (d) *Amia*

118. Poisonous spines are present on the operculum and on the dorsal fin in:

- (a) *Heteropneustes fossilis* (b) *Astroscopus*
(c) *Neoceratodus* (d) *Uranoscopus*

119. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) <i>Scoliodon</i>	1. Males guard eggs by coiling around eggs
(B) <i>Hippocampus</i>	2. Males brood the eggs
(C) <i>Pholis</i>	3. Larvivorous
(D) <i>Gambusia</i>	4. Viviparous

Answer codes:

	A	B	C	D
(a)	4	1	2	3
(b)	3	4	2	1
(c)	1	2	4	3
(d)	4	2	1	3

120. Which one of the following fishes exhibit migration for the purpose of spawning:
 (a) Salmon (b) *Hilsa* (c) *Anguilla* (d) All of these
121. Which one of the following is an incorrect pair?
 (a) *Scoliodon* – Placoid scale (b) *Mystus* – Giant river catfish
 (c) *Polypterus* – Cycloid scale (d) *Labeo* – Operculum
122. Dorsal fin is modified into an adhesive disc in:
 (a) *Pristis* (b) *Sphryna* (c) *Echeneis* (d) *Synaptura*
123. Which one of the following is known as a freshwater shark?
 (a) *Wallago* (b) *Labeo* (c) *Anguilla* (d) *Mystus*
124. The excretory and genital systems are completely separate in both sexes in:
 (a) *Scoliodon* (b) *Labeo* (c) *Labeo* and *Catla* (d) All of these
125. Which one of the following is correct about fishes?
 (a) Oviparity (b) Ovoviviparity (c) Viviparity (d) All of these
126. Which one of the following statements is incorrect?
 (a) *Lepisosteus* and *Amia* are freshwater forms.
 (b) In bony fishes, kidneys and gills play important roles in osmo and ionic regulation of ammonia and urea.
 (c) The body of *Polydon* is covered with placoid scales.
 (d) In *Lepidosiren*, during the breeding season males develop vascular papillae on the pelvic fin.
127. Consider the following statements with reference to rays and skates:
 (A) In rays and skates, pectoral fins are connected to the side of head forming a disc
 (B) Gill slits are located on the ventral side of the body
 (C) Electric organs are used by rays for communication
 (D) Electric organs can generate a shock of up to 200 volts
- The incorrect statements are:
 (a) All (b) A and B (c) B, C and D (d) None
128. Consider the statements with reference to mangrove killifish:
 (A) Mangrove killifish can live inside trees
 (B) Can change their body and metabolism, i.e., adjust to stay alive when out of water
 (C) Gills are altered to retain water and nutrients while they excrete nitrogen through their skin
 (D) They are hermaphrodite, having self-fertilisation
- The correct statements are:
 (a) B and C (b) A and C (c) C (d) All
129. Swim bladder is lacking in members of the family:
 (a) *Anguilliformes* (b) *Perciformes* (c) *Pleuronectiformes* (d) All

130. Match column I and column II and select the correct answer using answer codes:

Column I	Column II
(A) <i>Gastromyzon</i>	1. Pelvic fin is modified into claspers
(B) <i>Neoceratodus</i>	2. Pectoral fins are modified for sensory function
(C) <i>Polynemus</i>	3. Lobate leaf-like pectoral fins
(D) Skates and rays	4. Both paired fins participate in the formation of sucker

Answer codes:

A	B	C	D
(a) 2	3	4	1
(b) 4	3	2	1
(c) 3	4	1	2
(d) 4	2	3	1

131. A transitional condition of the swim bladder between the physostomous and physoclistous type is found in:

- (a) *Anguilla* (b) *Pleuronectes* (c) *Dipnoi* (d) *Polypterus*

132. Consider the following characters of *Lepisosteus*.

- (A) Presence of numerous small cheek plates (B) Opisthocoelous vertebrae
(C) Presence of pyloric caeca (D) Air bladder with cellular wall

Of these characters, the specialised characters are:

- (a) All (b) A and B (c) B and C (d) None

133. Which one of the following is not applicable to fishes?

- (a) Sinus venosus (b) Venous heart
(c) Single circulation (d) Extra embryonic membranes

134. Weberian apparatus is absent in:

- (a) Scorpionfish (b) Ribbonfish (c) Silver promfret (d) All

135. Which one of the following is a hermaphrodite fish?

- (a) *Hypoplecturus* (b) *Amia calva* (c) *Polymixia yuri* (d) *Holtbymia*

136. Ovaries, blood, eggs, liver intestine and skin of this fish contain poison which can be fatal:

- (a) Goldfish (b) Puffer fish (c) Porcupinefish (d) Ratfish

137. Which one of the following is commonly known as a ratfish?

- (a) *Pristis* (b) *Diodon* (c) *Chimaera* (d) *Carassius*

138. Which one of the following is an incorrect match?

- (a) Ganoid scales – *Lepidosteus* (b) Bony plates/scutes – *Hippocampus*
(c) Ability to change sex – *Amphiprion* (d) Electric organ – *Rhincodon*

139. Consider the following statements:

- (A) In fishes olfactory sacs play a key role in respiration
(B) Eye of teleosts lack *campanula Halleri*
(C) The body of *Fistularia* is covered with cycloid scales
(D) In elasmobranchs, thyroid is a paired structure

The correct statements are:

- (a) A, B and C (c) B and D (c) C and D (d) None

140. What is incorrect about intestinal bulb?
 - (a) Intestinal bulb is a characteristic feature of cyprinids
 - (b) It is an organ for storage of food
 - (c) It secretes digestive enzymes
 - (d) It contains absorptive and mucous secreting cells
141. Direct afferent and efferent blood connection is lacking in:
 - (a) *Polypterus*
 - (b) *Amia*
 - (c) *Labeo*
 - (d) All
142. Bitterling is applicable to:
 - (a) *Clarius*
 - (b) *Rhodeus*
 - (c) *Anguilla*
 - (d) *Clupea*
143. Campanula Halleri is associated with:
 - (a) Smell
 - (b) Respiration
 - (c) Excretion
 - (d) Process of accommodation
144. What is incorrect about *Polypterus*?
 - (a) Spiracles are present.
 - (b) A pair of gular plate is present.
 - (c) Pharyngeohypophyseal duct remains open through life.
 - (d) None
145. In which one of the following fishes are males attached with the various parts of the female, and the blood vascular system of each parasitic male and that of female host join together?
 - (a) *Vandellia*
 - (b) *Ceratias*
 - (c) *Carapus*
 - (d) *Polyodon*
146. External gills are found in:
 - (a) Young of *Polypterus*
 - (b) Larva of *Lepidosiren*
 - (c) *Necturus*
 - (d) All
147. Which one of the following has the ability to feed both inside the host as well as when away from the host?
 - (a) *Lophius*
 - (b) *Hexanchus*
 - (c) *Carpus*
 - (d) *Labrus*
148. An abdominal vein is present in:
 - (a) *Neoceratodus*
 - (b) *Lepidosiren*
 - (c) *Protopterus*
 - (d) All
149. Dipnoi differs from amphibians in having:
 - (a) Dermal scales
 - (b) Tooth plates
 - (c) Vomerine teeth
 - (d) Autostylic jaw suspension
150. Which one of the following shows sexual dimorphism?
 - (a) *Scoliodon*
 - (b) *Lepidosiren* (during breeding season)
 - (c) *Protopterus*
 - (d) *Neoceratodus*
151. Which one of the following sometimes penetrates the urethra of men if they micturate while in water?
 - (a) *Polyodon*
 - (b) *Vandellia*
 - (c) *Carapus*
 - (d) *Labrus*
152. Glassfish is applicable to:
 - (a) *Leptocephalus*
 - (b) *Labrus*
 - (c) *Carapus acus*
 - (d) *Lophius*
153. In which one of the following fishes is the amount of mineral so little that bones can be easily cut with a small knife?
 - (a) *Regalecus*
 - (b) *Mola*
 - (c) *Cyclopterus*
 - (d) All

154. What is incorrect about *Latimeria*?
 (a) Only surviving representative of coelacanthus (b) Body is covered with cosmoid scales
 (c) Tail is diphycercal type (d) Only one dorsal fin
155. Accessory organ is lacking in:
 (a) *Protopterus* (b) *Neoceratodus* (c) *Lepidosiren* (d) None
156. Spiral valve is either absent or vestigial in all teleosts except:
 (a) *Chirocentrus* (b) *Labrus* (c) *Amia* (d) *Clarias*
157. Which one of the following is incorrect about *Neoceratodus*?
 (a) Frontanellas are present (b) Does not aestivate
 (c) Monopneumous (d) No sexual dimorphism
158. Oviducts are lacking in:
 (a) Dipnoi (b) Salmonidae (c) Salmonidae and eels (d) None
159. What is incorrect about *Chimaera*?
 (a) Closed spiracle (b) Cephalic and pelvic claspers
 (c) Fleshy boneless skin flap or operculum (d) Viviparous
160. Guitarfish is applicable to:
 (a) *Rhinobatus* (b) *Trygon* (c) *Stegostoma* (d) *Hexanchus*
161. Which one of the following is not a ganoid fish:
 (a) *Polypterus* (b) *Anguilla* (c) *Polyodon* (d) *Amia*

Answers to Multiple-Choice Questions

1. (d)	2. (a)	3. (a)	4. (c)	5. (d)	6. (a)	7. (c)	8. (b)
9. (a)	10. (b)	11. (d)	12. (a)	13. (d)	14. (c)	15. (d)	16. (a)
17. (b)	18. (c)	19. (d)	20. (c)	21. (b)	22. (d)	23. (a)	24. (b)
25. (b)	26. (a)	27. (d)	28. (b)	29. (c)	30. (c)	31. (b)	32. (c)
33. (b)	34. (c)	35. (d)	36. (b)	37. (d)	38. (d)	39. (d)	40. (d)
41. (a)	42. (a)	43. (b)	44. (c)	45. (a)	46. (c)	47. (b)	48. (a)
49. (a)	50. (d)	51. (d)	52. (c)	53. (a)	54. (a)	55. (d)	56. (d)
57. (b)	58. (a)	59. (d)	60. (b)	61. (a)	62. (d)	63. (d)	64. (d)
65. (a)	66. (c)	67. (a)	68. (c)	69. (a)	70. (a)	71. (a)	72. (d)
73. (a)	74. (d)	75. (a)	76. (a)	77. (a)	78. (d)	79. (a)	80. (d)
81. (a)	82. (a)	83. (b)	84. (c)	85. (d)	86. (d)	87. (c)	88. (c)
89. (a)	90. (d)	91. (a)	92. (b)	93. (a)	94. (d)	95. (a)	96. (b)
97. (d)	98. (a)	99. (b)	100. (d)	101. (d)	102. (a)	103. (d)	104. (c)
105. (a)	106. (c)	107. (a)	108. (b)	109. (c)	110. (a)	111. (c)	112. (a)
113. (c)	114. (d)	115. (a)	116. (b)	117. (a)	118. (d)	119. (d)	120. (d)
121. (c)	122. (c)	123. (a)	124. (c)	125. (d)	126. (c)	127. (d)	128. (d)
129. (d)	130. (b)	131. (a)	132. (b)	133. (d)	134. (d)	135. (a)	136. (b)
137. (c)	138. (d)	139. (d)	140. (c)	141. (b)	142. (b)	143. (d)	144. (c)

145. (b) 146. (d) 147. (c) 148. (a) 149. (b) 150. (c) 151. (b) 152. (a)
 153. (d) 154. (d) 155. (b) 156. (a) 157. (a) 158. (c) 159. (d) 160. (a)
 161. (b)

Fill in the Blanks

1. _____ is the study of scales.
2. The study of fishes is called _____.
3. Air bladder arises from the dorsal wall of the _____.
4. The body of all fishes is covered by scales, except the members of family _____ and some bottom dwellers.
5. In chondrichthyes, the caudal fin is _____.
6. Bombay duck belongs to the order _____.
7. The body of members of the order belontiiformes is covered with _____ scales.
8. In osteichthyes, jaw suspension is mostly _____.
9. The members of the order cypriniformes are characterised by the presence of unique _____ present between the ear and swim bladder.
10. _____ and _____ scales are found in most bony fishes.
11. In fishes, blood in the capillaries flows in a direction opposite to the flow of water, known as _____.
12. Fishes have _____ circulatory system.
13. The scales of fishes are _____ in origin.
14. Actinopterygians may have _____ or _____ or _____ scales, or are without scales.
15. Cartilaginous fishes have _____ pairs of gill slits.
16. Taste buds of catfish are concentrated on _____.
17. The earliest vertebrates to develop jaws were called _____.
18. The *Chimaera* is a primitive type of _____ fish.
19. _____ is the fastest fish.
20. Most fish-eating fishes have _____ mouth.
21. Bottom-feeder fishes have _____ mouth.
22. Surface-feeder fishes have _____ mouth.
23. _____ is the slowest fish.
24. Placoid scales are made up of _____ and _____.
25. All fins of *Latimeria* are lobed, except for the _____ ones.

26. Cartilaginous fishes with operculum are called _____.
27. _____ is the largest fish.
28. In elasmobranchii, the oviducts are called _____ ducts.
29. Fishes that tolerate a narrow range of salinity are called _____.
30. An odd fish living on land, called _____, belongs to the family aptocheiidae.
31. *Amphipnous cuchia* lacks _____ fins as well as dorsal and ventral fins and are devoid of fin rays.
32. In holocephali, the cleavage is _____.
33. Salmon shows _____ migration.
34. In placoderms, jaw suspension is _____.
35. In _____, the dorsal fin is divided into a number of finlets.
36. In _____ and _____, the dorsal fins are totally lacking.
37. _____ type of caudal fin is considered to be the most primitive type.
38. In *Acipenser*, the caudal fin is fully _____.
39. The sound perception is better in those fishes which possess _____ in comparison to those which lack them.
40. The electric organs of *Astroscopus* are modified _____ muscles.
41. In elasmobranchs, the retinal layer lacks cones except _____ and _____.
42. Organs of Fahrenholz are found in _____ dipnoi.
43. Anal fin is divided into two parts in _____.
44. Three major types of caudal fins in different fishes are _____, _____ and _____.
45. In the adult *callorhynchus*, the tail is _____ type, but _____ type in its young ones.
46. The inner position of the intestine of *Scoliodon* is folded to form an anticlockwise spiral called _____.
47. Depending upon the presence or absence of duct, the swim bladder may be of two types, viz., _____ and _____.
48. Fishes originated during the _____ period of the Palaeozoic era.
49. Type of fish known to have evolved first was _____.
50. *Latimeria* was first caught at the coast of _____ in 1938.
51. Labyrinth organ is an _____ organ.
52. Clownfish (*Amphiprion*) lives in symbiosis with _____.
53. Puffer fish contains a deadly poisonous toxin called _____.
54. The world's most venomous fish is _____.
55. In electric fish, the electric organ is a _____ organ.
56. On the ventral surface of snout of the electric rays are found special type of sense organs called _____.
57. Skates and rays are _____ elasmobranchs.
58. In fishes, milt is a group of _____.

Answers to Fill in the Blanks

1. Squamatology	2. Ichthyology	3. Gut
4. Siluridae	5. Heterocercal	6. Scopeliformes
7. Cycloid	8. Amphistylic	9. Weberian apparatus
10. Cycloid, ctenoid	11. Counter current exchange	12. Closed
13. Mesodermal	14. Cycloid, ctenoid, ganoid	15. 4–7
16. Barbles	17. Placoderms	18. Chondrichthyes
19. Sailfish	20. Terminal	21. Subterminal
22. Supraterminal	23. Sea horse	24. Enamel, dentine
25. Dorsal	26. Holocephali	27. <i>Rincodon</i>
28. Mullerian	29. Stenohaline	30. <i>Rivulus marmorate</i>
31. Pectoral	32. Holoblastic	33. Anadromous
34. Autostylic	35. <i>Polypterus</i>	36. Sting rays, eagle rays
37. Diphyccercal	38. Heterocercal	39. Weberian ossicles
40. Eye	41. <i>Mustelus</i> , <i>Myliobatis</i>	42. Larval
43. <i>Gadus</i>	44. Diphyccercal, heterocercal, homocercal	45. Heterocercal, diphyccercal
46. Scroll valve	47. Physostomous, physoclistous	48. Ordovician
49. Ostracoderm	50. Africa	51. Accessory breathing
52. Anemones	53. Tetrodotoxin	54. Stone fish
55. Muscular organ	56. Vesicles of Savi	57. Hypotrematic
58. Sperms		

True or False

1. Fishes are the first group of animals having paired jaws which are ectothermic.
2. Fishes have paired pectoral and pelvic fins.
3. Fishes lack middle ear.
4. Most nerves of fishes are nonmedullated.
5. The vertebrae of fishes are either cartilaginous or bony.
6. The epithelial cells of adult *Scoliodon* are ciliated.
7. Placoid scale develops both from epidermis and dermis.
8. *Scoliodon* lacks gall bladder.
9. Organ of Corti is well developed in fishes.
10. *Latimeria* swims by rotating the pectoral fins.

11. Sexual dimorphism is distinct in *Neoceratodus*.
12. In chondrichthyes, jaw suspension is hyostylic.
13. In crossopterygians, spiracles are lacking.
14. The electric organs of *Astroscopus* are modified eye muscles.
15. Fishes have monocular vision.
16. In salmonidae, eggs come out through abdominal pores.
17. *Neoceratodus* has a paired air bladder.
18. Holocephali lacks opercular flaps.
19. Holocephali lacks stomach.
20. Adult teleosts have a mesonephric kidney.
21. All placoderms were jawed.
22. The urea concentration is high in the circulation of sharks but not in rays.
23. Elasmobranchs convert some urea to trimethylamine oxide.
24. The Mermaid's purse of dogfish contains a urea reserve.
25. Lateral line system is ill developed in actinopterygians.
26. *Anguilla anguilla* is able to breathe cutaneously both on land and in water.
27. Teleosts lack vasa efferentia.
28. The embryo of *Scoliodon* synthesises urea and stores it in the yolk.
29. Short-fin mako shark and great white shark are endothermic.
30. Bull shark can excrete large amounts of urea by changing its kidney function.
31. Fishes were the first animals to have backbones.
32. Heart of *Scoliodon* receives only oxygenated blood.
33. Rectal glands are lacking in *Labeo*.
34. Spiracles are present in lungfish.
35. *Echeneis* lacks air bladder.
36. In minnow, taste receptors are located in the tail.
37. Conus arteriosus is well developed in *Labeo*.
38. In *Labeo*, pallium is thin and nonnervous.
39. The retina of chondrichthyes lacks rod cells.
40. In *Amia*, the pseudo branch lack direct afferent or efferent blood connection.
41. Poison glands of fishes are modified skin glands.
42. Scales have concentric patterns.
43. Cycloid scales are arranged in a non-overlapping pattern.
44. Bony fishes lack parathyroid gland.
45. Bombay ducks show discontinuous distribution.
46. Many species of cichlids brood their eggs in their mouth.
47. Saltwater fish are rich in Omega 3 fatty acids.

48. Cyprinids are herbivorous.
49. Catfish can hunt on land.
50. In *Latimeria*, the swim bladder is well developed.
51. Otoliths generally provide the most accurate age of a fish.
52. Fish of the genus *Serranus* are synchronous hermaphrodites.
53. Mangrove rivulus can live without water for many days.
54. *Protopterus* shows sexual dimorphism.
55. Goldfish are not found in nature.
56. Flesh of *Tetradon* is poisonous.
57. Lungfish have two dorsal fins.
58. Pipefish lack pectoral fins.
59. In some marine teleosts, distal convoluted tubule is lacking.
60. *Rhinodon* is viviparous.
61. Rectal gland is lacking in actinopterygians.
62. Mangrove rivulus is capable of breeding without a mate.
63. In fishes, paired nasal sacs open into the mouth.
64. *Lepidosiren* is a Latin American lungfish.
65. Fishes possess both exoskeleton and endoskeleton.
66. Mandibular pseudobranchs are lacking in *Polypterus*.
67. Pectoral fins are shorter in speedy fishes.

Answers to True or False

1. True	2. True	3. True	4. False	5. True	6. False	7. True	8. False
9. False	10. True	11. False	12. True	13. False	14. True	15. True	16. True
17. False	18. False	19. True	20. True	21. True	22. False	23. True	24. True
25. False	26. True	27. True	28. True	29. True	30. True	31. True	32. False
33. True	34. False	35. True	36. True	37. False	38. True	39. False	40. True
41. True	42. True	43. False	44. True	45. True	46. True	47. True	48. False
49. True	50. False	51. True	52. True	53. True	54. False	55. True	56. True
57. False	58. True	59. True	60. False	61. True	62. True	63. False	64. True
65. True	66. True	67. False					

Give Reasons

1. The blood and tissues of chondrichthyes are isotonic to seawater.
 - Because of the presence of high amount of urea and trimethylamine oxide in their body.
2. Fishes have scales.
 - Because scales provide protection.
3. Fish communities change from one area to another.
 - Because of change of factors like water temperature, water velocity, clarity, as well as alkalinity in the available habitat from area to area.
4. Most fishes swim by pushing their bodies against the water sideways.
 - Because their body muscles are built in a way that limits them to lateral movements.
5. Cycloid scales differ from ctenoid scales.
 - Because the exposed margin in cycloid scales is smooth while exposed margins in ctenoid scales have minute teeth/spines called ctenii, making them rough to touch.
6. It is not advisable to eat fishes like shark, king mackerel and swordfish.
 - Because of their high mercury content.
7. Intestine is longer in rohu (*Labeo*).
 - Because *Labeo* is a herbivorous fish.
8. The dead body of a shark gradually starts smelling like ammonia.
 - Because when a shark dies, the urea present in the body is broken to ammonia by bacteria.
9. Scales can be used to calculate the age of a fish.
 - Because they are permanent structures.
10. Ectodermal cap present in a placoid scale is an important one.
 - Because in the absence of this enamel cap, sharks are unable to feed.
11. Cartilaginous fishes are heavier than seawater.
 - Because they lack swim bladder and lungs.
12. In rays, dorsal fins are reduced.
 - Due to their adaptation to bottom-dwelling mode of life.
13. In viviparous fishes, ovaries also discharge function of uteri.
 - Because they provide shelter and nourishment to developing eggs.
14. Placodermi is so called.
 - Because of the presence the heavy defensive armour of bony plates and a hyoid arch that remains unmodified and does not support the jaws.
15. *Scoliodon* is commonly known as dogfish.
 - Because of its well-developed sense of smell.
16. Intestinal bulb has no digestive role.
 - Because it lacks gastric glands.
17. Young salmon grow faster in oceans.
 - Because of abundance food in oceans.

