ZOOLOGY

CLASS XI

(Under AHSEC Curriculum)

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Assam Electronics Development Corporation Limited
(AMTRON)
(A Government of Assam Undertaking)

Name of the textbook

BIOLOGY

Name of the Chapter

Animal Kingdom

(Chapter 4)

CONTENTS

4.1 General Features:

Over a million species of animals with different structure and forms have been described till now. In spite of these differences, these are various fundamental features common to various individuals in relation to the arrangement of gills, body symmetry, nature of coelom, pattern of digestive, circulatory and reproductive system which are used as the basis of classification.

4.1.1 Levels of Organization:

Animals are divided into 3 categories on the basis of their organization.

1. **Cellular level of organization:** The animal body is formed of many cells but without coordination to form tissues. e.g. Sponges.
2. **Tissue level of organization:** The animal body is formed of many cells with coordination amongst them for specific functions and organized to form tissue. e.g. Coelenterate.
3. **Organ System level of organization:** The animal body is multi cellular and the cells coordinate to form tissue, organ and system. e.g. from flatworm to mammals.

4.1.2 Body Plans:

On the basis of shape and size, animals have 3 types of body plan.

1. **Cell aggregate plan:** In this type of body plan, the cells are aggregated with no coordination amongst them. e.g. sponges.
2. **Blind Sac Plan:** In this type of body plan, the multi cellular animal has organ system organization with incomplete alimentary Camel in which single acts as both mouth and anus. e.g. *Fasciola* also found in coelenterate.
3. **Tube within Tube plan:** In this type of body plan the multicellular animal has organ system organization with complete alimentary carnal having separate openings for mouth and anus. It is again of two types.

   (a) Protostomous: In this type of body plan, blastopore or archenteron of gastrular forms mouth earlier than anus. E.g. Annelids, Echinoderms, Arthropods and Molluscs.

   (b) Deuterostomous: In this type of body plan, blastopore of gastrula forms anus earlier than the mouth. e.g. Echinoderms and chordates.

Besides these three body plan animal's body can also be divided into another 3 types on the basis of sections made.

1. **Transverse plan:** It is a dorsoventral section which lies perpendicular to the anterior and posterior axis of the body.
2. **Vertical or Sagittal plan:** It passes through dorso ventral line along the length of the body. Vertical section through the middle line is sagittal plan.

4.1.3 Symmetry:

Symmetry is the arrangement of similar body parts on the two sides or opposite sides of the body. On the basis of symmetry animals are of two types. (1) Asymmetrical, (2) Symmetrical.

Asymmetrical: Animals of highly irregular form of body that cannot be divided into two equal similar halve from any plane are called asymmetrical. e.g. Amoeba, snails, certain sponges.

Symmetrical: When body of an animal can be divided in two similar parts by any one or more plane is called symmetrical. On the basis of plane of division symmetry in animals is of 3 types.

(a) **Spherical or Universal symmetry:** The body of animals can be divided into similar halves by any plane passing through the centre of the body. e.g. Volvox.

(b) **Radial Symmetry:** Body can be divided in two similar halves by any plane through the centre from top to bottom is called radial symmetry. e.g. sponges.

(c) **Bilateral Symmetry:** Body can be divided into two similar halves by only one plane along the longitudinal axis of the body. e.g. all the vertebrates.

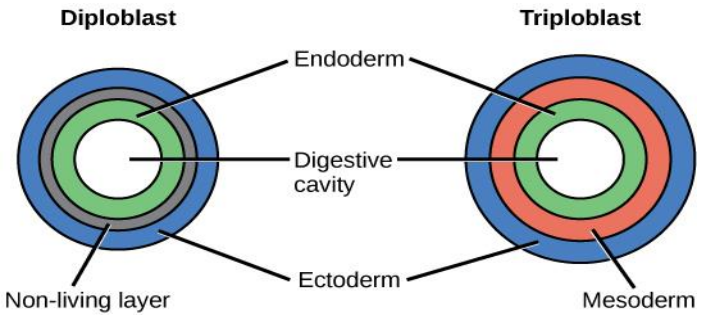


Fig. 4-1: Showing germinal layers.

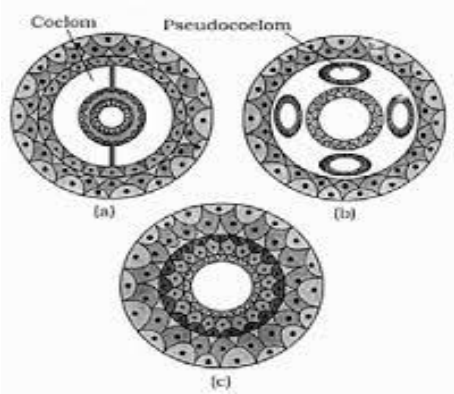


Fig. 4.2: Digrammatic sectional view of Coelom

a) True coelom b) Pseudocoelom and c) acoelom

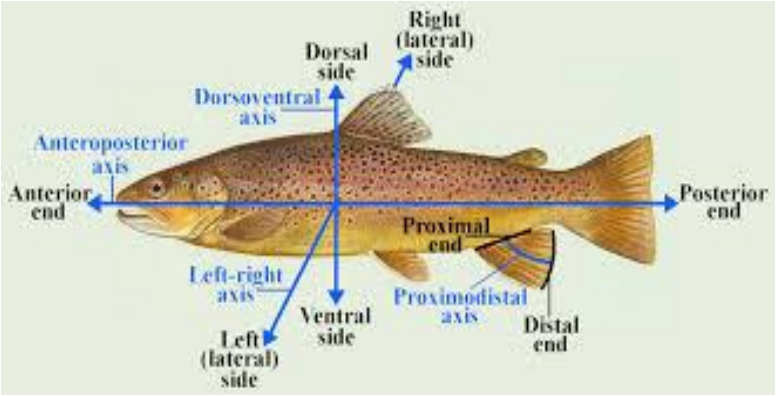


Fig. 4-3: Different views of an animal

4.1.4 Germ layers:

The embryonic fundamental cell layers of gastrula from which all the body organs are formed are called germ layers. On the basis number of germ layers, animals are of Diploblastic and Triploblastic.

Diploblastic Animal: Animals possessing two germ layers i.e. ectoderm and endoderm are called diploblastic. e.g. coelenterates.

Triploblastic Animals: Animals in which three germ layers i.e. ectoderm, mesoderm and endoderm are present. e.g. the other platyhelminthes to chordates.

4.1.5 Body Cavity / Coelom:

Coelom is the space between body wall and gut wall. On the basis of nature of coelom, animals are divided into following types:

1. **Acoelomate:** Animals have no coelom are called acoelomate. e.g. Invertebrates up to flatworms.
2. **Pseudocoelomate:** In this type of animals, the coelom is not lined by peritoneal layers i.e. the pseudocoel or false coelom. E.g. Aschelminthes (Roundworms).
3. **Eucoelomate:** Animals with true coelom which is lined by mesodermal peritoneal layers are called true coelomate or eucoelomate. e.g. From Annelids to Mammals.
4. **Haemocoelomate:** Animals with true coelom, but is reduced and the cavity is pseudcoel filled with blood called haemocoelomates. e.g. Molluscs and Arthropods.

On the basis or origin, coelom is of two types

(a) **Schizocoel:** The body cavity is formed by splitting of mesoderm. e.g. Annelids, Arthropod and Molluscs.
(b) **Enterocoel:** Coelom is formed from gastrula. e.g. Echinoderms and chordates.

4.1.6 Segmentation:

In annelids, arthropods, molluscs and vertebrates, there is repeatation internal body parts which is named as metamerism. Externally divided body segments by grooves or annuli are called metameres or somites. The body cavity is internally divided by septa.

4.1.7 Notochord:

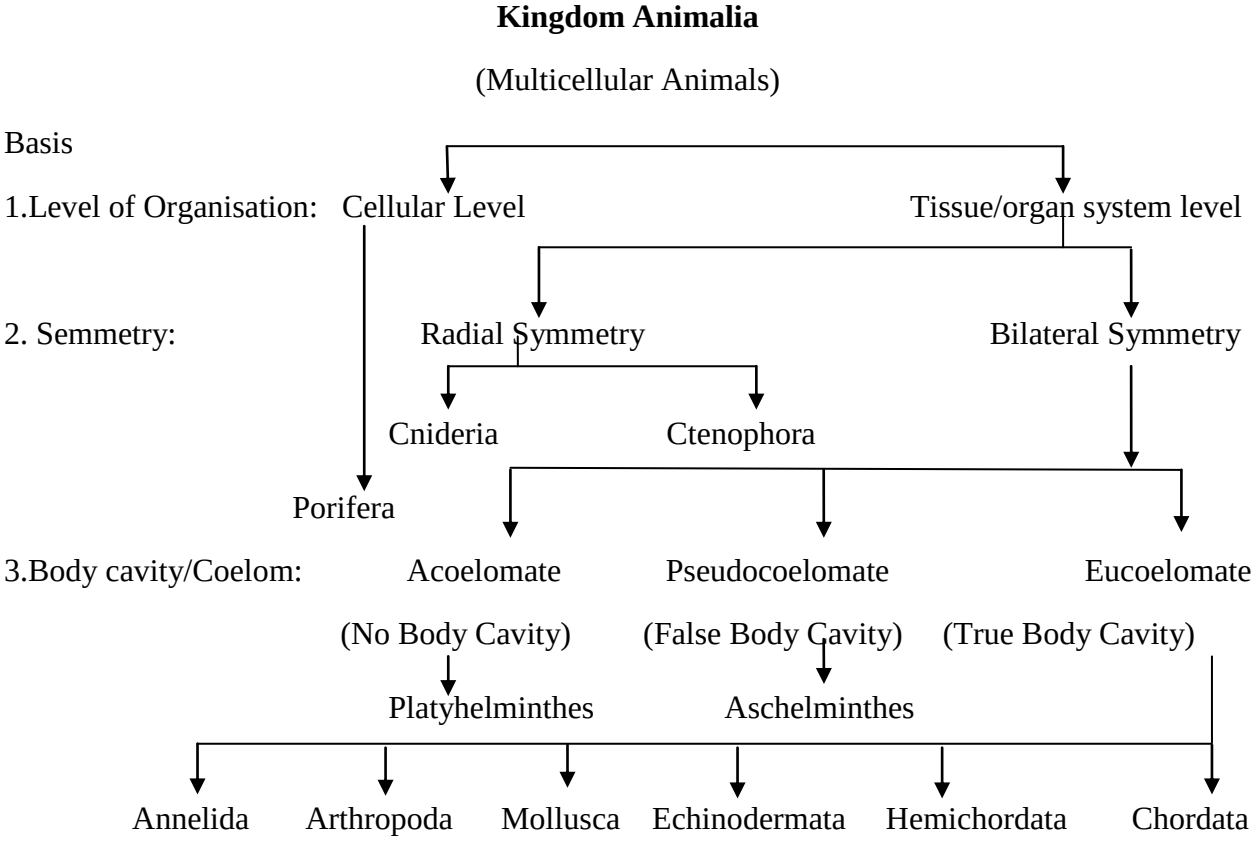
Notochord is a solid and enjoined mesodermally rod like structure present on dorsal side between alimentary canal and nervous system.

On the basis of presence and absence of notochord animals are divided into two categories.

1. **Non Chordates:** Animals lack of notochord are non-chordates. e.g. Poriferans to echinoderms.
2. **Chordates:** Animals possessing notochord at least in some stages of life are chordates. e.g. Cephalochordates, Urochordates and vertebrates.

Classification of Kingdom Animalia:

Broad classification of kingdom Animalia based on common fundamental feature



Classification of Kingdom Animalia:

4.2 Phylum : Porifera

The members of this phylum are commonly called as sponges and regarded as the first step towards the multicellularity.

Grant (1836) first suggested the name Porifera (Latin word- porus -pore; feros- to bear) to this group of animals that refers the pores structure of their body.

The sponges are the most primitive multicellular animals with great variation in structure, habit and habitats. This phylum includes about 5000 species known.

4.2.1 General Characters:

1. All are aquatic, mostly marine except one family in freshwater.
2. Multicellular organism with cellular level of body organization of asymmetry or radial symmetry, diploplastic, cylindrical or vase like, acoelomate body form.

