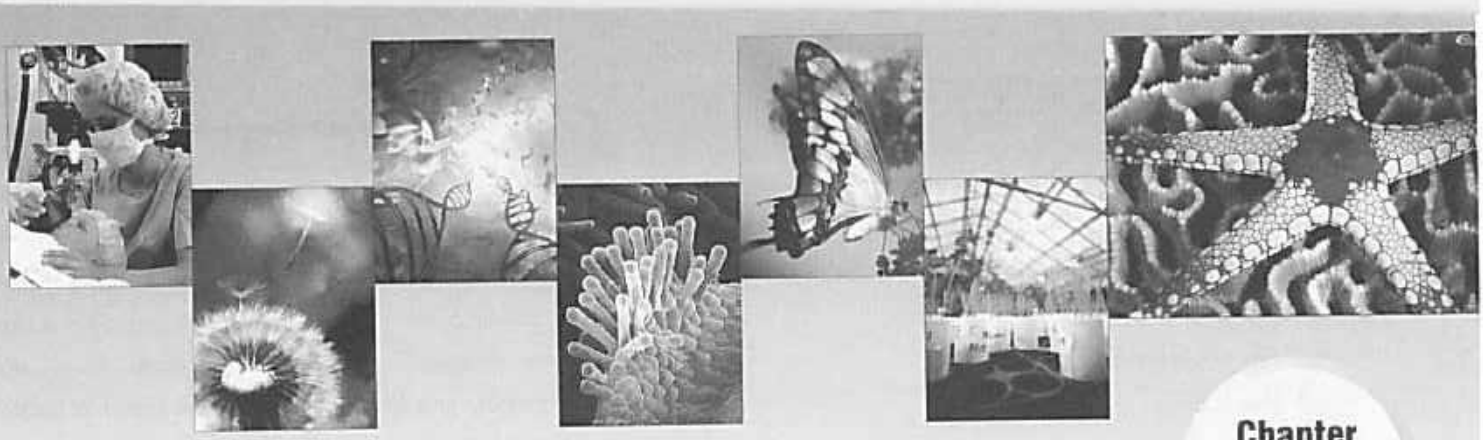


Chapter

1.7

Animal Kingdom

Important terms and Classification of animals

The kingdom animalia or animal kingdom is the kingdom of consumer organisms having ingestive type of nutrition. It is the largest kingdom, with 1.2 million members. It has numerous organisms having different type of form, structure, organisation, complexity and development.

General features of animals

The animals possess several general features which taken together, distinguish them from the members of other kingdom.

(1) Animals are multicellular eukaryotes and in most cases their body cells form tissues that become arranged as organs and organ systems.

(2) Animals have heterotrophic mode of nutrition. They get carbon and energy by ingesting other organism or by absorbing nutrients from them. Animals may be herbivores, carnivores, omnivores, parasites, suspension feeders or deposit feeders.

(3) Animals require oxygen for aerobic respiration.

(4) Animals are motile, possess active movement during some stage of their life cycle. Even the sessile sponges have free swimming larval stages.

(5) The animal body cells of nearly all species have diploid chromosome number.

(6) Animal cells lack a cell wall; this provides flexibility to their cells, the most striking characteristic of animals.

(7) Animals are able to make rapid responses to external stimuli as a result of the activity of nerve cells, muscle or contractile tissue or both.

(8) Animals can reproduce sexually. Although some exhibit remarkable diversity of reproductive behaviour, all are capable of sexual reproduction.

(9) Animal life cycle includes stages of embryonic development. Mitotic cell divisions (cleavage) transform the animal zygote into a multicellular embryo.

Terms related to classification

(1) **Anaima :** Animals without red blood e.g., sponges, cnidaria, mollusca, arthropoda, echinodermata, etc.

(2) **Enaima :** Animals with red blood *e.g.*, vertebrates.

(3) **Vivipara :** Animals which give birth to young ones are included in this subgroup *e.g.*, man, dogs, cows, etc.

(4) **Ovipara :** Animals which lay eggs are included in this subgroup *e.g.*, frogs, toads, lizards, snakes, birds, etc.

(5) **Anamniotes :** Vertebrates without embryonic membranes *e.g.*, fishes, amphibians.

(6) **Amniotes :** Vertebrates with embryonic membranes (chorion, amnion, allantois, yolk sac) *e.g.*, reptiles, birds, mammals.

(7) **Acraniata or Protochordata :** Chordates without cranium (brain box). It includes urochordata and cephalochordata.

(8) **Chordates :** Animals with notochord dorsal tubular nerve cord, paired pharyngeal gill slits. All urochordates, cephalochordates and vertebrates are called chordates.

(9) **Craniata or Vertebrate :** Chordates with cranium. It includes cyclostomes, pisces, amphibians, reptiles, birds and mammals.

(10) **Nonchordates :** Animals without notochord (a rod like elastic structure which supports the body). Phylum Porifera to phylum Hemichordata are called nonchordates.

(11) **Invertebrates :** Animals without vertebral coloumn (backbone). All the nonchordates, urochordates and cephalochordates are collectively called invertebrates.

(12) **Levels / Grades of organization :** Four levels of organization are found in multicellular animals.

(i) **Acellular or Molecular or Protoplasmic level :** It is present in protozoans.

(ii) **Cellular level :** The body consists of many cells which may be similar or show minor division of labour. Distinct tissues are not formed, *e.g.*, sponges.

(iii) **Tissue level :** The body is multicellular. The cells form poorly defined tissues. The cells occur in two distinct layers or tissues of specialized cells *e.g.*, coelenterates.

(iv) **Organ-system level :** The body is multicellular. The cells are organised into tissues, tissues into organs and organs into organ systems. Except sponges and coelenterates, all the animals of the kingdom animalia have organ-system level of organization.

(13) **Animal body plans :** It have three types of body plans :

(i) **Cell aggregate plan :** The body consists of a cluster or aggregation of cells which have rudimentary differentiation but are not organized into tissues or organs. It is found in sponges.

(ii) **Blind sac plan :** The body has a single cavity which function as digestive tract and coelom both and have one opening to the outside. The single opening functions as both mouth for ingestion (intake of food) and anus for egestion (undigested waste is passed out) such a digestive tract is called incomplete animals having blind sac body plan show tissue grade body organisation. The cells are specialized, organised into tissues and show division of labour. It is found in coelenterates and flatworms.

(iii) **Tube-within-a-Tube plan :** The body has two tubes, one formed by the body wall and the second formed within it by the digestive tract. Digestive tract is a continuous tube-like structure that has two opening, a mouth for ingestion and anus for egestion such a digestive tract is called complete. In between two tubes is present coelom in which are present a number of organs. Food is digested and absorbed in the digestive tract. This type of body plan is found in Aschelminthes upto chordates.

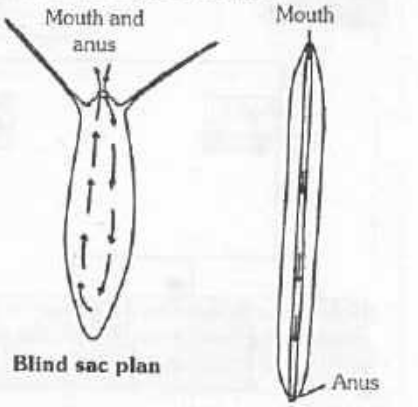


Fig : 1.7-1 Types of body plan

(14) **Animal symmetry :** Body symmetry is the similarity of parts in different regions and directions of the body. When the body is not divisible into equal halves by any plane it is called asymmetrical or asymmetric as found in *Amoeba* and some sponges. An animal is said to be symmetrical if its body is divisible into equal halves by one or more planes. Four types of symmetry found in animals are –

(i) **Spherical symmetry :** In this type of symmetry, any plane passing through the centre divides the body into equivalent or mirrored, halves. It is found in animals whose body resembles a sphere. e.g., Protozoans such as *Volvox*, *Heliozoa*, *Radiolaria*.

(ii) **Radial symmetry :** In this type of symmetry, a number of similar parts radiate out from a central axis. The body of the individual can be divided into equal halves by any plane passing through the centre from top to bottom. This type of symmetry is found in some sponges (*Sycon*), coelenterates (*e.g.*, *Hydra*, jelly fish), echinoderms (*e.g.*, star fish).

(iii) **Biradial symmetry :** In this type of symmetry, only two planes passing through the longitudinal axis. The body can be divided into two similar halves by one or two vertical planes only. This type of symmetry is found in sea walnuts (phylum ctenophora) and sea anemones (Anthozoa). The animals which show radial and biradial symmetry have oral and aboral sides. The oral sides is that which has mouth, whereas the aboral side is one which is opposite to oral side.

(iv) **Bilateral symmetry :** In this type of symmetry, the body can be divided into two equal halves by a median longitudinal or sagittal plan only. The appearance of bilateral symmetry in animal evolution was a major advancement, because bilateral animals are much better fitted for directional (forward) movement than in radially symmetrical animals. This type of symmetry is found in many invertebrates and all vertebrates.