AMPHIBIA

Multiple-Choice Questions

1. Amphibians are animals which can live:
(a) Only on land (b) Only on water
(c) Both on land and water (d) Estuarine water
2. Amphibians originated during the:
(a) Ordovician period of the Paleozoic era (b) Devonian period of the Paleozoic era
(c) Carboniferous period of the Paleozoic era (d) Mesozoic era
3. A characteristic feature of Amphibians is:
(a) Webbed limbs
(b) Presence of dermal scales on the skin
(c) Presence of glandular and moist skin which is without scales
(d) Presence of pentadactyl limbs
4. Amphibians are:
(a) Bilaterally symmetrical and cold-blooded agnatha
(b) Bilaterally symmetrical and warm-blooded
(c) Radially symmetrical and cold-blooded gnathostomes
(d) Bilaterally symmetrical and cold-blooded gnathostomes
5. Internal scales are present in the members of:
(a) Anura (b) Urodela (c) Apoda (d) None
6. Which one of the following is lacking in amphibians?
(a) Head (b) Neck (c) Trunk (d) Tail
7. Limbless amphibians are:
(a) Anura (b) Urodela (c) Apoda (d) Urodela and apoda
8. Amphibia is the:
(a) Smallest class of vertebrata
(b) Largest class of vertebrata
(c) First group of vertebrata completely adapted for terrestrial life
(d) First group of anamniota
9. Which one of the following is an amphibian?
(a) *Ichthyophis* (b) *Hydrophis* (c) Horned toad (d) All
10. Tree frog is the common name of:
(a) *Hyla* (b) *Proteus* (c) *Siren* (d) *Ichthyophis*

11. *Necturus* is commonly known as:
 - (a) Mud puppy
 - (b) Tree frog
 - (c) Congo eel
 - (d) Blindworm
12. *Rhacophorus* is commonly known as:
 - (a) Tree frog
 - (b) Congo eel
 - (c) Water dog
 - (d) Flying frog
13. Limbless amphibians belong to the order:
 - (a) Anura
 - (b) Urodela
 - (c) Gymnophiona
 - (d) Salientia
14. Which one of the following is a limbless amphibian?
 - (a) *Necturus*
 - (b) *Proteus*
 - (c) *Ichthyophis*
 - (d) *Salamandra*
15. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(a) <i>Liopelma</i>	1. No parental care
(b) <i>Xenopus</i>	2. Discontinuous distribution
(c) <i>Ascaphus</i>	3. Vocal sacs are lacking in males
(d) <i>Alytes</i>	4. Tail muscles are present and vertebrae are amphicoelous

Answer codes:

A	B	C	D
(a) 4	3	2	1
(b) 2	4	1	3
(c) 4	1	2	3
(d) 3	1	4	2
16. Extra columella is lacking in:
 - (a) Apoda
 - (b) Urodela
 - (c) Some anurans
 - (d) All
17. (i) Consider the following characteristics of an amphibian:
 - (a) Reduced lungs
 - (b) Copulatory organ present and fertilisation is internal
 - (c) Tail muscles are present
 - (d) Vertebrae are amphicoelous and ribs are free
 (ii) The name of this amphibian is:
 - (a) *Xenopus*
 - (b) *Ascaphus*
 - (c) *Alytes*
 - (d) *Rhacophorus*
18. Which one of the following is not applicable to amphibians?
 - (a) Mesonephric kidney
 - (b) Persistent notochord
 - (c) Skull dicondylic
 - (d) Cranial nerves – 10 pairs
19. Which one of the following is a viviparous amphibian?
 - (a) *Salamandra*
 - (b) *Dermophis thomensis*
 - (c) *Typhlonectes compressicauda*
 - (d) All
20. Consider the following statements:
 - (A) The evolution of pentadactyl limbs and terrestrial respiration occurred during the Devonian period
 - (B) Amphibian skin lacks scales but in some cases dermal scales may be present
 - (C) The haemoglobin of a frog has relatively high affinity for oxygen in comparison with mammals
 - (D) *Proteus* and *Necturus* have highly developed organ of Jacobson

The correct statements are:

- (a) All
- (b) A and B
- (c) B and C
- (d) C and D

21. Total neoteny is shown by:
 (a) *Proteus* (b) *Siren* (c) *Ambystoma* (d) All
22. Which one of the following is not applicable to *Salamandra*?
 (a) Four-limbed amphibians (b) Lacks external ears
 (c) Vocal sacs (d) Exhibits paedomorphosis
23. The distribution of amphibians is worldwide, except in:
 (a) Antarctica (b) New Zealand
 (c) Antarctica and Greenland (d) Antarctica and Finland
24. Caecilians possess:
 (a) Limbs (b) Jaws and teeth (c) Tail (d) None
25. Female frogs lack:
 (a) Copulatory pads (b) Vocal sacs (c) Mesorchium (d) All
26. Which one of the following is not applicable to *Triton*?
 (a) Eyelids (b) Palatine teeth
 (c) Neoteny (d) Amphicoelous vertebrae
27. Digits are opposable in:
 (a) *Rhacophorus* (b) *Hyla venulosa* (c) *Chiromantis* (d) *Megalobatrachus*
28. Vertebrae are not procoelous in:
 (a) *Dendrobates* (b) *Hyla* (c) *Bufo* (d) *Polypedates*
29. Which one of the following is toothless?
 (a) *Bufo* (b) *Rana* (c) *Xenopus* (d) Toads
30. Gymnophionas are found in:
 (a) Ethiopian region (b) Oriental region (c) Neotropical region (d) All
31. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|----------------|---------------------------|
| (A) Mud nest | 1. <i>Salamandra atra</i> |
| (B) Leaf nest | 2. <i>Triton</i> |
| (C) Shoot nest | 3. <i>Phyllomedusa</i> |
| (D) Viviparity | 4. <i>Hyla faber</i> |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 3 | 1 | 4 | 2 |
| (b) 4 | 3 | 2 | 1 |
| (c) 4 | 1 | 3 | 2 |
| (d) 3 | 4 | 2 | 1 |
32. Sense of smell is well developed in:
 (a) Anura (b) Urodela (c) Gymnophiona (d) All
33. *Salamandra* is a member of class:
 (a) Amphibia (b) Reptilia (c) Aves (d) Mammalia
34. Which one of the following is an incorrect statement?
 (a) Male frog has a vocal sac.
 (b) A frog has ears but no pinnae.

- (c) Functional kidney of frog tadpole is mesonephrous.
(d) Frogs are ureotelic.
35. Axolotl is the larva of:
(a) *Ambystoma* (b) *Ichthyophis* (c) *Siren* (d) *Alytes*
36. Retention of sexual maturity during the larval stage is known as:
(a) Polyembryony (b) Cryptorichidism (c) Neoteny (d) Apolysis
37. Neoteny is shown by:
(a) Axolotl larva (b) Tornaria larva (c) Ammocoetus larva (d) Leptocephalus
38. In which one of the following is the tongue absent?
(a) *Ichthyophis* (b) *Salamandra* (c) *Bufo* (d) *Siren*
39. The poison gland of *Bufo* is modified:
(a) Mucous gland (b) Parotid gland (c) Sublingual gland (d) Sebaceous gland
40. Functional kidney of the tadpole larva of a frog is:
(a) Archinephrous (b) Pronephrous (c) Mesonephrous (d) Metanephrous
41. Frogs are:
(a) Cold-blooded amphibious gnathostomes (b) Cold-blooded amphibious agnatha
(c) Warm-blooded amphibious gnathostomes (d) Cold-blooded and retain chordate characters throughout life
42. Nitrogenous waste product of a frog is:
(a) Ammonia (b) Urea (c) Uric acid (d) Urea and uric acid
43. Tadpole larva of a frog is:
(a) Ureotelic (b) Uricotelic (c) Ammoniotelic (d) Aminotelic
44. During the hibernation period, the frog respires through:
(a) Lungs (b) Skin (c) Buccal epithelium (d) All
45. Skin of a frog contains:
(a) Poison glands (b) Mucous glands
(c) Both poison and mucous glands (d) No gland
46. Males are smaller than females and are without vocal sacs in:
(a) Midwife toad (b) *Hyla* (c) *Ichthyophis* (d) *Salamandra*
47. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|--------------------------------|--|
| (A) Caecilians | 1. Brood their developing young in vocal sac |
| (B) Poison dart frog | 2. Brood the developing young in stomach |
| (C) <i>Rhinoderma darwini</i> | 3. Young ones have developed jaws and teeth, which they use to scrap secretions called uterine milk from the walls of the oviducts |
| (D) <i>Rheobatrachus silus</i> | 4. Mother carries tadpoles on her back |
- Answer codes:
- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 3 | 4 | 1 | 2 |
| (b) | 4 | 1 | 2 | 1 |
| (c) | 2 | 4 | 1 | 3 |
| (d) | 3 | 1 | 4 | 3 |

48. Which one of the following has the ability to change their sex?
 (a) *Hyperolius viridiflavus* (b) *Rheobatrachus silus*
 (c) *Oophaga pumilio* (d) *Desmognatus acneus*
49. Which one of the following is incorrect about the white tree frog (*Litoria caerulea*)?
 (a) Males are generally bigger than females
 (b) Capable of colour change
 (c) Eyes have horizontal pupils instead of vertical
 (d) A fatty ridge is present over the eyes
50. Which one of the following is applicable to amphibians?
 (a) Ectothermic (b) Anamniote
 (c) Juvenile water breathing (d) All
51. Which one of the following inhabits brackish waters?
 (a) *Hyperolius viridiflavus* (b) *Typhlonectes compressicauda*
 (c) Fejervarya raja (d) *Rana temporaria*
52. Chorus is applicable to:
 (a) Birds (b) Elephants (c) Frogs (d) Rodents
53. What is incorrect about *Xenopus*?
 (a) Males lack vocal cords (b) Have ability to change their appearance
 (c) Foot bears claws (d) Have ability to change sex
54. Which one of the following is not found in any fish nor urodela or apoda, but is present in anura?
 (a) Exoskeleton (b) Cloacal aperture
 (c) Tympanic membrane (d) Nictitating membrane
55. The entire primary palatoquadrate is unossified in:
 (a) *Rana temporaria* (b) *Rana tigrina* (c) *Rana pipens* (d) *Rana esculenta*
56. Gills are retained throughout life in:
 (a) *Salamandra* (b) *Necturus* (c) *Alytes* (d) *Ichthyophis*
57. Tick the correct match:
 (a) *Necturus* – neoteny (b) *Bufo* – vocal sacs
 (c) *Xenopus* – without tongue (d) *Proteus* – axolotl
58. Male frog can be distinguished from female frog by:
 (a) Having larger size (b) Having vocal sacs and copulatory pads
 (c) Having pigmented skin (d) Having well-developed copulatory organ
59. Which one of the following statements is incorrect?
 (a) *Salamandra* is a tailed amphibian. (b) *Necturus* retains external gill throughout life.
 (c) The number of salivary glands in frogs is two. (d) There is no salivary gland in frogs.
60. Absence of neck in frog helps it in:
 (a) Swimming (b) Climbing (c) Capturing of prey (d) Jumping
61. The respiratory organ of a tadpole larva is:
 (a) Lung (b) Skin (c) Gill (d) Buccal epithelium
62. A diaphragm is lacking in:
 (a) *Xenopus* (b) *Ichthyophis* (c) *Bombinator* (d) All

63. Hellbender is the name of:
(a) *Triturus* (b) *Megalobatrachus* (c) *Cryptobranchus* (d) *Alytes*
64. Parental care is absent in:
(a) *Rhacophorus* (b) *Alytes* (c) *Xenopus* (d) *Hyla*
65. Indian bullfrog is:
(a) *Rana tigrina* (b) *Rana esculenta* (c) *Rana limnocharis* (d) *Rana temporaria*
66. Jaws are toothless in:
(a) Frogs (b) Toads (c) Fishes (d) Snakes
67. If a frog is transferred from 18°C to 30°C, its body temperature will change to:
(a) 24°C (b) 30°C (c) Remain unchanged (d) 19°C
68. Lack of metamorphosis in axolotl larva is due to:
(a) Deficiency of iodine in water or diet (b) Deficiency of Na⁺ and K⁺ in water
(c) High concentration of iodine in water (d) High concentration of Na⁺ and K⁺ in water
69. In urodels, the tail is devoid of tail fin, except:
(a) *Salamandra* (b) *Triton* (c) *Cryptobranchus* (d) *Trylotriton*
70. The portal system is found in amphibians:
(a) Hepatic (b) Renal (c) Hypophyseal (d) All
71. Limbs are lacking in members of the order:
(a) Anura (b) Urodela (c) Gymnophiona (d) None
72. *Rhacophorus* is :
(a) Tree frog (b) Flying frog (c) Midwife toad (d) Fire-bellied toad
73. Direct development is shown by:
(a) *Eleutherodactylus* (b) *Bombina orientalis*
(c) *Dendrobates ornata* (d) *Ceratophrys*
74. What is incorrect about the order caudata?
(a) Eyelids are present (b) Claws on toes
(c) Urinary bladder is present (d) All
75. Batrachotoxin is present in high concentration in:
(a) *Phylllobates terribilis* (b) *Atelopus*
(c) *Dendrobates* (d) *Mynobates*
76. What is incorrect about the poison arrow frog?
(a) Coloured body (b) Active during day (c) Lives in water (d) Powerful toxin
77. Which one of the following is a horned frog?
(a) *Phrynosoma* (b) *Xenopus* (c) *Ceratophrys* (d) *Rhinoderma*
78. Which one of the following is known as Darwin's frog?
(a) *Notaden bennetti* (b) *Chiroleptes platycephalus*
(c) *Rana sylvatica* (d) *Rhinoderma darwinii*
79. *Ichthyostega* was one of the earliest:
(a) Bony fish (b) Amphibian (c) Reptile (d) None

80. The larval form does not feed before developing into an adult in:
 (a) *Ambystoma opacum* (b) *Desmognathus aeneus*
 (c) *Ascaphus truei* (d) *Phyllobates*
81. Pentadactyl limbs first appeared in:
 (a) Pisces (b) Amphibians (c) Reptiles (d) Aves
82. Midwife toad is the common name of:
 (a) *Xenopus* (b) *Pipa* (c) *Alytes* (d) *Triturus*
83. Internal fertilisation and penis-like extension from the cloacal chamber is found in:
 (a) *Ascaphus* (b) *Cryptobranchus* (c) *Megalobatrachus* (d) *Triturus*
84. The larval characteristic is retained by adults in:
 (a) Proteids (b) Sirenids (c) Amphiumids (d) All
85. Which one of the following statements incorrect concerning amphibians?
 (a) They are capable of respiration on land.
 (b) The acquisition of lungs has resulted in a great change in their circulatory system.
 (c) They have completely solved the problem of reproduction on land.
 (d) They are the pioneer vertebrates to invade land from water.
86. Tail muscles are absent in anurans, except:
 (a) *Liopelma* (b) *Breviceps* (c) *Ascaphus* (d) *Xenopus*
87. Elongated snake-like limbless amphibians belong to the order:
 (a) Anura (b) Urodela (c) Gymnophiona (d) Squamata
88. The amphibian that does not require water for breeding:
 (a) *Ascaphus* (b) *Dendrobates* (c) *Elutherodactylus* (d) *Phyllobates*
89. It has been observed that treatment of premetamorphic tadpoles stimulates the synthesis of:
 (a) Messenger RNA (b) Ribosomal RNA (c) Transfer RNA (d) All
90. Consider the following statements with reference to tadpole metamorphosis:
 (A) There is an increase in total protein concentration during metamorphosis
 (B) Larger RBCs of larvae are replaced by smaller adult RBCs
 (C) Haemoglobin of tadpoles has more affinity for oxygen in comparison to adult haemoglobin
 (D) Muscle tissues degenerate earlier than the connective tissues
 The incorrect statements are:
 (a) A and B (b) A and C (c) B, C and D (d) None
91. Which one of the following toxins are unique to *Dendrobates historionicus* (Colombian arrow poison frog)?
 (a) Geyhyrotoxin (b) Geyphyrotoxin and histrionicotoxin
 (c) Batrachotoxin (d) Pyrrolizidines
92. Which one of the following is applicable to frogs?
 (a) Hibernation (b) Aestivation
 (c) Nictitating membrane (d) All
93. Adrenal glands having ectodermal, adrenaline-secreting tissue and mesodermal, steroid-secreting tissue first developed in:
 (a) Cyclostomata (b) Elasmobranchs (c) Dipnoi (d) Amphibians

94. Consider the following characteristics:
 (A) Ribs are lacking (B) Adults lack gills
 (C) Neotenuous forms (D) Mandible toothless
 Of the above mentioned characteristics, which one is not shown by anurans?
 (a) A (b) B (c) C (d) D
95. Which one of the following retains gill slits but not gills in adults?
 (a) *Cryptobranchus* (b) *Necturus* (c) *Siren* (d) *Salamandra*
96. Males have eversible cloaca in:
 (a) *Salamandra* (b) *Necturus* (c) *Ichthyophis* (d) None
97. Consider the following characters about urodela:
 (A) Body is divisible into head, trunk and tail (B) Tail fin is with fin rays
 (C) Vocal cords are present (D) Eyes are small with eyelids
 The correct statements are:
 (a) A (b) B and C (c) C and D (d) A and D
98. Hairy frog is the common name of:
 (a) *Ascaphus* (b) *Astylosternus* (c) *Ambystoma* (d) *Amphiuma*
99. *Ichthyophis* lacks:
 (a) Limbs and tail (b) Tympanum
 (c) Middle ear and internal nares (d) All
100. Longest gestation period is found in:
 (a) Elephants (b) Blue Whales (c) *Salamandra atra* (d) *Scoliodon*
101. Which one of the following is essential for amphibian metamorphosis?
 (a) Calcitonin (b) Thyroxine
 (c) Thyroxine and Ca^{++} (d) Growth hormones
102. Which one of the following is the largest vertebrate genus?
 (a) *Polypedates* (b) *Dendrobates* (c) *Eleutherodactylus* (d) *Rheobatorachus*
103. The only case of Mullerian mimicry in amphibians is shown by the:
 (a) Plethodontidae (b) Poison arrow frog family
 (c) Rhinodermatidae (d) Brevicipitidae
104. The only type of anurans to bear live young ones:
 (a) *Nectophrynoides* (b) *Pseudobufo*
 (c) *Brachycephalus* (d) *Hydromantes platycephalus*
105. Consider the following statements about the skeleton of anurans:
 (A) There is a general reduction in skull and girdle elements
 (B) Ribs, if present, never articulate with the sternum
 (C) Atlas articulates with two occipital condyles
 (D) There is an increase in joints in the pelvic limbs to increase jumping ability
 The incorrect statements are:
 (a) None (b) A and B (c) B and C (d) A and
106. Which one of the following is a true poisonous frog?
 (a) *Dendrobates* (b) *Minyobates* (c) *Phylllobates* (d) All

107. Which one of the following amphibians brood the developing young one in their stomach and do not feed it during the developmental period?
 (a) *Rhinoderma darwinii* (b) *Oophaga pumilio*
 (c) *Salamandra maculosa* (d) *Rheobatrachus silus*
108. Which one of the following is a major source of energy during the early development of amphibians?
 (a) Fats (b) Carbohydrates (c) Proteins (d) Fats and proteins
109. The larval salamander can be distinguished from the adult salamander by the presence of:
 (a) Open gill slits and external gills (b) A tail fin
 (c) Specialised dentition (d) All
110. What is not common between tadpoles and adult anurans?
 (a) A wide head (b) A short vertebral column
 (c) Lack of neck (d) A small mouth
111. Tadpoles of family microhylidae lack keratinised structure, except:
 (a) *Otophryne* (b) *Rhinoderma* (c) *Minyobates* (d) *Ceratophrys*
112. Urinary bladder is lacking in:
 (a) *Acris* (b) *Ascaphus* (c) *Bufo boreas* (d) None
113. Consider the following statements:
 (A) In *Ascaphus truei*, the pupils are vertical and the tongue is attached posteriorly
 (B) In anurans, the hindlimbs have four digits and the forelimbs have five digits
 (C) Members of the order caudata have teeth in both upper and lower jaws
 (D) Urinary bladder of amphibians serves as a storage site for water
 The incorrect statements are:
 (a) A, C and D (b) A and D (c) All (d) None
114. Vertical eye pupils are a characteristic of the anuran family:
 (a) Hylidae (b) Bufonidae (c) Pelobatidae (d) Ranidae
115. In amphibians, minimum amount of water is lost by:
 (a) Head (b) Trunk (c) Limbs (d) Ventral surface
116. Which one of the following is incorrect about salamanders?
 (a) Largest genomes among tetrapods (b) Neoteny
 (c) Internal and external fertilisation (d) Presence of copulatory organs
117. Labyrinthodonts were:
 (a) Terrestrial (b) Aquatic (c) Amphibious (d) Arboreal
118. Carotid arch is lacking in adults of the order:
 (a) Gymnophiona (b) Anura (c) Urodela (d) None
119. Which one of the following is applicable to *Salamandra*?
 (a) Regeneration and autotomy (b) Secretion of pheromones
 (c) Tri chromatic colour vision (d) All

Answers to Multiple-Choice Questions

1. (c)	2. (b)	3. (c)	4. (d)	5. (c)	6. (b)	7. (c)	8. (a)
9. (a)	10. (a)	11. (a)	12. (d)	13. (c)	14. (c)	15. (c)	16. (d)
17. (b)	18. (b)	19. (d)	20. (b)	21. (d)	22. (c)	23. (c)	24. (d)
25. (d)	26. (d)	27. (c)	28. (d)	29. (a)	30. (d)	31. (b)	32. (c)
33. (a)	34. (c)	35. (a)	36. (c)	37. (a)	38. (a)	39. (b)	40. (b)
41. (a)	42. (b)	43. (c)	44. (b)	45. (c)	46. (a)	47. (a)	48. (a)
49. (a)	50. (d)	51. (c)	52. (c)	53. (d)	54. (c)	55. (a)	56. (b)
57. (c)	58. (b)	59. (c)	60. (d)	61. (c)	62. (d)	63. (b)	64. (c)
65. (a)	66. (b)	67. (b)	68. (a)	69. (b)	70. (d)	71. (c)	72. (a)
73. (a)	74. (d)	75. (a)	76. (c)	77. (c)	78. (d)	79. (b)	80. (b)
81. (b)	82. (c)	83. (a)	84. (d)	85. (c)	86. (a)	87. (c)	88. (c)
89. (d)	90. (d)	91. (b)	92. (d)	93. (d)	94. (c)	95. (a)	96. (c)
97. (a)	98. (b)	99. (d)	100. (c)	101. (b)	102. (c)	103. (b)	104. (a)
105. (a)	106. (d)	107. (d)	108. (a)	109. (d)	110. (d)	111. (a)	112. (d)
113. (d)	114. (c)	115. (a)	116. (d)	117. (b)	118. (a)	119. (d)	

Fill in the Blanks

- The first vertebrates to colonise on the earth were the _____.
- Modern amphibians are called the _____.
- The term 'Amphibia' was first used by _____.
- Frogs are found in all continents, except _____.
- In amphibians, the colour of the skin is produced by _____, _____ and _____.
- Caecilians are found throughout the tropics except in _____ and east of Wallace's line in _____.
- The only group of amphibians having dermal scales is the _____.
- In caecilians, dermal scales are present only in _____.
- The tentacles of caecilians are present between _____ and _____.
- Lungless salamanders are found in central and south _____.
- _____ is a posture of a male clasping a female during the fertilisation of eggs.
- Amplexus may be _____ or _____.