3. Body with many pores, the ostia, and a central cavity, the spongocoel traversed by canals that serve for the flow of water through one or more water exits or osculum or oscula.

4. The body wall consists of two layers – the outer pinacoderm with flat cells called pinacocytes and the inner choanoderm with flagellated cells called choanocytes or collar cells. Between these layers a gelatinous materials named mesophil or mesenchyme consists of amoeboid cells or amoebocytes.

5. The body supported by a skeleton made up of calcareous spicules a sponging fiber.

6. Digestion intracellular and sponges is filter feeder.

7. Sensory and nerve cells are absent.

8. They are hermaphrodite is eggs and sperms are produced by the same individual sponges reproduce asexually- by budding and fragmentation.

9. Fertilization internal and indirect development with ciliated larval stage.

4.2.2 Classification:

On the basis of the formation of skeleton the phylum – Porifera is be divide into three classes-

Class 1- Calcarea: Skeleton is made up of calcium carbonate. E.g. *Sycon* (Scypha), *Grantia.*

Class 2- Hexactinellida: Skeleton of siliceous type. E.g. *Hyalonema* (Glass rope Sponge), *Euplectella* (The Venus flower basket).

Class 3- Desmospongia: Skeleton is made up of siliceous spicules or spongia fibres or both a absent. e.g. *Spongilla* (Fresh water sponge), *Euspongia* (Bath sponge), *Cliona* (Boring Sponge) etc.

4.3 Phylum : Coelentereta or Cnidaria :

The phylum coelenterate also called cnidaria includes the acoelomate, multicelluar tissue grade level of organisms. Leuckhart named these animals as Coelenterata (Gr.- koilos- cavity; enteron- intestine) which included sponges and ctenophores alongwith echinoderons and coelenterates. **Hatschek (1888)** separated this group into **Coelenterata** and **Ctenophora.**

4.3.1 General Characters of Phylum Coelenterata:

1. The Coelenterates diploblastic are tentacle bearing aquatic radially symmetrical diploblastic animals.
2. They are primitive metazoans of low cell-tissue grade organisms.
3. They are mostly marine some fresh water, solitary or colonial sessile or free swimming.
4. Coelom, respiratory, Circulatory and excretory systems are absent.
5. The body wall contains peculiar stinging cells, the nematocysts which are used for adhesion, food capture and offence and defence. The nematocysts are also called as cnidoblasts or cnidocytes.
6. They have a central gastro vascular acuity with a single opening, month on hypostome.
7. Skeleton may or may not be present.
8. Two types of individuals occur, attached polyps and free swimming medusa.
9. Most of coelenterates exhibit polymorphism having the polypoid and medusoid forms.
10. Coelenterates show asexual reproduction by budding and sexual reproduction by medusa.
11. Development is generally indirect except Hydra and includes Planula Larva for dispersal.

4.3.2 Classification of Phylum: Cnidaria / Coelenterata :

According to Hymen (1940), Phylum Coelenterata is divided into three classes on the basis of development of zooids.

1. **Class I: Hydrozoa** – (Gr. - hydros = water; zoon = animal) – Both medusa and polyp are well developed except Hydra. Animals are radially symmetrical. e.g. *Hydra, Obelia* (Sea far), *Physalia* (Portuguese man of war). *Velella* (Sail by wind).
2. **Class II: Scyphozoa** (Gr. skyphos = cup) = Medusa is well developed but polypoid phase is reduced. Tetramerous radial symmetry. e.g. *Auralia* (Jelly Fish).
3. **Clas III: Anthozoa / Actinozoa** (Gr. Anthagoj = flower) Polypoid phase is well developed while medusa absent. Symmetry is hexamerous radial. e.g. *Adamsea* (Sea anemone), *Fungia* (Mushroom Coral), *Gorgonia* (Sea fan), *Pennatula* (Sea Pen), *Medrepora* (Stage horn Coral), *Medrina* (Brain Coral) etc.

4.4 Phylum : Ctenophora (Gr. ktenos = comb; pherein = bearing)

The Ctenophoras are free swimming, transparent pelagic animals with low grade triploblastic form. e.g. Escseholtz (1829) first recognized the Ctenophores as distinct group.

4.4.1 General Character :

1. Ctenophores are exclusively marine and most are planktonic. Only one parasitic species known. There are about 100 species.

2. Biradially symmetrical body, Diploblastic animals but mesoglea is with many amoebocytes and smooth muscle fibers and is developed fem mesoderm so it is called mesoblast.

3. Tissue level organization.

4. Locomotion is by cilliary movements of 8 rows of nautically arranged comb plates or ctenes hence commonly called as comb jellies or sea walnuts.

5. Alimentary canal complete, Digestion partly intercellular and partly intracellular.

6. Respiration and excretion occur through body surface.

7. Narrows system is of diffuse type.

8. Peculiar sense organ the statocyst, lies in a pit at the aboral pole and helps in equilibrium.

9. Bioluminiscence is well marked.

10. Bisexual or hermaphrodite.

11. Fertilization external and development includes a ciliated cydipid larva.

Example:- *Ctenophora, Pleurobrachi*a (goose berry), *Cestum* (Venus's Girdle).

4.4.2 Classification : Phylum : Ctenophora

The phylum Ctenophora or Acnidaria is divided into two classes.

Class 1 : Tentaculata – (Micro Pharyngea) – Body bears tentacles, Stomodocum is small. e.g. *Hormiphora* and *Pleurobrachia*.

Class 2:- Nuda (Macropharyngea) – Body without tentacles, mouth and stomodaeum are specious e.g. *Beroe.*

4.5 Phylum: Platyhelminthes:

The name Playhelminthes (Gr.– platys – flat; helminth – worms) was first coined by Gagenbour (1859). This phylum includes the flat worms.

4.5.1 General Character:

1. Body dorsoventrally flattened, leaf like or ribbon like without metamerical segments.

2. These are bilateral, acoelomate, triploblastic animal of tissue-organ level of organization.

3. Presence of definite head and tail.

4. The body may be enclosed by a single layered epidermis or by a firm living integument and muscle layers.

5. The epidermis carries suckers and hooks for attachment with hart body.

6. Alimentary canal is incomplete anus absent.

7. Excretion and more regulation occur by peculiar cells called flame cells or solenocytes.

8. Respiration occurs through general body surface.

9. Nervous system ladder like sense organs poorly developed.

10. Mostly hermaphrodite Fertilization is internal.

11. Asexual multiplication and alternation of generation found in some forms.

12. Life history includes larval stage.

4.5.2 Classification:

The Phylum platyhelminthes is divided into three classes on the basis of body shape, mouth portion and habitat.

Class 1 Turbellaria :

1. Body unsegmented and leaf like and free living.
2. Mouth present on the ventral side of middle of body.

3. Body externally covered with ciliated epidermis.

Example: *Plannaria, Dugesia*

Class 2 Trematoda:

1. Body leaf like and unsegmented.
2. Mouth present on the anterior end of body
3. These are either ectoparasite or endoparasite.

Example: *Fasciola hepatica* (Liver fluke)

Class 3 Cestoda:

1. Body ribbon like and divided into segments called proglottids.
2. Mouth and alimentation absent.
3. This includes all the tapeworms.

Example: *Taenia solium*.

4.6 Phylum: Aschelminthes

Gagenbour (1859) grouped the Pseudocoelomate animals in a group, Nemathelminthes which includes only one group of animals commonly known as round worms. Grobben (1910) used the term Aschelminthes for this group.

4.6.1 General Character:

1. The body is elongated, cylindrical, vermiform without segmentation.

2. These are bilaterally symmetrical, triploblastic, pscudocoelomate organ system level of organization.

3. Body wall is extremely covered with a definite cuticle of scleroprotein.

4. These are first animas to have straight and complete alimentary canal with muscular pharynx.

5. Respiration occurs by diffusion through the body surface.

6. The excretory system consists of gland of cells or of intracellular canal.

7. Nervous system is formed of circum pharyngeal nerve ring.

8. Mostly dioecious i.e sexes separate -male and female are distinct. Female are longer than males. Male is smaller in size and has penial spicules and cloacal aperture, while in female anus.

9. Fertilization is internal and development of egg is direct.

4.6.2 Classification:

This phylum consists of heterogenous groups of animals. This phylum is classified into five classes. One large group class Nematoda and other four small group Rotifera, Gastrotricha, Kinorhyncha and Nematophora.

Some authors consider these groups as separate distinct Phylum.

Class 1- Nematoda. e.g. *Ascaris, Wuchereria, Trichinella*.

Class 2- Rotifera – *Philodina, Rotaria*.

Class 3- Gastrotricha – *Chaetonotus.*

Class 4- Kinorhycha – e.g. *Echinoderes.*

Class 5- Gordius Nematophora – e.g. Gordius, Nectonema.

4.7 Phylum: Annelida:

The phylum Annelida was first coined the name by Lamarck (1809) for the higher segmented worms. This phylum includes soft bodied, elongated metamerically segmented worms. There are about 7,000 known species.

4.7.1 Character:

1. Body is soft, elongated, and cylindrical or flattened, metamerically segmented, bilaterally symmetrical, triploblastic coelomate and organ system level of organization.

2. Body is covered by a thin cuticle.

3. Alimentary canal is straight and complete.

4. Respiration usually occurs through the skin.

5. Closed circulatory system is appeared in this phylum.

6. Excretion occurs by segmentally arranged coiled organs, **nephridia.**

7. Nervous system is formed of circum pharyngeal nerve ring and a solid, double ganglionate nerve cord.

8. They may be unisexual or bisexual. Asexual reproduction by budding or fission occurs in some cases.

9. Life cycle may include a trochophore larva in some cases.

4.7.2 Classification:

The phylum Annelida is divided into three classes on the basis of the presence or absence of parapodia, setae, metameres and other morphological features.

Class 1- Polychaeta (Gr. polys-many; chaite-hairs)

1. Body bears unjointed locomotory appendages called parapodia with numerous long setae. E.g. *Nereis* (the sand worm), *Aphrodite* (The sea mouse).

Class 2- Oligochaeta (Gr. – oligos – few; chaite – hairs)

Body without head and parapodia, setae are small and few. e.g. *Pheretima* (Earthworm), *Tubifex* (Blood worm).

Class 3- Hirudinea – (Gr. hirudo- leech)

Body without head, parapodia and setae. Locomotion by posterior sucker.

Example – *Hirudinaria* (The cattle leech)

4.8 Phylum: Arthropoda (Gr. arthros- join; podos- foot):

The Phylum Arthropoda is the largest group of animal kingdom which are found all over world wherever the life is possible on the earth. This phylum is the most dominant animals constituting almost 83% of all the known species of animals. Von Seibold coined the term Arthropoda.

4.8.1 General Character of Phylum Arthropoda:

1. Arthropods are of organ system level of organization.

2. They are triploblastic, haemocoelomate, bilaterally symmetrical, metamerically segmented animal.

3. Body divisible into head, thorax and abdomen.

4. Body is covered with sclerotized exosketeton formed of chitinous plates sclerites.

5. The appendages are jointed and variously modified for feeding, walking, jumping, swimming, clinging, sensory reception, copulation and defence.

6. Digestive system complete with mouth and anus.

7. Circulatory system is open type and without blood vessels. Colourless blood, the haemolymph flows in the haemocoel.

8. Sensory organs like antennae, compound and simple eyes, statocysts or balance organs are present.

9. Excretion is by antennary glands, Malpighian tubules or coxal glands.

10. Respiration is by gills, tracheae, book gills or book lungs.

11. Nervous system consists of circum oesophageal ring and a double ventral nerve cords.

12. Mostly dioecious or unisexual. Fertilization is internal. They are mostly oviparous and few viviparous.

13. Development may be direct or indirect.

4.8.2 Classification:

The Phylum Arthropoda is divided into seven sub phyla: Trilobitomorpha, Chelicerata, Mandibulata, Onychophora, Targigrada, Pentastomida and Pycnogonida. Out of these Onychophera, Targigrada, Pentastomida and Pycnogonida are doubtful Arthropoda. The taxonomists consider Onychophora as an independent phylum.

Sub Phylum: Trilobitomorpha:

All are extinct and in fossil forms without antennae and mandibles. e.g. *Dalmanites, Triarthrus*.

Sub Phylum: Chelicereta:

The first pair of head or pre oral appendages is modified to chelicereae with claws. This sub Phylum is divided into 3 classes.