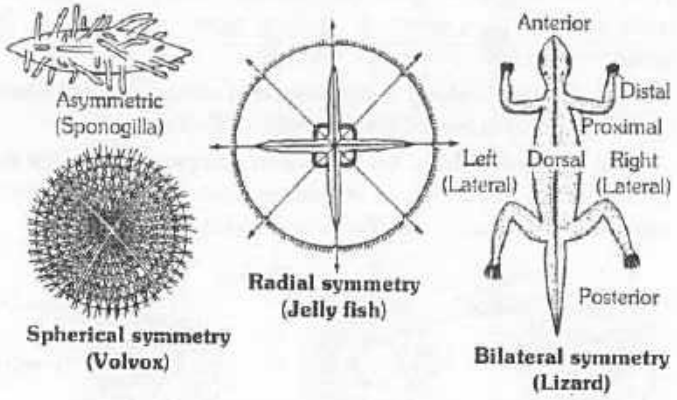


Fig : 1.7-2 Types of symmetry

(15) **Germ layers :** They are primary layers of cells which differentiate in the animal embryos at the gastrulation stage. The germ layers give rise to all the tissues/organs of the fully formed individual. The embryos of poriferans and coelenterates have two germ layers, the ectoderm and endoderm. These animals are called diploblastic. The embryos of all other animals (from phylum Platyhelminthes to phylum Chordata) have three layers – the ectoderm, mesoderm and endoderm. These animals are called triploblastic animals.

(16) **Segmentation :** Segmentation is a type of body form having a linear sequence of units of segments possessing a similar or modified structure. It occurs in three animal phyla-Annelida, Arthropoda and Chordata.

(17) **Metameric segmentation (True metamerism or True segmentation) :** It is a type of segmentation where external divisions correspond to internal divisions. The body is often divided both externally and internally into a number of segments (metameres) *e.g.*, annelids. Segmentation is mostly external in arthropods and mainly internal in man and other chordates (vertebrae, body muscles, some blood vessels and nerves).

(18) **Pseudometamerism (False segmentation) :** It is found in tapeworms. In tapeworms, the proglottides (segments of tapeworms) are budded off from the neck, hence this segmentation is called pseudometamerism (pseudosegmentation). It differs from true segmentation of embryonic origin as found in annelids, arthropods and chordates.

(19) **Body cavity or Coelom :** A body cavity or coelom is a fluid-filled space between the gut and the outer body wall of an animal. It contains the major internal organs.

(i) **Acoelomates :** The animals which do not have coelom are called acoelomates *e.g.* sponges, coelenterates, ctenophorans and flat worms.

(ii) **Pseudocoelomates :** The animals which have body cavity, called pseudocoel (false coelom) derived from blastocoel of the embryo are called pseudocoelomates. Round worms (Nemathelminthes) are psuedocoelomates.

(iii) **Eucoelomates (Coelomates) :** The animal which possess true coelom are called eucoelomates or coelomates. The true coelom is a body cavity which arises as a cavity in embryonic mesoderm. In this case, the mesoderm of the embryo provides a cellular lining, called coelomic epithelium or peritoneum, to the cavity. The coelom is filled with coelomic fluid secreted by the peritoneum. True coelom is of two types; schizocoelom or schizocoel and enterocoelom or enterocoel.

(a) Schizocoelom. It develops as a split in the mesoderm sheet. It is found in annelids, arthropods, molluscs.

(b) Enterocoelom. The mesoderm arises from the wall of the embryonic gut archentron or enteron as hollow outgrowths which form this type of coelom. It occurs in echinoderms and chordates.

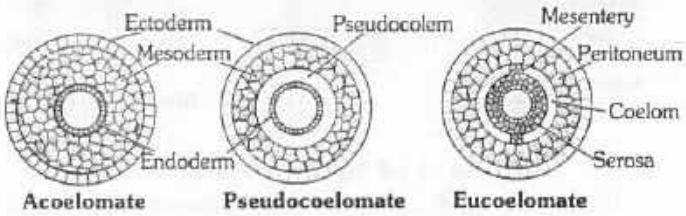
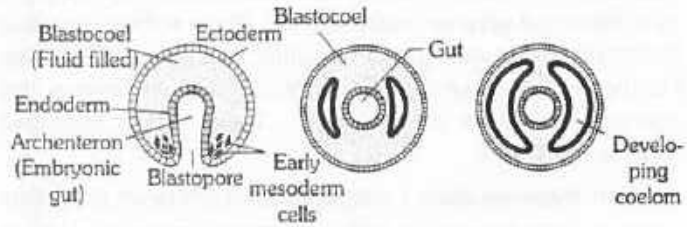


Fig : 1.7-3 Different types of coelom

Schizocoelous



Enterocoelous

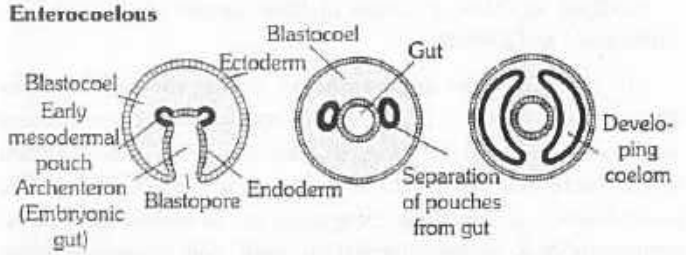


Fig : 1.7-4 Two different types of coelom formation

(iv) **Haemocoelomates :** The primary body cavity or blastocoel persists to some extent in many animals either enclosed within narrow blood vessels as in annelids or open as blood-containing space called a haemocoel and such animals are called haemocoelomates. Haemocoels occur in Mollusca and Arthropoda.

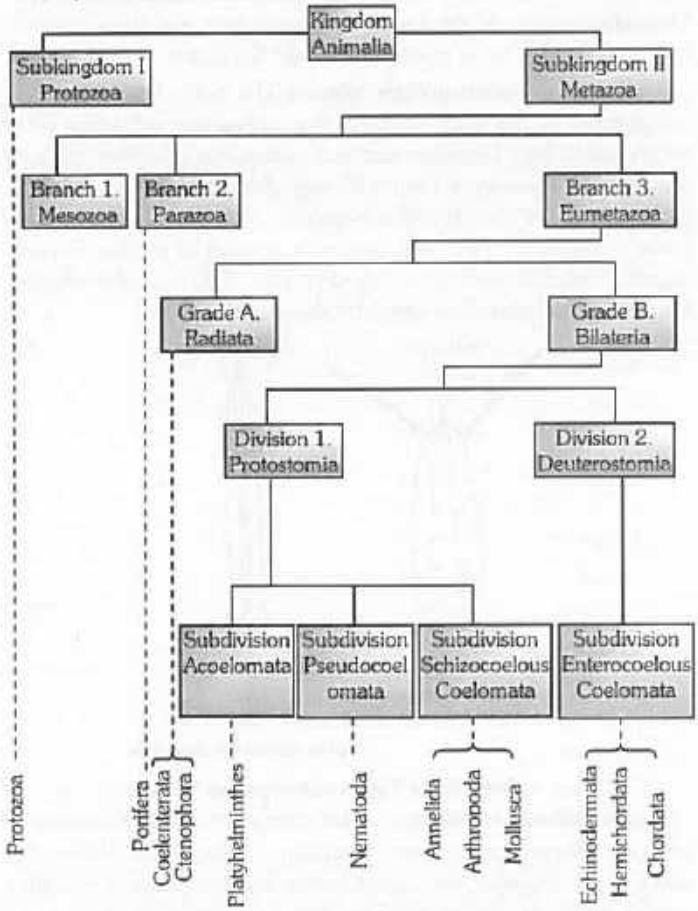
(20) **Protostomes and Deuterostomes :** The terms protostome and deuterostome denote the differences in the embryonic origin of the mouth.

In protostomes (first mouth) the mouth forms from the first opening of the embryo namely blastopore, the opening from outside into the archenteron, cleavage is determinate and spiral e.g. Platyhelminthes, Aschelminthes, Annelida, Arthropoda and Mollusca.

In deuterostomes (second mouth) the mouth never develops from the blastopore, although the blastopore may give rise to the anus cleavage which is indeterminate and radial. e.g. Echinodermata and chordata.

Outline classification of animal kingdom

The animal kingdom is subdivided into two sub-kingdoms, namely Protozoa and Metazoa.



Subkingdom 1. Protozoa : It includes microscopic, unicellular animals. It contains a single Phylum called protozoa. e.g. *Euglena*, *Amoeba*, *Paramecium* etc.

Subkingdom 2. Metazoa : This subkingdom includes multicellular animals. e.g. Porifera to Chordata. The subkingdom Metazoa is divided into three branches, namely Mesozoa, Parazoa and Eumetazoa.

Branch 1. Mesozoa : It is intermediate between Protozoa and Metazoa. It includes endoparasitic animals. e.g. *Dicyema*, *Rhopalura* etc.

Branch 2. Parazoa : It includes sponges.

Branch 3. Eumetazoa : It includes true multicellular organisms. They have tissue organ and organ system grade of organization. e.g. Coelenterata to Chordata. Eumetazoa is further divided into two grades, namely Radiata and Bilateria.

Grade A. Radiata : It includes radially symmetrical animals. e.g. Coelenterata.

Grade B. Bilateria : It includes bilaterally symmetrical animals. e.g. Platyhelminthes to Chordata. The grade Bilateria is further divided into two divisions namely proterostomia and deuterostomia.

Division 1. Protostomia : In this group of animals, the blastopore develops into the mouth. It is further divided into 3 subdivision.