13. _____ is a tongueless African clawed frog.
14. In amphibians, digestive, excretory and reproductive systems empty into a common terminal chamber called _____.
15. Red-eyed tree frog belongs to the family _____.
16. The three major groups of living amphibians are _____, _____ and _____.
17. _____ is the largest group of living amphibians.
18. In toads, vision is _____.
19. Each testis of a frog is attached with the ventral side of a kidney by a thin fold of membrane called _____.
20. Amphibians lacking a tongue are _____ and _____.
21. The heart of amphibians is _____ chambered.
22. Amongst amphibians, eyes are best developed in _____.
23. Members of family pipidae lack eyelids, except _____ in which lower eyelids are present.
24. In *Rana*, vertebrae are _____.
25. In anurans, the caudal region is represented by a single rod-shaped bone called _____.
26. Amphibians are the members of the class _____, the subphylum _____ and the phylum Chordata.
27. _____ is the land of urodel.
28. In frogs, dentition is _____, _____ and _____.
29. The total number of bones in frogs is _____.
30. Forelimbs of frogs have _____ bones.
31. Vertebral column of frogs is made up of _____ vertebrae and one _____.
32. _____ is the largest amphibian.
33. _____ is the only Indian urodela.
34. _____ period is regarded as the age of amphibians.
35. In frogs, acoustic ridges are found in _____.
36. The nucleus of eggs of urodel has large chromosomes with high content of DNA and is known as _____ chromosomes.
37. _____ is the largest toad.
38. Retention of sexual maturity during the larval stage is known as _____.
39. Facultative neotenus forms can be induced to metamorphose by treatment with _____.
40. In Gymnophiona, the cleavage is _____.
41. _____ and _____ are burrowing frogs having modified snout for burrowing purposes.
42. In most salamanders, fertilisation is internal and the transfer of sperms occurs via _____.
43. Larvae of amphibians have _____ kidneys.

44. In amphibians, the cleavage is _____ and _____.
45. Amphibians were top predators during _____ and _____ periods.
46. The true poisonous frogs belong to the family _____.
47. The dendrobatidae toxins are diverse set of small organic molecules called _____.
48. Oriental fire-bellied toads have _____-shaped pupils.
49. _____ is the smallest frog.
50. _____ is the study of amphibians and reptiles.
51. The golden poison frog stores its poison in _____.
52. In frogs, the centre of gravity is located just behind the _____.
53. In *Ascaphus*, fertilisation is _____.
54. Lungless salamanders are included in the order caudata and the family _____.
55. True toads belongs to the family _____ and the order _____.

Answers to Fill in the Blanks

1. Amphibians	2. Lissamphibia	3. Carolus Linnaeus (1758).
4. Antarctica	5. Xanthophores, melanophores, iridophores	6. Madagascar, Australia
7. Caecilians	8. Tail	9. Eye, nostril
10. America	11. Amplexus	12. Inguial, axillary
13. <i>Xenopus</i>	14. Cloaca	15. Hylidae
16. Anura, urodela and gymnophiona	17. Anura	18. Monocular
19. Mesorchium	20. <i>Xenopus, Pipa</i>	21. Three
22. Anurans	23. <i>Pseudohymenochirus</i>	24. Procoelous
25. Urostyle	26. Amphibian, vertebrata	27. North America
28. Homodont, acrodont, polyphyodont	29. 153	30. 24
31. Nine, urostyle	32. <i>Megalobatrachus</i>	33. <i>Trilotriton</i>
34. Carboniferous	35. Ampulla	36. Lamphrush
37. <i>Bufo marinus</i>	38. Neoteny	39. Thyroxine
40. Meroblastic	41. <i>Cacopus, Breviceps</i>	42. Spermatophores
43. Pronephrous	44. Holoblastc, unequal	45. Carboniferous, Permian
46. Dendrobatidae	47. Alkaloids	48. Heart
49. <i>Eleutherodactylus Iberia</i>	50. Herpetology	51. Skin glands
52. Sacrum	53. Internal	54. Plethodontidae
55. Bufonidae, anura		

True or False

1. Amphibians are the only class of vertebrates having free-living tadpole and adult stages.
2. Amphibians first appeared on the earth during the Devonian period.
3. Ecdysis is common in amphibians.
4. Amphibians have the ability to change their body colour according to the surrounding environment.
5. Cannibalism is found in amphibians.
6. Amphibians lack the ability to differentiate between kin and nonkin.
7. Larvae of salamanders and caecilians are herbivorous.
8. Anuran larvae are herbivores.
9. The tentacles of caecilians are chemoreceptors.
10. Only oviparous caecilians show parental care.
11. In some anurans, development is direct.
12. All amphibians cannot hear.
13. Breeding in most amphibians is seasonal.
14. *Salamandra maculosa* is oviparous.
15. Amphibians have the same patterns of limbs and girdles, as found in higher tetrapods.
16. Eyelids are well developed in permanent aquatic amphibians.
17. The first cervical vertebra of frogs lacks centrum, but bears transverse processes.
18. Lateral line organs occur in tadpoles.
19. The caecilians are tropical in distribution.
20. The larvae of three living orders of amphibians are morphologically very similar.
21. Some salamanders live out their entire lives on land.
22. Anuran larvae have external as well as internal gill stages.
23. Hell blender is the common name of *Ambystoma*.
24. Jacobson's organ is absent in aquatic amphibians.
25. In newts, lungs serve as a hydrostatic organ.
26. Cutaneous respiration does not occur in *Bufo*.
27. Vocal cords are present in urodela.
28. *Triturus* develops lateral line organ during the breeding season.
29. Parotid glands are lacking in *Salamandra*.
30. In frogs, oviduct is formed by the Wolffian duct.
31. Vocal cords develop for the first time in anurans.
32. *Bufo* visits water only for breeding.
33. In *Necturus*, there are three pairs of gills and three pairs of gill slits.
34. *Necturus* represents a permanent neotenic larval stage.
35. *Hyla* lacks a vocal sac.

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36. In frogs, digestion begins from the buccal cavity.
37. *Ichthyophis* is a limbless amphibian.
38. Tenth spinal nerve is generally well developed in *Rana tigrina*.
39. *Salamandra* lacks gills.
40. *Rana goliath* is the largest frog.
41. Tongue of *Bufo* is sticky and bifid.
42. In desert amphibians, the nitrogenous waste product may be uric acid.
43. In amphibians, external nares are connected with pharyngeal region by internal nares.
44. Amphibians lack a hypophyseal portal system.
45. Amphibians larvae possess paired fins.
46. After hatching, the tadpoles first eat the remaining gel from which they hatched.
47. Toad and frog tadpoles are initially herbivorous, later becoming carnivorous.
48. All colourful frogs are poisonous.
49. The poison of poisonous amphibians cannot permeate our skin.
50. Toads have teeth in the upper jaw only.
51. Frogs drink and breathe through their skin.
52. Pollution is the biggest enemy of frogs.
53. Tree frogs have developed adhesive pads on the toes of their feet.
54. Tadpoles lack teeth.
55. Some salamanders live entirely on land.
56. In amphibians, various development stages utilise different nutrients.
57. In *Hyla venulosa*, the digits are webbed.
58. *Siren* lacks organ of Jacobson.
59. Amphibian skull is autostylic.
60. Dry-skinned toads do not need water to breed.
61. Transportation of carbon dioxide is less efficient in amphibians.

Answers to True or False

1. True	2. True	3. True	4. True	5. True	6. False	7. False	8. True
9. True	10. True	11. True	12. False	13. True	14. False	15. True	16. False
17. False	18. True	19. True	20. False	21. True	22. True	23. False	24. True
25. True	26. True	27. False	28. True	29. False	30. False	31. True	32. True
33. False	34. True	35. False	36. False	37. True	38. False	39. True	40. True
41. False	42. True	43. True	44. False	45. False	46. True	47. True	48. False
49. True	50. False	51. True	52. True	53. True	54. False	55. True	56. True
57. False	58. False	59. True	60. False	61. True			

Give Reasons

1. In recent years, the number of amphibian species and the size of many amphibian populations has been declining.
 - Because most amphibians have soft skin which is hygroscopic, and due to this ability of their skin, they become particularly susceptible to certain man-made toxins and pollutants.
2. Frogs have long sticky tongues.
 - For catching the prey, like flying insects.
3. Toads have rough skin.
 - Because most toads have special structures in their skin that secrete poisonous fluids, and these structures make their skin bumpy.
4. Most amphibians live in wet or damp conditions.
 - Because the skin of amphibians lacks shell, scales or outer dried covering, so they live in wet or damp places to prevent dehydration.
5. The crossopterygians are supposed to be the ancestors of amphibians.
 - Because crossopterygians evolved many important features that enabled them to colonised on land, such as:
 - (a) They have a more rigid skeleton that would support the body weight on land
 - (b) Presence of leg bones
 - (c) Presence of nostrils
6. Frogs are good bio-indicators.
 - Because:
 - (a) They have permeable skin which allows free movement of substances into the body
 - (b) Can absorb and concentrate toxins in their fatty tissues
 - (c) They spend one part of their life on land and the other part in water
7. Life history of amphibians is more complex in comparison with other vertebrates.
 - Due to the following reasons:
 - (a) Selection of breeding grounds
 - (b) Appropriate climatic condition
 - (c) Characteristics of microhabitats (such as physicochemical and biological characteristics)
 - (d) Courtship
 - (e) Type of fertilisation
 - (f) Type of metamorphosis
8. During amphibian metamorphosis, there is an increase in the total protein concentration.
 - Because increase in protein concentration raises the osmotic pressure of the blood and thus increases water retaining capacity. This provides an adaptive change from aquatic life to terrestrial life.
9. When a frog swallows his meal, the eye balls close and become depressed in the head.
 - It is so because eyeballs apply pressure and push the food down to the throat.

10. *Rhinoderma darwinii* is known as Darwin's frog.
 - Because it was discovered by Charles Darwin during his World Voyage.
11. Wood frog completely freeze solid, still their organs don't get damaged.
 - Because the high amount of sugar present in the blood acts as an antifreeze agent.
12. Tree frogs have adhesive pads on the toes of their feet.
 - Because these adhesive pads help them to climb on trees.
13. Tadpoles can turn rapidly.
 - Because of their highly flexible tails.
14. Frog is an ideal animal for vertebrate study.
 - Because of its universal distribution and its many structures can be demonstrated by an opening of the body cavity.
15. A frog differ from toads.
 - Because:
 - (a) Frogs are diurnal while toads are nocturnal
 - (b) Frogs are mostly aquatic, but may come on land for feeding while toads are mostly terrestrial and come to water for breeding
 - (c) Frogs lay eggs in masses while toads lay eggs in line

REPTILIA

Multiple-Choice Questions

1. Mesozoic era is known as the era of:
(a) Amphibians (b) Reptiles (c) Birds (d) Mammals
2. The modern reptiles include:
(a) Lizards, snakes, crocodiles and tuatara (b) Lizards, dinosaurs, crocodiles and tuatara
(c) Snakes, lizards, crocodiles, tortoise alligator and tuatara (d) Lizards, crocodiles, euryapsida, parapsida and tuatara
3. The skin of reptiles is covered by:
(a) Scales (b) Horny plates (c) Horny scutes (d) All
4. Reptiles are:
(a) Cold-blooded amniotes (b) Cold-blooded amniotes
(c) Warm-blooded amniotes (d) Cold-blooded agnathans
5. The first true terrestrial vertebrates are:
(a) Dipnoi (b) Amphibians (c) Reptiles (d) Birds
6. The most remarkable development in reptiles towards the terrestrial mode of life is:
(a) Development of lungs (b) Presence of scales on the body
(c) Cleidoic eggs (d) Development of pentadactyl limbs and powerful muscles
7. What is incorrect about *Eryx*?
(a) Double-headed snake (b) Prehensile tail
(c) Nonpoisonous snake (d) None
8. Study of lizards is known as:
(a) Phenology (b) Ophiology (c) Saurology (d) Ornithology
9. Study of snakes is known as:
(a) Ophiology (b) Horology (c) Herpetology (d) Serology
10. A common feature among fishes, amphibians and reptilians is the:
(a) Presence of scales (b) Cold-blooded and shelled eggs
(c) Cold-blooded and laying of eggs (d) Cold-blooded and amniotes
11. Reptiles lack:
(a) Yolk sac (b) Chorion and allantois (c) Amnion (d) None
12. Jacobson's organ is related with:
(a) Vision (b) Smell (c) Respiration (d) Reproduction

13. Reptiles originated during the:
 (a) Carboniferous period of Palaeozoic era (b) Mesozoic era
 (c) Cenozoic era (d) Cretaceous period of Mesozoic era
14. Connecting link between amphibians and reptiles is:
 (a) *Seymouria* (b) *Ichthyophis* (c) *Sphenodon* (d) *Hydrophis*
15. Snakes lack:
 (a) Girdles (b) Limbs (c) Urinary bladder (d) All
16. Following characters were observed in a reptile:
 (a) Non-expandible mouth (b) Movable eyelids
 (c) Ear openings (d) Long and fragile tail
- This reptile is:
 (a) Horned toad (b) Grass snake (c) Glass snake (d) Rat snake
17. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|---------------------------|------------------------|
| (A) Post-anal tail | 1. <i>Chelone</i> |
| (B) Adhesive lamellae | 2. <i>Phrynosoma</i> |
| (C) Desert adaptation | 3. <i>Hemidactylus</i> |
| (D) Carapace and plastron | 4. Snake |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 4 | 3 | 2 | 1 |
| (b) 4 | 1 | 3 | 2 |
| (c) 3 | 4 | 2 | 1 |
| (d) 2 | 2 | 1 | 3 |
18. Besides mammals, secondary palate is found in:
 (a) Birds (b) Snakes (c) Crocodiles (d) Tortoises
19. Which one of the following is not applicable to reptiles?
 (a) Ectothermic (b) Amniotes (c) Cleidoic egg (d) Dicondylic skull
20. Reptiles are found everywhere except:
 (a) Asia (b) New Zealand (c) Greenland (d) Antarctica
21. Which one of the following is not applicable to *Sphenodon*?
 (a) Endemic to New Zealand (b) Tuatara
 (c) Living fossil (d) No sexual dimorphism
22. Amniotes:
 (a) Include reptiles, birds and mammals (b) Have amnion
 (c) Have no larval stages (d) All
23. Copulatory organs are paired and eversible in members of the order:
 (a) Crocodilia (b) Squamata (c) Chelonia (d) Rhynchocephalia
24. The hood of a cobra is:
 (a) Noncellate (b) Monocellate (c) Bicellate (d) All

25. Which one of the following is lacking in chelonian?
 - (a) Movable quadrate
 - (b) Pecten
 - (c) Sternum
 - (d) All
26. Which one of the following is movable in snakes?
 - (a) Maxilla
 - (b) Palatine
 - (c) Pterygoid
 - (d) All
27. Which one of the following is an incorrect match?
 - (a) Teeth are lacking in lower jaw – *Typhlops*
 - (b) Upper jaw is toothless – *Glauconia*
 - (c) Rattle – *Carotatus*
 - (d) Procoelous vertebrae – *Sphenodon*
28. The skull of chelonians is:
 - (a) Anapsid
 - (b) Synapsid
 - (c) Diapsid
 - (d) Parapsid
29. Which one of the following is absent in reptiles?
 - (a) Cavum venosum
 - (b) Cavum arteriosum
 - (c) Conus arteriosus
 - (d) Cavum pulmonale
30. *Sphenodon* lacks:
 - (a) Sinus venosus
 - (b) Ductus arteriosus
 - (c) Ductus caroticus
 - (d) None
31. Which one of the following conserves water by excreting excess salt from the blood stream through nasal salt glands?
 - (a) *Phrynosoma*
 - (b) *Iguana*
 - (c) Komodo dragon
 - (d) Collared lizard
32. Which one of the following is a viviparous snake?
 - (a) *Enhydrina*
 - (b) *Vipera russelli*
 - (c) *Uropeltis grandis*
 - (d) All
33. Which one of the following is not applicable to *Dryophis*?
 - (a) Horizontal pupil
 - (b) Oviparous
 - (c) Nonpoisonous
 - (d) Viviparous
34. Which one of the following is not a member of the order squamata?
 - (a) Caimans
 - (b) Snakes
 - (c) Lizards
 - (d) Amphisbaenids
35. Hepatic piston is applicable to:
 - (a) Crocodiles
 - (b) Tortoises
 - (c) *Sphenodon*
 - (d) Snakes
36. Which one of the following is known as a living fossil?
 - (a) *Seymouria*
 - (b) *Sphenodon*
 - (c) *Ophisaurus*
 - (d) *Brontosaurus*
37. Mesozoic era is known as the:
 - (a) Golden age of dinosaurs
 - (b) Golden age of *Archaeopteryx*
 - (c) Golden age of birds
 - (d) Golden age of primitive amphibians
38. Slowworm (glass snake) is a:
 - (a) Degenerated lizard without limbs and scales
 - (b) A primitive snake
 - (c) Poisonous lizard
 - (d) Extinct reptile
39. Which one of the following is a viviparous snake?
 - (a) Cobra
 - (b) *Python*
 - (c) Krait
 - (d) None
40. Which one of the following can change its body colour?
 - (a) *Iguana*
 - (b) *Heloderma*
 - (c) *Draco*
 - (d) *Chameleon*
41. Which one of the following is a poisonous lizard?
 - (a) *Draco*
 - (b) *Gecko*
 - (c) *Heloderma*
 - (d) *Varanus*
42. A flying lizard is:
 - (a) *Phrynosoma*
 - (b) *Varanus*
 - (c) *Draco*
 - (d) *Typhlops*

43. Which one of the following is not found in India?
 (a) *Gavialis gangeticus* (b) *Alligator mississippiensis*
 (c) *Crocodylus porosus* (d) *Trionyx gangeticus*
44. Which one of the following shows a friendly partnership with birds?
 (a) *Crocodylus porosus* (b) *Crocodylus niloticus*
 (c) *Gavialis gangeticus* (d) *Alligator*
45. A primitive and generalised type of reptile is:
 (a) *Draco* (b) *Phrynosoma* (c) *Uropeltis* (d) *Sphenodon*
46. The only skin gland recorded in reptiles is the:
 (a) Femoral gland (b) Uropygial gland (c) Oil gland (d) Odoriferous gland
47. The absence of skin glands and acquisition of scales over the body in reptiles are:
 (a) Degenerate characters
 (b) Evolutionary achievements for living on dry land and water
 (c) Evolutionary achievements for living on dry land
 (d) Primitive characters
48. In which one of the following snakes has parthenogenesis been observed?
 (a) *Glauconia blandfordi* (b) *Uropeltis grandis*
 (c) *Ramphotyphlops braminus* (d) *Xenopeltis unicolour*
49. Which one of the following is not lacking in nonpoisonous snakes?
 (a) Poison gland (b) Loreal shield (c) Head shield (d) Streptostylism
50. In reptiles, lachrymal glands are well developed except in:
 (a) *Sphenodon* (b) Snakes (c) *Chameleon* (d) All
51. In which one of the following reptiles do ureters not open separately in cloaca?
 (a) Crocodiles (b) Snakes (c) Turtles (d) *Sphenodon*
52. Which one of the following is capable of bipedal locomotion?
 (a) *Sphenodon* (b) *Crotaphytus collaris* (c) *Mabouia carinata* (d) *Lepidophyma*
53. *Dendrophis* is commonly known as:
 (a) Grass snake (b) Water snake (c) Wolf snake (d) Tree snake
54. Which one of the following is not a viviparous lizard?
 (a) *Xantusia* (b) *Lepidophyma* (c) *Cricosaura* (d) *Ophisops*
55. Occipital condyle is tripartite in:
 (a) *Sphenodon* (b) Turtles (c) Snakes (d) Lizards
56. Crocodiles have:
 (a) Pecten (b) Procoelous vertebrae (c) Chevron bones (d) All
57. Which one of the following can squirt blood from the eyes?
 (a) *Phrynosoma* (b) *Chameleon* (c) *Heloderma* (d) *Sphenodon*
58. In sea snakes, ventral shields are:
 (a) Narrow (b) Rudimentary (c) Absent (d) All
59. A pro-atlas bone is present between the atlas and the occipital region of the skull in:
 (a) *Sphenodon* (b) *Chameleon* (c) Crocodiles (d) All

60. What is correct about the members of the class reptilia ?
 - (a) Development is direct
 - (b) Eggs are megalecithal
 - (c) There is no parental care
 - (d) All
61. Cobra is characterised by:
 - (a) Presence of hood
 - (b) Presence of spectacle mark
 - (c) Third supra-labial shield touching the eye
 - (d) All
62. If tail is flat, the snake is:
 - (a) Krait
 - (b) *Python*
 - (c) *Hydrophis*
 - (d) Coral snake
63. All snakes are oviparous except:
 - (a) Viper and pit viper
 - (b) Sea snakes and vipers
 - (c) Viper and *Python*
 - (d) *Python* and boa
64. The correct statement regarding crocodiles is:
 - (a) Skin is thick with scales, bony plates and scutes
 - (b) The heart is four chambered
 - (c) Pineal gland is absent and muscular diaphragm is present
 - (d) All
65. The main nitrogenous waste product of reptiles is:
 - (a) Uric acid
 - (b) Urea
 - (c) Ammonia
 - (d) All
66. Which one of the following has a third eye?
 - (a) *Sphenodon*
 - (b) Snakes
 - (c) *Chameleon*
 - (d) Crocodiles
67. The only reptile having a four-chambered heart is:
 - (a) Crocodile
 - (b) *Sphenodon*
 - (c) Tortoise
 - (d) *Barkudia*
68. In which one of the following reptiles is the diaphragm present?
 - (a) Snakes
 - (b) Lizards
 - (c) Crocodiles
 - (d) *Sphenodon*
69. Snakes lack:
 - (a) Movable eyelids
 - (b) Limbs
 - (c) Girdles
 - (d) All
70. The correct statement regarding snakes is:
 - (a) All sea snakes are nonpoisonous
 - (b) All snakes are oviparous
 - (c) Snakes do not have movable eyelids
 - (d) All snakes have nictitating membrane
71. Sternum, tympanum, nictitating membrane and urinary bladder are absent in:
 - (a) All reptiles
 - (b) All lizards
 - (c) All snakes
 - (d) All crocodiles
72. Vestigial pelvic girdle and hind limbs are present in:
 - (a) *Python* and kraits
 - (b) Boa and sea snakes
 - (c) *Python* and boa
 - (d) *Python* and coral snakes
73. Poison glands of snakes are modified:
 - (a) Parotid glands
 - (b) Maxillary teeth
 - (c) Submaxillary glands
 - (d) Sublingual glands
74. 4th infralabial is the largest in:
 - (a) *Hydrophis*
 - (b) Krait
 - (c) Cobra
 - (d) Coral snake