Class 1- Merostomata- e.g. *Pterygotus, Limulus* (The King crab).

Class 2- Arachnida- e.g. Scorpions, Palamnaeus, Chelifer, *Agelena* (Funnel web spider), *Latrodectus* (Black widow), *Achaearanea* (House Spider).

Class 3- Pycnogonida- The small size spider with 8 pairs of walking legs. e.g. *Pycnogonum, Nymphon*.

Sub Phylum 3 Mandibulata:

1. Body divisible into head, thorax and abdomen.
2. Head possesses segmented appendages, 1 or 2 pairs of maxillae.
3. Compound eyes present.

This sub Phylum is divided into six classes:

Class 1- Crustacea:

1. Exoskeleton is chitinous, hard and calcareous.
2. Two pairs of 5 segmented antennae.
3. Appendages typically biramous.
   e.g *Daphnea* (The water flea), *Palaemon* (Prawn), *Eupagurus* (The hermit crab), *Cancer* (The crab), *Oniscus* (The wood louse), *Palinurus* (The lobster)

Class 2- Diplopoda:

1. Exoskeleton calcified.
2. Body elongated, cylindrical with head, Thorax and abdomen.
3. Abdominal segment bears two pairs of legs.
   e.g. *Julus* (the millipede); *Spirobolus*.

Class 3- Chilopoda:

1. Exoskeleton is uncalcified.
2. Body divided into head and trunk.
3. Trunk with 15-173 segments and each segment bears one pair of seven jointed walking legs.
4. First pair of legs form poison claws.
   e.g. *Scolopendra* (The centipede).

Class 4- Symphyla:

1. Trunk 12 segmented and each segment bears one pair of clawed walking legs. e.g. *Symphalella, Scrutigerella*.

Class 5- Pauropoda:

1. Minute soft bodied arthropods with nine or ten pairs of walking legs.
2. Eyes are lacking.
   e.g. *Pauropus.*

Class 6- Insecta:

This is the largest class of the phylum Arthropoda. Insects are the most successful land invertebrates and occur in water but rare in the sea.

1. Body is divisible into head, thorax and abdomen.
2. Exoskeleton chitinous.
3. Thorax has 3 segment- prothorax, mesothorax and metathorax.
4. Each thoracic segment bears one pair of jointed legs i.e. 3 pairs of legs.
5. Mesothorax and metathorax bear one pair of wings each.
6. Respiration occurs by tracheae.
7. Excretion takes place by Malpighian tubules.
   e.g. *Periplanata* (Cockroach), *Lepisma* (Silver Fish), *Schistocerca* (Locust), Termites, *Ephemera* (May Fly), Dragon flies, *Pediculus* (Human louse), Beetles, *Belostoma* (Giant water bug), House Fly (*Musca*), Butterflies, *Anopheles, Culex, Apis* (Honey bee), Wasps, Ant.

Sub Phylum 4: Targigrada:

1. Mouth retractile with a pair of styles.
2. Four pairs of unjointed stampy clawed legs.
   e.g. *Macrobiolus* (Water bear).

Sub Phylum 5: Linguatulida:

1. Vermiform parasitic worms with two pairs of ventral retractile hooks.
   e.g. *Linguatula* (Tongue worm).

Sub Phylum 6: Pycnogonida:

1. Small, marine, spider like, abdomen vestigial.
   e.g. *Pycnogonium, Nymphon*(Sea Spider).

Sub Phylum 7: Onychophora:

1. Primitive unsegmented worm like with numerous stampy unjointed clawed legs.
   e.g. *Paripatus.*

Sub Phylum Onychophora is considered as a separate Phylum by the taxonomists.

4.9 Phylum: Mollusca:

Molluscs are the second largest group of Animalia having about 80,000 known living species.

4.9.1 General Character:

1. Molluscs are soft bodied, triploblastic, true coelomate bilaterally symmetrical, organ system organization level of animals.

2. Body is enclosed in a calcareous shell.

3. Body is divided into distinct head, muscular foot and a visual mass.

4. A glandular mantle over the visceral hump.

5. Buccal mass with a rasping organ, radula, and Digestive gland is hepato pancreas.

6. Mantle cavity with anal, excretory and genital apparatus in it.

7. Respiration takes place directly by gills or ctenidia, by lungs or both.

8. Excretion by paired metanephridia.

9. Sexes usually separate but a few hermaphrodites.

10. Fertilization is external or internal. Development may be direct or indirect.

11. Larval forms found are Glochidium or Trochophore or Velliger.

4.9.2 Classification:

The Phylum Mollusca is divided into six classes on the basis of foot and shell.

Class 1- Monoplacophora:

1. Bilaterally symmetrical body with a doom shaped mantle.
2. Foot broad and flat with 8 pairs of pedal retractor muscles.
3. Shell is formed of only one plate.
   e.g. *Neoplina.*

Class 2- Amphineura:

1. Foot is sole like or reduced or absent.
2. Shell is formed of 8 plates
   e.g. *Chiton.*

Class 3- Gastropoda:

1. Foot is large and modified into stomach.
2. Spirally coiled, unvalvular shall.
   e.g. *Pila* (Apple snail), *Limax* (Slug), *Aplysia* (Sea hare), *Achatina* (Land snail).

Class 4- Pelecypoda or Bivalvia:

1. Foot is wedge shaped.
2. Shell is formed of two valves, hinged dorsally.
   e.g. *Pinctada* (Pearl oyster), *Teredo* (Ship Worm), *Unio* (Fresh water mussel), *Solen* (Razor Shell).

Class 5- Scaphopoda:

1. Foot is conical for digging.
2. Shell is like elephant tusk.
   e.g. *Dentelium*.

Class 6- Cephalopoda / Siphonopoda:

1. Shall may be internal or external or absent.
2. Foot is partly modified into head with eight to ten arms and partly into siphon.
   e.g. *Sepia* (Cuttle fish), *Loligo* (Squid), *Octopus* (Devil Fish), *Nautilus.*

4.10 Phylum: Echinodermata (Gr. echinos-spines; derma- skin) (Spiny skinned animals)

The Phylum Echinodermata includes exclusively marine with exception a single species in brackish water forms. Jacob Klein (1734) named the term Echinodermata.

4.10.1 General Character:

1. The echmoderms are mostly free living, palegic or attached to substratum, radially symmetrical, triploblastic, true coelomate pentamerous animals.

2. Embryonic coelom is modified into water vascular system.

3. Mesodermal endoskeleton of calcareous plates usually with spines.

4. An excretory system is absent.

5. Sexes are separate, reproduction sexual.

6. Fertilization is external. Development is indirect with free swimming ciliated bilaterally symmetrical larva.

4.10.2 Classification:

The Phylum Echinodermata is classified into five classes:

Class 1- Asteroidea:

1. Star shaped body with 5 arms.
2. Oral surface bears mouth and ambulacral grooves while aboral surface has anus and medreporite.
3. Development includes Bipinnaria or Brachiolaria larva.
   e.g. *Asterias* (Star fish), *Pentaceros* (Star fish).

Class 2- Ophiuroidea:

1. Star shaped body with 5 arms demarketed from the central disc.
2. Medreporite is in the aboral surface.
3. Development includes Pleuteus larva.
   e.g. Brittle Star (*Ophiothrix).*

Class 3- Echinoidea:

1. Globular body with no arms.
2. Body with movable opines.
3. Development includes Echinopluteus larva.
   e.g. *Echinus* (Sea Urchin); *Clypeaster* (Lake Urchin), *Echinocardium* (Heart Urchin).

Class 4- Holothuroidea:

1. Elengated, cylindrical cucumber like body without arms.
2. Medreporite is towards oral side and is internal.
3. Development includes Auricularia larva.
   e.g. *Holothurion* (Sea cucumber), Cucumaria (Sea Cucumber).

Class 5- Crinoidea:

1. Arms are branched, spines absent.
2. No medreporite.
3. Development includes Doliolaria larva.
   e.g. *Antedon* (The Feather star or sea lily).

4.11 Phylum: Hemchordata (Gr. hemi=half; chordate- notochord)

1. Hemichordates are vermiform, solitary or colonial, enterocoelous coelomate, triploblastic, bilaterally symmetrical unsegmented animals.
2. Body divisible into proboscis, collar and a long trunk.
3. Digestive tube complete, straight or U-shapes.
4. Proboscis gland is organ of excretion.
5. Sexes are unisexual. Development includes a Tornaria larva.

4.11.1 Classification:

The Phylum Hemichordata is divided into 4 classes:

Class 1- Enteropneusta:

1. Proboscis cylindrical and tapering.
2. Collar without ciliated arms.
   e.g. *Balanoglossus*, *Seccoglossus.*

Class 2- Pterobranchia:

1. Body short, compact. Proboscis shield like and collar bears ciliated arms.
   e.g. *Rhabdopleura Cephalodiscus*.

Class 3- Planctosphaeroidea:

1. Few smell, rounded, transparent and pelagic larva.
   e.g. Planctophaera.

Class 4- Graptolita:

1. Fossil forms were abundant in Ordovician and Silurian periods and placed as an extinct class.
   e.g. *Dendrograptus.*

4.12. Phylum: Chordata

Phylum chordate is the most advanced animal phylum and includes about 48,000 living species. All the chordates have certain salient features.

4.12.1 General Character:

1. **Notochord** is a solid, unjointed, stiff but flexible rod located on the dorsal side between alimentary canal and nervous system.
2. Dorsal hollow **nerve cord** is a hollow tubular cord lies dorsal to the notochord. It is generally differentiated into anterior broader **brain** and posterior narrow longer **spinal cord**.
3. **Gill slits** are paired openings present on the lateral sides of the pharynx to the exterior.
4. **Muscular tail** is the post anal part of the body.
5. Other chordate characters are bilaterally symmetrical, triploblastic, organ system organization of organisms.

4.12.2 Classification:

The Phylum Chordate is divided into 3 sub phyla on the basis of the structure of notochord.

Sub Phylum 1. Urochordata, 2. Cephalochordata and 3. Vertebrata.

Urochordata and Cephalochordata are commonly called lower chordates or invertebrate chordates are often together as Protochordata or Craniata. Vertebrates are named as higher chordate.

4.12.3 Sub Phylum: Urochordata

1. Urochordates are marine, sessile, filter feeding invertebrate chordates.

2. **Notochord is present only in tail of larva** and is lost during metamorphosis. No brain box.

3. Pharyngeal slits are numerous.

4. Body is enclosed in a test called **tunic** composed of **tunicia.**

5. More chordate like larva, the tadpole.

e.g. *Hardmenia (*Sea squirt), *Salpa, Doliolum, Ascidia, Oikopleura*.

4.12.4 Sub Pylum: Cephalochordata

1. **Notochord extends to the anterior tip** did persist throughout the life.
2. Central nervous system is present but is not differentiated into brain and spinal cord
3. The tail persists throughout life.
   e.g. *Branchiostoma* or *Amphioxus.*

4.12.5 Sub Pylum: Vertebrata / Craniata

1. Notochord is present in embryonic stage and it is replaced by a rod or cartilaginous bony rings, vertebrae called **vertebral column**.
2. Central nervous system is differentiated is to brain and spinal cord.
3. Brain is enclosed in a **brain box or cranium** hence is called Craniata.
4. Jaws may or may not be present.
5. Exoskeleton consists of scales, feathers or hairs. In some, these may be absent.
6. Endoskeleton consists of cartilages or bones or both.
7. Alimentary canal is complete.
8. Respiration occurs by gills or skin or lungs.
9. Excretory organs re one pair of kidneys for excretion and osmoregulation.
10. Two pairs of lateral appendages in the form of fins in fishes, limbs in tetrapods for locomotion.
11. Unisexual with one pair of gonads.

4.12.6 Classification:

Sub phylum Vertebrata is divided into two sub divisions on the basis of presence or absence of jaws.

Sub division Agnathostomata or Agnatha and Gnathostomata

Sub division: Agnathostomata

1. Mouth is **not bounded by jaws** and **circular**

2. Exoskeleton and paired appendages are absent.
3. Internal ear has one or two semi circular canal.

   This sub division has a single class.