Subdivision 1. Acoelomata : In this group of animals, a coelom (Cavity lying between the gut and the body wall) is absent. e.g. Platyhelminthes

Subdivision 2. Pseudocoelomata : In this group of animals, a false coelom (cavity not lined with coelomic epithelium) is present. e.g. Aschelminthes or Nematoda.

Subdivision 3. Schizocoelous Coelomata : In this group, a true coelom is present. e.g. Annelida to chordata.

Division 2. Deuterostomia : In this group of animals, the blastopore develops into the anus. It consist of one subdivision.

Subdivision Enterocoelous coelomata : Coelom is enterocoel which originates as pouches of embryonic gut (archenteron)

Characters of Non Chordata (Invertebrates) : The animals which lack vertebral coloumn are called invertebrates. e.g. *Amoeba*, sponges, *Hydra*, worms, insects, etc., Invertebrates are characterised by the following salient features –

(1) The vertebral column is absent.

(2) The nerve cord is solid in nature.

(3) The nerve cord is present on the ventral side and never on the dorsal side.

(4) When alimentary canal is present, it lies dorsal to the nerve cord.

(5) Invertebrates may be acoelomate or pseudocoelomate or true coelomate.

(6) They have either asymmetry or radial symmetry or bilateral symmetry.

(7) The circulatory system is open type or closed type.

(8) They exhibit all possible types of reproduction.

The invertebrates are grouped into about 30 phyla. These phyla are of two types, namely minor phyla and major phyla.

Minor phyla : (1) Mesozoa (2) Nemertinea (3) Endoprocta (4) Acanthocephala (5) Rotifera (6) Gastrotricha (7) Kinorhyncha (8) Nematomorpha (9) Ectoprocta (10) Brachiopods (11) Phoronida (12) Chaetognatha (13) Priapulida (14) Sipunculida (15) Echiuroidea (16) Pogonophora etc.

Table : 1.7-1 Major phyla : It include following phylum

Phylum	Some representatives	Existing species
Porifera	Sponges	5,000
Cnidaria	Hydrozoans, jellyfishes, corals, sea anemones	9,000
Ctenophora	Venus's girdle	100
Platyhelminthes	Turbellarians, flukes, tapeworm	13,000
Nemathelminthes	Pinworms, hookworms	15,000
Annelida	Polychaetes, earthworms, leeches	9,000
Mollusca	Snails, slugs, clams, squids, octopuses	60,000
Arthropoda	Crustaceans, spiders, insects	900,000
Echinodermata	Sea, stars, sea urchins	6,000
Chordata	Protochordates (nonverte- brate chordates), vertebrates	2,100
	Fishes	25,600
	Amphibians	3,000
	Reptiles	6,000
	Birds	9,000
	Mammals	4,000

Phylum Porifera : The sponges (pore bearing animals)

(Gk. *Porus* = Pore; *ferre* = To bear)

Brief History : Robert Grant (1825) finally proved that sponges are animals, and coined the name 'Porifera' for these. Schulze (1878), Butschli (1884), Sollas (1884) and Delage (1898) separated sponges from other metazoans on the basis of embryological studies, and suggested a separate group, "Parazoa" for these.

General Characters

(1) All the sponges are aquatic, sedentary, asymmetrical or radially symmetrical. These are the first multicellular organisms and have cellular grade of organization.

(2) They are diploblastic. Ectoderm is formed by pinacocyte and endoderm is formed by choanocyte. Both layers are called pinachoderm and choanoderm. A gelatinous noncellular mesenchyme is present in between them.

Choanocytes (flagellated collar cells) are present only in sponges.

(3) Mesenchyme contains free amoebocytes and skeletal elements.

(4) Different types of amoebocytes are :

Archaeocytes	:	undifferentiated totipotent cells.
Chromocytes	:	with pigment granules.
Thesocytes	:	with reserve food granules.
Myocytes	:	highly contractile, spindle-shaped cells.
Trophocytes	:	supply nutrients to developing cells (nurse cells)
Gland cells	:	secrete slimy substance.
Sex cells	:	develop from archaeocytes only during breeding season.

(5) The body is perforated by numerous minute pores called ostia.

(6) The ostia open into a large cavity called spongocoel or paragastric cavity.

(7) The spongocoel opens to the outside by a large opening called osculum.

(8) Sponges have a canal system and they need a continuous current of water flowing through their bodies for respiration, excretion, nutrition and reproduction.

(9) Different types of canal system in sponges are asconoid, syconoid and leuconoid.

(10) The simplest type of canal system in porifera is asconoid type.

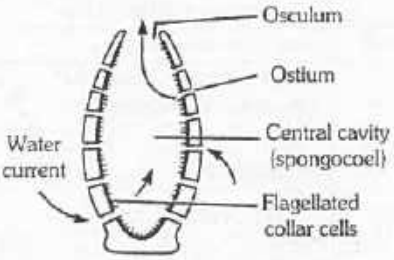


Fig : 1.7-5 Asconoid Type of canal system

(11) The course taken by the water current way be shown as under –

Ingressing water $\xrightarrow{\text{Ostia}}$ Spongocoel $\xrightarrow{\text{Osculum}}$ To outside

(12) The sponges possess an endoskeleton in the form of calcareous spicules, siliceous spicules and spongin fibres.

(13) Excretion and respiration occur by diffusion.

(14) They have greater power of regeneration due to totipotent archaeocytes.

(15) Digestion in sponges is intracellular like protozoans. Digestion takes place in the choanocytes.

(16) All sponges are hermaphrodite, reproduction takes place by asexual or sexual methods.

(17) Gemmules are internal buds containing archaeocytes, mostly found in fresh water sponges, concerned with asexual reproduction.

(18) Development is indirect or direct. The common larval forms are parenchymula (*leucosolenia* and *Clathrina*), amphiblastula (*Sycon*), etc.

Classification of porifera : On the basis of types of endoskeleton, phylum porifera is divisible into three classes

Class 1. Calcarea or Calcispongiae

(1) Skeleton is formed of Calcareous spicules.

(2) Radially symmetrical.

(3) Choanocyte cells are large and conspicuous.

(4) Canal system asconoid (ascon) or syconoid (sycon) type.

(5) These are also known as limy sponges.

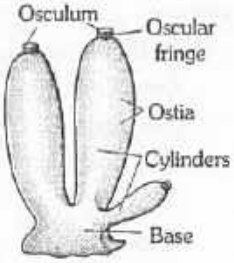


Fig : 1.7-6 *Sycon*

Examples : *Clathrina, Leucosolenia, Sycon, Grantia*, etc.,

❑ *Leucosolenia* is a smallest sponge with asconoid type of canal system.

Class 2. Hexactinellida Or Hyalospongiae

(1) Skeleton is formed of six rayed triaxon, siliceous spicules,

(2) Canal system is branched or unbranched.

(3) Radially symmetrical.

(4) These are also known as glass sponges.

Examples : *Pheronema, Hyalonema, Euplectella*, etc.,

❑ *Euplectella* is the sponge which is given as a Gift in Japan and known as "venus flower basket". It show commensalism with shrimps of the genus spongicola, 'life upto death'.

Class 3. Demospongia

(1) Skeleton either absent or present. When present it is either formed of spongin fibres or combination of spongin fibres and siliceous spicules.

(2) The siliceous spicules when present are never six rayed.

(3) The canal system is complicated Rhagon type or leuconoid type.

(4) Rhagon larva is formed.

(5) These sponges are of great economic importance.

Examples : *Cliona, Spongilla, Chalina, Euspongia, Hippospongia, Oscarella*, etc.,

❑ *Spongilla* is a fresh water sponge.

❑ *Cliona* is harmful to oyster industry.

❑ Spheciospongia is the largest sponge.

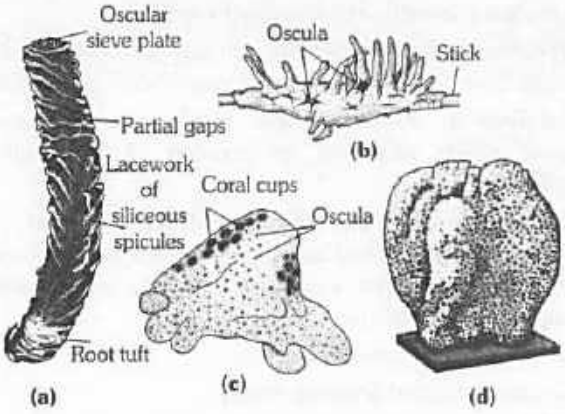


Fig : 1.7-7 Some economically important – sponges
(a) *Euplectella* (b) *Spongilla*
(c) *Cliona* (d) *Euspongia*

Table : 1.7-2 Common Names

Scypha (= Sycon)	–	Urn sponge, Crown sponge
Euplectella	–	Venus' flower-basket
Phyllospongia	–	*Leaf sponge*
Pheronema	–	Bowl sponge
Hyalonema	–	Glass-rope sponge
Cliona	–	Boring sponge
Chalina	–	Mermaids gloves (Dead man's fingers)
Spongilla	–	Freshwater sponge
Euspongia	–	Bath sponge, Horse sponge
Poterion	–	Neptune's goblet
Hippospongia	–	Horse sponge
Hircinia	–	Horny sponge

Phylum-Cnidaria (Coelenterata)

(Gk. *knide* = nettle or stinging cell)

Brief History : Peyssonel (1723) and Trembley (1744) proved these to be animals. Hence, Linnaeus (1758), Cuvier (1796) and Lamarck (1801) included these under 'Zoophyta', together with sponges. Leuckart (1847) included sponges and cnidarians under his phylum Coelenterata. Finally, Hatschek (1888) divided "Coelenterata" into three phyla-Spongiaria (= Porifera), Cnidaria and Ctenophora.