75. Most lizards replace their teeth throughout their life except:
(a) Geckos and agamid (b) Horned lizard
(c) *Chameleon* and agamid (d) Gila monster
76. Which one of the following statements is correct?
(A) In turtles, sex is determined by the temperature at which the egg is incubated; warmer temperatures produce females, while low temperatures result in males.
(B) In crocodiles, incubation of eggs at higher temperatures results in males.
(C) In snakes, sex is determined by sex chromosomes.
(D) All
77. Chevron bones are present in the caudal region of:
(a) Lacertilia (b) Crocodilia
(c) *Sphenodon* (d) All
78. Urinary bladder is not lacking in:
(a) *Varanus* (b) Snakes (c) Crocodiles (d) *Sphenodon*
79. Anal glands are a characteristic of:
(a) *Sphenodon* (b) *Varanus* (c) Snakes (d) Turtles
80. The arrangement of scales in squamata is:
(a) Keeled (b) Smooth (c) Sculptured (d) All
81. In which one of the following orders of class reptilia is the number of vertebrae always smaller as compared to members of other orders?
(a) Chelonia (b) Crocodilia (c) Squamata (d) Rhynchocephalia
82. Which one of the following statements is incorrect?
(a) Telidae is a family of lizards generally known as whiptails.
(b) *Cnemidophorus* and *Aspidoscelis* are parthenogenetic genera of the family telidae.
(c) *Tupinambis* is the nonparthenogenetic genus of the family telidae.
(d) None
83. The wall lizard that regularly eats seeds:
(a) *Meroles anchietae* (b) *Gallotia stehlini*
(c) *Holaspis laevis* (d) All
84. Which one of the following is a viviparous lizard?
(a) *Holaspis guentheri* (b) *Ophisops*
(c) *Zootoca vivipara* (d) *Gallotia stehlini*
85. Which one of the following is incorrect about reptiles?
(a) Ectothermic metabolism (b) Strong bony skeleton
(c) Ventricle of heart partly divided by a septum (d) Toes without claws
86. Clavicles and interclavicle are lacking in:
(a) Crocodilia (b) Chelonia (c) Rhynchocephalia (d) None
87. Poison of this snake is haemotoxic:
(a) Cobra (b) Viper (c) Krait (d) Sea snake
88. Cloacal respiration is found in:
(a) Turtles (b) Crocodiles (c) Alligators (d) Sea snakes

89. Which one of the following is known as flying dragon?
 (a) *Phrynosoma* (b) *Draco* (c) *Chameleon* (d) *Heloderma*
90. Consider the following statements with reference to *Sphenodon*.
 (A) Preserved since Jurassic times
 (B) A photosensitive organ (third eye) is present on the crown of its head
 (C) The metabolism is extremely slow, but there is a very high rate of genetic evolution
 (D) The sex of *Sphenodon* depends on the temperature at which the embryo develops
 The incorrect statements are:
 (a) A and D (b) B and D (c) C and D (d) None
91. Which one of the following is a limbless lizard?
 (a) *Anguis* (b) *Ophis* (c) *Rhineura* (d) All
92. Egg tooth is lacking in the embryo of:
 (a) Crocodiles and chelonians (b) *Sphenodon*
 (c) Birds (d) None
93. In chelonians, the tongue is:
 (a) Immobile (b) Bifid (c) Protrusible (d) All
94. Fangs of snakes are modified:
 (a) Canines (b) Incisors (c) Maxillary teeth (d) None
95. In which one of the following are teeth the absent?
 (a) Turtles (b) *Sphenodon* (c) *Python* (d) *Iguana*
96. Which one of the following is absent in crocodiles?
 (a) Tongue (b) `Quadrate (c) Urinary bladder (d) Clavicles
97. Copulatory organ is absent in:
 (a) *Varanus* (b) Turtles (c) *Sphenodon* (d) Crocodile
98. Carapace and plastron are present in:
 (a) *Sphenodon* (b) *Trionyx* (c) *Heloderma* (d) *Chameleon*
99. A kinetic skull is present in:
 (a) *Sphenodon* (b) *Chameleon* (c) Snakes (d) Crocodiles
100. Turtles are:
 (a) Freshwater *Chelone* (b) Marine *Chelone*
 (c) Both marine and freshwater (d) Terrestrial *Chelone*
101. Eggs of reptiles are:
 (a) Homolecithal (b) Telolecithal (c) Centrolecithal (d) Alecithal
102. Though in crocodiles the heart is four chambered, yet there is no separation of pure and impure blood. This is due to the presence of:
 (a) Foramen of ovalis (b) Foramen of monro
 (c) Foramen of Panizza (d) Conus arteriosus
103. Flat tail is found in:
 (a) *Python* and cobra (b) *Hydrophis* and boa
 (c) Coral snake and *Enhydrina* (d) *Hydrophis* and *Enhydrina*

104. Shelled eggs are found in:
(a) Amphibians and reptiles (b) Reptiles and birds
(c) Reptiles and mammals (d) All amniotes
105. Which one of the following is absent in nonpoisonous snakes?
(a) Hood (b) Loreal shield (c) Poison gland (d) All
106. Snake venom is soluble in:
(a) Water (b) Glycerine
(c) Both water and glycerine (d) None
107. Stem reptiles are:
(a) *Cotylosaurus* (b) *Ichthyosaurs* (c) *Pterosaurs* (d) *Pelycosauria*
108. The only animal capable of stretching its tongue more than its body length is the:
(a) *Sphenodon* (b) *Chameleon* (c) *Echidna* (d) Komodo dragon
109. The scales are smooth in:
(a) King cobra (b) Rattle snake (c) Garter snake (d) All
110. Snakes lack:
(a) Sternum (b) Mobility of eyeballs
(c) Well-developed vision (d) All
111. Krait belongs to family:
(a) Colubridae (b) Elapidae (c) Viperidae (d) Hydrophiidae
112. In Geckos, vertebrae are:
(a) Acoelous (b) Procoelous (c) Amphicoelous (d) Opisthocoelous
113. Ophidian lacks:
(a) Interparietal foramen (b) Jugal
(c) Epipterygoid (d) All
114. Which animal has the capacity to move and focus its eyes separately, rotating them in different directions and focusing them on two different objects simultaneously?
(a) *Anguis* (b) *Heloderma* (c) *Chameleon* (d) *Sphenodon*
115. What is incorrect about ophidians?
(a) Tongue is bifid and protrusible
(b) Left lung is reduced or absent
(c) Vertebrae are longer and narrow than those of tetrapods
(d) External ear and middle ear are lacking
116. Skin is not shed and seals grow gradually to replace wear in:
(a) Crocodiles (b) *Sphenodon* (c) Glass snake (d) None
117. Copulatory organ is lacking in:
(a) Crocodiles (b) *Anguis* (c) *Sphenodon* (d) Turtles
118. Turtles have:
(a) Poor sound perception (b) Good sense of smell
(c) Sharp vision and colour perception (d) All
119. A loreal pit is present between the eye and nostril in:
(a) Viper (b) Pit viper (c) Krait (d) King cobra

120. The snake which feeds on other nonpoisonous snakes:
(a) Cobra (b) King cobra (c) Pit viper (d) Krait
121. The snake which makes a nest for laying eggs:
(a) King cobra (b) Cobra (c) Pit viper (d) *Python*
122. Painkillers like cobroxin and nyloxin are prepared from the venom of:
(a) Cobra (b) Krait
(c) Pit viper and cobra (d) *Hydrophis*
123. The classification of class reptilia is based on:
(a) Temporal fossa (b) Scales, bony plates and scutes
(c) Nature of jaw suspension (d) All
124. Loreal pit of pit viper is a:
(a) Thermoreceptor (b) Chemoreceptor (c) Rheoreceptor (d) None
125. A highly advanced characteristic present in crocodiles is:
(a) Large body size (b) Strong teeth
(c) Cleidoic eggs (d) Four-chambered heart
126. Snakes perceive sound through:
(a) Tympanum (b) Middle ear (c) Skin (d) Tongue
127. Snakes are distributed all over the world, but are not found in:
(a) Australia (b) New Zealand (c) Germany (d) Fiji
128. Foramen of Panizza is found in the heart of:
(a) Snakes (b) *Sphenodon* (c) *Draco* (d) Crocodile
129. The incorrect match is:
(a) *Sphenodon* – Living fossil (b) Crocodile – Four-chambered heart
(c) Cobra – Can change body colour (d) Snakes – Well-developed urinary bladder
130. The poison of viper effects on:
(a) Nervous system (b) Excretory system
(c) Digestive system (d) Circulatory system
131. The poison of cobra effects on:
(a) Nervous system (b) Circulatory system
(c) Excretory system (d) Digestive system
132. Which one of the following is a nonpoisonous snake?
(a) Rat snake (b) Viper (c) *Hydrophis* (d) Coral snake
133. What is incorrect about *Cricosaura*?
(a) Smallest night lizard (b) Fourth finger with four phalanges
(c) Frontonasal scales are present (d) Parietal scale is present
134. Which one of the following statements is correct?
(a) Fluctuation in environmental temperature influences reptiles to a great extent.
(b) In tropical countries, reptiles remain active throughout the year.
(c) In temperate countries, reptiles remain active during the day.
(d) All

135. The skull of reptiles is characterised by:
 (a) Lack of cartilaginous element (b) Presence of single occipital condyle
 (c) Presence of parietal and coronary structures (d) All
136. The skin is shed completely by:
 (a) *Draco* (b) *Heloderma* (c) *Chelone* (d) Snakes
137. A lizard can be distinguished from a snake by the presence of:
 (a) Eyelids (b) Tympanum
 (c) Paired pentadactyl limbs (d) All
138. In which group of vertebrates is the heart either three or four chambered?
 (a) Amphibians (b) Reptiles (c) Birds (d) Mammals
139. Autotomy is shown by:
 (a) Lizards (b) Crocodiles (c) Snakes (d) None
140. Autotomy is:
 (a) A signal of courtship (b) A mode of reproduction
 (c) Voluntary breaking of tail (d) A signal to alert from enemies
141. Which one of the following characteristics differentiates reptiles from birds?
 (a) Megalecithal eggs (b) Presence of scales
 (c) Well-developed limbs (d) Body temperature
142. Snakes are ectothermic and belong to the class:
 (a) Amphibia (b) Reptilia (c) Aves (d) Mammalia
143. Consider the following statements:
 (A) Snakes are reptiles without limbs, having a body covered with scales
 (B) Snakes lack eyelids
 (C) Snakes eat prey as a whole
 (D) A few snakes are oviparous and a few are viviparous
 The correct statements are:
 (a) All (b) A, B and C (c) B and C (d) A and D
144. *Chameleon* changes its body colour:
 (a) To camouflage (b) According to light and temperature
 (c) According to its moods (d) All
145. Which one of the following is a living marine lizard?
 (a) *Amblyrhynchus* (b) *Varanus komodoensis*
 (c) *Mabouia carinata* (d) *Heloderma*
146. What is incorrect about crocodilia?
 (a) Diapsid skull (b) Movable quadrate
 (c) Parietal foramen is lacking (d) Median, erectile and grooved penis
147. Teeth are strictly similar in:
 (a) Gharials (b) Crocodiles (c) Alligators (d) None
148. Consider the following statements with reference to a *Sphenodon*:
 (A) Highly developed heart in comparison to other reptiles
 (B) Parietal eye and nictitating membrane are present

- (C) Eardrum is present
- (D) The sex of hatchlings depends on temperature

The incorrect statements are:

- (a) None (b) A and B (c) A and C (d) B and D
149. True cerebral cortex (neopallium) first developed in:
- (a) Crocodiles (b) Lizards (c) Snakes (d) Birds
150. The only continent where the number of poisonous snakes is more than nonpoisonous snakes:
- (a) Asia (b) Australia (c) Europe (d) Africa
151. Ten pairs of cranial nerves are found in:
- (a) Lacertilia (b) Ophidia (c) Rhynchocephalia (d) Crocodilia
152. Which one of the following reptiles can cool the body by panting?
- (a) *Sauromalus* (b) *Dryophis* (c) *Lepidophyma* (d) None
153. Consider the following statements:
- (A) A rattle is a horny structure found in the rattlesnake
 - (B) Rattle gains a segment, each time a snake sheds its skin
 - (C) Rattle helps in knowing the age of a snake
 - (D) Buzzing sound of the rattle is used as a warning
- The incorrect statements are:
- (a) A, C and D (b) B and C (c) C (d) None
154. Which one of the following is different?
- (a) *Hydrophis* (b) *Dryophis* (c) *Ichthyophis* (d) *Dendrophis*
155. In which one of the following is the roof of the skull solid?
- (a) Anapsida (b) Diapsida (c) Parapsida (d) Synapsida
156. Which one of the following is incorrect with reference to *Chelone*?
- (a) Second and third cervical vertebrae are opisthocoelous
 - (b) Fourth vertebra is amphicoelous
 - (c) Fifth and sixth vertebrae are procoelous
 - (d) None
157. What is common among all reptiles?
- (a) Transverse anal opening (b) Oviparity
 - (c) Post-anal tail (d) Secondary palate
158. In which one of the following snakes is a special heat-sensitive pit present on the head between the nostrils and eyes?
- (a) Copper head (b) Cotton mouth (c) Rattlesnake (d) All
159. In Lacertilian, vertebrae are procoelous except:
- (a) Geckos (b) *Draco* (c) *Chameleon* (d) *Heloderma*
160. Which one of the following is present in lacertilian but lacking in ophidian?
- (a) Jugal (b) Urinary bladder (c) Fossae (d) All
161. What is incorrect about *Chelone*?
- (a) Edible turtle (b) Anapsid-type skull (c) Claws are present (d) None

162. Which one of the following is a correct match?

- (a) Anapsid – Chelonians
 (b) Parapsid – Mammals like reptiles
 (c) Diapsid – Protosaurs
 (d) Synapsid – Rhynchocephalia

Answers to Multiple-Choice Questions

1. (b)	2. (c)	3. (d)	4. (b)	5. (c)	6. (c)	7. (b)	8. (c)
9. (a)	10. (c)	11. (d)	12. (b)	13. (a)	14. (a)	15. (d)	16. (c)
17. (a)	18. (c)	19. (d)	20. (d)	21. (d)	22. (d)	23. (b)	24. (d)
25. (d)	26. (d)	27. (d)	28. (a)	29. (c)	30. (d)	31. (b)	32. (d)
33. (b)	34. (a)	35. (a)	36. (b)	37. (a)	38. (a)	39. (d)	40. (d)
41. (c)	42. (c)	43. (b)	44. (b)	45. (d)	46. (a)	47. (c)	48. (c)
49. (d)	50. (d)	51. (c)	52. (b)	53. (d)	54. (d)	55. (c)	56. (d)
57. (a)	58. (d)	59. (d)	60. (d)	61. (d)	62. (c)	63. (b)	64. (d)
65. (a)	66. (a)	67. (a)	68. (c)	69. (d)	70. (c)	71. (c)	72. (c)
73. (a)	74. (b)	75. (c)	76. (d)	77. (d)	78. (d)	79. (c)	80. (d)
81. (a)	82. (d)	83. (a)	84. (c)	85. (d)	86. (b)	87. (b)	88. (a)
89. (b)	90. (d)	91. (d)	92. (d)	93. (d)	94. (c)	95. (a)	96. (d)
97. (c)	98. (b)	99. (c)	100. (c)	101. (b)	102. (c)	103. (d)	104. (b)
105. (d)	106. (c)	107. (a)	108. (b)	109. (a)	110. (d)	111. (b)	112. (c)
113. (d)	114. (c)	115. (c)	116. (a)	117. (c)	118. (d)	119. (b)	120. (b)
121. (a)	122. (a)	123. (a)	124. (a)	125. (d)	126. (c)	127. (b)	128. (d)
129. (d)	130. (d)	131. (a)	132. (a)	133. (d)	134. (d)	135. (d)	136. (d)
137. (d)	138. (b)	139. (a)	140. (c)	141. (d)	142. (b)	143. (a)	144. (d)
145. (a)	146. (b)	147. (a)	148. (c)	149. (a)	150. (b)	151. (b)	152. (a)
153. (d)	154. (c)	155. (a)	156. (d)	157. (c)	158. (d)	159. (a)	160. (d)
161. (c)	162. (a)						

Fill in the Blanks

- Body temperature in reptiles is regulated by the _____ of the brain.
- The classification of reptiles is based on _____ in the skull.
- _____ snake is the smallest reptile.
- _____ is the longest venomous snake.
- _____ of South Africa is the smallest species of crocodiles.
- All reptiles have middle ear except _____.

7. Largest living forms of reptiles are included in the order _____.
8. In reptiles, succession of teeth is a continuous process except. _____.
9. Most primitive type of reptilian skull is _____.
10. Pit organs of snakes are _____ receptors.
11. The only reptile lacking copulatory organ is _____.
12. In lacertilian, the nictitating membrane is movable except _____.
13. The body of a turtle is covered by a protective shell consisting of a dorsal carapace and ventral _____.
14. In reptiles, the cleavage is _____.
15. _____ is the only living representative of the order rhynchocephalia.
16. Zygosphenes and zyganterons are found in the vertebrae of _____.
17. The poison gland of snakes is the modified _____ salivary gland.
18. _____ and _____ are limbless lizards.
19. Nonvenomous snakes belong to the family _____.
20. Snakes belong to the order _____ and the suborder _____.
21. _____ and some _____ are vegetarian lizards.
22. The poison of *Heloderma* is _____.
23. _____ is a herbivorous lizard.
24. The fangs of snakes are _____ teeth.
25. The poison of cobra and krait is _____.
26. Teeth of crocodiles are _____.
27. _____ is the study of lizards.
28. _____ were the first vertebrates to have 12 pairs of cranial nerves.
29. The first reptiles evolved in the upper _____ period.
30. In reptiles, kidneys are _____.
31. Nitrogenous waste product of reptile is _____.
32. *Barkudia* is an Indian _____ lizard.
33. _____ is a saltwater crocodile.
34. In reptiles, adrenal glands are located very close to the gonads except _____.
35. Vertebrae are _____ in the order squamata.
36. _____ is a parthenogenetic lizard.
37. Side winding motion is used by snakes living in _____.
38. The interclavicle of reptiles is _____ shaped.
39. Caimans belong to the order _____.
40. _____ is the oldest known reptile.

41. The first true reptiles are categorised as _____.
42. _____ is a genus of wall lizard.
43. _____ is the family of wall lizards.
44. *Holaspis* is one of the few arboreal _____.
45. _____ is a family of very small viviparous lizards.
46. A leopard is known for its distinctive _____ and _____ carapace.
47. In reptiles, all reproductive activities take place in _____.
48. Nocturnal geckos have only _____ cells in their retina.
49. Heart of crocodiles consists of _____ chambers.
50. _____ era is known as the golden age of reptiles.
51. *Gavialis gangeticus* is found only in _____.
52. *Trionyx* is known as _____ turtle.
53. *Crotalus* is distinguished by the presence of a _____.
54. _____ is an edible turtle.
55. Slowworms belong to the family _____.
56. In turtles, inspiration and expiration occur by the movement of _____ and _____.
57. The richest deposit of fossil is found in _____.
58. Crocodiles and birds arose from the _____ dinosaurs.
59. Lepidosaur, include all modern reptiles except _____ and _____.
60. The foramen of Panizza is a communicating structure between _____ and right systemic arches.
61. The plastron of turtles is made up of _____ pieces.
62. Among lizards, parthenogenesis is well documented by _____ lizards.
63. Cobroxin is used to block _____.
64. Nyloxin is used for the treatment of _____ pain.
65. _____ was the longest dinosaur.

Answers to Fill in the Blanks

1. Hypothalamus	2. Temporal fossa	3. Pygmy rattle
4. King cobra	5. Dwarf caiman	6. Snakes
7. Crocodilia	8. Lizards	9. Anapsida
10. Infrared rays	11. <i>Sphenodon</i>	12. Amphisbaenidae
13. Plastron	14. Meroblastic	15. <i>Sphenodon</i>
16. Snakes	17. Parotid	18. <i>Anguis, Ophisaurus</i>

19. Colubridae	20. Squamata ophidia	21. Iguanas, skinks
22. Neurotoxic	23. <i>Iguana</i>	24. Maxillary teeth
25. Neurotoxic	26. Thecodont	27. Saurology
28. Reptiles	29. Carboniferous	30. Metanephric
31. Uric acid	32. Limbless	33. <i>Crocodylus porosus</i>
34. Turtles	35. Procoelous	36. Molloch
37. Sand	38. T	39. Crocodilia
40. <i>Hylonomus</i>	41. Anapsids	42. <i>Tropidosaura</i>
43. Lacertidae	44. Lacertids	45. Xantusidae
46. Yellow black	47. Cloaca	48. Cone
49. Four	50. Mesozoic	51. India
52. Soft-shelled	53. Rattle	54. <i>Chelone</i>
55. Amphisbaenidae	56. Pectoral girdle, hyoid apparatus	57. North America
58. Archosaur	59. Turtles, crocodiles	60. Left
61. Nine	62. Cnemidophorus l	63. Nerve transmission
64. Arthritis	65. <i>Diplodocus</i>	

True or False

- Snakes are closely related to lizards.
- Scales of snakes are made up of keratin.
- Snakes shed their skin in relation to their growth rate.
- Rattlesnakes can bite sometimes even after their death.
- Tiny gecko of the Virgin Island is the smallest lizard of the world.
- Regenerated tails of lizards contain vertebrae.
- Neopallium is lacking in *Sphenodon*.
- Among reptiles, crocodiles and lizards have the best developed sense of hearing.
- In reptiles, the urinary bladder is allantoic in nature.
- Monitors and *Chameleon* have the ability to undergo tail autotomy.
- Geckos have vocal cords.
- Draco* comes to the ground only to mate and to lay eggs.
- All crocodiles are not oviparous.
- In *Sphenodon*, teeth are present.
- In snakes, a well-developed sternum is present.