Class 1- Cyclostomata:

1. Presence of **circular mouth** bounded by bony sheathed suctorial funnel without jaws.
2. Median fins present.
3. **Single nostril** present on the dorsal side.
4. They have and elongated body bearing 6-15 pairs of gill slits for respiration.
5. Circulation is of close type.
6. They are marine but migrant for spawning to fresh water. After spawning within few days they die.
7. Development includes an ammocoete larva.

   e.g. *Petromyzon* (Sea lamprey), *Myrine* (Hag fish).

Sub Division- Gnathostomata:

1. Mouth is always bounded by **jaws.**
2. Notochord replaced by vertebral column.
3. **Paired nostril** present.
4. Paired appendages (fins or limbs) are present.

This sub division Gnathostomata is classified into two super classes- Pisces and Tetrapoda.

Super Class 1- Pisces:

1. Primarily aquatic habitat.
2. Locomotion is by fins.
3. Respiration is by gills.

This super class is classified into two classes- Chondrichthyes and Osteichthyes.

Class 1- Chondrichthyes:

1. Endoskeleton completely cartilaginous.
2. They are marine.
3. Exoskeleton is formed of **placoid scales**.
4. Month is located ventrally.

5. Notochord persistent throughout life.
6. **Gill slits** are separate and **without operculum**.
7. Due to the absence of air bladder, they have to swim constantly to avoid sinking.
8. **Heart two chambered** and they are poikilotheremic animals.
9. Sexes separate.

   e.g. *Scoliodon* (Dog fish), *Pristis* (Saw fish), *Carcharodon* (Great white shark), *Trygon* (Sting Ray), *Torpedo* (Electric Ray).

Class - Osteichthyes:

1. They are marine and fresh water streamlined bodied fishes with bony endoskeleton.
2. Four pairs of gills in a gill chamber which is covered by **operculum.**
3. Body is covered with **cycloid** and **ctenoid scales**.
4. Heart is **two chambered**.
5. Sexes separate, mostly oviparous.
   e.g. *Labeo rohita* (Rohu), *Catla calta* (Bahu), *Cirrhana mrigal* (Mrigal), *Wallago attu* (Borali), *Mystus seenghala* (Singara / Tengra), *Opheocephalus punctatus* (Goroi Fish), *Notopterus chitala* (Chital), *Notopterus notopterus* (Kanduli), *Anguilla* (Eel), *Hilsa* (Ilish), *Exocoetus* (Flying fish), *Hippocampus* (Sea horse), *Clarius* (Magur), *Tetradon* (Globe fish), *Anabas* (Koi fish) etc. *Protopterus* (African Lung fish), *Betta* (fighting fish), *Pterophyllum* (Angel fish).

Super Class - Tepapoda:

This super class is divided into 4 classes:

Class 1 - Amphibia:

1. The amphibeans were the first vertebrates to invade land but they have not fully adopted for terrestrial life. They live in damp places and breed in water where they, grow their larval stage.
2. Exoskeleton is absent. Skin is thin, moist, glandular and vascular.
3. Endoskeleton is largely bony. Skull is **dicondylic.**
4. Body divisible into head and trunk.
5. Appendages are of two pairs of pentadactylous limbs.
6. A tympanum represents the ear.
7. Alimentary canal, urinary and reproductive tracts open into a common, chamber called cloaca, which opens to the exterior.

8. Respiration is by gills, lungs and through skin.
9. The heart is three chambered.
10. Sexes separate, Fertilization external.
    e.g. *Bufo* (Toad), *Rana* (Frog), *Hyla* (Tree frog), *Salamandra* (Salamandes), *Ichthyophis* (Caecilian).

Class 2- Reptilia:

1. The reptiles were the first vertebrates fully adopted for life on dry land.
2. Body is covered by dry and cornified skin, epidermal scales **or scutes**.
3. They do not have external ear opening tympanum represents ear.
4. They have two pairs of pentadactyle limbs with clawed digits.
5. Skull is **monocondylic.**
6. Heart is **3 chambered** except **four chambered in crocodile**.
7. Snakes and lizards shed their scales as skin cast.
8. Fertilization internal and development is direct.
    e.g. *Chelone* (Turtle), *Testudo* (Tortoise), *Chaemeleon* (Tree lizard), *Hemidactylus* (Wall lizard), Poisonous snakes – *Naja naja* (Cobra), *Bangurus* (Krait), *Vipera* (Viper).

Class 3- Aves:

The characteristics feature of Aves is the presence of feathers and most of them can fly except flightless birds.

1. They possess **beak without teeth**.
2. The fore limbs are modified into **wings** and the hind limbs have scales and all modified for walking, swimming or clasping the tree branches.
3. Endoskeleton is fully ossified and long banes are hollow with air cavities.
4. Skin is dry without glands except the oil gland at the base of the tail.
5. Heart is completely **four chambered.**
6. They are warm blooded animals.
7. Air sacs are connected to lungs as supplement respiration.
8. Sexes separate. Fertilization internal.
    e.g. *Corvus* (Crow), *Columba* (Pigeon), *Psittacula* (Parrot), *Struthio* (Ostrich), *Pavo* (Peacock), *Aptenodytes* (Penguin), *Neophron* (Vulture), *Passer domesticus* (The house sparrow), *Anas* (Duck), *Milvus* (Kite), *Upupa* (The hoopae*), Gallus* (Fowls*),*

Eudidynamis (The Cuckoo), *Archaepteryx*- The ancient or lizard bird of Jurassic period.

Class 4- Mammalia:

1. Mammals are primarily terrestrial animals with distribution of varied habitat like polar ice caps, deserts, mountains, forest, grass lands and dark caves.
2. Body is covered with **hairs** and possesses a pair of external **pinae**.
3. The most unique character is the presence of **mammary glands** by which the young ones are nourished.
4. They possess heterodant (incison, cavine, premolar and molars), thcodant (in sockets of jaw bones) andgenerally diphyodont (two sets of teeth) type of teeth.
5. They have two pairs of limbs adopted for walking, running, climbing, burrowing, and swimming or flying.
6. **Heart four chambered**.
7. Respiration is pulmonary.
8. Sexes separate, fertilization internal.
   e.g. Oviparous = *Orinithorhynchu*s (Duck billed platypus) and *Trachyglossus* (spiny ant eater). Viviparous:- *Hystrix* (Porcupine), *Macropus* (Kangaroo), *Pteropus* (flying fox), *Camelus (*Camel), *Rattus* (Rat), Manis (Scaly ant eater or Pangolin), *Cavis* (Dog), *Felis* (cat), *Panthera tigris* (Tiger), *Panthera leo* (Lion), *Elephus* (Elephant), *Eqquus* (Horse), *Rhinoceros* (Rhino), *Macaca* (Monkey), *Hyalobates* (Gibbon), *Homo sepiens* (Man), *Delphinus* (Dolphin), *Balaenoptera* (Blue Whale).

Question & Answers

Very Short Answer type Questions:

Q1. Nam the two layers of cell in a diploblastic animal.

Ans: Ectoderm and Endoderm.

Q2. What is bioluminescence?

Ans: Ability of living organisms to emit light.

Q3. What is Mesoglea?

Ans: Gelatinous layer between ectoderm and endoderm in diploblastic animals.

Q4. Name the flatworm that has high power of regeneration.

Ans: Plannaria has high power of regeneration.

Q5. What is meant by cephalisation?

Ans: Cephalisation is the differentiation of a definite head at the anterior end of an organism.

Q6. What is the skeleton of Poriferans made of?

Ans: Calcareous or siliceous spicules or sponging fibres are the skeleton of poriferans.

Q7. Name the largest phylum of kingdom Animalia.

And: Phylum Arthropoda is the largest phylum of Animalia.

Q8. What are sedentary animals?

Ans. Animals live fixed to substratum are sedentary animals.

Q9. What is a sagittal section?

Ans: Median longitudinal vertical section is sagittalsection.

Q10. What are triploblastic animals?

Ans: Triploblastic animals that develop from three germ layers.

Q11. What exoskeletal structures are found in man?

Ans: Nails and hairs are exoskeletal structures found in man.

Q12. Name three kind of excretory organs found in invertebrates?

Ans: Flame cells, nephridia and Malpighian tubules are the excretory organs found in invertebrates.

Q13. What is the source of coelomic fluid?

Ans: Mesodermal epithelial lining of the coelom is the source of coelomic fluid.

Q14. Name two animal groups with incomplete digestive tract.

Ans: Cnideria and Platyhelminthes are with incomplete digestive tract.

Q15. Name the two cellular layers of a sponge body.

Ans: Dermal and choanocytic cellular layers of a sponge body.

Q16. Name the special cells characteristics of Coelenterates.

Ans: Nematoblasts or cnidoblasts are the special cells characteristics of Coelenterates.

Q17.. Name a segmented mollusc. .

Ans: *Neoplina* is a segmented mollusc.

Q18. What organs the echinoderms have for respiration and locomotion?

Ans: Dermal branchiae and tube feet are the organs for respiration and locomotion in echinoderms respectively.

Q19. Mention a sanguivorous annelid. Give its class also.

Ans: *Hirudinaria granulosa* (cattle leech) is a sanguivorous annelid. Class Hirudinea.

Q20. Which arthropod has two pairs of appendages per abdominal segment?

Ans: Millipede has two pairs of appendages in each abdominal segment.

Q21. Name three useful insects.

Ans: Honey bee, Silk moth and Lac insect are useful insects.

Q22. Name three social insects.

Ans: Honey bee, White ant and ants are social insects.

Q23. Mention three wingless insects.

Ans: Bedbug (*Cimex*), Louse (*Pediculas*) and Ratflea (*Pulex*) are wingless insects.

Q24. Which sponge is used as a marriage gift?

Ans.: Euplectella, the Venus's Flower Basket `is a sponge used as marriage gift.

Q25. Give one example of Cephalochordata.

Ans.: *Branchiostoma(Amphioxus)* .

Q26. What is the function of lateral line sense organ?

Ans.: The lateral line organ detects the currents and waves in water.

Q27. Name a fish which has lungs in addition to gills.

Ans.: *Protopterus* is a lung fish which has lungs in addition to gills.

Q28. Mention the mode of breathing in tadpole of frog.

Ans.: The mode of breathing in tadpole of frog is branchial.

Q29.: What type of RBCs do mammals have?

Ans.: Mammals have circular, biconcave and anucleated RBCs.

Q30. What is a diaphragm?

Ans.: Membranous partition between thorax and abdomen is called diaphragm.

Q31.: How many chambers a camel's stomach has?

Ans.: camel's stomach has three chambers viz. rumen, reticulum and abomasums.

Q32. Name a vertebrate that bears horny teeth on the tongue.

Ans.: *Petromyzon*, the lamprey bears horny teeth on the tongue.

Q33. Name the fish that has electric organ.

Ans.: *Torpedo* (Sting ray) has electric organ

Q34 Name the two sub phyla included in Phylum Protochordata.

Ans.: Phylum Protochordata includes sub phyla Cephalochordata and Urochordata.

Q35. How do atrium and coelom differ?

Ans.: Atrium is lined by ectodermal epithelium and coelom is lined by mesodermal epithelium.

Q36. What are endothermic animal?

Ans.: Animals which generate most of their body heat by metabolism. E.g. birds and mammal.

Q37. For what are light flashes used by luminescent fishes?

Ans.: Light flashes are used by luminescent fishes to attract prey or mate or startle intruders.

SHORT QUESTION AND ANSWERS

Q1. Give one example of each of cellular and tissue organization.

Ans: Cellular organization: Sponges
Tissue organization: Coelenterates.

Q2. What are deuterostomous animals? Give one example.

Ans: Animals in which blastopore of gastrula forms anus are deuterostomous animals.
e.g.- Echinoderms and Chordates.

Q3. What are protostomous animals? Give one example.

Ans: Animals in which blastopore forms mouth are protostomous animals.
e.g. Annelids, Arthropods etc.

Q4. Differentiate radial symmetry and bilateral symmetry.

Ans: **Radial Symmetry:** Body of an animal can be divided into two similar halves by any plan passing the centre is radial symmetry.
Bilateral Symmetry: Body of an animal can be divided into two similar halves by only one plane along longitudinal axis of the body is bilateral symmetry.

Q5. Define metameric segmentation.

Ans: Metameric segmentation is the external division of the body by annuli corresponds to internal division of coelom or body cavity by septa.
e.g. as in Annelids.