General characters

(1) Coelenterates are radially symmetrical animals with tissue grade of body organization.

(2) All the members of this phylum are aquatic, mostly marine.

(3) They are solitary or colonial, sedentary or free swimming.

(4) The body wall is diploblastic. It is made up of two layers of cells, namely the ectoderm and the endoderm with a non-cellular layer called mesogloea in between.

(5) Cnidarians exhibit dimorphism with polypoid and medusoid stage (Metagenesis or alternation of generation).

(6) Asexual phase is generally polyp and sexual phase is medusa.

(7) Coelom is absent; Hence coelenterates are acoelomate animals.

(8) A gastrovascular cavity or coelenteron is present. It can be compared to the gut of higher animals.

(9) Mouth is present but anus is absent (blind-sac body plan). Mouth is surrounded by tentacles.

(10) The most characteristic feature of coelenterates is the presence of nematocysts or stinging cells.

(11) Digestion is extracellular as well as intracellular.

(12) Respiratory, excretory and circulatory system are absent. Oxygen is carried to various tissues through general body surface by diffusion.

(13) Primitive nervous system with synaptic or non-synaptic nerve net but no brain.

(14) Sense organs are statocysts (tentaculocysts), ocelli and olfactory pits.

(15) Reproduction both asexual and sexual.

(16) Development is indirect as there are one or two larval forms, Planula (*Obelia*) and Ephyra (*Aurelia*).

Classification of coelenterata : On the basis of the dominance of medusoid or polypoid phase in the life cycle, phylum coelenterata is divided into three classes –

Class 1. Hydrozoa (Gr. hydros, water, zoios, animal)

(1) Hydrozoa are solitary and fresh water or mostly colonial and marine, sessile and free-swimming forms.

(2) They exhibit tetramerous or polymerous radial symmetry.

(3) Body wall consists of an outer ectoderm and an inner endoderm separated by a non-cellular gelatinous mesogloea.

(4) Gastrovascular cavity is without stomodaeum, septa or nematocysts bearing gastric filament.

(5) Skeleton or horny structure is horny perisarc in some forms, while coenosarc secretes a skeleton of calcium carbonate forming massive stony structure or coral in other forms.

(6) They exhibit polymorphism. There are two main types of zooids, the polyp and medusa. Medusa is provided with true muscular velum.

(7) Many hydrozoa exhibit alternation of generation.

(8) Reproductive products of sex cells are usually ectodermal in origin and discharged externally.

(9) Cleavage is holoblastic, embryo ciliated planula.

(10) Both polypoid and medusoid stages are present.

Examples : *Hydra, Tubularia, Bougainvillea, Hydractinia, Eudendrium, Pennaria, Obelia, Sertularia, Plumularia, Companularia, Millepora, Stylaster, Geryonia, Physalia, Porpita, Velella, Pericolpa, Periphylla, Cynaea, Rhizostoma or Pilema Cassiopeia*, etc.,

- Obelia is trimorphic and marine colony.
- Hydranth of *obelia* bears twenty four (24) tentacles while medusa bears sixteen (16) tentacles in addition to tentaculocysts.

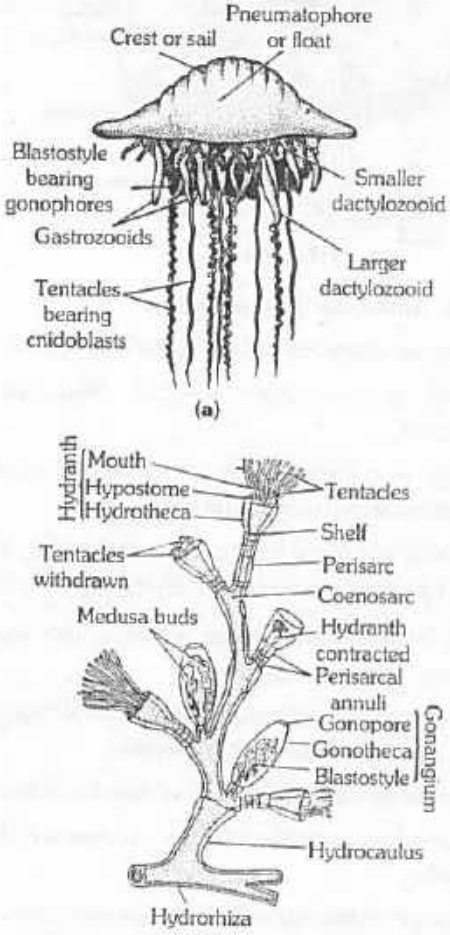


Fig : 1.7-8 (a) Physalia (b) Obelia

Class 2. Scyphozoa (Gr. skyphos, cup, zoios, animal)

(1) Scyphozoa include large jellyfishes or true medusae.

(2) They are exclusively marine.

(3) Medusae are large, bell or umbrella-shaped and without true velum. They are free swimming or attached by an aboral stalk.

(4) Marginal sense organs are tentaculocysts.

(5) Polypoid generation is absent or represented by small polyp, the scyphistoma which gives rise to medusae by strobilization or transverse fission.

(6) Gastrovascular system is without stomodaeum, with gastric filaments and it may or may not be divided into four inter-radial pockets by septa.

(7) Mesogloea is usually cellular.

(8) Gonads are endodermal and the sex cells are discharged into the stomach.

Examples : *Lucernaria, Haliclysus, Aurelia, Rhizostoma, Charybdea, Periphylla, Chrysaora.*

❑ *Rhizostoma* is a polystomous scyphozoan with many mouth bearing structures called scapuletes.

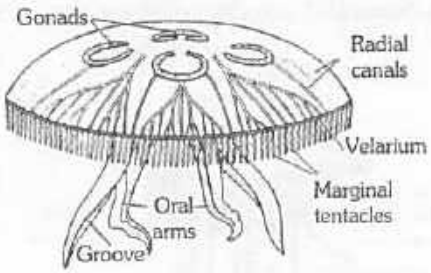


Fig : 1.7-9 *Aurelia*

Class 3. Anthozoa (Actinozoa)

(1) These are solitary or colonial exclusively marine forms.

(2) They are exclusively polypoid. Medusoid stage is altogether absent.

(3) Body is cylindrical with hexamerous, octomerous or polymerous biradial or radiobilateral symmetry.

(4) The oral end of the body is expanded radially into an oral disc bearing hollow tentacles surrounding the mouth in the centre.

(5) The stomodaeum is often provided with one or more ciliated grooves, the siphonoglyphs.

(6) Gastrovascular cavity is divided into compartments by complete or incomplete septa or mesenteries.

(7) Mesenteries bear nematocysts at their free edges.

(8) Mesogloea contains fibrous connective tissue and amoeboid cells.

(9) They are exclusively marine, many forms corals.

Subclass 1. Alcyonaria (Octocorallia)

(1) These are colonial marine forms.

(2) Polyps are long or short cylinders terminating orally into a flat circular oral disc having the oval or elongated mouth in the centre.

(3) Polyps always bear eight pinnate, hollow tentacles.

(4) Eight complete mesenteries are present.

(5) Single ventral siphonoglyph is present

(6) Endoskeleton is the product of mesogloeal cells comprised of calcareous spicules either calcareous or horny in nature.

(7) Polyps are dimorphic in some forms.

Examples : *Tubipora, Clavularia, Alcyonium, Xenia, Heliopora, Gorgonia, Corallium, Testudo,* etc.,

❑ Corals form rocks in the sea, called the coral reefs. The largest coral reef is the great barrier reef which is 1200 miles long and surrounds Australia complete.

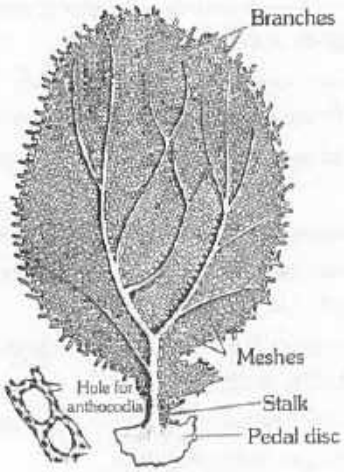


Fig : 1.7-10 *Gorgonia*

Subclass 2. Zoantharia (Hexacorallia)

(1) These are solitary or colonial marine forms.

(2) Tentacles simple, rarely branched, hollow cone shaped, numerous arranged in the multiple of five and six but never eight.

(3) Mesenteries are numerous arranged in the multiple of five or six, may be complete or incomplete.

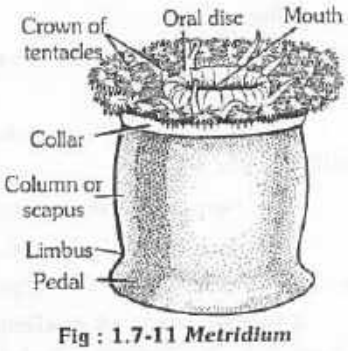


Fig : 1.7-11 *Metridium*

(4) Two siphonoglyphs are commonly present.