16. Some arboreal snakes have binocular vision.
17. Turtles are both herbivorous and carnivorous.
18. The anal opening in *Sphenodon* is longitudinal.
19. A clitoris is present in female crocodile.
20. In chelonian, the cloacal aperture is transverse.
21. The newly born rattlesnakes possess rattle.
22. In ophidian and chelonian, the sternum is absent.
23. In most ophidian and lacertilian, a rudimentary caecum is present at the junction of small and large intestines.
24. Lizards and snakes are the largest group of reptiles.
25. The snout of an alligator is shorter, wider and rounder than crocodiles.
26. When an alligator's mouth is closed, the teeth are not visible.
27. Komodo dragons are endangered.
28. Ductus caroticus is present in snakes.
29. Skull is streptostylic in snakes.
30. Snakes have a well-developed parietal organ.
31. Fangs are modified teeth.
32. In *Chameleon*, feet are zygodactylus
33. In snakes, lungs are symmetrical.
34. In *Chameleon*, both forelimbs and hindlimbs become prehensile.
35. Abdominal ribs are lacking in crocodiles.
36. Thymectomy from young reptiles decreases the capacity for adaptive response.
37. Reptiles do not rely on heat source to maintain their body temperature.
38. Tortoises on Galapagos Islands have been known to live for more than 200 years.
39. A secondary palate is present in most of the reptiles.
40. Spiny-tailed *Iguana* is the world fastest reptile.
41. A crocodile can stick its tongue out.
42. Modern reptiles have brain that is small in relation to their body.
43. Gecko reproduces asexually by parthenogenesis.
44. Skull bones are kinetic in worm lizards.
45. In reptiles, air is sucked into the lungs by changing the size and pressure within the body cavity.
46. Lateral line system is present in aquatic reptiles.
47. Egg tooth is present in the embryos of lizards and snakes.
48. Reptiles are less active than amphibians.
49. In reptiles, digestion is more rapid than the amphibians .
50. Sense of hearing is well developed in reptiles.
51. Snake venom is not soluble in water.

52. Tongue is protrusible in turtles.
53. Lizards lack urinary bladder
54. Snakes swallow the whole prey.
55. In snakes, during swallowing, the glottis may be projected forward.
56. All lizards have camouflage ability.
57. Chelonians and crocodilians have paired copulatory organs.
58. The reptilian placenta is formed by the union of yolk sac and chorion, or by the fusion of chorion allantois and uterine lining.
59. Chordae tendineae are lacking in the heart of reptiles.
60. Snakes lack osteoderms
61. Snakes lack eustachian tube.
62. *Stegosaurus* was a horned dinosaur.
63. *Iguanodon* was the heaviest dinosaur.
64. A female snake can store sperms for several years.
65. *Cricosaura* is an Indian viviparous lizard.

Answers to True or False

1. True	2. True	3. True	4. True	5. True	6. False	7. True	8. True
9. True	10. False	11. True	12. True	13. False	14. True	15. False	16. True
17. True	18. False	19. True	20. False	21. False	22. True	23. True	24. True
25. True	26. True	27. True	28. False	29. True	30. False	31. True	32. True
33. False	34. True	35. False	36. True	37. False	38. True	39. False	40. True
41. False	42. True	43. True	44. False	45. True	46. False	47. True	48. False
49. True	50. False	51. False	52. False	53. False	54. True	55. True	56. False
57. False	58. True	59. False	60. True	61. True	62. True	63. False	64. True
65. False							

Give Reasons

1. Reptiles are not found in the coldest regions of the world.
 - Because being ectothermic, they lack an effective system for regulating their body temperature. Their body temperature tends to approach the environment and as such, survival will be difficult.
2. Alligators live near water.
 - Because they are cold-blooded and need water to maintain their constant body temperature.

3. Snakes and lizards flick their tongues in air.
 - Because by doing so, they capture scent particles, as they do not smell through their nose. This activity helps them to search for food.
4. Shedding of skin is more rapid in young snakes in comparison to old snakes.
 - Because young snakes grow faster in comparison to the old ones, particularly during the first two years of their lives, during which they grow fastest.
5. Reptilian kidney is unable to produce liquid urine; more concentrated than their body fluid.
 - Because reptilian kidneys lack loop of Henle.
6. Reptiles need heat.
 - Because being ectothermic, they are unable to generate their own heat, like birds and mammals. So, for performing different functions, like moving properly, digesting food, and other functions of the body, they need heat.
7. Many snakes shed their skin throughout life.
 - Because they grow throughout their lives.

AVES

Multiple-Choice Questions

1. Ornithology is the study of:
(a) Reptiles (b) Birds (c) Migration of birds (d) Birds' eggs
2. Study of birds' eggs is called:
(a) Odology (b) Odontology (c) Osteology (d) Phenology
3. Phenology is the study of:
(a) Habit of birds (b) Migration of birds
(c) Fossil history of birds (d) Movement of birds
4. *Archaeopteryx* is a connecting link between:
(a) Amphibians and reptiles (b) Reptiles and birds
(c) Birds and mammals (d) Reptiles and mammals
5. Fossil of *Archaeopteryx* was discovered in:
(a) Central Asia (b) England (c) Germany (d) Africa
6. *Archaeopteryx* became extinct during the :
(a) Permian period (b) Jurassic period
(c) Cretaceous period (d) Devonian period
7. The correct statement regarding birds:
(a) Their body temperature does not change
(b) Their anterior part of the body is concerned with flight and the posterior part is concerned with the movement on land
(c) Respiratory system is specialised to perform double respiration
(d) All
8. In birds, jaws are:
(a) Muscular and powerful (b) Modified into beak
(c) Poorly developed (d) Absent
9. Sunbird is famous for:
(a) Laying eggs in other bird's nest (b) Migrating into India from Siberia
(c) Sucking flower nectar (d) Its peculiar beak
10. Smallest bird is:
(a) Humming bird (b) Weaver bird (c) Sparrow (d) Stork
11. Which one of the following is a flightless bird?
(a) Emu (b) Sunbird (c) Swan (d) Pelican

12. Largest living bird is:
 (a) Dodo (b) Ostrich (c) Albatross (d) Swift
13. The bird which can fly backwards is:
 (a) Swift (b) Humming bird (c) Wagtail (d) Arctic tern
14. Fastest flying bird is:
 (a) Albatross (b) Wagtail (c) Arctic tern (d) Swift
15. Smallest living flightless bird is:
 (a) Emu (b) Tinamus (c) Kiwi (d) Flamingo
16. Largest animal egg is of:
 (a) Crocodile (b) *Echidna* (c) Ostrich (d) Tortoise
17. The bird that lays eggs on ice is:
 (a) Arctic tern (b) Humming bird (c) Albatross (d) Penguin
18. Sense of smell is well developed in:
 (a) Crows (b) Cuckoos (c) Kiwis (d) Penguins
19. The national bird of India is:
 (a) Crow (b) Cuckoo (c) Sparrow (d) Peacock
20. Cuckoo is famous for:
 (a) Its beak's colour (b) Its sweet sound
 (c) Its habit of laying eggs in a crow's nest (d) None
21. Paddle-like wings are found in:
 (a) Penguins (b) Swans (c) Albatrosses (d) Sunbirds
22. Characteristic of avian eye is the presence of:
 (a) Retina (b) Pecten (c) Comb plates (d) Iris
23. Pecten is present in the eye of all birds except:
 (a) Ostriches (b) Crows (c) Cuckoos (d) Kiwis
24. Syrinx is found in:
 (a) Pisces (b) Amphibia (c) Birds (d) None
25. The only cutaneous gland found in birds is the:
 (a) Uropygial gland (b) Femoral gland (c) Green gland (d) Coxal gland
26. Which one of the following is absent in pigeons?
 (a) Syrinx (b) Pecten (c) Uropygial gland (d) Gall bladder
27. The statement "Birds are glorified reptiles" was given by:
 (a) Young (b) Huxley (c) Nobel (d) Goldstein
28. Tail vertebrae of birds fused to form:
 (a) Synsacrum (b) Furcula (c) Pygostyle (d) Urostyle
29. Consider the following statements about ratites:
 (A) Hindlimbs are adapted to cursorial life (B) Syrinx is present
 (C) Skull is dromaeognathous (D) Youngs altricial
 The correct statements are:
 (a) None (b) A and B (c) B and C (d) C and D

30. Pterylae is not applicable to:
 (a) Pigeon (b) Ratites (c) Ratites and penguins (d) Penguins and kiwis

31. Ratites lack:
 (a) Down feathers (b) Furcula (c) Functional tail (d) All

32. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Protrusible tongue	1. Guinea fowl
(B) Monogamous	2. Penguin
(C) Air sacs are absent	3. Emu
(D) Polygamous	4. Humming bird

Answer codes:

A	B	C	D
(a) 3	1	2	4
(b) 4	3	2	1
(c) 2	3	1	4
(d) 3	4	2	1

33. Feathers help in:
 (a) Heat regulation (b) Sexual display (c) Flight (d) All
34. In which one of the following birds do feet help in thermoregulation?
 (a) Sand grouse (b) Kingfisher (c) Woodpecker (d) Hawk

35. Birds lack:
 (a) Nictitating membrane (b) Organ of corti
 (c) Harderian gland (d) Ear ossicles

36. Copulatory organ is present in:
 (a) Ducks (b) Geese (c) Ratites (d) All

37. Airsacs, which are characteristic of birds, are also found in:
 (a) *Draco* (b) Crocodiles (c) Chamaeleon (d) *Sphenodon*

38. What is incorrect about the circulatory system of aves?
 (a) Heart is four chambered
 (b) Well-developed renal portal system
 (c) Sinus venosus and truncus arteriosus are lacking
 (d) RBCs are nucleated

39. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Lumbricalis	1. Activity of biceps
(B) Gastrocnemius	2. Acts as the flexor of third digit
(C) Ectepicondylo-radialis	3. Activity of triceps
(D) Anconeus	4. Extension of tarso-metatarsus

Answer codes:

A	B	C	D
(a) 3	1	2	4
(b) 4	3	2	1
(c) 2	3	1	4
(d) 3	4	2	1

40. Which one of the following is an unpaired air sac?
 (a) Cervical (b) Interclavicular (c) Posterior thoracic (d) Anterior thoracic
41. Pigeon lacks:
 (a) Sexual dimorphism (b) Terminal nerve
 (c) Gall bladder (d) All
42. Which one of the following is found in pigeons?
 (a) Crypts of Leiberkuhn (b) Caecal gland
 (c) Crop gland (d) All
43. Which one of the following is applicable to birds?
 (a) Endothermic (b) Bipedal (c) Oviparous (d) All
44. Which one of the following is not a pleognathae?
 (a) Penguin (b) Ostrich (c) Emu (d) Kiwi
45. Most birds have poor sense of smell except:
 (a) Ostriches (b) Kiwis (c) Pitohuis (d) Penguins
46. Generally birds' scales do not overlap significantly except in:
 (a) Sparrows and pigeons (b) Ostriches and kiwis
 (c) Parrots and sparrows (d) Kingfishers and woodpeckers
47. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|----------------|---------------------|
| (A) Geese | 1. Kleptoparasitism |
| (B) Some ducks | 2. Nectar feeders |
| (C) Sunbirds | 3. Mainly grazers |
| (D) Gulls | 4. Filter feeders |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 2 | 4 | 3 | 1 |
| (b) 3 | 2 | 4 | 1 |
| (c) 4 | 1 | 3 | 2 |
| (d) 3 | 4 | 2 | 1 |
48. Which one of the following is an incorrect match?
 (a) Cutting beak – Sparrows (b) Fruit-eating beak – Parrots
 (c) Insectivorous beak – Swifts (d) Tearing and piercing – Vultures
49. Which one of the following birds lays the largest egg in proportion to the size of its body?
 (a) Ostrich (b) Emu (c) Kiwi (d) Cassowary
50. Which one of the following is not applicable to birds?
 (a) Tetrachromatic (b) Cranial sutures
 (c) Nictitating membrane (d) Loop of Henle
51. What is incorrect about cloaca of birds?
 (a) Waste is expelled through it (b) Helps in thermoregulation
 (c) Birds mat through it (d) Females lay eggs through it
52. A prominent keel in the sternum is lacking in:
 (a) Rheas (b) Emus (c) Ostriches (d) All

53. Foramen triosseum (triosseal) canal is formed by the articulation of:
 (a) Humerus, scapula and coracoid (b) Humerus, scapula and clavicle
 (c) Femur, radio-ulna and interclavicle (d) Humerus scapula and coracoid
54. Which one of the following is a set of flightless birds of neognathae?
 (a) Kiwis, rails and penguins (b) Penguins, rails and puffins
 (c) Ostriches, kiwis and emus (d) Rails, kiwis and emus
55. Consider the following statements:
 (A) Flamingos are not pink at the time of birth, but when they feed on cyanobacteria (growing in water) they become pink
 (B) Neognathae have mobile palate
 (C) All flightless birds have been included in palaeognathae
 (D) Aves are the largest group of vertebrates
- The correct statements are:
 (a) All (b) B, C and D (c) A, B and D (d) B and D
56. A bony ring of plate is present in the eyes of:
 (a) Ostriches and kiwis (b) Eagles and hawks
 (c) Owls and eagles (d) Penguins and owls
57. Pecten is lacking in the eye of:
 (a) Owls (b) Bulbuls (c) Cassowaries (d) Kiwis
58. Consider the following statements about birds:
 (A) Teeth are lacking in all tertiary and recent birds
 (B) At the junction between large and small intestines, a pair of caeca are present
 (C) The lungs are spongy and distensible
 (D) The temperature of the blood is low
- The incorrect statements are:
 (a) A and B (b) B and C (c) C and D (d) B and D
59. Which one of the following is not a monogamous bird?
 (a) Kea (b) Bobwhite (c) Penguin (d) Emu
60. All palaeognathes are flightless, except:
 (a) Kiwis (b) Rheas (c) Tinamous (d) Cassowaries
61. The upper jaw is movably articulated with cranium in:
 (a) Parrots (b) Gulls (c) Puffins (d) Gallus
62. Which one of the following is an incorrect statement about galliformes?
 (a) Terrestrial and nonmigratory (b) Sexual dimorphism is distinct
 (c) Polygamous (d) Beak is provided with a tactile organ
63. Match column I with column II and select the correct answer using answer codes:
 Column I (Birds) Column II (Skulls)
 (A) Schizognathous 1. Parrots
 (B) Desnognathous 2. Ratites
 (C) Aegithognathous 3. Crows
 (D) Dromaeognathous 4. Penguins

Answer codes:

	A	B	C	D
(a)	3	2	4	1
(b)	2	3	1	4
(c)	4	2	3	1
(d)	4	1	3	2

64. Birds showing an inherent capacity of mimicry:
 - (a) Mynas
 - (b) Parrots
 - (c) Mocking birds
 - (d) All
65. Bird having both ovaries:
 - (a) Hawk
 - (b) Ostrich
 - (c) Rhea
 - (d) Penguin
66. Humming bird:
 - (a) Sucks nectar
 - (b) Can fly backwards
 - (c) Also known as sunbird
 - (d) All
67. Furcula of bird is formed by:
 - (a) Interclavicle
 - (b) Clavicle
 - (c) Both clavicle and interclavicle
 - (d) Pelvic and pectoral girdle
68. Flight muscles of birds are attached to:
 - (a) Keel of sternum
 - (b) Scapula
 - (c) Coracoid
 - (d) Pygostyle
69. What is true about birds?
 - (a) Their nitrogenous waste product is urea.
 - (b) They are omnivorous.
 - (c) They possess diaphragm.
 - (d) They are warm-blooded feathered bipeds.
70. In birds:
 - (a) Heart is four chambered
 - (b) Sinus venous is absent
 - (c) Only one ovary (left) is functional
 - (d) All
71. The wishbone of bird is derived from:
 - (a) Pelvic girdle
 - (b) Pectoral girdle
 - (c) Vertebrae
 - (d) Skull
72. The skull of bird is:
 - (a) Monocondylic
 - (b) Dicondylic
 - (c) Tricondylic
 - (d) Tetracondylic
73. In birds:
 - (a) There are 12 pairs of cranial nerves
 - (b) Eye power is sharp but smelling power is poor
 - (c) Only right aortic arch is present
 - (d) All
74. In birds, dentition is:
 - (a) Homodont
 - (b) Heterodont
 - (c) Acrodont
 - (d) Teeth are absent
75. Birds arose from reptiles and exhibit a significant advancement over reptiles by having:
 - (a) Regulated body temperature
 - (b) High metabolic rate
 - (c) Highly developed sense organs and care of young ones
 - (d) All
76. One of the unique features of avian life is that:
 - (a) In them, basic organisation remains fairly uniform
 - (b) The basic organisation varies with seasonal change
 - (c) The basic organisation may be uniform or variable
 - (d) Their eggs are shelled

77. Birds show differences in:
(a) Body form and shape of beak (b) Flying ability
(c) Instinctive behaviour (d) All
78. In birds, the tail is used :
(a) For steering and brake during flight
(b) Works as a balancing organ during walking or perching
(c) Both (a) and (b)
(d) None
79. Air sacs of birds:
(a) Act as balloons (b) Function as bellows
(c) Regulate and maintain body temperature (d) All
80. The reptilian characters of *Archaeopteryx* are:
(a) Nonpneumatic solid bone (b) Jaws contain teeth in sockets
(c) Vertebrae without a pygostyle (d) All
81. The avian characters of *Archaeopteryx* are:
(a) Forelimbs modified into wings (b) Monocondylic skull
(c) Presence of merrythought bone (d) All
82. Tail feathers are absent in:
(a) Eagles (b) Vultures (c) Kiwis (d) Pelicans
83. Which one of the following birds are monogamous?
(a) Penguin and Emu (b) Ostrich and Penguin
(c) Ostrich and Emu (d) Bobwhite and Ostrich
84. Which one of the following is the national bird of New Zealand?
(a) Emu (b) Ostrich (c) Kiwi (d) Rhea
85. The kidney of birds is:
(a) Metanephric (b) Mesonephric
(c) Both mesonephric and metanephric (d) Pronephric
86. Furcula is found only in:
(a) Amphibians (b) Reptiles (c) Aves (d) Mammals
87. Which one of the following is a group of predatory birds?
(a) Eagle, sparrow hawk, king vulture, kite (b) Kite, king vulture, sand piper, crow
(c) Penguin, sunbird, duck, rhea (d) Ostrich, eagle, parrot, pelican, wood pecker
88. Which one of the following statements is incorrect?
(a) The heart of birds is four chambered. (b) Ostrich is a polygamous bird.
(c) All birds have copulatory organs. (d) In birds, the right ovary and oviduct are vestigial.
89. In ostrich, feet are adapted for:
(a) Perching (b) Swimming (c) Running (d) Wading
90. The feet are not adapted for perching in:
(a) Ducks (b) Sparrows (c) Owls (d) Fowls
91. In woodpeckers, the feet are adapted for:
(a) Perching (b) Climbing and clining (c) Wading (d) Raptorial

92. Oil glands are absent in all flightless birds except:
(a) Ostriches (b) Emus (c) Kiwis (d) Rheas
93. Beak is adapted for tearing and piercing in:
(a) Eagles (b) Spoonbills (c) Humming birds (d) Kingfishers
94. Tinamus is found in the:
(a) Oriental region (b) Australian region
(c) Neotropical region (d) All
95. Eggs of birds are:
(a) Cleidoic (b) Megalecithal (c) Telolecithal (d) All
96. The posterior part of the body of birds is not adapted for:
(a) Climbing (b) Perching (c) Flying (d) Swimming
97. Wing skeleton is lacking in:
(a) Moas (b) *Hesperonis* (c) Penguins (d) All
98. Members of the families accipitridae, falconidae and pandionidae are found in every continent except:
(a) Europe (b) Antarctica (c) Australia (d) Asia
99. Which one of the following is applicable to Penguins?
(a) Bergmann's rule (b) Camouflage
(c) Supra-orbital gland that filters excess salt from the blood stream (d) All
100. All members of this order have webbed toes:
(a) Falconiformes (b) Anseriformes (c) Gruiformes (d) Cuculiformes
101. Consider the following statements with reference to palaeognathae:
(A) Uropygial glands are present (B) Well-developed pygostyle
(C) Furcula is lacking (D) Air sac is lacking or ill developed
The correct statements are:
(a) All (b) B, C and D (c) C and D (d) None
102. In birds, the vertebrae are:
(a) Acoelous (b) Heterocoelous (c) Procoelous (d) Amphicoelous
103. In which one of the following birds is the double fovea present?
(a) Sparrows (b) Parrots (c) Kingfishers (d) Mynas
104. Ducks can:
(a) Swim (b) Walk (c) Fly (d) All
105. In which one of the following birds is the urinary bladder present?
(a) Emus (b) Penguins (c) Ostriches (d) Cassowaries
106. What is incorrect about kiwis?
(a) Well-developed power of smell (b) Nocturnal and carnivorous
(c) Down feathers are present (d) Syrinx is lacking
107. The largest order of the class Aves is:
(a) Passeriformes (b) Apodiformes (c) Trogoniformes (d) Falconiformes

108. Herons belong to the order:
(a) Gruiformes (b) Cuculiformes (c) Pelecaniformes (d) Ciconiiformes
109. A bird having a 5th digit is:
(a) Emu (b) Rhea (c) Moas (d) None
110. A bird that does not perch:
(a) Tinamou (b) Wood pecker (c) Partridges (d) Turkeys
111. Which bird feeds on its own feathers during preening?
(a) Hornbill (b) Snipe (c) Grebes (d) Bulbul
112. What is common between dinosaurs, crocodiles and birds?
(a) Beaks (b) Scales (c) Air sacs (d) Muscular gizzard
113. In the members of this order, all four toes are united by webbing:
(a) Pelecaniformes (b) Passeriformes (c) Procellariiformes (d) Ciconiformes
114. Totipalmate foot is found in:
(a) Ostriches (b) Crows (c) Sparrows (d) Ducks
115. Which one of the following is incorrect about air sacs?
(a) In birds there are nine air sacs
(b) Air sacs store air
(c) Allow lungs to maintain constant volume of air
(d) Directly involved in gaseous exchange
116. Oil glands, keel, pygostyle and syrinx are absent in:
(a) Kiwis and humming birds (b) Ostriches and swifts
(c) Wagtails and arctic terns (d) Ostriches and Emus
117. Filoplume and downfeather:
(a) Work as a balancing organ during walking or perching
(b) Used as steering brake during flight
(c) Help in insulation of the body
(d) All
118. The copulatory organ is absent in all birds except:
(a) Ducks (b) Geese (c) Ratitae (d) All
119. Birds are the first group of vertebrates:
(a) Which are warm-blooded and adapted for the aerial mode of life
(b) With developed parental care and body temperature regulation
(c) Have extra embryonic membranes and shelled eggs
(d) All
120. The arrangement of feathers on the body is called:
(a) Pterylosis (b) Pterylae (c) Apteria (d) Guano
121. Pigeon milk is secreted from:
(a) Crop glands (b) Gizzard glands (c) Intestinal glands (d) Liver
122. Ostrich, kiwi and penguin are:
(a) Running birds (b) Flightless birds
(c) Predatory birds (d) Arboreal birds and are not found in India