Q6. What are pseudocoelomates? Give one example.

Ans: Pseudocoelomates are the animals having false body cavity, the pseudocoel. e.g. Nematodes, *Ascaris.*

Q7. Define haemocoel. Name two groups of animals in which it is present.

Ans: Haemocoel is a pseudocoel or false coelom filled with blood. It is present in Arthropods and molluscs.

Q8. Which symmetry is most common in animals? Define it.

Ans: Bilateral symmetry is most common in animals. Bilateral symmetry is the symmetry in which a body can be divided into two similar halves by a median longitudinal vertical plane only.

Q9. Name the 3 primary germ layers formed in gastrula.

Ans: Ectoderm, mesoderm and endoderm are the three germ layers formed in gastrula.

Q10. What is haemolymph?

Ans: Haemolymph is the colourless fluid (Blood) that fills the haemocoel.

Q11. What is the mesodermal lining of a true coelom called?

Ans: Mesothelium in the invertebrates and peritoneum in the vertebrates is mesodermal lining of a true coelom.

Q12. Cite example of true and false metamerism.

Ans: True metamerism : Annelids

False metamerism : Tapeworms

Q13. What is Ovoviviparity?

Ans: Ovoviviparity is the development of heavily yolky eggs in the mother's reproductive tract without drawing nourishment from her.

Q14. Name the respiratory organs of insects and scorpion.

Ans: The respiratory organs of insects are tracheae and of scorpion are book lungs.

Q15. How do diploblastic and triploblastic animals differ from each other?

Ans: Diploblastic animals are developed from two primary germ layers, ectoderm and endoderm of gastrula (e.g. sponges) while the triploblastic animals are developed from three germ layers i.e. ectoderm, endoderm and mesoderm of gastrula. e.g. flat worms to mammals.

Q16. What is closed circulatory system? Name two groups of animals having these two types of circulation.

Ans: Blood flows through the blood vessels only called as closed circulatory system.
e.g. All the vertebrates and most annelids.

Q17. Name the excretory organs of annelids and insects.

Ans: The excretory organs of annelids are Malpighian tubules.

Q18. Define homeostasis.

Ans: Homoeostasis is the phenomenon by which maintenance of uniform conditions all the time in the body of an organism.

Q19. Which type of nervous system is found in flat worm?

Ans: Ladder type of nervous system is found in flat worm.

Q20. Define sexual dimorphism.

Ans: Sexual dimorphism can be defined as when the male and female sexes of a species are different in their morphology and physiology. i.g. Cockroaches human being etc.

Q21. What is Cephalization?

Ans: Caphalization is the differentiation of a distinct head at the anterior end of an animal.

Q22. What is the advantage of hermaphroditism?

Ans: The advantage of harmaphroditism is that it doubles the reproductive rate as all the individuals can lay eggs.

Q23. Name the 4 types of animals on the basis of their excretory matter.

Ans: On the basis of the excretory matter the animals are Ammoniotelic, Ureootelic, Uricotelic and aminotelic.

Q24. What is hermaphroditism? Give two examples.

Ans: Presence of both the sex organs, testis and ovarie,s are in the same animal is called hermaproditism. Then the animal is hermaphrodite.

e.g. Leech and earthworm.

Q25. What do you mean by poikilothermic nature? Name two groups of animals with such a condition.

Ans: Pokilothermic nature means variable body temperature that the animal changes its body temperature.

Fishes and amphibians are such groups of animal.

Q26. What is hibernation? What is its significance?

Ans: Some animals hide themselves and become inactive in the winter months (winter seasons). This phenomenon is called as hibernation or winter sleep.

Hibernation protects the animals in unfavorable environmental condition.

Q27. Cite unique features of nematodes.

Ans: The nematodes show the following unique features:

1. Syncytical epidermis.
2. Body wall musculature of longitudinal fibres only.
3. Body cavity without a living of mesodermal coelomic epithelium, i.e. Pseudocoel.
4. Now muscular intestine.

Q28. Give the features of cnidarians that show advancement over the poriferans.

Ans: The cnidarians shows advance features over the poriferams that:

1. Tissue level of organization of the body with well defined layers of cells.
2. Digestive cavity.
3. Nervous system and sense organs.

Q29. What are choanocytes? Write their functions.

Ans: Choanocytes are the flagellated collar cells of inner gastral layer or choanoderm.

The flagella of choanocytes beat and maintain water current.

Q30. Name two types of pores on the body of sponges. Mention their function.

Ans: Ostia and osculum.

Ostia acts as the inlets of water current, while osculum acts as the outlets of water current.

Q31. Name a fresh water sponge and a coelenterate.

Ans: Fresh water Sponges – Spongilla.

Fresh water coelenterate–Hydra.

Q32. On what basis, the phylum porifera is classified.

Ans: On the basis of endoskeleton elements the phylum Porifera is classified.

Q33. What is bioluminescence?

Ans: Emitting of light by an organism is bioluminescence.

Q34. Why coelenteron is called gastrovascular cavity?

Ans: Coelenteron is called gastrovascular cavity when both digestion and circulation occur in it.

Q35. What are cnidoblasts? Write their function.

Ans: The epidermis of coelenterates has peculiar stinging cells called cnidoblasts or nematoblasts. Cnidoblasts inject a poison chemical called hypnotoxin into prey to paralyse it.

Q36. What is polymorphism? Name one Coelenterate that shows polymorphism.

Ans: Polymorphism is the presence of many types of zooids or individuals in a coelenterate colony. e.g. *Physalia.*

Q37. Write two peculiar characters of phylum platyhelminthes.

Ans: Peculiar characters of phylum platyhelminthes are-

1. Platyhelminths are the first triploblastic and organ system organism.
2. Body is flat.
3. First animals of cephalisation.

Q38. Write the scientific name of filarial worm. How is it spread from man to man?

Ans: Filarial Worm – *Wuchereria brancrofti*.

Filarial worm is spread man to man by bite of Culex mosquitoes.

Q39. What is apolysis? Give its significance.

Ans: Apolysis is the shedding of ripe proglottids from the end of the body of Tapeworm. The shedded proglottids are eaten by pigs which act as the intermediate host.

Q40. What are the peculiar features that you find in parasitic platyhelminthes?

Ans: Platyhelminthes have hooks and suckers for attachment with the host. They have no alimentary canal and absorb the nutrients directly through their body surface.

Q41. What type body plan do the following animals have?
Hydra, Sponge, Flatworm, Nematode, Jelly fish, Earthworm, Spiders.

Ans:

Hydra	-	Blind sac body plan
Sponge	-	Cell aggregate body plan
Flat worm	-	Blind sac body plan
Nematode	-	Protostomous plan of tube within tube body plan
Jelly Fish	-	Blind sac body plan
Earthworm	-	Protostomous plan (Tube within tube)
Spiders		-Protostomous plan (Tube within tube) body plan.

Q42. Give two peculiar characters of Phylum Aschelminthes.

Ans: The peculiar character of Phylum Aschelminthes are-

1. They are the first animals with complete gut.
2. They are Pseudocoelomates and have fixed number of cells.

Q43. Write the habitat of Ascaris. List two differences between male and female Ascaris.

Ans: Ascaris lives in the intestine of children.

Difference**:-**

Male Ascaris has a curved posterior end and smaller than the female Ascaris.

Female Ascaris is straight and larger than the male Ascaris.

Q44. Name the locomotory organs in three classes of Phylum Annelida.

Ans: The locomotory organs of the 3 classes of Phylum- Annelid are as follows:

Class 1 – Oligochaeta - Setae

Class 2 – Polychaeta - Parapodia

Class 3 – Hirudinea - Suckers.

Q45. What are annuli? What is their function?

Ans: The ring like grooves of annelid are called annuli.

Annuli divide the body of annelid into segment or metameres or somites.

Q46. Name 3 wingless insects parasitic or human.

Ans: Parasitic wingless insects or human are- Head louse- *Pediculus*, the bed bug- *Cimex* and the human flea- *Pulex irritans.*

Q47. Mention 3 characters of a spider in which it differs from an insect.

Ans: Spider differs from an insect in the following characters:

1. The body of a spider has two unsegmented division- Cephalothorax and abdomen.
2. Spider possesses four pairs of walking legs.
3. Spider does not possess antennae and wings.

[Insects has division of head, thorax and abdomen; 3 pairs of wings; and two pairs of wings and one pair of antennae]

Q48. Write 3 peculiar characters of Phylum Arthropoda.

Ans: 1. Arthropods bear jointed legs.

2. Mouth parts are segmented.

3. The body cavity is of haemocoel type.

Q49. Why Peripatus is called a connecting link between Annelids and Arthropods?

Ans: Peripatus of the Phylum Onychophora is considered as the connecting link between Annelids and Arthropods because it shows both the annelidan and arthropodan characters.

Peripatus has nephridia and unjointed legs like annelid and haemocoel and the respiratory organ Tracheae as in the Arthropods.

Q50. Give two peculiar character of class Insecta.

Ans: Characters of class Insecta:

1. The body is divided into segmented head, thorax and abdomen.
2. The three thoracic segments bear a pair of jointed legs in each (3 pairs of legs) and two pairs of wings.

Q51. Differentiate a butterfly and a moth.

Ans:

Butterfly	Moth
1. A butterfly is diurnal	1. A moth is nocturnal
2. It has knobbed antenna	2. It has is nocturnal
3. The wings are upwardly directed at rest	3. Wings are outwardly directed at rest.

Q52. Why Neopilina is called a connecting link between Annelida and Mollusca.

Ans: Neopilina is the connecting link between Annelida and Mollusca because it has both Annelid characters and Mulluscan character. Annelid like character = Presence of metameric segmentation and nephridia and Molluscan character – possessing of shell, mouth and radula.

Q53. Why echinodermates are called spinny skinned animals?

Ans: Echinodermates are called spinney skinned animals as their body is covered by many spines.

Q54. Why Antedon is called living fossil?

Ans: Antedon (Sea lily or Feather star) is a living fossil which possesses much primitive character but is still living.

Q55. Write two peculiar character of Hemichordata?

Ans: Characters of Hemichordata –

1. Presence of many gill slits.
2. Presence of stomochord as a hollow outgrowth of the roof of the buccal cavity.

Q56. Why *Balanoglossus* is called a connecting link between echinodermets and chordates?

Ans: *Balanogossus* has both echinodermate characters and chordate character Echinodermate character- enterocoelic origin of coelom.

Chordate characters – Presence of gill slits and hollow stomochord.

Q57. What are the Urochordates? Give an example.

Ans: Urochordates are lower chordates having notochord in the tail of their larval stage but lost in the adult form due to retrogressive metamorphosis. e.g. Herdmania.

Q58. What is notochord? Give its functions.

Ans: Notochord is a solid rod on the dorsal side of an organism between the gut and nervous system. The notochord acts as a skeletal rod to provide support.

Q59. What is the fate of notochord in higher chordates?

Ans: The notochord is replaced by a vertebral column partly or fully in higher chordates.

Q60. Name two types of vertebrate metamorphosis. Mention one example of each.

Ans: The metamorphoses of vertebrates are

1. Progressive metamorphosis and
2. Retrogressive metamorphosis.

Progressive metamorphosis undergone by frog's tadpole and
retrogressive metamorphosis shown by Herdmania's tadpole.

Q61. Write two characters of cephalochordata. Give one example.

Ans: Characters of Cephalochordata-

1. Presence of notochord throughout the body and even in adult.
2. Presence of many pairs of genes. e.g. Amphioxus (Lancelet).

Q62. Why are Urochordata, cephalocherdata called Protochordata?

Ans: Urochordata and cephalochordata are lower groups of chordates and they do not possess the brain box or cranium. Hence, these two groups are called Protochordata or Acraniata.

Q63. Why *Amphioxus* is called a typical chordate?

Ans: Amphioxus has all the basic characters of chordates such as-

1. Notochord persists throughout life.
2. Presence of central nervous system without the differentiation of brain and spinal cord.
3. Tail persists throughout life.

Q64. "All vertebrates are chordates but all chordates are not vertebrates." Justify the statement.

Ans: All vertebrates are chordates because they have notochord and gill slits at least in their embryos but there are certain chordates like *Herdmenia* and *Amphioxus* which do not have vertebral column. Hence all vertebrates are chordates but all chordates are not vertebrates.