(5) Endoskeleton when present is calcareous, derived from ectoderm.

(6) Polyps are usually monomorphic.

Examples : *Actinia, Metridium, Adamsia, Edwardsia, Astraea, Fungia, Zoanthus, Antipathes, Aeropora or Madrepora,* etc.

❑ Metridium shows commensalism with *Eupagurus.*

Some representative animals

Hydra

(1) *Hydra* belongs to class Hydrozoa of phylum coelenterata.

(2) **Trembly** (1744), a Swiss biologist discovered *Hydra*.

Linnaeus (1758) gave the name *Hydra*, a Greek word, means 'Water serpent' based on its ability to regenerate its lost parts.

(3) *Hydra* is a solitary polyp found in freshwater (stagnant). Among coelenterates *Hydra* is one of the smallest polyps.

(4) It is colourless carnivorous coelenterate having radial symmetry.

(5) *Hydra* is diploblastic and has tissue grade of organization with division of labour on morphological basis.

(6) *Chlorohydra viridissima* is called green *hydra*. It is green because of symbiotic association with a unicellular green algae *Chlorella vulgaris*. Algae live in the musculonutritive cells of *Hydra*.

(7) *Hydra* has a cylindrical body with 6-10 hollow tentacles. It helps in locomotion and food capture, so analogous (correspond functionally) to pseudopodia of *Amoeba*.

(8) Mouth is situated on a manubrium or hypostome. It is most sensitive in the body. *Hydra* has no anus.

(9) The body wall of *Hydra* consists of ectoderm and endoderm, in between a thin, delicate, transparent and non-cellular mesogloea.

(10) Ectoderm consists of epithelio-muscular cells, sensory cells, nerve cells, interstitial cells (totipotent) and stinging cells or cnidocytes having nematocysts.

(11) Inner gastrodermis has nutritive muscular cells, gland cells, nerve cells, sensory and interstitial cells. Nutritive muscular cells bear both flagella and pseudopodia.

(12) The contraction of muscle fibres in endothelio-muscular cells or nutritive muscle cells reduces the diameter of the body and works like circular muscles.

(13) Mesogloea is thin and acellular consisting of a proteinaceous matrix and it can be crossed by interstitial cells. It is neither cellular nor fibrous.

(14) Cnidoblasts or nematocysts are derived from interstitial cells of epidermis.

(15) Body cavity of *Hydra* is called coelenteron or gastrovascular cavity. Coelenteron serves the double purpose of digestion and circulation.

(16) Nematocysts are found only in epidermis mainly on tentacles. Nematocysts are also known as "independent effectors".

(17) *Hydra* paralyses its prey by nematocyst. If all nematocysts of a *Hydra* are removed it would affect its capacity to capture prey.

(18) Nematocyst plays an important role in locomotion, food capture both offence and defence.

(19) *Hydra* has four types of nematocysts : Penetrants or stenoteles (largest), valvents (smallest), stereoline glutinants (small, atrichous) and streptoline glutinants (large holotrichous)

(20) Digestion in *Hydra* is first extracellular (in gastrovascular cavity) and then intracellular (in endoderm cells).

(21) *Hydra* has no specialized cells for respiration, it respires by means of general body surface.

(22) Nitrogenous excretory product in *Hydra* is ammonia and it is removed through general body surface.

(23) *Hydra* possesses a very primitive nervous system consisting of a synaptic network of bipolar and multipolar nerve cells, but brain is absent.

(24) *Hydra* is monoecious or dioecious. Most species are dioecious or unisexual. Bisexual species of *Hydra* are protandrous, so avoid self-fertilization.

(25) *Hydra* reproduces asexually by exogenous budding, a type of vegetative propagation, and sexually by formation of gametes. *Hydra* reproduces by budding when plenty of food is available.

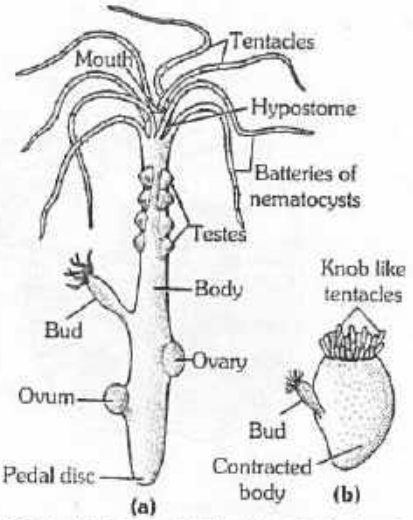


Fig : 1.7-12 *Hydra* (a) Expanded body with bud and gonads (b) Contracted body bearing bud

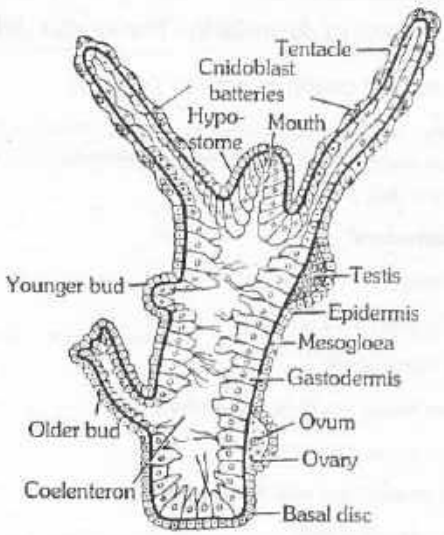


Fig : 1.7-13 Longitudinal section of entire animal

(26) *Hydra* normally possesses a single ovary (in aboral region) and many testes (in oral region).

(27) Fertilization occurs externally on the body by the entry of sperm into ovum.

(28) The developing embryo in *Hydra* drops down from the body of parent after the formation of gastrula.

(29) In the development of *Hydra* there is no moulting or ecdysis.

(30) No free larval stage (only a planula like stage) occurs in *Hydra*.

(31) *Hydra* has great regeneration capacities. A piece of *Hydra* will regenerate into a full *Hydra* if it contains a part of epidermis and gastrodermis and size is not less than 1/6 mm in diameter.

Table : 1.7-3 Common Names

Obelia	–	Sea fur
Millipora	–	Stinging coral
Physalia	–	Portuguese man-of-war
Velella	–	Little sail, Purple sail
Chiropsalmus	–	Sea wasp
Aurelia	–	Jellyfish
Metridium	–	Sea anemone
Adamsia	–	Sea anemone
Pennatula	–	Sea pen
Corallium	–	Precious red coral
Meandrina	–	Brain coral
Tubipora	–	Organ pipe coral
Heliopora	–	Blue coral
Astraea	–	Stony coral
Virgularia	–	Walking stick
Fungia	–	Mushroom coral
Alcyonium	–	Dead man's finger

Phylum-Ctenophora or Acnidaria- The comb Jellies

(Gk. *kteis* = comb; *pherein* = To bear)

Brief History : The ctenophores as a distinct group were first recognized by *Escscholtz* (1829). *Hatschek* (1889) placed it under a separate phylum called ctenophora.

General characters

(1) All the ctenophores are marine.

(2) They are solitary and pelagic.

(3) They are transparent.

(4) They have tissue-grade of organization.

(5) They have biradial symmetry.

(6) They are acoelomate animals.

(7) They are unsegmented.

(8) Their body-wall is diploblastic.

(9) The mesogloea contains cells.

(10) Nematocysts are absent.

(11) Special adhesive cells called colloblasts are present in all ctenophores.

(12) The gastrovascular system is well developed.

(13) Two anal openings are present.

(14) Skeletal system is absent.

(15) Excretion and respiration are carried out by diffusion.

(16) The nervous system is in the form of nerve net.

(17) An aboral sense organ is present in the form of statocyst.

(18) Cilia are used for locomotion.

(19) They are hermaphrodites.

(20) Development is indirect. It includes a cydippid larva.

Classification of Ctenophora

Class 1. Tentaculata

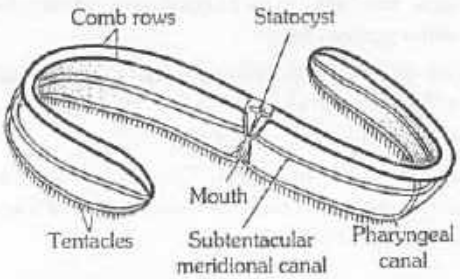
(1) The body is simple, rounded or oval or ribbon-like.

(2) Two long aboral tentacles are present.

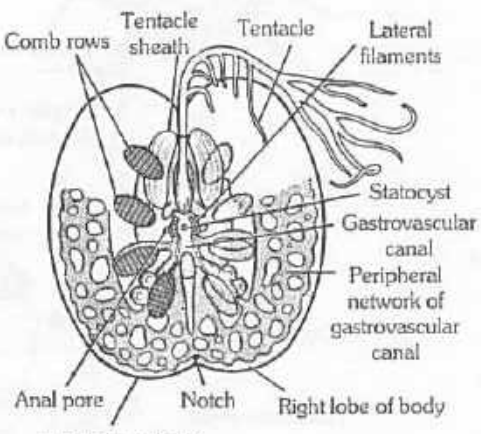
(3) Mouth is narrow and pharynx is small.