123. Which one of the following is correct about ratites?
 (a) Tail is functionless (b) Down feathers are absent
 (c) Penis is present (d) All
124. The syrinx is absent in all ratites except:
 (a) Kiwis (b) Rheas (c) Ostriches (d) Emus
125. The upper jaw is movably articulated with the cranium in:
 (a) Parrots (b) Gulls (c) Pigeons (d) Bob whites
126. The tongue is protrusible in:
 (a) Crows (b) Humming birds (c) Wood night jays (d) Snowy owls
127. The retina contains only rod cells in:
 (a) Owls (b) Parrots (c) Pigeons (d) Bulbuls
128. Which one of the following is an extinct bird?
 (a) Snowy owl (b) Lyre bird (c) Pittas (d) Dodo
129. Birds differ from bats due to the absence of:
 (a) Diaphragm (b) Homiothermy
 (c) Sinus venous (d) Four-chambered heart
130. The longest annual migration is covered by:
 (a) Wagtails (b) Hoopoes (c) Flamingos (d) Artic terns
131. Which one of the following an incorrect match?
 (a) Flurcula – Ratites (b) Uropygial gland – Kiwi
 (c) Syrinx – Rhea (d) Function-less tail – Ostrich
132. The feet of heron are:
 (a) Wading type (b) Raptorial type (c) Swimming (d) Scratching
133. Who is popularly known as the ‘Bird’s Man of India’?
 (a) Birbal Sahni (b) Salim Ali (c) J C Bose (d) Lalji Singh
134. If a bird is transferred from 28°C to 8°C, its body temperature will change to:
 (a) 28°C (b) 8°C (c) 18°C (d) Remain unchanged
135. Perching mechanism is a characteristic of:
 (a) Aquatic birds (b) Terrestrial birds (c) Aerial birds (d) Flight birds
136. In birds, the beaks are adapted to feed on:
 (a) Insects and larvae (b) Grains
 (c) Fish and flesh (d) All
137. The ability of young birds to return to the original ground of their parents is due to:
 (a) Intuition (b) Instinct (c) Intuition and instinct (d) Intelligence
138. Which one of the following is not a characteristic of birds?
 (a) Feathers (b) Pecten (c) Pneumatic bones (d) Copulatory organ
139. Which one of the following is well developed in young birds, but may become extremely reduced or disappear in adults?
 (a) Bursa of fabricius (b) Pecten
 (c) Olfactory lobes (d) Urinary bladder

140. In birds:
 - (a) Crop, liver and ovary are absent
 - (b) Teeth, gall bladder and urinary bladder are absent
 - (c) Forelimbs, copulatory organ and sound box are absent
 - (d) Jaws, teeth and pectoral girdle are absent
141. Sparrows are found all over the world except:
 - (a) Tropical South America and Antarctica
 - (b) New Zealand
 - (c) Andaman and Nicobar Island
 - (d) Africa
142. Pigeon's milk is rich in:
 - (a) Minerals
 - (b) Protein
 - (c) Fat
 - (d) Vitamin
143. Tinamus is an endemic genus of flightless birds found in the:
 - (a) Oriental region
 - (b) Neotropical region
 - (c) Australian region
 - (d) Ethiopian region
144. Unique characteristics of birds are:
 - (a) Endothermal
 - (b) Presence of feathers and modification of forelimbs into wings
 - (c) Development of extra embryonic membranes
 - (d) Cleidoic eggs
145. The common feature among ducks, geese and swans is:
 - (a) They lack a syrinx
 - (b) All toes are webbed
 - (c) They are incapable of flying well
 - (d) They are vegetarian
146. The skeleton is solid and air sacs are absent in:
 - (a) Rheas
 - (b) Kiwis
 - (c) Penguins
 - (d) Ducks
147. Young ones of birds are:
 - (a) Precocial
 - (b) Altricial
 - (c) Both (a) and (b)
 - (d) None
148. Feathers of birds are made up of:
 - (a) Keratin
 - (b) Chromo protein
 - (c) Fibroin
 - (d) Protein and polysaccharide
149. Which one of the following statements is incorrect about the members of the class aves?
 - (a) Renal portal system is well developed
 - (b) Oviparous
 - (c) Eggs develop by external incubation
 - (d) Sexual dimorphism is found in some birds like parrot and peacock
150. The largest and most powerful flight muscle is:
 - (a) Pectoralis major
 - (b) Pectoralis minor
 - (c) Coraco-branchialis longus
 - (d) Coarco-branchialis brevis
151. In birds, bones are:
 - (a) Solid having bone marrow
 - (b) Pneumatic having bone marrow
 - (c) Pneumatic and without bone marrow
 - (d) Solid and without bone marrow
152. What is common between crocodiles and birds?
 - (a) Pecten
 - (b) Twelve pairs of cranial nerves
 - (c) Cerebellum divided into a median vermis and lateral flocculi
 - (d) All

153. Birds lack:
 (a) Accommodation power (b) Parental care
 (c) Alveoli (d) None
154. The only vertebrates having fused collar bones:
 (a) Amphibia (b) Reptilia (c) Aves (d) Mammalia
155. Uncinate processes of the ribs are a characteristic of:
 (a) Sharks (b) Reptiles (c) Aves (d) Mammals
156. Consider the following statements with reference to birds:
 (A) Olfactory lobes are rudimentary (B) Cerebral hemispheres are large
 (C) Neopallium is well developed (D) There are 12 pairs of cranial nerves
 The correct statements are:
 (a) All (b) B and C (c) A, B and D (d) B, C and D
157. During gliding, the wings of birds are held at an angle of:
 (a) 30° (b) 60° (c) 90° (d) 120°
158. Which one of the following possesses good colour vision?
 (a) Fishes (b) Birds (c) Primates (d) All
159. Amphicoelous vertebrae are a characteristic of:
 (a) *Archaeopteryx* (b) Ostrich (c) Kiwi (d) Humming bird
160. The arrangement of pterylae varies in different:
 (a) Species (b) Families (c) Orders (d) All
161. The skull of a pigeon lacks:
 (a) Vomer (b) Palatine (c) Pterygoid (d) Jugal
162. Only the skull is pneumatic in:
 (a) Kiwis (b) Penguins
 (c) Ostriches and rheas (d) Penguins and kiwis
163. All four toes turn forward in:
 (a) Ostriches (b) Swifts (c) Parrots (d) Wood peckers
164. Zygodactylous condition is applicable to:
 (a) Rheas (b) Rheas and emus
 (c) Parrots and woodpeckers (d) Barn owls and parrots
165. The only vertebrate known to be capable of extracting nourishment from bee wax:
 (a) Barbets (b) Honey guides (c) Toucans (d) Bee eaters
166. Which one of the following activities is faster in birds in comparison with other animals?
 (a) Heart beat (b) Digestion (c) Breathing (d) Chewing
167. The order having the largest living birds:
 (a) Struthioformes (b) Sphenisciformes (c) Passeriformes (d) Apodiformes
168. Consider the following statements:
 (A) Dromaeognathous palate shows a number of reptilian features
 (B) In *Apteryx*, the vomer is long and unites with the palatine and pterygoid behind
 (C) In schizognathous palate, the vomer is either absent or small
 (D) In aegihognathous palate, the vomer is broad and truncates in front

The correct statements are:

- (a) All (b) A and B (c) B and D (d) A and D

169. Which one of the following is not applicable to birds?

- (a) Pneumatic bones (b) Ectothermic (c) Feathers (d) Double circulation

170. A humming bird flies:

- (a) Up and Down (b) Forward and backward (c) Upside down (d) All

171. Fastest swimming bird is:

- (a) Gentoo penguin (b) King penguin (c) Adelie penguin (d) Cape pigeon

172. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Clinging feet	1. Emu
(B) Wading feet	2. Humming bird
(C) Raptorial feet	3. Vulture
(D) Running feet	4. Heron

Answer Codes:

A	B	C	D
(a) 3	2	1	4
(b) 2	4	3	1
(c) 4	2	1	3
(d) 2	3	4	1

Answers to Multiple-Choice Questions

1. (b)	2. (a)	3. (b)	4. (b)	5. (c)	6. (c)	7. (d)	8. (b)
9. (d)	10. (a)	11. (a)	12. (b)	13. (b)	14. (d)	15. (c)	16. (c)
17. (d)	18. (c)	19. (d)	20. (c)	21. (a)	22. (b)	23. (d)	24. (c)
25. (a)	26. (d)	27. (b)	28. (c)	29. (c)	30. (c)	31. (d)	32. (b)
33. (d)	34. (a)	35. (d)	36. (d)	37. (c)	38. (b)	39. (a)	40. (b)
41. (d)	42. (d)	43. (d)	44. (a)	45. (b)	46. (d)	47. (d)	48. (a)
49. (c)	50. (b)	51. (b)	52. (d)	53. (a)	54. (b)	55. (c)	56. (b)
57. (d)	58. (c)	59. (b)	60. (c)	61. (a)	62. (d)	63. (d)	64. (d)
65. (a)	66. (d)	67. (c)	68. (a)	69. (d)	70. (d)	71. (b)	72. (a)
73. (d)	74. (d)	75. (d)	76. (a)	77. (d)	78. (c)	79. (d)	80. (d)
81. (d)	82. (c)	83. (a)	84. (c)	85. (a)	86. (c)	87. (a)	88. (c)
89. (c)	90. (a)	91. (b)	92. (c)	93. (a)	94. (c)	95. (d)	96. (c)
97. (a)	98. (b)	99. (d)	100. (b)	101. (c)	102. (b)	103. (c)	104. (d)
105. (c)	106. (c)	107. (a)	108. (d)	109. (d)	110. (a)	111. (c)	112. (d)
113. (a)	114. (d)	115. (d)	116. (d)	117. (d)	118. (d)	119. (a)	120. (a)
121. (a)	122. (b)	123. (d)	124. (b)	125. (a)	126. (b)	127. (a)	128. (d)
129. (a)	130. (d)	131. (a)	132. (a)	133. (b)	134. (d)	135. (c)	136. (d)

137. (b) 138. (d) 139. (a) 140. (b) 141. (a) 142. (b) 143. (b) 144. (b)
 145. (b) 146. (c) 147. (c) 148. (a) 149. (a) 150. (a) 151. (b) 152. (d)
 153. (c) 154. (c) 155. (c) 156. (c) 157. (c) 158. (d) 159. (a) 160. (d)
 161. (a) 162. (d) 163. (b) 164. (c) 165. (b) 166. (c) 167. (a) 168. (a)
 169. (b) 170. (d) 171. (a) 172. (b)

Fill in the Blanks

1. All modern birds are included in the subclass _____ having two subdivisions, viz., the _____ and _____.
2. The first classification of birds was given by _____.
3. During the _____ period, birds diversified into different variety of forms.
4. The retina of a bird contains a fan-shaped structure called _____.
5. Birds are vertebrates with _____ modified for flight.
6. In birds, the cleavage is _____.
7. In birds, the powerful down stroke of the wing is controlled by the _____ muscles.
8. The birds that give birth to naked and helpless young ones who must be fed by their parents are called _____.
9. Birds arose from _____ in the Jurassic period.
10. _____ is the world's smallest owl.
11. _____ is the national symbol of the United States.
12. The only bird known to have a nostril at the tip of its beak is the _____.
13. The longest migratory distance is covered by the bird _____.
14. Quill feathers in the tail are called _____.
15. Quill feathers in the wings are called _____.
16. Feathers are of four types, viz., _____, _____, _____ and _____ feathers.
17. Pecten is found in all birds except _____.
18. In birds, the last three or four caudal vertebrae fuse to form _____.
19. _____ is a famous migratory bird of India that comes to India from Siberia.
20. _____ is the national bird of India.
21. Skull of birds is _____.
22. _____ is the excreta of marine birds.
23. Clavicle and interclavicle together constitute _____ in birds.

24. _____ is the largest flying bird.
25. _____ is a recently extinct bird from Mauritius.
26. *Archaeopteryx* became extinct during the _____ period.
27. _____ is the fastest flying bird.
28. The major nitrogenous waste product of birds is the _____.
29. The kidney of birds is _____.
30. Pigeon milk is the secretion of _____.
31. The tail feathers of modern birds are attached to a specialised bone called _____.
32. The number of different muscles in birds is about _____.
33. In birds, there are _____ air sacs.
34. Skull of birds consists of _____ major bones.
35. There are more _____ in the eye of birds of diurnal habit while _____ are more in birds of nocturnal habit.
36. Bones of birds are _____ and _____.
37. Flight muscles of birds are attached to the _____ of the sternum.
38. *Archaeopteryx* was discovered by _____.
39. Perching muscles comprise two sets of muscles called _____ and _____.
40. The feathers covering the newly hatched birds are _____ feathers.
41. The arrangement of feathers on the body is known as _____.
42. A typical feather consists of a central _____ and an expanded distal part, the _____.
43. Swifts are almost universal except _____ regions.
44. Swifts are known from the _____ period.
45. The palate of birds can be classified into four types on the basis of relation of the _____, _____, _____ and _____.
46. _____ is the only species of parrots that builds nest.
47. Birds have _____ eyelids.
48. The artic tern migrates from the north pole to the _____.
49. External ear is lacking in all birds except _____ species.
50. The four birds that cannot fly are _____, _____, _____ and _____.
51. Mouse birds are endemic to _____.
52. The presence of gular pouch is a characteristic of the order _____ of the class aves.
53. In birds, last thoracic, lumbar, sacral and cervical vertebrae are fused to form _____.
54. Elephant birds were natives of _____.
55. The Grandy's corpuscles present in the skin of the beaks of birds are _____ receptors.
56. The Herbst's corpuscles present in the dermis of birds are _____ and _____ receptors.

57. Young chicken are reared mainly for meat and are called _____.
58. _____ is flightless Indian bird.
59. _____ are related with Charles Darwin.
60. Vultures belong to the order _____.
61. In birds, the _____ bone is always movable.
62. Avian eye contains a highly vascularised structure called _____, which is attached to the retina near the optic nerve .
63. _____ are the featherless space among pterylae.

Answers to Fill in the Blanks

1. Neornithes, paleognathae, neognathae	2. Willughby and John Ray	3. Cretaceous
4. Pecten	5. Feathers	6. Meroblastic
7. Pectoralis	8. Altricial	9. Theropod dinosaurs
10. Elf owl	11. Bald eagle	12. Kiwi
13. Arctic tern	14. Retrices	15. Reminges
16. Quill, contour, down, filoplume	17. Kiwi	18. Pygostyle
19. Wagtail	20. Peacock	21. Monocondylic
22. Guano	23. Furcula	24. Albatross
25. Dodo	26. Cretaceous	27. Swift
28. Uric acid	29. Metanephric	30. Crop
31. Pygostyle	32. 175	33. Nine
34. Five	35. Cones, rods	36. Spongy, light
37. Keel	38. Wagner	39. Flexor, extensor
40. Down	41. Pterylosis	42. Axis, vane
43. Polar	44. Oligocene	
45. Vomer, palatines, pterygoid, maxillo-palatines	46. <i>Myiopsitta monachus</i> (Quaker parrot)	47. Three
48. South pole	49. Nocturnal	50. Ostrich, emu, kiwi and penguin
51. Africa	52. Pelecaniformes	53. Synsacrum
54. Madagascar	55. Touch	56. Vibration, heat
57. Broilers	58. <i>Choriotis</i> (Great Indian bustard)	59. Galapagos finches
60. Falconiformes	61. Quadrate	62. Pecten
63. Apteria		

True or False

1. Humming birds have split tongues.
2. The heart of a humming bird beats 615 times in a minute.
3. Ostriches are an endangered species.
4. Ostriches lack keel in the sternum.
5. Ostriches bury their head in the sand.
6. Pigeons can see ultraviolet light.
7. Young ones of neognathae are precocial.
8. Kiwis and emus have the claws on the second digit.
9. Nocturnal birds mainly have the rods in the retina.
10. Humming birds have the highest metabolism of all the animals during the course of flight (except insects).
11. In birds, the volume of air changes with inhalation and exhalation.
12. Air flow in birds is bidirectional.
13. Air sacs participate in gaseous exchange.
14. Air sacs ventilate lungs.
15. Birds can breathe through mouth or nostrils.
16. The number of hollow bones in different species of birds remains the same.
17. The ability of an avian kidney to concentrate urine is as good as a mammalian kidney.
18. In a majority of birds, transfer of sperms occurs through the cloaca.
19. Cardiac output in birds is typically greater than that of mammals for the same body mass.
20. In birds, both upper and lower jaws move when the bird opens its mouth.
21. Hovering requires a lot of energy.
22. In birds, ribs are double-headed.
23. Pectoralis minor is a depressor muscle.
24. Pectoralis major is an elevator muscle.
25. Adult pigeon lacks down feathers.
26. In birds, scales are confined to the feet and are dermal.
27. Avian pelvic girdle is broad.
28. *Caprimulgus* (Poor will) hibernates during winter.
29. Penguin is a migratory bird.
30. Kite is a scavenger bird.
31. Most of the birds are monogamous.

32. Pitohui (*Pitohou dichrous*) is a poisonous bird.
33. In neognathae, ileum and ischium are not united posteriorly.
34. In koels, sexual dimorphism is distinct.
35. In pigeons, the cloaca is a tripartite chamber.
36. Perching muscles are not found in all birds.
37. Barbules are well developed in contour feathers.
38. Tactile feathers are well developed in nocturnal birds.
39. In birds, air in the lungs is renewed twice at every breath.
40. Secretion of pigeon milk is under the control of the prolactin hormone.
41. Skin of birds helps in the regulation and maintenance of body temperature.
42. The cerebellum of pigeons is hollow.
43. Sexual dimorphism is distinct in pigeons.
44. Clitoris is present in female members of palaeognathae.
45. Penguins lack air sacs.
46. In ratites, the scapula and coracoid are large.
47. The mechanical strength of bones in birds is reduced due to pneumacity.
48. Larger parrots (Macaws) live more than 75 years.
49. Wild parrots imitate.
50. Some birds sweat.
51. Birds save energy by flying in a 'V' formation.
52. In *Struthio*, the vomer is short and do not articulate with the maxillo-palatine.
53. In schizognathous palate, pterygoids touch the vomer.
54. In Ostriches, only two toes (3rd and 4th) are present.
55. The upper eyelid of an ostrich bears prominent eyelashes.
56. Male members incubate eggs in paleognathes.
57. In ratites, quadrate is Y shaped.
58. Birds have an excellent sense of sight and hearing.
59. The only wingless bird in the world is the kiwi of New Zealand.
60. The body temperature of birds is lower than that of human beings.
61. The vision of owl is binocular.
62. Syrinx of birds is homologous to the larynx of mammals.
63. Some swifts copulate during the course of flight.
64. Bursa of fabricius contains B lymphocytes.
65. Corpus striatum is poorly developed in birds.

Answers to True or False

1. True	2. True	3. False	4. True	5. False	6. True	7. False	8. True
9. True	10. True	11. False	12. False	13. False	14. True	15. True	16. False
17. False	18. True	19. True	20. True	21. True	22. True	23. False	24. False
25. True	26. False	27. False	28. True	29. False	30. False	31. True	32. True
33. False	34. True	35. True	36. False	37. False	38. True	39. True	40. True
41. False	42. False	43. False	44. True	45. True	46. False	47. False	48. False
49. False	50. False	51. True	52. True	53. False	54. True	55. True	56. True
57. True	58. True	59. True	60. False	61. True	62. False	63. True	64. True
65. False							

Give Reasons

- Some birds are known to put ants into their feathers.
 - Because ants secrete formic acid that kills parasites.
- At the time of flight, humming birds have a very high rate of metabolism.
 - To support the rapid beating of their wings.
- During warm conditions, the feathers of birds may be flattened.
 - Because it allows heat to escape.
- Birds have light-weight bones with large airy canals.
 - Because such bones reduce the body weight and assist in flight.
- In birds, the walls of the left ventricle are more thick and muscular.
 - Because the left ventricle needs to generate a lot of pressure to pump blood throughout the body.
- Birds tend to have larger hearts than mammals (relative to body size and mass).
 - Probably to meet the high metabolic demands of flight.
- Avian lungs maintain a constant volume of air.
 - Due to the presence of the air sacs, the lungs inflate but do not deflate to take in more oxygen (they hold more air). If there is inflation and deflation of lungs with every breath, a bird in the flight would be constantly gaining and losing altitudes.
- The skull of birds is light as compared with the proportion of the rest of its body.
 - Because of elimination of:
 - Heavy jaws
 - Jaws muscles
 - Teeth
- Birds have an evolved respiratory system, which is fundamentally different from mammals.
 - Because in flight, a bird requires more energy than a terrestrial mammal. During the course of migration, birds fly at higher altitudes where oxygen supply is less.

10. Air sacs do not play a direct role in gaseous exchange.
 - Because they are thin-walled structures having few blood vessels.
11. In aves, there is no mixing of oxygen-rich air and carbon-dioxide-rich air.
 - Because in aves, fresh air flows through the lungs in only one direction.
12. Birds have smaller number of bones as compared to mammals or reptiles.
 - Because in birds, there is a fusion of bones (an adaptation for flight), while they remain separate in mammals or reptiles.
13. Feathers of ostriches, kiwis, and cassowaries are primitive.
 - Because feathers of these birds lack hooks and barbules, so the barbs are free and the apteria are usually lacking in adults.
14. Seagulls can drink saltwater.
 - Due to the presence of special glands that filter out the salt from the blood.
15. Yolk in hen's egg does not stick to the shell.
 - Because a mother hen turns her egg about 50 times in a day.
16. Birds have acute eyesight with sharper vision as compared to humans.
 - Because there are many photoreceptor cells in the retina and a very high number of nerves connecting the receptors to the brain. Besides, in birds, there is a second set of muscles not found in other animals.
17. In birds, the lower surface of the wings is concave while the dorsal surface is convex.
 - Because this structural plan makes the down stroke of the wings more powerful.
18. Air sacs make the body light.
 - Because air sacs contain warm air.