Q65. What are the modifications that are observed in birds that help them fly?

Ans: The modifications that are observed in birds which help in flight are-

1. Body is steam lined.
2. Fore limbs are modified into wings.
3. Well developed flight muscles are present.
4. Presence of pneumatic bones to reduce the body weight.
5. Presence of keeled sternum.
6. Presence of air sacs that help in double respiration.

Q66. How important is the presence of air bladder in Pisces?

Ans: Presence of air bladder in Pisces is important particularly in bony fishes. Air bladder in bony fishes acts as the hydrostatic organs that help in balancing the body in water.

Q67. Could the number of eggs or young ones produced by an oviparous and viviparous mother be equal?

Ans: An oviparous animal always lays more eggs than the young ones produced by the viviparous animal because their eggs are exposed more too external unfavourable conditions and predators. The eggs have less chances of survival than the foetus developing inside the mother's body. Large number of eggs compensates the inevitable loss and ensures the continuation of the race.

Q68. Segmentation in the body is first observed in which of the following?

(a) Platyhelminthes (b) Aschelminthes

(c) Annelida (d) Arthropoda.

Ans: (c) Annelida.

Q69. Match the following-

Column I	**Column II**
(a) Operculum	(i) Ctenophora
(b) Parapodia	(ii) Mollusca
(c) Scales	(iii)Porifera
(d) Comb plates	(iv)Reptilia
(e) Radula	(v) Annelida
(f) Hair	(vi)Cyclostomata & Chondrichthyes

(g) Choanocytes	(vii) Mammalia
(h)Gill slits	(viii) Osteichthyes

Ans:

Column I	**Column II**
(a) Operculum	(a) Osteichthyes
(b) Parapodia	(ii) Annelida
(c) Scales	(iii)Reptilia
(d) Comb plates	(iv)Ctenophora
(e) Radula	(v) Mollusce
(f) Hair	(vi)Mammalia
(g) Choanocytes	(vii) Porifera
(h) Gill slits	(viii) Cyclostomata or chendrichthyes

Q70. Prepare a list of some animals that are found parasitic on/in human beings.

Ans: 1. *Taenia solium* (Tape worm)
2. *Ascaris lumbricoides* (Round worm)
3. *Ancylostoma* (Hook worm)
4. *Schistosoma* (Blood fluke).
5. *Wuchereria brancrofti* (Filarial worm).
6. *Pediculus humanus* (Head louse).

Q71. What is the difference between direct and indirect development is as follows.

Ans: In direct development, young one resembles the adult in morphology and physiology. e.g. human beings.

In direct development, young one differs from the adult in morphology and physiology. e.g. tadpole larva of frog.

Q72 Differentiate the following on the basis of characters asked in the subparts:

a. Human/ bird (number of condyles)
b. Whale and shark (number of respiratory apparatus and position)
c. Sea anemone/ Ctenophora (symmetry)
d. Crocodile/ Toad (number of chambers of heart)
e. Moth/Butterfly (wings in sitting position)

TEST QUESTIONS

OBJECTIVE TYPE QUESTION

Q1. Which one of the following is not a living fossil?

a. King crab b. Sphenodon

c. Archaeopteryx d. Peripatus Ans. (c)

Q2. Which one of following is a matching set of a phylum and its three examples?

a. Cnidaria- Bonellia, Physalia, Aurelia

b. Platyhelminthes- Planaria, Schistosoma, Enterobius

c. Mollusca- Loligo, Teredo, Octopus

d. Porifera- Spongilla, Eiplectella, Pennatula Ans. (c)

Q3. Metameric Segmentation is the characteristic of-

a. Platyhelminthes and Arthropoda b. Echinodermata and Annelida

c. Annelida and Arthropoda d. Mollusca and Chordata Ans. (c)

Q4. Biradial symmetry and lack of cnidoblasts are the characteristics of-

a. Starfish and sea anemone b. *Ctenoplana* and *Bereo*

c. *Aurelia* and *Paramecium* d. *Hydra* and Starfish Ans. (b)

Q5. In molluscs, the eye is present over a stalk called-

a. Ostracum b. Operculum

c. Ommatophores d. Osphradium Ans. (c)

Q6. "Turbellarians" are free living-

a. Nematodes b. Cestodes

c. Flat worm d. Trematodes Ans. (c)

Q7. The characteristic larva of phylum Coelenterata is-

a. Plannula b. Cysticercus

c. Rhabditiform d. Wriggler Ans. (a)

Q8. In *Amoeba,* the contractile vacuole is present-

a. Near the trailing end
b. Near the advancing end
c. At the middle of the body
d. Anywhere inside the body Ans. (a)

Q9. Animals undergoing inactive stage during winter are known as-

a. Aestivation
b. Hibernation
c. Adaptation
d. Acclimatization Ans. (b)

Q10. Retrogressive metamorphosis is seen in-

a. Herdmania
b. *Gambusia*
c. Frog
d. Butterfly Ans. (a)

Q11. Which species of *Plasmodium* is found in South America and West Africa and is least harmful?

a. P. ovale
b. *P. Vivax*
c. *P. Falciparum*
d. *P. Malariae* Ans. (a)

Q12. Which is incorrect?

a. Oligochaeta - *Pheretima*
b. Hirudinea- *Hirudo*
c. Nematoda- *Ascaris*
d. Polychaeta- *Lumbricus* Ans. (d)

Q13. IIIicium is modification of-

a. Dorsal fin
b. Caudal fin
c. Scales
d. Ist dorsal spine Ans. (d)

Q14. A poisonous lizard is-

a. Varanus
b. *Chamaeleon*
c. Ancistrodon
d. Heloderma Ans. (d)

Q15. Which of the following statements is true?

a. All living members of class Cyclostomata are parasites of some fishes.
b. There are about 2000 species in the class Osteichthyes.
c. *Cliona* belongs to the subphylum Cephalochordata
d. *Ascaris lumbricoides* is a flat worm. Ans. (a)

Q16. Which of the following statements is / are not true?

1. In Urochordata, notochord is present only in larval tail.
2. In Cephalochordata, notochord extends from head to tails region.
3. *Branchiostoma* belongs to Hemichordata.
4. Only one class of living members, class Cyclostomata represents the agnathans.

(a) 1, 2 and 4 only (b) 3, 4 and 1 only (c) 3 only, (d) 1 and 4 only, Ans. (c)

Q17. Which of the following statements are true / false?

1. In *Torpedo*, the electric organs are capable of generating strong electric current to paralyze prey.
2. Bony fishes use pectoral, pelvic, dorsal, anal and caudal fins in swimming.
3. Amphibian skin is moist and has thick scales.
4. Birds are poikilothermic animals.

(a) 1, 2 and 3 are true; 4 is false, (b) 1 and 2 are true; 3 and 4 are false.
(c) 1,and 4 are true; 2 and 3 are false. (d) Only 4 is true; 1, 2, and 3 are false.
Ans. (b)

Q18. Which of the following pairs are correctly matched?

Animals Morphological features

1. Crocodile……4-chambered heart
2. Sea urchin……Parapodia
3. *Obelia*…… Metagenesis
4. Lemur…… Thecodont

(a) only 1 and 2, (b) 1, 3 and 4, (c) 2, 3 and 4 (d) only 1 and 4 Ans. (b)

Q19. Which one of the following is a matching pair of a body features and the animal possessing it?

a. Ventral heart- Scorpion
b. 2. Post-anal tail- *Octopus*
c. Ventral central nervous system- Leech
d. Pharyngeal gill slits absent in embroyo- *Chameleon* Ans. (c)

Q20. Reason of death of a patient due to cobra-bite is-

a. Destruction of RBCs b. Inactivation of nerves
c. Permanent contraction of muscles d. None of the above Ans. (b)

Q21. Exoskeleton / scales are absent in-

a. Fish b. Reptiles

c. *Ichtyophis* d. *Rana tigrina* Ans. (d)

Q22. The cyst wall of *Euglena* is formed of-

a. Lipids b. Histones

c. Carbohydrates d. Lipoproteins Ans. (c)

Q23. Types of quill (flight) feathers are-

a. Down feathers b. Coverts

c. Filoplumes d. Remiges Ans. (d)

Q24. Which of the following is true about preen gland?

1. Occur in birds 2. Also known as uropygial gland

3. Occur in bats 4. Help in digestion

(a) 1, 2 and 3 are correct (b) 1 and 2 are correct

(c) 2 and 4 are correct (d) 1 and 3 are correct Ans. (b)

Q25. Cartilaginous fish have-

1. Placoid scales 2. Cycloid or ctenoid scales scales

3. Scroll valve 4. Operculum

(a) 1, 2 and 3 are correct (b) 1 and 2 are correct

(c) 2 and 4 are correct (d) 1 and 3 are correct Ans. (d)

Q26. Which of the following belongs to phylum Arthropoda?

1. Cockroach 2. Gold fish

3. Silver fish 4. Cuttle fish

(a) 1, 2 and 3 are correct (b) 1 and 2 are correct

(c) 2 and 4 are correct (d) 1 and 3 are correct Ans. (d)

Q27. Which of the following is absent in force limb of frog?

1. Brachium 2. Webs

3. Antebrachium 4. Tarsals

(a) 1, 2 and 3 are correct (b) 1 and 2 are correct

(c) 2 and 4 are correct (d) 1 and 3 are correct Ans. (c)

Q28. Which one of the following is a unique feature of the mammalian body?

a. Homeothermy b. Presence of diaphragm

c. Rib cage d. Four-chambered heart Ans. (b)

Q29. Animals have the innate ability to escape from predation. Example for the same is given below. Select the incorrect example-

a. Enlargement of body size by swallowing air in puffer fish.

b. Melanism in moths.

c. Poison fangs in snakes.

d. Colour change in chameleon. Ans. (c)

Q30. In contrast to the annelids, the platyhelminthes show-

a. Redial symmetry b. Presence of pseudocoel

c. Bilateral symmetry d. Absence of body cavity Ans. (d)

Q31. The excretory matter of bony fish is-

a. Urea b. Protein

c. Ammonia d. Amino acid Ans. (c)

Q32. Study of the reptiles is known as-

a. Serpentology b. Herpotology

c. Ichthyology d. None of these Ans. (b)

Q33. Which of the following is an egg-lying mammal?

a. Whale b. Platypus

c. Penguin d. Kangaroo Ans. (b)

Q34. The post anal tail is present in-

a. Chordates b. Vertebrates

c. Invertebrates d. All of them Ans. (a)

Q35. Book lungs are respiratory organs in-

a. Scorpion b. Prawn

c. Snail d. Cockroach Ans. (a)

Q36. Which one of the following is not a characteristic feature of subphylum Vertebrata?

a. Dorsal tubular nerve cord b. Ventral muscular heart

c. Presence of notochord in adult d. Presence of kidneys Ans. (c)

Q37. Which one of the following is correctly paired?

a. *Trygon* = monitor b. *Ichthyophis* = crow

c. *Corvus* = limbless amphibian d. Pristis = saw fish Ans. (d)

Q38. *Daphnia* is commonly known as-

a. Clam shrimp b. Fairy shrimp

c. Tadpole shrimp d. Water fleas Ans. (d)

Q39. Canal system is a characteristic of-

a. *Hydra* b. Sponges

c. *Ascaris* d. None of these. Ans. (b)

Q40. Haemocoel is found in-

a. Echinoderms b. Sponges

c. Arthropods d. Annelids Ans. (c)

Q41. *Chamaeleon is a / an-*

a. Arthropod b. Reptiles

c. Amphibian d. Bird Ans. (b)

Q42. Which one of the following groups of three animals each is correctly matched with their one characteristic morphology features?

a. Scorpion, spider, cockroach…… Ventral solid central nervous syste

b. Cockroach, locust, *Taenia*…… Metameric segmentation

c. Liver fluke, sea anemone, sea cucumber… Bilateral symmetry

d. Centipede, prawn, sea urchin…… Jointed appendages Ans. (a)

Q43. Polyp phase is absent in-

a. *Hydra* b. *Aurelia*

c. *Physalia* d. *Obelia* Ans. (b)

Q44. Which of the following phyla, while the adult shows radial symmetry, the larva shows bilateral symmetry?

a. Annelida b. Arthropoda

c. Mollusca d. Echinodermata Ans. (d)

Q45. Which of the following animals is unisexual?

a. Tapeworm b. Leech

c. Sponge d. Cockroach Ans. (d)

Q46. In which of the following organisms, Malpighian tubules are found?