Examples : *Pleurobrachia, Hormiphora, Mertensia Mnemiopsis, Bolinopsis, Velamen, Cestum, Ctenoplana, Coeloplana*, etc.

- *Cestum* is commonly called "venus's girdle".
- *Ctenoplana* shows commensallism with *Alcyonea*.



(a)



(b)

Fig : 1.7-14 (a) *Velamen* (b) *Ctenoplana*

Class 2. Nuda

(1) Body is large thimble-shaped or conical.

(2) Tentacles are absent.

(3) Mouth is wide and pharynx is large.

(4) The meridional vessels are produced into a complex system of anastomosing branches.

Example : *Beroe*

❑ *Beroe* is commonly called "Swimming eye of cat".

Phylum Platyhelminthes : The flat worms

(Gk. *platys* = broad or flat; *helmin* = worm)

Brief History : Aristotle mentioned tapeworms, but scientific studies of flatworms began only in the 18th century. It was Gegenbaur (1859) who placed these in a separate group and suggested the present name of the phylum.

General Characters

(1) They are dorso-ventrally flattened like a leaf.

(2) They show organ grade of organization.

(3) They are acoelomate animals. The cavity in platyhelminthes is filled with mesenchyme or parenchyma.

(4) They are triploblastic animals. The cells of the body wall are arranged in three layers.They are the ectoderm, the mesoderm and the endoderm.

(5) They are bilaterally symmetrical animals. The body of the animal can be divided into two equal similar halves through only one plane. Animals with this symmetry have definite polarity of anterior and posterior ends.

(6) Some members have segmented body. The segmentation in platyhelminthes is called pseudometamerism.

(7) Many of the parenchyma cells give rise to muscle fibres.The muscle fibres are arranged in circular, longitudinal and vertical layers.

(8) The digestive system is completely absent from Cestoda and Acoela. The alimentary canal is branched in Turbellarians. The anus is absent from them.

(9) The respiratory organs are absent. In parasites respiration is anaerobic.

(10) There is no circulatory system.

(11) The excretory system is formed of protonephridia (flame cells or solenocytes).

(12) Anus is absent like coelenterates, with blind sac body plan.

(13) The nervous system is well developed. It is formed of longitudinal nerve cords with ganglia. A pair of anterior ganglia form the brain. The longitudinal nerve cords are connected together by transverse connectives.

(14) They are hermaphrodites, *i.e.*, both male and female reproductive organs are present in the same animal.

(15) Fertilization is internal in them. Self or cross fertilization takes place in them.

(16) Their development is direct or indirect. Endoparasites show usually indirect development with many larval stages. Their life cycle is completed in one or two hosts.

(17) They are free living or parasitic. In parasitic worms adhesive organs like hooks, spines, suckers and adhesive secretions are present.

Classification of platyhelminthes : On the basis of digestive tract and free living or parasitic nature phylum platyhelminthes has been divided into three classes –

Class 1. Turbellaria (L. turbella, a string)

(1) Most of the turbellarians are free living but some of them are ecto commensal or parasitic, commonly called planarians or flat worms.

(2) The body epidermis is either cellular or syncytial and covered with cilia. Epidermis contains rhabdites.

(3) Segmentation is absent.

(4) Digestive system is present except in a few.

(5) Suckers are absent.

(6) Life cycle is simple, development direct.

Example : *Dugesia, Notoplana, Bipalium, Thysanozoon*, etc.

❑ *Bipalium* is the only terrestrial planarian.

Class 2. Trematoda (Gr. trema, hole)

(1) Ecto or endoparasites of vertebrates; commonly called flukes.

(2) Body mostly oval, unsegmented.

(3) Body wall without cilia, but covered by a thick, resistant, syncytial tegument.

(4) Suckers, and often hooks and spines, present for attachment to host tissues.

(5) Sense organs usually absent in adults.

(6) Digestive system well developed with terminal mouth, but no anus.

(7) Mostly hermaphrodite. Life cycle simple or complicated.

Examples : *Polystomum, Fasciola, Schistosoma* (blood fluke of man and other mammals), *Opisthorchis*, etc.

❑ *Opisthorchis sinensis* is commonly known as chinese liver fluke of man.

Class 3. Cestoda

(1) All endoparasites. Mostly in alimentary canal of vertebrates; commonly called tapeworms.

(2) Body long and slender, tape-like, usually divided into small segments (= proglottids).

(3) Body wall non-ciliated, with a thick tegument.

(4) Anterior end with suckers and other attachment organs.

(5) No mouth, digestive system absent, digested liquid food is absorbed from host tissues by diffusion through body wall.

(6) Sense organs absent.

(7) Each proglottid contains one or two complete sets of hermaphrodite (bisexual) reproductive organs.

(8) Life-cycle usually complicated with alternation of hosts. Embryo hooked.

Examples – *Taenia, Echinococcus, Hymenolepsis, Diphyllobothrium, Echinococcus, Dipylidium.*

- *Hymenolepsis* is dwarf tapeworm. It is monogenetic tapeworm of man.
- *Dipylidium* is dog tapeworm.
- *Diphyllobothrium* is the largest tapeworms.
- *Echinococcus* is also called hydatid worm. Its hydatid cyst shows exogenous as well as endogenous budding. Parasite of small intestine of dogs, cats, etc. It has only 3-4 proglottids.

Some representative animals

Planaria

(1) *Dugesia* (Planaria) is found commonly in freshwater ponds, lakes, streams and shallow rivers.

(2) Planaria are gregarious, i.e., they live in groups.

(3) The head bears a pair of lateral projections called auricles.

(4) The mouth opens on the mid ventral surface near the middle of the animal.

(5) The pharynx is a tubular structure that can be everted beyond the mouth.

(6) Planarians have remarkable power of regeneration.

(7) If an individual is cut transversely into two parts, the anterior fragment will regenerate a new tail and a posterior piece will develop a new head.

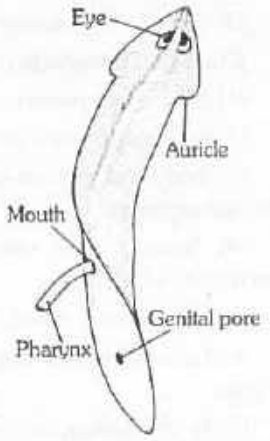


Fig : 1.7-15 *Dugesia* (planaria)

(8) Neoblast cells found in planarians which is help in regeneration.

Fasciola hepatica

(1) *Fasciola hepatica*, commonly known as sheep liver fluke is an endoparasite of sheep which reside in the liver and bile duct.

(2) The liver fluke has a dorsoventrally flat, unsegmented body with two suckers, oral sucker (anterior sucker) and acetabulum (ventral sucker).

(3) Liver fluke is covered with a cuticle, lacks ciliated epidermis.

(4) There are three permanent apertures on the body-mouth (surrounded by oral sucker), genital pore (located between the two suckers), excretory pore (At the extreme posterior end). During breeding season a temporary opening, the aperture of laurer's canal is also developed. Laurer's canal is present between the genital aperture and the uterus.

(5) Suctorial pharynx with bifurcated intestine. A large number of caeca or diverticulae arise from each branch of intestine.

(6) Digestion is holozoic. The parasite obtains nourishment from bile, blood, lymph and epithelial cells.

(7) Respiration is anaerobic.

(8) Excretion occurs with the help of flame cells.

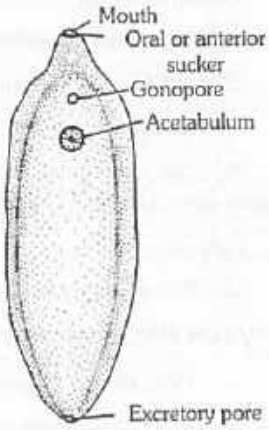


Fig : 1.7-16 *Fasciola hepatica*

(9) *Fasciola* is a digenetic endoparasite. Its primary host is sheep causing 'liver rot' and the secondary or intermediate host is the snail of genus *Limnaea* and *Planorbis*.

(10) *Fasciola hepatica* is a hermaphrodite. Male has a pair of testes and female has an ovary, vitelline gland for yolk formation and mehlis's gland for lubrication.

(11) Fertilization is internal. Cross fertilization commonly occurs.

(12) Different larval stages of *Fasciola hepatica* according to development sequence are : miracidium-sporocyst-Redia-Cercaria-Metacercaria.

(13) Stage in the life cycle of Fasciola when it infects intermediate host (snail) is miracidium and primary host is metacercaria.

(14) Miracidium and cercaria larva are free swimming form in water. Redia and sporocyst are formed in snail.

(15) *Fasciola* exhibits both alternation of generation and alternation of host.

Schistosoma

(1) *Schistosoma* is commonly known as human blood fluke and it is found in the blood vesseles and hepatic portal system of man, cat, pig, dog, etc.

(2) Phenomenon of sexual dimorphism occurs. Thus male and female are separate but they live in close association.

(3) Male is flattened while female is slender. Both possess oral and ventral suckers.

(4) The ventral folding from the male's body forms a groove known as 'Gynaecophoric canal' in which the female individual lives.