MAMMALIA

Multiple-Choice Questions

1. Study of mammals is called:
(a) Myology (b) Malacology (c) Mastology (d) Mammology
2. Which one of the following is regarded as a connecting link between reptiles and mammals?
(a) *Archaeopteryx* (b) *Echidna* (c) *Desmognathus* (d) *Dinosaurs*
3. The primary character present in mammals is the:
(a) Regulation of body temperature (b) Viviparity
(c) Mammary gland (d) Four-chambered heart
4. In mammals, limbs are adapted for:
(a) Walking and running (b) Walking, climbing and swimming
(c) Walking and burrowing (d) All
5. Presence of seven cervical vertebrae is a characteristic of:
(a) Amphibians (b) Reptilians (c) Aves (d) Mammals
6. Hindlimbs are absent in:
(a) Cetaceans and sirenians (b) Pholidota and cetaceans
(c) Sirenians and hyracoidea (d) All
7. Horse of the river is:
(a) *Hippocampus* (b) *Hippopotamus*
(c) Whale (d) Dolphin
8. The national mammal of India is :
(a) Tiger (b) Lion (c) Elephant (d) Cheetah
9. Graafian follicles are found in the ovary of:
(a) Amphibians (b) Reptiles (c) Aves (d) Mammals
10. Uterus and vagina are absent in:
(a) Elephants (b) *Echidna* (c) Kangaroos (d) Armadillos
11. Skull is dicondylic in:
(a) Amphibians (b) Reptiles and birds
(c) Aves and mammals (d) Amphibians and mammals
12. Pinnae are absent in:
(a) Lagomorpha (b) Sirenia
(c) Metatheria (d) Edentata

13. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Pony horns	1. <i>Rhinoceros</i>
(B) Hollow horns	2. Cattle
(C) Antlers	3. Deer family
(D) Keratin fibrous horn	4. Antelope

Answer codes:

A	B	C	D
(a) 3	2	4	1
(b) 4	1	2	3
(c) 4	2	3	1
(d) 2	1	3	4

14. Sweat glands are not lacking in:

- (a) *Ceatacea* (b) *Hippopotamus* (c) *Talpa* (d) *Mus*

15. Milk having the highest percentage of fat is that of:

- (a) Elephants (b) Cats (c) Porpoises (d) Rats

16. What is incorrect about perissodactyla?

- (A) Gall bladder is lacking (B) True horns are lacking
(C) Rumination occurs (D) Premolar and molars are similar

17. Vagina and uterus are lacking in:

- (a) *Zaglossus* (b) *Macropus* (c) *Didelphys* (d) *Phascolomys*

18. Rabbit is:

- (a) Polygamous (b) Coprophagous (c) Harmful to farmers (d) All

19. Consider the following statements:

- (a) Gorillas have 32 teeth (b) Gorillas have no tail
(c) Gorillas cannot swim (d) Molars and canines are large in gorillas

The incorrect statements are:

- (a) A and C (b) B and D (c) A and D (d) None

20. Eusociality is shown by:

- (a) Rabbits and hare (b) Damaraland mole rats and naked mole rats
(c) Baboons (d) Baboons and chimpanzees

21. Which one of the following is incorrect about primates?

- (a) Highly intelligent (b) Monophyletic
(c) Stereoscopic vision (d) Eusocial

22. Kleiber's law is applicable to:

- (a) Rats (b) Rabbits (c) Whales (d) All

23. Which one of the following is incorrect about naked mole rats?

- (a) Eusocial mammal (b) Low metabolic rate (c) Lack of pain sensation (d) Endothermy

24. Which one of the following is a diagnostic mammalian trait?

- (a) Pelage (b) Diaphragm
(c) Single dentary bone (d) Foramen of Panizzae

25. Ischial callosities is the peculiar feature of?
 (a) Howling monkey (b) Gibbon (c) Chimpanzee (d) Gorilla
26. Which one of the following is known as a sulphur bottom whale?
 (a) Killer whale (b) Blue whale (c) Sperm whale (d) Porpoise
27. Enlarged caecum is a peculiar feature of:
 (a) Koalas (b) Kangaroos (c) Hedge hogs (d) Flying foxes
28. Which one of the following is incorrect about nil gai (*Bos laphus*)?
 (a) Family bovidae and order artiodactyla (b) Found all over India, except West Bengal
 (c) Horns are solid and present in both sexes (d) Two white spots on the cheek and a white ring is present below each fetlock
29. In metatheria, caudal vertebrae are with chevron bone except in:
 (a) Marsupial moles (b) Koalas and wombats
 (c) Marsupial mole and opossums (d) Kangaroos
30. Which one of the following lacks carnassials tooth?
 (a) Otters (b) Wild dogs (c) Racoons (d) Foxes
31. Penis is provided with a bone in the members of:
 (a) Pinnipedia (b) Ursidae (c) Fissipedia (d) Viverridae
32. Mammal having the thickest skin is:
 (a) Indian elephant (b) African elephant (c) *Rhinoceros* (d) *Hippopotamous*
33. Skunks use their scent glands as a means of:
 (a) Defence (b) Communication
 (c) Marking of territories (d) Sex attractant
34. Prototherians are confined to:
 (a) Oriental region (b) Ethiopian region (c) Australian region (d) Neo-tropical region
35. Which one of the following is a sanguivorous mammal?
 (a) Desmodus (b) Hedgehog (c) Armadillo (d) Blue whale
36. Which one of the following never drinks water?
 (a) Kangaroo (b) Kangaroo rat (c) Pangolin (d) Walrus
37. Canines are absent in:
 (a) Guinea pigs (b) Mice (c) Porcupines (d) All
38. Epipubic bone is found in:
 (a) Rats (b) Kangaroos (c) Kangaroo rats (d) Desmodus
39. One of the characteristic features of the mammalian brain is the presence of:
 (a) Corpora quadrigemina (b) Corpus callosum
 (c) Vermis and lateral lobes (d) Pons varolli
40. Which one of the following is present in rabbits but is absent in frogs?
 (a) Salivary glands (b) Thyroid gland (c) Islets of Langerhans (d) None
41. Echidna is:
 (a) Primitive mammal
 (b) The connecting link between reptiles and mammals

- (c) Egg-laying mammal
(d) All
42. Kangaroo:
(a) Is a metatheria mammal (b) Is a native of the Australian region
(c) Gives birth to immature young ones (d) All
43. Which one of the following is correct about armadillo?
(a) Body is covered with large overlapping horny scales
(b) Has no teeth
(c) Tongue is long and protrusible
(d) All
44. Which one of the following is correct about whales?
(a) Blubber is present (b) Skin glands are absent
(c) Forelimbs are modified into paddle-like flippers and hindlimbs are absent (d) All
45. Thermal regulation is shown by:
(a) Elephants (b) Mules (c) Humans (d) All
46. Match column I with column II and select the correct match using answer codes:
- | Column I | | Column II | |
|--------------------------------------|--|------------------------|--|
| (a) Baleen | | 1. Otter | |
| (b) Well-developed carnassials teeth | | 2. <i>Hippopotamus</i> | |
| (c) Skull bones with air spaces | | 3. Elephant | |
| (d) Even toed ungulate | | 4. Whale | |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 4 | 2 | 3 | 1 |
| (b) 4 | 1 | 3 | 2 |
| (c) 3 | 1 | 2 | 4 |
| (d) 1 | 4 | 2 | 3 |
47. Which one of the following is not applicable to monotremata?
(a) Constant body temperature (b) Corpus callosum
(c) Scrota sac (d) All
48. Ambergris is obtained from the:
(a) Intestinal canal of sperm whales (b) Musk gland of deer
(c) Fat of pigs (d) Wool of sheep
49. Metatherians are mainly confined to the Australian region, except:
(a) Koalas (b) Wombats (c) Bandicoots (d) Opossums
50. Uterine gestation is absent in:
(a) Wombats (b) Marsupial moles (c) Spiny anteaters (d) Giant anteaters
51. Anthropoids lack:
(a) Retia mirabilia (b) Epicondylar foramen (c) Third trochanter (d) All
52. True chorioallontic placenta is found in:
(a) Wombats (b) Bandicoots (c) Opossums (d) Koalas

53. In which one of the following is the 7th vertebra pierced by a foramen for the vertebral artery:
 (a) Humans (b) Chimpanzee (c) *Hippopotamus* (d) Pig
54. Consider the following statements:
 (A) Extremely beautiful (B) Eats only leaves of *Eucalyptus*
 (C) Vestigial trait (D) Produces a young one every second year
 This animal is:
 (a) Koala (b) Opossum (c) Wombat (d) Bandicoot
55. Discontinuous distribution is not applicable to:
 (a) Kangaroos (b) Bandicoots (c) Marsupial moles (d) Opossum
56. Horny scales over the head, body and tail are found in:
 (a) Wombats (b) Sloths (c) Pangolins (d) Kangaroo rats
57. Ambergris is soluble in:
 (a) Water (b) Alcohol (c) Alcohol and ether (d) All
58. Mammals differ from birds in having:
 (a) Single aortic arch (b) Warm blood
 (c) Seven cervical vertebrae (d) Lack of flight ability
59. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|---------------|---------------|
| (A) Pangolin | 1. Pinnipedia |
| (B) Manatee | 2. Edentata |
| (C) Armadillo | 3. Sirenia |
| (D) Sea lion | 4. Pholidota |
| | 5. Cetacea |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 4 | 5 | 2 | 1 |
| (b) 2 | 3 | 4 | 5 |
| (c) 1 | 5 | 2 | 1 |
| (d) 4 | 3 | 2 | 1 |
60. Penis conducts only sperms in:
 (a) Wombats (b) Pangolins (c) *Echidna* (d) Cape anteaters
61. Which one of the following is not applicable to mammals?
 (a) Dicondylic skull (b) Diaphragm (c) Renal portal system (d) Graafian follicle
62. Which one of the following is incorrect about metatheria?
 (a) Discontinuous distribution (b) Marsupium
 (c) Diphyodont (d) Gestation
63. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|----------------------|-------------------|
| (A) Digging | 1. Sloth |
| (B) Cursorial | 2. <i>Echidna</i> |
| (C) Scansorial | 3. Loris |
| (D) Arboreal hanging | 4. Deer |

Answer codes:

	A	B	C	D
(a)	2	1	4	3
(b)	1	4	3	2
(c)	2	4	3	1
(d)	4	2	1	3

64. Particular mating season is not applicable to:
 - (a) Baboons
 - (b) Giraffes
 - (c) Humans
 - (d) All
65. Smallest man-like ape is the:
 - (a) Gibbon
 - (b) Chimpanzee
 - (c) Gorilla
 - (d) Orangutan
66. In humans, the number of cervical vertebrae is:
 - (a) 9
 - (b) 8
 - (c) 7
 - (d) 6
67. In whales:
 - (a) Hair are absent
 - (b) Salivary glands are absent
 - (c) Placenta is zonary
 - (d) All
68. The incorrect statement is:
 - (a) Hair are mammalian monopoly
 - (b) Cervical vertebrae are usually seven in mammals
 - (c) Four-chambered heart is a mammalian monopoly
 - (d) In mammals, fertilisation is always internal
69. The only poisonous mammal is:
 - (a) Duck-billed platypus
 - (b) Opposum
 - (c) Hedgehog
 - (d) Sloth
70. The mammal that hibernates during winters is:
 - (a) *Echidna*
 - (b) *Talpa*
 - (c) Kangaroo
 - (d) Opposum
71. Sonar and radar systems are found in:
 - (a) Blue whales
 - (b) Pangolins
 - (c) Bats
 - (d) Porcupines
72. Herbivorous marine mammal is:
 - (a) Sew cow
 - (b) Sea horse
 - (c) Sea hare
 - (d) Sea mouse
73. Hair is absent in the members of order:
 - (a) Insectivora
 - (b) Chiroptera
 - (c) Edentata
 - (d) Cetacea
74. Which one of the following is a characteristic of mammals?
 - (a) Warm-blooded
 - (b) Paired limbs
 - (c) Muscular diaphragm
 - (d) Metanephric kidney
75. Which one of the following is absent in mammals?
 - (a) Vertebral column
 - (b) Ventral double nerve cord
 - (c) Four-chambered heart
 - (d) Exoskeleton
76. Bats belong to the order:
 - (a) Chiroptera
 - (b) Carnivora
 - (c) Insectivora
 - (d) Rodentia
77. Kangaroos are marsupials because:
 - (a) They have mammary glands
 - (b) Fertilisation is internal
 - (c) They give birth to immature young ones
 - (d) They possess marsupium

78. Most primitive eutherian is:
 (a) Shrew (b) House mouse (c) *Orca* (d) Porcupine
79. In elephants:
 (a) Upper lip is absent (b) Nose is absent
 (c) Lower lip is absent (d) Upper lip and nose drawn out in front of mouth as long and prehensile muscular proboscis
80. In elephants:
 (a) Two upper incisors elongated as tusks (b) Canines and premolars are absent
 (c) Only one or two pairs of molars functional at a time in each jaw for mastication of food (d) None
81. Placenta is found in:
 (a) Reptiles (b) Birds (c) Prototherians (d) Eutherians
82. A toothless horny beak is found in:
 (a) *Echidna* (b) Kangaroo (c) Opossum (d) Whale
83. Presence of epipubic bone, cloaca, abdominal testis in prototheria, shows its affinity with:
 (a) Reptiles (b) Metatheria (c) Eutheria (d) Aves
84. A characteristic of *Rhinoceros* is the presence of:
 (a) Massive body (b) Thick skin (c) Horn (d) Mammary glands
85. Red sweat is a peculiarity of:
 (a) *Rhinoceros* (b) *Hippopotamus* (c) Walrus (d) Zebra
86. Which one of the following statements is incorrect?
 (a) Llamas are cousins of camels (b) The body of a llama is covered with woolly hair
 (c) Hump is present in llamas (d) Llamas are found in South America
87. The peculiar feature of camels and llamas is the:
 (a) Presence of eunucleated red blood corpuscles (b) Presence of hump
 (c) Presence of woolly hair (d) Presence of seven cervical vertebrae
88. Match column I with column II and select the correct answer using answer codes:
- | Column I | | | | Column II | | | |
|--------------------------|--|--|--|----------------------|--|--|--|
| (A) Tooth comb | | | | 1. African hyaena | | | |
| (B) Laughing cry | | | | 2. <i>Rhinoceros</i> | | | |
| (C) Fibrous horn | | | | 3. Giraffe | | | |
| (D) Unable to make sound | | | | 4. Loris | | | |
- Answer codes:
- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 4 | 3 | 1 | 2 |
| (b) | 2 | 1 | 4 | 3 |
| (c) | 4 | 1 | 2 | 3 |
| (d) | 4 | 2 | 3 | 1 |
89. Diastema is applicable to:
 (a) Ox (b) Rabbit (c) Rat (d) All

90. Consider the following statements:
 (A) Molars have more than two roots and only two cusps and have milk predecessors
 (B) In humans, the last molar is called the wisdom tooth
 (C) The tusks of walrus are modified upper canines
 (D) Male musk deer lacks canines
 The incorrect statements are:
 (a) A, C and D (b) B and C (c) A and D (d) None
91. In which one of the following does the female produce 4–8 young ones of the same sex?
 (a) Shrew (b) Armadillo (c) Porcupine (d) Mongoose
92. What is correct about protoheria?
 (a) Constant body temperature (b) Uterus and vagina are present
 (c) Corpus callosum is lacking (d) Chordae tendinae are present
93. Megalecithal egg is found in:
 (a) Koalas (b) *Echidna* (c) Scaly anteaters (d) Bandicoots
94. Plantigrade locomotion is found in:
 (a) Deer (b) Rabbits (c) Asses (d) Humans
95. Consider the following characteristics:
 (a) Hindlimbs are lacking (b) Forelimbs are modified into flippers
 (c) Feeds on fishes, Molluscs and Arthropods (d) Highly intelligent mammal
 The animal is:
 (a) Walrus (b) Dolphin (c) Whale (d) Porpoise
96. Solitary life is applicable to:
 (a) Hare (b) Deer (c) Rabbit (d) None
97. The feature which differentiates humans from apes:
 (a) A large brain (b) Bipedal gaits
 (c) Sparse body hair and speech (d) All
98. Mammals are viviparous except:
 (a) *Echidna* and opossum (b) Opossums and koalas
 (c) *Echidna* (d) *Echidna* and whale
99. Mammals are generally geared to alertness and activity, This is made possible by:
 (a) Four-chambered heart and well-developed lungs
 (b) Constant body temperature
 (c) Muscular diaphragm
 (d) Constant body temperature and high metabolic rate
100. Blubber present in the body of whales to:
 (a) Prevents loss of heat (b) Reduce the specific gravity
 (c) Act as insulator (d) All
101. Seals are:
 (a) Aquatic carnivores (b) Terrestrial carnivores
 (c) Arboreal insectivores (d) Aquatic herbivores
102. Padded feet are a characteristic of:
 (a) Elephants (b) Goats (c) Buffaloes (d) Nilgai

103. The mammal in which algae grow on hair in order to give a protective colouration:
 (a) Sloth (b) Pangolin (c) Whale (d) Flying fox
104. Baleen is found in:
 (a) Lions (b) *Rhinoceros* (c) Blue whales (d) *Echidna*
105. Sweat glands in humans:
 (a) Are scattered all over the body
 (b) Are concentrated around the nose
 (c) Are more numerous on palms, soles and armpits
 (d) Are only found on palms
106. The mammal in which the pinna houses the sweat glands:
 (a) *Rhinoceros* (b) Dog (c) *Echidna* (d) *Hippopotamus*
107. Sweat glands are absent in:
 (a) Cetacea and sirenia (b) *Mus* and *Talpa*
 (c) Spiny anteater (d) All
108. In rats, cats and dogs, sweat glands:
 (a) Are absent (b) Are scattered all over the body
 (c) Are found around the nose (d) Are found in the sole of the feet
109. The mammal in which sweat glands are present around the lips:
 (a) Rabbits (b) Humans (c) Dogs (d) Whales
110. The sweat glands are fewer in:
 (a) Polar bears (b) Humans (c) *Echidna* (d) Dogs
111. Mammary glands are modified:
 (a) Sweat glands (b) Endocrine glands
 (c) Sebaceous glands (d) None
112. Which one of the following is a correct match?
 (a) Placenta – Prototheria
 (b) Sweat glands – *Echidna*
 (c) Blubber – *Echidna*
 (d) Horn – *Rhinoceros*
113. Which one of the following statements is correct?
 (a) All mammals are oviparous.
 (b) All mammals are omnivorous.
 (c) All mammals possess dorsal tubular nerve cord.
 (d) All mammals possess ventral nerve cord.
114. Pinnae are absent in members of the order:
 (a) Cetacea (b) Rodentia (c) Proboscidea (d) Artiodactyla
115. Whales respire through:
 (a) Gills (b) Skin (c) Lungs (d) Lungs and skin
116. Which one of the following is not applicable to Indian female elephants?
 (a) Proboscis (b) Tusk (c) Pinnae (d) Flat tail

117. Which one of the following is a semifossorial mammal?
 (a) *Taxidea* (b) *Cyanocephalus* (c) *Mus* (d) *Ovis*
118. Which part of a tooth is used for mastication?
 (a) Enamel (b) Root (c) Dentine (d) Crown
- A distinct cloaca is found in:
 (a) Sloth (b) *Echidna* (c) Bat (d) Walrus
120. Eggs of eutherian are:
 (a) Microlecithal (b) Mesolecithal (c) Megalecithal (d) Cleidoic
121. Prototherians are egg laying mammals and their eggs are:
 (a) Alecithal (b) Microlecithal (c) Mesolecithal (d) Megalecithal
122. Only left-systemic arch is found in:
 (a) Mammals (b) Aves (c) Reptiles (d) Amphibians
123. On the basis of possession of horns, the correct group is:
 (a) *Rhinoceros*, *Hippopotamus* and *Giraffa* (b) *Rhinoceros*, nilgai and goat
 (c) Nilgai, *Giraffa* and *Odobenus* (d) Zebra, *Giraffa* and mule
124. Teats are lacking in the mammary glands of:
 (a) Kangaroos (b) *Echidna* (c) Elephants (d) Mares
125. Match column I with column II and select the correct answer using answer codes:
- | Column I | Column II |
|------------------------|------------------------|
| (A) Poison gland | 1. Porcupine |
| (B) Polyembryony | 2. Dolphin |
| (C) Spines on the back | 3. Male <i>Echidna</i> |
| (D) Echolocation | 4. Armadillo |
- Answer codes:
- | A | B | C | D |
|-------|---|---|---|
| (a) 4 | 1 | 3 | 2 |
| (b) 3 | 2 | 4 | 1 |
| (c) 3 | 4 | 1 | 2 |
| (d) 2 | 4 | 1 | 3 |
126. Squirrels are found all over the world except:
 (a) New Zealand (b) Australia (c) New Guinea (d) Tropical Africa
127. Which one of the following statements is correct?
 (a) In humans and bats, the number of cervical vertebrae is seven.
 (b) Three-toed sloth has nine cervical vertebrae.
 (c) Manatee and two-toed sloth have six cervical vertebrae.
 (d) In whales and giraffes, the number of cervical vertebrae is more than nine.
128. Which one of the following is an extinct marsupial?
 (a) Numbat (b) *Ekaltadeta* (c) Red kangaroo (d) Sugar glider
129. Which one of the following is a burrowing marsupial?
 (a) Quokka (b) Numbat (c) Wombat (d) Koala

130. What is incorrect about bandicoots?
 - (a) Marsupials found in Australia and New Guinea
 - (b) Powerful clawed hindlegs
 - (c) Nocturnal
 - (d) Herbivorous
131. Puggle is applicable to:
 - (a) *Echidna*
 - (b) Koala
 - (c) Kangaroo
 - (d) Wombat
132. Which one of the following is incorrect?
 - (a) Anteaters are the only mammals lacking teeth.
 - (b) Two giraffes can have the same pattern of spots.
 - (c) Two zebras cannot have the same pattern of stripes.
 - (d) With age chimpanzees may become bald.
133. The mammal that usually does not need to drink water:
 - (a) Koala
 - (b) Camel
 - (c) Otter
 - (d) None
134. Which one of the following is incorrect?
 - (a) Sinus venosus is absent in mammals.
 - (b) Mature mammalian red blood corpuscles are non-nucleated.
 - (c) In mammals, fertilisation is always internal.
 - (d) Mammalian eggs are mesolecithal.
135. Which one of the following is not an exoskeleton of mammals?
 - (a) Hair
 - (b) Scales
 - (c) Chitin
 - (d) Hooves
136. The largest animal is:
 - (a) Elephant
 - (b) Blue whale
 - (c) Chimpanzee
 - (d) Lion
137. In humans, the feet are:
 - (a) Plantigrade
 - (b) Unguligrade
 - (c) Digitigrade
 - (d) None
138. The main characters that differentiate mammals from other vertebrates are:
 - (a) Pinnae, hairy skin and oviparity
 - (b) Nails, mammary glands and oviparity
 - (c) Hairy skin, mammary glands and placenta
 - (d) Pinnae, cleidoic egg and hairy skin
139. Which one of the following is a correct match?
 - (a) Cetacea – Whale
 - (b) Lagomorpha – Rat
 - (c) Proboscidea – Horse
 - (d) Digitigrade – Human being
140. Walrus, seal and sea lion are:
 - (a) Mammals
 - (b) Amphibians
 - (c) Pisces
 - (d) Reptiles
141. Flying lemur is a:
 - (a) Nocturnal true flying mammal
 - (b) Gliding mammal with patagium
 - (c) Bird
 - (d) Primates
142. The fastest running mammal is:
 - (a) Lion
 - (b) Tiger
 - (c) Deer
 - (d) Cheetah
143. Which one of the following are extinct in India?
 - (a) Cheetah
 - (b) Nilgai
 - (c) Armadillo
 - (d) Lion
144. In mammals, the placenta is formed by:
 - (a) Chorioallantois
 - (b) Amnion
 - (c) Chorion
 - (d) Yolk sac