1. Honey bee 2. Frog

3. Ascaris 4. Rabbit Ans. (a)

Q47. …….. type of eyes are found in the insects-

a. Camera eye b. Red eye

c. Normal eye d. Compound eye Ans. (d)

Q48. Highest degree of polymorphism is found in-

a. Protozoa b. Cnidaria

c. Platyhelminthes d. Arthropoda Ans. (b)

Q49. Sea mouse belongs to phylum-

a. Mollusca b. Cnidaria

c. Arthropoda d. Annelida Ans. (a)

Q50. Which one of the following animals belongs to Cyclostomata?

a. Channa b. *Loris*

c. *Dodo* d. Petromyzon Ans. (d)

Q51. Comb plates are found in-

a. Admsia b. *Aurelia*

c. *Nereis* d. *Pleurobrachia* Ans. (d)

Q52. In echolocation, the animal that produces high frequency sound is-

a. Monkey b. Butterfly

c. Bat d. Squirrel Ans. (c)

Q53. In which triploblastic animal, coelom is absent?

a. Platyhelminthes b. Aschelminthes

c. Annelids d. Arthropods Ans. (a)

Q54. 'Royal jelly' is secreted from-

a. Hypopharyngeal gland b. Salivary gland

c. Milk gland d. Skin glands Ans. (a)

Q55. A waxy substance secreted by honey bee to repair combs is called-

a. Propolis b. Honey dew

c. Nectar d. Sporopollenin Ans. (a)

Q56. Which one of the following pairs of animals comprises "jawless fishes"?

a. Lampreys and eels b. Mackerals and rohu

c. Lampreys and hag fishes d. Guppies and hag fishes Ans. (c)

Q57. *Peripatus* is a connecting link between-

a. Ctenophora and Platyhelminthes b. Mollusca and Echinodermata

c. Annelida and Arthropoda d. Coelenterata and Porifera Ans. (c)

Q58. Phylum Protozoa is classified on the basis of-

a. Mode of reproduction b. Locomotory organelles

c. Annelida and Arthropoda d. Coelenterata and Porifera Ans. (b)

Q59. Which of the following is a connecting link between mammals and reptiles?

a. Peripatus b. *Balanoglossus*

c. *Ornithorhynchus* d. *Archaeopteryx* Ans. (c)

Q60. Egg of reptiles and birds is-

a. Mesolecithal b. Telolecithal

c. Polylecithal d. Alecithal Ans. (c)

Q61. Tube feet are locomotory organs of-

a. Spider
b. Reptiles
c. Starfish
d. Cat fish
Ans. (c)

Q62. Tissues are absent from the body of-

a. Sponges
b. Annelida
c. Platyhelminthes
d. Arthropoda
Ans. (a)

Q63. All flatworms differ from all round worms in having?

a. Triploblastic body
b. Solid mesoderm
c. Bilateral symmetry
d. Metamorphosis
Ans. (b)

Q64. The second largest aquatic vertebrate is-

a. Blue whale
b. Whale shark
c. Sea elephants
d. Dugongs
Ans. (b)

Q65. Limbless amphibians are called-

a. Paddle worms
b. Glow worms
c. Caecilians
d. Pin worms
Ans. (c)

Q66. The second largest phylum in animal kingdom is-

a. Annelida
b. Arthropoda
c. Chordata
d. Mollusca
Ans. (d)

Q67. Siphonophora is the order in-

a. Protozoa
b. Cnidaria
c. Porifera
d. Annelida
Ans. (b)

Q68. Choanocytes form the lining of paragastric cavity in-

a.. Jelly fishes
b. Sponges
c. Helminthes
d. Echinoderms
Ans. (b)

Q69. Secondary radial symmetry is found in-

a. Cnidaria
b. Jelly fish
c. Echinodermata
d. Hemichordata
Ans. (c)

Q70. Which of the following is not a character of chordates?

a. Ventral nerve cord
b. Rod-like notochord
c. Pharyngeal gill slits
d. Bilateral symmetry
Ans. (a)

Q71. Mushroom gland is a part of-

a. Male reproductive system of cockroach
b. Female reproductive system of cockroach
c. Male reproductive system of rabbit
d. Female reproductive system of rabbit
Ans. (a)

Q72. Cold-blooded animals fall under the category of-

a. Ectotherms
b. Psychrotherms
c. Endotherms
d. Thermophiles
Ans. (a)

Q73. Air bladder is present in-

a. Chondrichthyes
b. Star fishes
c. Actinopterygii
d. Flying fishes
Ans. (c)

Q74. In which phylum, the body is segmented-

a. Porifera
b. Coelenterata
c. Annelida
d. Mollusca
Ans. (c)

Q75. Pseudocoelomate among these is-

a. Porifera
b. Annelida
c. Aschelminthes
d. Mollusca
Ans. (c)

Q76. Limbless amphibian is-

a. Ichthyophis
b. *Hyla*
c. Rana
d. Salamandra
Ans. (a)

Q77. Flightless bird among the following is-

a. Columba
b. *Neophron*
c. *Struthio*
d. *Corvus*
Ans. (c)

Q78. Which one of the following animals possesses high regeneration capacity-

a. Planaria
b. *Taenia*

c. *Salpa* d. *Periplaneta* Ans. (a)

Q79. "Organ of Jacobson" helps in-

a. Touch b. Vision

c. Smell d. Hearing Ans. (c)

Q80. Radula is found in-

a. Pila sp. b. *Chiton sp.*

c. *Lamellidens sp.* d. *Pinctada sp.* Ans. (a)

Q81. Which one of the following is a catadromous fish?

a. Hilsa sp. b. *Mystus sp.*

c. *Anguilla sp.* d. *Channa sp.* Ans. (c)

Q82. The phenomenon of torsion occurs in-

a. Gastropoda b. Pelecypoda

c. Cephalopoda d. Amphineura Ans. (a)

Q83. The internal buds of fresh water sponges are otherwise called:

a. Choanocytes b. Gemmule

c). Osculum d. Blastula Ans. (b)

Q84. What is common between parrot, platypus and kangaroo?

a. Oviparity b. homeothermy

c) toothless jaws d. functional post anal tail Ans. (b)

Q85. What is common in silver fish, scorpion, crab and honey bee?

a. Compound eyes b. poison gland

c). jointed appendages d. metamorphosis Ans. (c)

Q86. In mollusks, eye is present on the tip of a stalk called:

a. Osphradium b. ostracum

c) ommatophore d. operculum Ans. (c)

Q87. Ephyra is the stage in the life cycle of

a. Physalia b. Obelia

c) Sea anemone d. Aurelia Ans. (d)

Q88. Which of the following match is correct?

a. Cockroach ----Crustacea b. *Pil*a --- Pelecypoda

c) Spider --------Arachnida d. *Uni*o ---Gastropoda Ans. (c)

Q89. Which of the following is incorrect for *Pheretima*?

a. Genital paoillae are present on 17^{th} and 19^{th} segment.

b. Male genital pores are present on 18^{th} segment.

c. Clitellum is present on segment 24,25 and 26

d. Segments of earthworm are called somites Ans. (c)

Q90. Which of the following is an exclusively echinoderm character?

a. Radial symmetry b. Tube feet

c) Mesodermal endoskeleton d. Coelom divided Ans. (b)

Combine Entrance Examination

Biology

Q1. Which of the following is not included under *in situ* conservation?

a. Botanical garden
b. National park
c. Sanctuary
d. Biosphere reserve *Ans.:(a)*

Q2. The two bacteria found to be very useful in genetic engineering experiments are-

a. *Nitrovacter* and *Azotobacter*
b. *Rhizobium* and *Diplococcus*
c. *Nitrosomonos* and *Klebsiella*
d. *Escherichia* and *Agrobacterium*

Ans.: (d)

Q3. Which one of the following is the wrong pairing for the disease and its causal organism?

a. Root knot of vegetables - *Meloidogyne*
b. Loose smut of wheat – *Ustilago nuda*
c. Late blight of potato – *Altetnaria solani*
d. Black rust of wheat – *Puccinia graminis* *Ans.:(c)*

Q4. Which one of the following pairs of plants is not seed producer?

a. *Punica* and *Pinus*
b. Fern and *Funaria*
c. *Ficus* and *Chlamydomonas*
d. *Funaria* and *Ficus* *Ans.: (b)*

Q5. Moss and ferns are found in moist and shady places because both-

a. Require presence of water for fertilization.
b. Cannot complete with sun-loving plants.
c. Do not need sunlight for photosynthesis.
d. Depend for their nutrition on microorganism which can survive only at low temperature. *Ans.:(a)*

Q6. Metameric segmentation is the characteristic of which of the following pairs?

a. Mollusca and Chordata
b. Platyhelminthes and Arthropoda
c. Echinodermata and Annelida
d. Annelida and Arthropoda *Ans.: (d)*

Q7. If a earthworm is pricked with a needle on its outer surface without damaging its gut, the fluid that comes out is-

a. haemolymph b. slimy mucus

c. excretory fluid d. coelomic fluid *Ans.: (d)*

Q8. Which one of the following pairs is mismatched?

a. Apis indica - Honey b. *Kenia lacca* - Lac

c. *Bombyx mori* - Silk d. *Pila globosa* – Pearl *Ans.: (d)*

Q9. The most advanced character of crocodile is-

a. four-chambered heart b. powerful jaws

c. shelled eggs d. thecodont dentition *Ans.: (d)*

Q10. The skull of bird is-

a. acondylic b. monocondylic

c. dicondylic d. amphicondylic *Ans.: (b)*

Q11. Cabbage is the-

a. entire plant b. large terminal bud

c. large axillary bud d. modified shoot *Ans.: (b)*

Q12. Anthesis is a phenomenon which refers to-

a. development of anther b. formation of pollen

c. opening of flower bud d. reception of pollen by stigma *Ans.: (c)*

Q13. An ovule which becomes curved so that the necellus and embryo sac lie at right angle to the funicle is-

a. hemianatropous b. anatropous

c. orthtropous d. campylotropous *Ans.: (a)*

Q14. The long filamentous threads protruding at the end of a young cob of maize are-

a. hairs b. anthers

c. styles d. stamens *Ans.: (c)*

Q15. What type of inflorescence is found in *Ficus*?

a. Cyathium b. Umbel
c. Hypanthodium d. Racemose *Ans.: (c)*

Q16. The aleurone layer in maize grain is especially rich in-
a. protein b. starch
c. lipid d. auxin *Ans.: (a)*

Q17. The apical meristem of the root is present-
a. only in radicles b. only in tap roots
c. only in adventitious roots d. in all the roots *Ans.: (d)*

Q18. The length of different internodes in a culm of sugarcane is variable because of-
a. shoot apical meristem
b. position of axillary buds
c. size of leaf lamina at the node below each internode
d. intercalary meristem *Ans.: (d)*

Q19. Reduction in vascular tissue, mechanical tissue and cuticle is a characteristic of-
a. hydrophytes b. epiphytes
c. xerophytes d. mesophytes *Ans.: (c)*

Q20. Mast cells secrete-
a. haemoglobin b. hippurin
c. myoglobin d. histamine *Ans.: (d)*

Q21. Middle lamella is composed mainly of-
a. calcium pectate b. phosphoglycerides
c. hemicellulose d. muramic acid *Ans.: (a)*

Q22. Chemically hormones are-
a. biogenic amines only
b. proteins only
c. proteins, steroids and biogenic amines
d. steroids only. *Ans.: (c)*

Q23. The catalytic efficiency of two different enzymes can be compared by the-

a. pH optimum value
b. K_m value
c. formation of the product
d. molecular sizes of the enzymes *Ans.: (b)*

Q24. Centromere is a part of-

a. centrosome
b. endoplasmic reticulum
c. chromosome
d. Ribosome *Ans.: (c)*

Q25. Rubber does not swell in water due to the absence of-

a. osmosis
b. plasmolysis
c. diffusion
d. imbibition *Ans.: (d)*

Q26. In soil, the water available for root absorption is-

a. capillary water
b. gravitational water
c. hygroscopic water
d. combined water *Ans.: (a)*