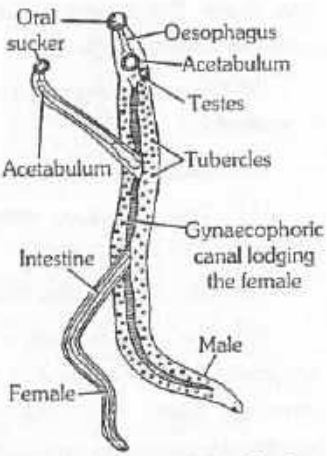


Fig : 1.7-17 *Schistosoma* both male and female

(5) Blood fluke feeds on blood. It respires anaerobically. Excretion occurs with the help of flame cells.

(6) Blood fluke is digenetic, primary host is man and secondary host is snail.

(7) Fertilization is internal. After fertilization the egg develops into miracidium larva which is free swimming. Later on it penetrates snail body and get converted into cercaria larva. The cercaria infect man by penetrating his skin.

(8) Redia and metacercaria stage do not occurs in blood fluke.

(9) Blood fluke causes schistosomiasis or bilharzia.

Taenia solium

(1) *Taenia solium* is commonly known as pork-tape-worm.

(2) Adult tapeworm lives in the small intestine of man (primary host), larval stage in the secondary or intermediate host pig or cattle.

(3) *Taenia solium* possesses elongated ribbon or tape like segmented body (pseudometamerism).

(4) Body is divided into three parts, namely scolex, neck and strobila. Scolex has a rostellum bearing two circles of chitinous hooks and four suckers for holding onto the host. Neck is the region of proliferation of new proglottids. Strobila is long tapering part having large number of proglottids. Proglottids are of three types-young, mature and gravid.

(5) Young or immature proglottids are behind neck without reproductive organs.

(6) Mature proglottids are in the middle having reproductive organs, both male and female.

(7) Gravid proglottids (rectangular in shape) are with branched uterus containing fertilized eggs.

(8) Apolysis is the process of separation of gravid proglottids.

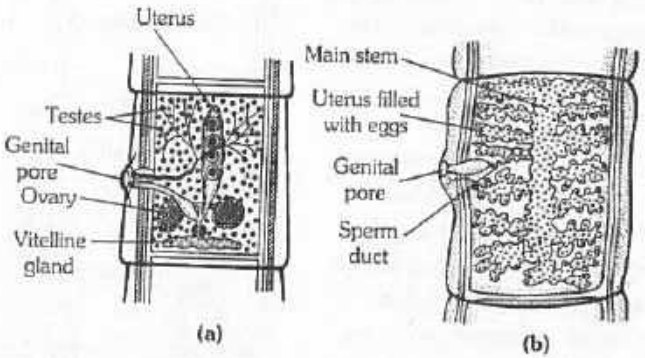


Fig : 1.7-18 (a) Mature proglottid, (b) Gravid proglotid

(9) Body wall lacks a cellular epidermis. It consists of cuticle (parasitic adaptation), musculature and mesodermal tissue called parenchyma.

(10) Digestive system is simple without alimentary canal. Food is absorbed through body surface.

(11) Respiration is anaerobic in *Taenia solium*.

(12) Flame-cells (solenocytes) are excretory in function.

(13) All tapeworms are hermaphrodites, and a complete reproductive system occurs in each mature proglottid. Fertilization is internal, cross type within the same proglottid or between two proglottids of the same strobilla.

(14) The fertilised eggs develop into an embryo that gets covered by a shell. The shelled embyros are called onchospheres. Secondary host pig acquires infection by ingesting the onchospheres. Hexacanth is developed in shell with six hooks.

(15) Hexacanth stage is the infective stage to pig. In the stomach of pig, hexacanth will be released, it goes through blood circulation and on reaching muscles get encysted in the form of bladderworm (cysticercus). Human host gets infection by eating raw or poorly cooked 'measly pork'. Cysticercus is infective stage to man.

(16) Cysticerci in pig muscle can remain viable for several years.

(17) *Taenia saginata* (*Taeniarhynchus saginatus*) is commonly known as 'the beef tapeworm'.

(18) Like *Taenia solium*, it is digenetic, man is the primary host and cattle is the intermediate host.

(19) It is also called 'unarmed tapeworm' because the scolex does not possess hooks.

(20) During infection with taenia necrosis of brain and epilepsy may appear.

(21) The disease caused by bladderworm is known as cysticercosis. Cysticercosis is more dangerous than taeniasis.

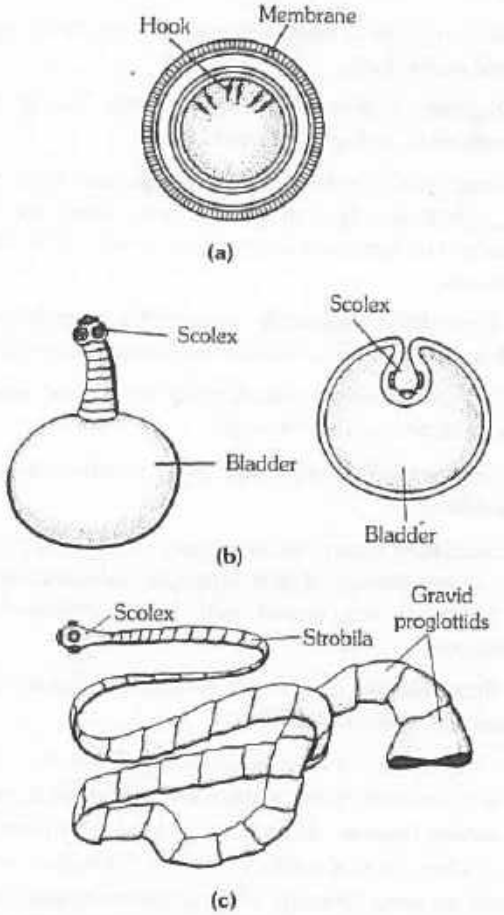


Fig : 1.7-19 Life cycle of *Taenia solium* (a) Onchosphere (b) Bladderworm (Cysticercus) (c) Adult tapeworm

Table : 1.7-4 Common Names

Fasciola hepatica	–	Sheep liver fluke
Fasciola gigantica	–	Cattle liver fluke
Schistosoma mansoni	–	Human blood fluke
Fasciolopsis buski	–	Intestinal fluke
Paragonimus westermani	–	Lung fluke
Taenia solium	–	Pork tapeworm
Taenia saginata	–	Beef tapeworm
Echinococcus granulosus	–	Dog tapeworm

Phylum Aschelminthes (Nemathelminthes)- The round worms

(Gk. *nema* = thread; *helmin* = worm)

Brief History : Ancient people were familiar with certain large-sized nematode parasites of domestic animals. Minute nematodes were discovered only after the invention of microscope. Linnaeus (1758) included these in "*Vermes*" Rudophi (1793, 1819) included these under "Nematoidea" Gegenbaur (1859) ultimately proposed "Nemathelminthes" for these.

General Characters

(1) Many endoparasites of various animals and plants; others free–living and widely distributed in all sorts of water and damp soil.

(2) Mostly minute or small; some large (1 mm to 25 cm); some upto several meters long.

(3) Slender, cylindrical, elongated body usually tapering towards both ends, and unsegmented.

(4) Body wall formed of a thick, tough and shiny cuticle, a syncytial hypodermis beneath cuticle, and innermost layer of peculiar, large and longitudinally extended muscle cells arranged in four quadrants.

(5) Triploblastic, bilaterally symmetrical, pseudocoelomate, false coelom derived from embryonic blastocoel, unsegmented.

(6) Straight alimentary tract terminal mouth and anus. These are first animals to have complete gut.

(7) 'Tube within a tube body' plan, organ-system grade of body organization.

(8) Circulatory system and respiratory organs absent. A simple excretory system consists of protonephridia, comparatively simpler or complicated sensory organs, and a well–developed nervous system present

(9) Reproductive system well–developed. Usually unisexual with sexual dimorphism.

(10) Many kinds of Nematodes are parasites of useful plants and domestic animals. Some of these are pathogenic to their hosts, causing serious diseases. Even man is a host for more than 50 species, of which *Ascaris lumbricoides* and *Enterobius vermicularis* (pin worm) are very common. Other common human nematodes are *Wuchereria* which causes Filaria, *Trichinella* causing trichinosis, and *Ancylostoma* causing hookworm disease.

Classification of Nemathelminthes : On basis of the presence or absence of some specialized sense organs and caudal glands, and characteristics of excretory system, nematodes are classified into two classes –

Class 1. Phasmidia or Secernentea or Rhabditea

(1) Mostly parasitic.

(2) Possess a pair of unicellular, pouch-like sense organs, called phasmids, near hind end of body.

(3) Another pair of reduced, pore–like sense organs, called amphids, present near anterior end.

(4) Excretory system with paired lateral canals.

(5) Caudal glands absent.

Examples – *Ascaris, Enterobius, Ancylostoma, Wuchereria, Trichuris, Trichinella, Dioctophyma, Rhabditis Necator, Gnathostoma, Dracunculus, Loa,* etc.

Class 2. Aphasmidia or Adenophorea or Enoplea

(1) Mostly small, free-living.

(2) No phasmids.

(3) Amphids spiral, cord like or disc like, seldom pore like.

(4) No lateral excretory canals.

(5) Caudal glands present.

Examples : *Enoplus, Dorylaimus, Mermis, Halichoanolaimus, Monohystera, Desmoscolex,* etc.