145. Mammalian hair are made up of:
 (a) Lipoprotein (b) α keratin (c) β keratin (d) Chromoprotein
146. Which one of the following glands are present in mammals?
 (a) Sweat glands and sebaceous glands (b) Mammary glands
 (c) Scent and meibomian glands (d) All
147. Dentition in mammals is:
 (a) Acrodont, homodont and polyphyodont (b) Acrodont, heterodont and polyphyodont
 (c) Thecodont, homodont and diphyodont (d) Thecodont, heterodont and diphyodont
148. Diaphragm helps in:
 (a) Breathing (b) Digestion
 (c) Keeping the body temperature constant (d) None
149. Polyembryony is shown by:
 (a) Armadillo (b) Opossum (c) Mole (d) *Echidna*
150. Gestation period is the shortest in:
 (a) *Echidna* (b) Kangaroo (c) Opossum (d) Koala
151. Most powerful and largest primate is the:
 (a) Gorilla (b) Chimpanzee (c) Gibbon (d) Human being
152. The mammal in which horns are present only in males:
 (a) Pig (b) Giraffe (c) Nilgai (d) *Rhinoceros*
153. Tusks of pigs are modified:
 (a) Jaws (b) Incisors (c) Canines (d) None
154. Gynaecomastism is found in:
 (a) *Echidna* (b) Kangaroo (c) Spider monkey (d) Armadillo
155. The longest gestation period is of:
 (a) Giraffe (b) Cow (c) Elephant (d) Buffalo
156. Canines are absent in:
 (a) Some ungulates (b) Rodents (c) Lagomorphs (d) All
157. In humans the last molars are called:
 (a) Wisdom teeth (b) Isodont (c) Carnassial teeth (d) None
158. Match column I with column II and select the correct answer using answer codes:

Column I	Column II
(A) Double vagina	1. Rat
(B) Tori	2. Perissodactyla
(C) Gall bladder is absent	3. Kangaroo
(D) Hoofs	4. Ungulates

Answer codes:

A	B	C	D
(a) 3	1	2	4
(b) 4	2	1	3
(c) 2	4	3	1
(d) 3	4	1	2

159. In which one of the following is the monophyodont condition found?
 (a) Sloth (b) Duck-billed platypus (c) Toothed whale (d) All
160. Consider the following statements about sirenia:
 (A) Bones are spongy and contain oils (B) Head is lacking
 (C) Epiphyses are more distinct (D) Retia mirabilia are absent
 The correct statements are:
 (a) All (b) A, B and C (c) B and D (d) None
161. Scrotum is lacking in:
 (a) Hedgehog (b) Mole (c) Shrew (d) All
162. Match column I with column II and select the correct answer using answer codes:

Column I (Type of locomotion)	Column II (Mammal)
(A) Digitigrade	1. Zebra
(B) Saltatorial	2. Kangaroo
(C) Leaping	3. Cheetah
(D) Unguligrade	4. Rabbit

 Answer codes:

A	B	C	D
(a) 4	2	1	3
(b) 3	4	2	1
(c) 2	3	4	1
(d) 4	3	2	1
163. Consider the following statements:
 (A) Caecum is larger and is vegetarian in comparison to carnivores
 (B) In humans, the distal part of caecum is well developed
 (C) Koala has the shortest caecum
 (D) Caecum is lacking in sloths and cetacean
 The correct statements are:
 (a) All (b) A, C and D (c) B and D (d) A and D
164. Tapetum cellulosum is found in:
 (a) Seals (b) *Platanista* (c) *Procavia* (d) Chiroptera
165. In which one of the following mammals do canine and incisor continue to grow throughout life?
 (a) Walrus (b) Hamster (c) Ox (d) Elephant
166. Consider the following statements about hyracoidean:
 (A) Found in India (B) Gall bladder is lacking
 (C) Canines are absent (D) There are three premolars and four molars
 The correct statements are:
 (a) All (b) A and B (c) B and C (d) A and D
167. In which one of the following are all milk teeth retained except the last premolars?
 (a) Chiroptera (b) Marsupials (c) Cetacea (d) Pholidota
168. Which one of the following is lacking in the stomach of camels?
 (a) Rumen (b) Reticulum (c) Omasum (d) Abomasum

169. In which one of the following do adults retain the embryonic lobulated kidney?
 (a) Cetacea (b) Artiodactyla (c) Proboscidea (d) All
170. Hair are mainly used for:
 (a) Protection (b) Beautiful appearance (c) Insulation (d) Sensation
171. What is common between dolphins and bats?
 (a) Echolocation (b) Placenta (c) Mammary glands (d) All
172. Which one of the following is not a characteristic of mammals?
 (a) Diaphragm (b) Mammary glands (c) Exoskeleton (d) Heterodont dentition
173. Which one of the following is included in the order pinnipedia?
 (a) Walrus (b) Sea lion (c) Seal (d) All
174. Cervical ribs are absent in mammals except in:
 (a) Monotremata (b) Marsupials (c) Whales (d) *Hyrax*
175. In mammals, the maximum number of cervical vertebrae is found in:
 (a) Camel (b) Giraffe (c) Sloth (d) Shrew
176. The largest mammalian order is:
 (a) Rodentia (b) Carnivora (c) Chiroptera (d) Primates
177. Pachyderm is applicable to:
 (a) Bat (b) Elephant (c) Deer (d) Zebra
178. Which one of the following is not found in cetacean?
 (a) Skull bones with dipole (b) Baleen
 (c) Foam (d) Melon
179. Which one of the following is applicable to gibbons?
 (a) Live in the rain forests of tropical West Africa
 (b) Powerful apes
 (c) Males have a big goiter-like throat sac and two fatty swellings in the cheeks
 (d) The smallest, cleanest and gentlest anthropoid ape

Answers to Multiple-Choice Questions

1. (d)	2. (b)	3. (c)	4. (d)	5. (d)	6. (a)	7. (b)	8. (a)
9. (d)	10. (b)	11. (d)	12. (b)	13. (c)	14. (b)	15. (c)	16. (c)
17. (a)	18. (d)	19. (d)	20. (b)	21. (d)	22. (c)	23. (d)	24. (d)
25. (b)	26. (b)	27. (a)	28. (c)	29. (b)	30. (c)	31. (a)	32. (c)
33. (a)	34. (c)	35. (a)	36. (b)	37. (d)	38. (b)	39. (b)	40. (a)
41. (d)	42. (d)	43. (d)	44. (d)	45. (d)	46. (b)	47. (d)	48. (a)
49. (d)	50. (c)	51. (d)	52. (b)	53. (c)	54. (b)	55. (d)	56. (c)
57. (c)	58. (c)	59. (d)	60. (c)	61. (c)	62. (c)	63. (c)	64. (d)
65. (a)	66. (d)	67. (d)	68. (c)	69. (a)	70. (a)	71. (c)	72. (a)
73. (d)	74. (c)	75. (b)	76. (a)	77. (d)	78. (a)	79. (d)	80. (d)

81. (d) 82. (a) 83. (a) 84. (c) 85. (b) 86. (c) 87. (a) 88. (c)
 89. (d) 90. (c) 91. (b) 92. (c) 93. (b) 94. (d) 95. (b) 96. (a)
 97. (d) 98. (c) 99. (d) 100. (d) 101. (a) 102. (a) 103. (a) 104. (c)
 105. (c) 106. (d) 107. (d) 108. (d) 109. (a) 110. (a) 111. (a) 112. (d)
 113. (c) 114. (a) 115. (c) 116. (b) 117. (a) 118. (d) 119. (b) 120. (a)
 121. (d) 122. (a) 123. (b) 124. (b) 125. (c) 126. (b) 127. (d) 128. (b)
 129. (c) 130. (d) 131. (a) 132. (b) 133. (a) 134. (d) 135. (c) 136. (b)
 137. (a) 138. (c) 139. (a) 140. (a) 141. (b) 142. (d) 143. (a) 144. (a)
 145. (b) 146. (d) 147. (d) 148. (a) 149. (a) 150. (c) 151. (a) 152. (c)
 153. (c) 154. (a) 155. (c) 156. (d) 157. (a) 158. (a) 159. (d) 160. (d)
 161. (d) 162. (b) 163. (d) 164. (a) 165. (b) 166. (c) 167. (b) 168. (c)
 169. (d) 170. (c) 171. (d) 172. (c) 173. (d) 174. (a) 175. (c) 176. (a)
 177. (b) 178. (a) 179. (d)

Fill in the Blanks

- _____ era is known as the era of mammals.
- In mammals, vertebrae are _____.
- In mammals, the anterior thoracic cavity is separated from the posterior abdominal cavity by a muscular _____.
- The number of cranial nerves in mammals is _____ pairs.
- Monotremata are confined to the _____ region.
- In Indian elephants, there are _____ nails in each foot.
- Elephant tusks are modified upper _____.
- Secodont condition is found in _____.
- Lophodont condition is found in _____.
- The largest living rodent is _____.
- In rodentia, locomotion is _____ type.
- Meibomian glands are modified _____ glands.
- Hoofs are characteristics of _____ mammals.
- In ruminants, sweat glands are located on the _____ and on the interdigital fold of _____.
- In mammals the vertebral column is divided into five distinct regions called _____, _____, _____, _____ and _____.
- The most intelligent ape is the _____, and is found in Africa.
- Carnassial teeth are last _____ of the upper jaw and first _____ of the lower jaw.

18. The proboscis of tapir is formed of nose and _____.
19. _____ deer is without antlers.
20. _____ sloth is the slowest terrestrial mammal.
21. Mole and shrew are members of the order _____.
22. All apes and humans belong to the family _____.
23. Lemur is found only in _____.
24. Locomotion in a kangaroo is _____.
25. The baleen plate of whales is modified _____.
26. The only ape found in India is _____.
27. A male mammal that produces milk is _____.
28. In mammals, the shortest gestation period is found in _____.
29. The oldest known form of *Loris* is _____.
30. _____ are the only mammals having a bony dermal exoskeleton.
31. In mammals, ovulation is _____ or _____.
32. An adipose dorsal fin is found in the members of the order _____.
33. In dogs and cats, sweat glands are found in the _____ of the feet.
34. Cheek teeth in humans are _____ type.
35. _____ produces sounds similar to crackling human laugh.
36. The centre of _____ is the only area of limits to mammals.
37. The first mammal existed about _____ years ago.
38. Mice belong to the order _____.
39. The brain region called neocortex is unique to _____.
40. The green colour of fur of sloth and polar bear is due to the presence of _____ growth.
41. _____ is a spiny mammal.
42. The colour of hair is due to a group of proteins called _____.
43. Hair is _____ in origin.
44. Walrus is found in _____.
45. Distribution of blue whales are restricted to _____ ocean.
46. A tooth with low crown is called _____ while tooth having high crown content is called _____.
47. The cowlick present on the forehead of humans is an example of _____.
48. The largest living animals belong to the order _____.
49. _____ is the national animal of India.
50. In mammals, teeth are _____, _____ and _____.
51. In mammals, the principal nitrogenous waste product is the _____.
52. Kangaroo is the national animal of _____.
53. Baleen plates are used for _____.

54. Hallux and pollex are opposable in the members of _____ of class mammalian.
55. In simians, all digits end in _____.
56. Poison spur is found in _____ duck-billed platypus.
57. In elephants, locomotion is _____.
58. Mammal are viviparous except _____.
59. In mammals, jaw suspension is _____.
60. In mammals, the lower jaw is made up of a single bone called _____.
61. In mammals, the cleavage is _____ and equal.
62. Smallest mammal is the _____.
63. _____ is the loudest mammal.
64. A panda has _____ teeth.
65. A panda's diet is _____.
66. A panda's eyes have _____-like pupils.
67. Bears' eyes have a _____ pupil.
68. Duck-billed platypus have a waterproof fur which covers the entire body, except _____ and _____.
69. Striped skunk belongs to the order _____.
70. The first true mammal appeared in _____ period.
71. _____ is the world's largest species of the monkey.
72. The new world monkeys include _____, _____ and _____.
73. The only catarrhines that have spread outside of southeastern Asia and Africa is the _____.
74. The order primate was established by _____.
75. _____ are the only carnivorous primates.
76. The _____ is the only primate species that feeds mainly on grass.
77. Primates evolved from _____ animals.
78. In India, the official state of the horned rhinoceros is _____.
79. _____ is the world's first cloned dog.
80. Cetaceans have poor vision except _____.
81. _____ is the closet living relative of cetaceans.
82. The body of cetaceans is insulated by a thick layer of fat called _____.
83. Modern mammalian orders appeared in the Paleocene and _____ epochs.
84. Female pandas are called _____, males are called _____ and the young ones are called _____.
85. Basic body plan of mammals is inherited from _____ mammal-like reptiles.
86. Tongue is movable in all mammals except _____.
87. Most mammals walk on four legs except _____.
88. In all mammals, amnion chorion and allantois are present except _____.

Answers to Fill in the Blanks

1. Cenozoic	2. Acoelus	3. Diaphragm
4. 12	5. Australian	6. Five
7. Incisors	8. Carnivores	9. Elephant
10. Capybara (<i>Hydrochoerus</i>)	11. Plantigrade	12. Sebaceous
13. Ungulates	14. Muzzle, skin	
15. Cervical, thoracic, lumbar, sacral, caudal	16. Chimpanzee	17. Premolar, molar
18. Upper lip	19. Musk	20. Three-toed
21. Insectivora	22. Haminidae	23. Madagascar
24. Saltatorial	25. Tooth	26. Gibbon
27. <i>Echidna</i>	28. Opossum	29. <i>Progalago</i>
30. Armadillos	31. Spontaneous, induced	32. Cetacea
33. Sole	34. Bunodont	35. <i>Hyaena</i>
36. Antarctica	37. 200 million	38. Rodentia
39. Mammals	40. Algae	41. Hedgehog
42. Melanins	43. Epidermal	44. Arctic
45. Antarctic	46. Brachydont, hysodont	47. Whorl
48. Cetacea	49. Tiger	50. Heterodont, thecodont, diphyodont
51. Urea	52. Australia	53. Straining
54. Primates	55. Nails	56. Male
57. Digitigrade	58. Prototheria	59. Craniostylic
60. Dentary	61. Holoblastic	62. Striped skunk (<i>Mephitis mephitis</i>)
63. Blue whale	64. 42	65. Bamboo
66. Slit	67. Round	68. Feet, bill
69. Carnivora	70. Jurassic	71. <i>Mandrill</i>
72. Howler, squirrel, capuchin	73. Humans	74. Carl Linnaeus (1758)
75. Tarsiers	76. <i>Gelada</i>	77. Arboreal
78. Assam	79. Snuppy	80. Dolphins
81. <i>Hippopotamus</i>	82. Blubber	83. Eocene
84. Sows, boars, cubs	85. Therapsid	86. Whales
87. Humans	88. Monotremes	

True or False

1. Mammals can regulate their body temperature.
2. Skull of mammals is dicondylic.
3. Cape anteater (*Orycteropus*) is the single genus of order tubulidentata.
4. In members of the order rodentia, incisors grow throughout life.
5. Hyperdactyly and hyperphalangy are found in Dolphins.
6. Monotremes are the most primitive mammals.
7. Sea lions have distinct external ears.
8. Howler monkeys are the smallest of the new world monkeys.
9. Bones of cetaceans are light, spongy and filled with oil.
10. Blubber helps in changing body volume during deep diving.
11. Placental mammals became distinct from marsupial during the Cretaceous period.
12. Placentals and marsupials exhibit divergent evolution.
13. In dogs, the vertebral column becomes flexible during the course of walking.
14. The feet of bears and opossum are plantigrade.
15. Aquatic mammals are unable to modulate sound emitted by them.
16. Sebaceous glands are lacking in pangolin.
17. In carnivores, scent glands are present near the anus.
18. In whales, there are 11 pairs of ribs.
19. Cetaceans have poor vision but excellent hearing.
20. Some cetaceans are capable of echolocation.
21. The tail of cetaceans moves up and down.
22. The fastest mammal in the air is the big brown bat (*Eptesicus fuscus*).
23. Walruses are larger than seals.
24. The rhesus monkey is not found in India.
25. Opossum is omnivorous.
26. In metatheria, the cleavage is meroblastic
27. Koala is monophagus.
28. Salivary gland is present in cetaceans.
29. *Mantus* lacks incisors.
30. Gall bladder is lacking in artiodactyla.
31. The number of skull bones in mammals is 28.
32. In perissodactyla, cervical vertebrae are opisthocoelous.
33. Foramen transversarium in the cervical vertebrate is the characteristic of mammals.
34. In bats, the ulna is very long.
35. Monotremes lack ventral abdominal vein.

36. Dental formula of *Macropus* is 5.1.3.4/5.1.3.4.
37. Dentine is tubular in tubulidentata.
38. Tusks in pigs are modified canines.
39. *Desmodus* is sanguivorous.
40. Genetically, human beings and dogs are 97 per cent the same.
41. Killer whale (*Orcinus orca*) is the fastest mammal in water.
42. Blue whale (*Balaenoptera*) is also known as sulphur bottom whale.
43. Gestation in eutherian is metabolically expensive.
44. Lactation is less energetically expensive than gestation.
45. Blue whales may live more than 200 years.
46. Ears of elephants help in losing excess heat.
47. African female elephants lack tusks.
48. Baleen is made up of keratin.
49. Most mammals have colour vision.
50. Olfaction is well developed in cetaceans.
51. In mammals, 80–90 per cent energy is spent in maintaining constant body temperature.
52. Golden males lack sweat glands.
53. *Manis* lacks stapes.
54. Cochlea is absent in monotremes.
55. Kangaroo is a polyestrous mammal.
56. In mammals, the length of the neck is determined by the length of individual vertebrae.
57. Both right and left precavals persist in all mammals.
58. Australian numbat lacks marsupium.
59. All mammals share three characters not found in other animals, middle ear bones, hair and mammary glands.
60. Thermoregulation plays an important role in dictating mammalian behaviour.
61. Naked mole rat is endothermic.
62. *Teinolophos* is the earliest known monotremes.
63. Tooth comb, grooming claw and post-orbital bar are the characteristic of lemuroids.
64. Black lemur is endemic to India.
65. In many mammals, hair varies throughout the year.
66. In metatheria, ureters pass outside the genital ducts.
67. Rats lack scent glands.
68. Sloth belongs to the order pholidota.
69. Retia mirabilia helps in respiration in aquatic mammals.
70. Zebra is an even-toed ungulate.
71. In antelopes, scent glands are located on their cheeks.
72. Elephants have scent glands behind their eyes.
73. The cave-dwelling bat produces ultrasonic cries, a clicking of the tongue.

74. Canines and premolars are well developed in proboscideans.
75. Horns of *Rhinoceros* are connected with the skull.
76. In humans, gorillas and chimpanzees, there are 16 thoracic vertebrae.
77. The skull of a lemur is intermediate between primates and lower mammals.
78. The ulna is vestigial in chiroptera.
79. In sloths, cervical vertebrae are ankylosed.
80. Oil of sperm whales is edible.
81. Acetabulum of *Echidna* is perforated.
82. In dogs, the tongue helps in temperature regulation.

Answers to True or False

1. True	2. True	3. True	4. True	5. False	6. True	7. True	8. False
9. True	10. True	11. True	12. True	13. False	14. True	15. False	16. True
17. True	18. False	19. True	20. True	21. True	22. True	23. True	24. False
25. True	26. False	27. True	28. False	29. True	30. False	31. False	32. True
33. True	34. False	35. False	36. False	37. True	38. True	39. True	40. True
41. True	42. True	43. True	44. False	45. True	46. True	47. False	48. True
49. False	50. False	51. True	52. True	53. False	54. True	55. False	56. True
57. False	58. True	59. True	60. True	61. False	62. True	63. True	64. False
65. True	66. False	67. False	68. False	69. True	70. False	71. True	72. True
73. True	74. False	75. False	76. False	77. True	78. True	79. True	80. False
81. True	82. True						

Give Reasons

1. Cetaceans have a large body size.
 - Because it is an adaptation, as large body size guarantees that the muscle mass is more. This stores much oxygen. Also, the metabolic rate is slow due to a large body mass.
2. Monotremes and marsupials can be considered to be separate from other mammals.
 - Because they are primitive and have different reproductive patterns (Monotremes are egg-laying, while marsupials give birth to immature young ones).
3. Rodentia is a very successful group of mammals.
 - Due to the following reasons:
 - (a) Have nearly cosmopolitan distribution
 - (b) Ability to utilise broad spectrum of food
 - (c) High fecundity

- (d) Quick operation of natural selection due to rapid population turnover
- (e) Small size helps in escaping from predators and occupying shelters
- 4. Mammals have occupied a wide range of habitats.
 - Being endothermic, mammals are able to regulate their body temperature and thus they remain active even in extreme temperatures.
- 5. Groups of mammals can huddle together for warmth or descend into cool burrows to avoid extreme heat.
 - Additionally, by widening and constricting blood vessels, heat can be carried to different parts of the body.
- 6. Koalas do not need to drink water.
 - Because koalas eat the leaves of a particular type of *Eucalyptus* tree, from which they derive all the fluid needed by them.
- 7. The stomach of monotremes is not considered as a true stomach.
 - Because the lining of epithelium lacks glands.
- 8. Giant pandas do not hibernate.
 - Because their food is available throughout the year.
- 9. Naked mole rat (*Heterocephalus*) lacks sensation.
 - Because its skin lacks the key neurotransmitter substance 'P' which is responsible for sending pain signals to the central nervous system.
- 10. Cetaceans need to come on the water surface.
 - Because, being mammals, cetaceans are air breathers, so they came to the surface to exhale carbon dioxide and to inhale oxygen.
- 11. Study of evolution of mammals is important.
 - Because it helps us:
 - (a) Know our past
 - (b) Know the distribution of mammals
 - (c) Understand evolution
- 12. Mammals need nutritious and plentiful diet.
 - To maintain their high body temperature, they require more energy.
- 13. Ears of elephants help in losing excess heat.
 - Because hot blood flows near the surface of the skin.
- 14. Loss of the ability to regulate body temperature endothermically in naked mole rats does not affect their lives.
 - Because they live underground in an environment with a very stable temperature regime.
- 15. Mammal species living in cold climates tend to be larger than those populations of the same species living in warm climates.
 - Because heat loss from the body is proportional to the surface area, but heat generated is proportional to the mass and the ratio of surface area to the mass is less as the animal is larger. Thus, small animals lose heat more quickly than the larger ones and hence, animals having a larger size find it easier to stay warm.
- 16. Marsupials differ from placental mammals.
 - Because marsupials bear the young ones inside a pouch.