Q27. The first acceptor of electrons from an exited chlorophyll molecule of pigment system II is-

a. iron-sulphur protein
b. ferredoxin
c. quinone
d. cytochome *Ans.: (d)*

Q28. Floridean starch is reserved food in-

a. Rhodophyceae
b. Phaeophyceae
c. Chlorophyceae
d. Xanthophyceae *Ans.: (a)*

Q29. The formation of embryo from ovule is known as-

a. parthenogenesis
b. parthenocarpy
c. double fertilization
d. none of the above *Ans.: (c)*

Q30. Alkaloid obtained from *Papaver somniferum* is-

a. nicotine
b. cocaine
c. morphine
d. Solanine *Ans.: (c)*

Q31. Which of the following is an important source of edible protein?

a. Spirogyra
b. *Porphyra*

c. *Spirulina* d. *Cephaleuros* *Ans.: (c)*

Q32. The important site for formation of glycoproteins and glycolipids is-

a. Golgi apparatus b. Plastid

c. Lysosome d. Vacuole *Ans.: (a)*

Q33. Which of the following pairs of gases is the major cause of greenhouse effect?

a. CO_2 and CO b. CFCs and SO_2

c. CO_2 and N_2O d. CO_2 and O_3 *Ans.: (c)*

Q34. Which one is correct about 'test-tube' baby?

a. Fertilization inside the female genital tract and growth in the test tube.

b. Rearing of prematurely born baby inside the incubator

c. Fertilization outside and gestation inside the womb of mother

d. Both fertilization and development of embryo are affected outside the female genital tract. *Ans.: (c)*

Q35. Nucleated RBCs are present in which of the following?

a. Rabbit b. Camel

c. Embryo of human d. Both (b) and (c) *Ans.: (b)*

Q36. Some plants contain nitrogen-fixing bacteria *Rhizobium* in the root nodules. The relationship is known as-

a. ammensalism b. commensalism

c. mutualism d. competition *Ans.: (c)*

Q37. Respiratory roots (pneumatophores) are present in-

a. mesophytes b. halophytes

c. xerophytes d. lithophytes *Ans.: (b)*

Q38. The plant group in which stomata opens in night is-

a. mesophytes b. succulents

c. hydrophytes d. halophytes *Ans.: (b)*

Q39. The cell wall of fungi is formed by-

a. chitin and mannose b. cellulose

c. glucose d. lipids *Ans.: (a)*

Q40. A normal woman whose father was colour-blind is married to a normal man. The sons would be-

a. 75% colour-blind b. 50% colour-blind

c. all normal d. all colour-blind *Ans.: (b)*

Q41. Hybridoma is a biotechniue which involves fusion of-

a. B-cell with T-cell b. T-cell with Spleen cell

c. spleen cell with myeloma cell d. myeloma cell with liver cell *Ans.: (c)*

Q42. During transcription, the nucleotide sequence of the DNA strand that is being coded is ATACG. Then the nucleotide sequence in mRNA would be-

a. TATGC b. TCTGG

c. UAUGC d. UATGG *Ans.: (c)*

Q43. Arrange the following events of meiosis in the correct order:

a. Terminalization b. Crossing-over

c. Synapsis d. Disjunction of genomes

a. IV, III, II and I; b. III, II, IV and I; c. II, I, IV and III; d. I, IV, III and II *Ans.: (b)*

Q44. In which form does the food transported in plants?

a. Sucrose b. Fructose

c. Glucose d. Lactose *Ans.: (a)*

Q45. How many molecules of glycine are required to release one CO_2 molecule in Photorespiration?

a. One b. Two

c. Three d. Four *Ans.: (b)*

Q46. Tetradynamous condition is found in-

a. Hibiscus rosa-sinensis b. *Petunia hybrida*

c. *Helianthus annuus* d. *Brassica campestris* *Ans.: (d)*

Q47. Synthesis of urea occurs in-

a. kidney b. Liver

c. gallbladder d. urinary bladder *Ans.: (b)*

Q48. Extinction of a species in a food chain is compensated by-

a. Ecological succession b. Ecological pyramid

c. Food web d. Water cycle *Ans.: (d)*

Q49. Increase in the concentration of pollutants at higher trophic levels is called-

a. recycling b. eutrophication

c. biodegradation d. biomagnification *Ans.: (d)*

Q50. In C_4 plants, the carbon dioxide fixation occurs in-

a. guard cells b. spongy cells

c. palisade cells d . bundle sheath cells *Ans.: (d)*

Q51. The genetically modified (GM) brinjal in India has been developed for-

a. insect resistance b. enhancing shelf life

c. enhancing mineral content d. drought resistance *Ans.: (a)*

Q52. The parts of DNA which shift their positions are called-

a. exons b. introns

c. transposons d. cistrons *Ans.: (c)*

Q53. Single-cell protein means-

a. a protein synthesized by muscle cell.

b. a protein synthesized by microorganisms.

c. a protein synthesized by skin cell .

d. a protein synthesized by liver cell. *Ans.: (b)*

Q54. An angiospermic plant has 24 chromosomes in ‘microspore mother cell’. The number of chromosomes in its endosperm will be-

a. 12 b. 24

c. 36 d. 48 *Ans.: (c)*

Q55. Which of the following is not an endocrine gland?

a. Thyroid b. Thymus

c. Adrenal d. Parotid *Ans.: (d)*

Q56. Trisomy of 21st chromosome in human leads to-

a. Edwards' syndrome b. Down's syndrome

c. Patau's syndrome d. Turner's syndrome *Ans.: (b)*

Q57. In a given DNA segment, the number of nucleotides of guanine is 75 and those of thymine is also 75. The total number of nucleotides in the segment will be-

a. 75 b. 750

c. 225 d. 300 *Ans.: (d)*

Q58. The frequency of crossing-over between two linked genes is-

a. higher if they are recessive.

b. difficult to predict.

c. proportional to the distance between them.

d. same as if they are not linked. *Ans.: (c)*

Q59. Sucking of liquids from surface by a cell is known as-

a. diffusion b. phagocytosis

c. pinocytosis d. osmosis *Ans.: (c)*

Q60. Which of the following minerals helps in N_2 fixation?

a. Copper b. Zinc

c. Molybdenum d. Magnesium *Ans.: (c)*

Q61. Which of the following is a Gram-negative bacterium?

a. *Escherichia coli* b. *Bacillus subtilis*

c. *Streptomyces coelicolor* d. *Amycolatopsis orientalis* *Ans.: (a)*

Q62. Which group of fungi is known as 'Fungi imperfecti'?

a. Zygomycetes b. Ascomycetes
c. Basidiomycetes d. Deutermycetes *Ans.: (d)*

Q63. Pearl can be obtained from-
a. Porifera b. Coelenterata
c. Mollusca d. None of the above *Ans.: (c)*

Q64. Which of the following is homoeothermic?
a. Duck b. Wall lizard
c. Toad d. Both (a) and (b) *Ans.: (a)*

Q65. Pyrimidines of RNA are-
a. adenine and guanine b. uracil and Cytosine
c. adenines d. thymine and cytosine *Ans.: (b)*

Q66. The functional unit of a gene which specifies synthesis of one polypeptide is-
a. recon b. codon
c. clone d. cistron *Ans.: (d)*

Q67. Which one is the edible part of cauliflower?
a. Inflorescence b. Tree
c. Bud d. Fruit *Ans.: (a)*

Q68. Which is not a modifier stem?
a. Onion b. Ginger
c. Potato d. Sweet potato *Ans.: (d)*

Q69. Which part of mango fruit is edible?
a. Epicarp b. Mesocarp
c. Endocarp d. Receptacle *Ans.: (b)*

Q70. The polysaccharide made up of sugar and uronic acid is called-
a. starch b. cellulose
c. mucopilysaccharide d. polyuronic acid *Ans.: (c)*

Q71. The the cell cycle, the DNA synthesis is taking place in-

a. G_0 phase
b. M phase
c. S phase
d. G_1 phase
Ans.: (c)

Q72. Human egg is-

a. Homolecithal
b. Telolecithal
c. Centrolecithal
d. Alecithal
Ans.: (d)

Q73. The sum total of genes in a population is known as-

a. gene pool
b. gene bank
c. genome
d. genotype
Ans.: (a)

Q74. The improvement of genetical quality of human race through selective breeding is called-

a. eugenics
b. euphenics
c. euthenics
d. none of the above
Ans.: (a)

Q75. When both the alleles are equally expressed in hybrid, it is known as-

a. dominance
b. bivalence
c. codominance
d. all of the above
Ans.: (c)

Q76. The male bee's are-

a. haploid
b. polyploid
c. diploid
d. triploid
Ans.: (a)

Q77. Anticodon occurs in-

a. tRNA
b. DNA
c. mRNA
d. rRNA
Ans.: (a)

Q78. Which of the following are homologous?

a. Wings of grasshopper and forelimb of flying squirrel.
b. Tentacles of hydra and arms of starfish.
c. Forelimb of bat and forelimb of horse.
d. Wings of bird and wings of moth.
Ans.: (c)

Q79. Resistance against disease is due to-

a. immunoglobulin b. HLA protein

c. antigen d. histamine *Ans.: (c)*

Q80. The first organic acid which is produced through fermentation is-

a. propionic acid b. lactic acid

c. citric acid d. oxalic acid *Ans.: (b)*

Q81. The aquatic fern which is an excellent biofertilizer is-

a. *Azolla* b. *Salvinia*

c. *Marsilea* d. *Pteridium* *Ans.: (a)*

Q82. 'Molecular scissor' used in genetic engineering is-

a. DNA ligase b. DNA polymerase

c. helicase d. restriction endonuclease *Ans.: (d)*

Q83. PCR is required for-

a. DNA synthesis b. DNA amplification

c. Protein synthesis d. Amino acid synthesis *Ans.: (b)*

Q84. The most stable ecosystem is-

a. forest b. mountain

c. desert d. ocean *Ans.: (d)*

Q85. A scion is grafted to a stock. The quality of fruit produced will be determined by the genotype of-

a. stock b. scion

c. both stock and scion c. neither stock nor scion *Ans.: (b)*

Q86. Vegetative propagation in *Pistia* occurs by-

a. stolon b. offset

c. runner d. sucker *Ans.: (b)*

Q87. A true dihybrid condition is-

a. ttRr b. Ttrr

c. ttrr d. TtRr *Ans.: (d)*

Q88. Vaccines cannot protect us from-

a. malaria b. polio

c. smallpox d. tuberculosis *Ans.: (a)*

Q89. Transcription means synthesis of-

a. DNA b. Protein

c. Lipid d. RNA *Ans.: (d)*

Q90. Excessive consumption of ethanol causes damage of-

a. liver b. kidney

c. lung d. Heart *Ans.: (a)*

Q91. Anthocyanins occur in-

a. chloroplast b. leucoplast

c. chromoplast d. vacuole *Ans.: (d)*

Q92. Genetic transfer through virus is called-

a. conjugation b. transduction

c. sexduction d. transformation *Ans.: (b)*

Q93. Which of the following bacteria causes tetanus?

a. *Clostridium* b. *Diplococcus*

c. *Bacillus* d. *Mycobacterium* *Ans.: (a)*

Q94. Diatoms do not decay readily because-

a. they are non-living cells b. they have waterproof cell walls

c. they have siliceous cell walls d. they have mucilaginous cell walls

Ans.: (c)

Q95. The fungus used in genetic experiments is-

a. *Neurospora* b. *Rhizopus*

c. *Mucor* d. *Claviceps* *Ans.: (a)*

Q96. The simple mechanical tissue consisting of living cell is-

a. collenchyma b. parenchyma

c. sclerenchyma d. aerenchyma *Ans.: (b)*

Q97. In which of the following plants there will be no transpiration?

a. Aquatic, submereged plants b. Plants living in desert

c. Aquatic plants with floating leave d. Plants growing in hilly region *Ans.: (a)*

Q98. The rate of photosynthesis is higher in-

a. red light b. green light

c. very high light d. continues light *Ans.: (a)*

Q99. Which of the following utilizes inorganic materials from soil?

a. Autotroph b. Decomposer

c. Saprophyte d. Heterotroph *Ans.: (c)*

Q100. The pyramid of energy in aquatic ecosystem is-

a. always straight b. always inverted

c. bell-shaped d. none of the above *Ans.: (b)*