Some representative animals

Ascaris

(1) *Ascaris lumbricoides,* the common roundworm belong to the class Rhabditea of the phylum Nemathelminthes. It is the most common endoparasite in the small intestine of human beings. It is monogenetic, i.e., without any secondary host. The worm is more common in children.

(2) The body is elongated, unsegmented, cylindrical with tapering ends and four streaks- two lateral, one ventral and one dorsal.

(3) Sexes are separate with sexual dimorphism. Male is smaller than female with curved tail, two penial setae (copulatory organs) and cloaca. Female is with straight posterior end of the body and posterior transverse anus and separate gonopore situated ventrally 1/3 from the anterior end. In both the excretory pore is situated mid-ventrally, a little behind the mouth. Ventral surface of male bears fifty pairs preanal and five pairs postanal papillae. These sensory papillae are absent in female.

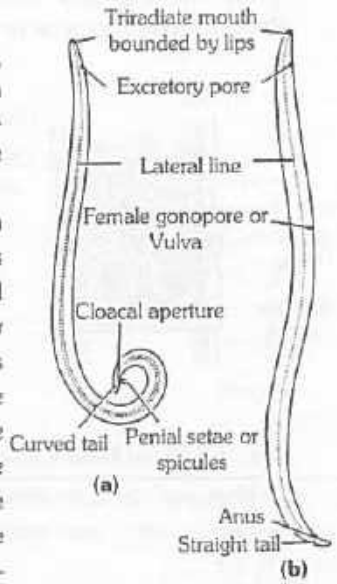


Fig : 1.7-20 *Ascaris*
(a) Male (b) Female

(4) Mouth both in male and female is terminal, triradiate surrounded by three denticulate lips. One median dorsal and two ventrolateral. Dorsal lip bears two sensory double papillae (tangoreceptors). Both sensory papillae and amphids (chemoreceptors) are present on ventrolateral lips.

(5) Body wall consists of outer cuticle, middle epidermis and inner longitudinal muscle layer. Circular layer is absent. Cuticle is thick which protects the body of the parasite from mechanical injury and also resistant to action of digestive enzymes of the host. The epidermis is syncytial (coenocytic) with scattered nuclei and without partition walls.

(6) The body cavity of *Ascaris* is pseudocoel formed by vacuoles originated from persistent embryonic blastocoel.

(7) There is no alimentary canal and digestive gland. The parasite absorbs digested food of the host so their is no need of digestive organs. Absorption occurs through the general body surface. Salivary glands do not occurs in *Ascaris*.

(8) Respiratory system is absent, respiration is anaerobic.

(9) Excretory system is H-shaped. It is consists of a single excretory cell or renette cell. Excretory products are ammonia and urea.

(10) Sense organs are simple like labial papillae, cervical papillae, anal papillae, amphids and phasmids.

(11) *Ascaris* is dioecious or unisexual. Testes is single and median, so male *Ascaris* is monarchic (monodelphic). Only anterior part of testis is functional, so testis (also ovary) is telogonic.

(12) *Ascaris* sperm is peculiar without flagellum, tail less, asymmetrical and amoeboidal.

(13) Female *Ascaris* has paired ovaries so female *Ascaris* is didelphic.

(14) Copulation occurs in the intestine of host. Fertilization in the lower part of uteri. The egg is mammilated, oval, m-shape with three protective covering–outer protein layer, middle chitinous shell and inner membrane made of esterified glycosides.

(15) Embryonic development takes place only outside the body of human host in soil because it requires low temperature, more oxygen and suitable moisture.

(16) Inside the shell the zygote develops into rhabditiform larva or first stage juvenile in 10-14 days.

(17) The larva of first stage is not infective . It rests for a week and completes first moult within egg and becomes second stage rhabditiform larva which is infective.

(18) The transmission of infective stage through embryonated egg takes place by contaminated food and water.

(19) The embryonated egg passes into the intestine of man and second stage larva hatches out from the egg.

(20) Three types of migration by *Ascaris* larva are – primary migration, secondary migration and aberrant migration.

(21) Primary migration is from intestinal wall → hepatic portal → liver → hepatic vein → heart → pulmonary artery → lungs.

(22) Secondary migration is from lungs back to intestine of the host ; lungs → bronchi → trachea → pharynx → gullet → oesophagus → stomach → intestine.

(23) In lungs, larva complete its second and third moulting (becomes third and fourth stage larva). In small intestine it completes fourth or final moulting and becomes fifth stage of larva.

(24) Duration of wandering journey from intestine to intestine is about three weeks. Within 8-10 weeks adult *Ascaris* starts reproduction.

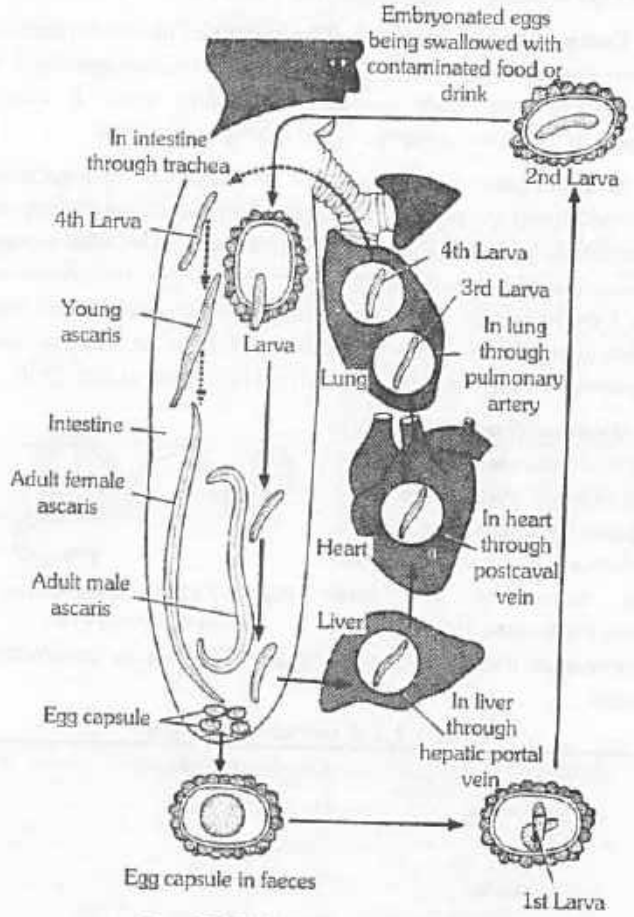


Fig : 1.7-21 Life cycle of *Ascaris*

(25) Aberrant migration is the migration from lungs to brain, spinal cord, eyes, etc.

(26) *Ascaris* is pathogenic. It cause the disease, ascariasis. Most pathogenic larva of *Ascaris* is fourth stage larva.

(27) Main symptoms of ascariasis are – abdominal discomfort, nausea, vomiting, diarrhoea and colic pain.

(28) Toxin produced by *Ascaris* may interfere with protein digestion.

(29) Ascariasis can be treated by antihelminthetic drugs such as oil of Chenopodium, Santonin, Antipar, Tetrachloroethylene, Alcopar, Decaris, Diethylcarbamazine, etc.

Some other nematode parasite :

***Ancylostoma duodenale* :** It is an endoparasite of human small intestine. The parasite is monogenetic. It is popularly called old world hookworm. Adults live in the intestine of man and feed upon blood. No secondary host. Juveniles penetrate through the skin of hand and feet. It causes 'Ancylostomiasis'.

Wuchereria bancrofti **:** It is a digenetic parasite. Human being are primary host while female mosquito mostly of *culex* and *Aedes* species is the secondary or intermediate host.

Adults live in human lymph vessel and lymph glands. It is a viviparous nematode, larvae called 'microfilaria. Larvae appear in cutaneous blood (superficial blood) in midnight. Presence of few worms not harmful. They block lymph glands and lymph vessels, swell body parts like arms, scrotum and mammary glands. This results in the disease 'Elephantiasis' or 'Filariasis'

Enterobius Vermicularis **(Pin worm) :** This worm inhabits human caecum, colon, appendix and rectum. It is monogenetic, no intermediate host. Eggs contain rhabditiform larva. It cause 'Oxyurasis', the main symptom being itching of anal parts.

Dracunculus medinensis **:** It is a digenetic endoparasite with man being the primary host and cyclops as the secondary or intermediate host. It is also called 'Fiery serpent'. The adult worms occur in the subcutaneous tissue, especially of arms, shoulders and legs, forming blisters. Female is very long while male is short. The guinea worm disease has been eradicated from India. The last case was reported from the Jodhpur district of Rajasthan in July 1996.

Loa loa **(Eye worm) :** It is a filarial roundworm of central and Western Africa. The adult migrates through the subdermal connective tissues of human host. Sometimes they pass across the eyeball. Local swelling accompanies these migrations. Tabanid flies act as transmitting vectors.

Fig : 1.7-22 Adult eye worm, *Loa loa*, from eye

Table : 1.7-5 Common Names

Ascaris	–	*Common roundworm*
Ancylostoma	–	Hookworm
Necator	–	Hookworm
Wuchereria	–	Filarial worm
Enterobius (Oxyuris)	–	Pinworm
Trichuris	–	Whipworm
Dracunculus	–	Guinea worm
Loa loa	–	Eye worm
Strongyloides	–	Thread worm

Phylum Annelida – The segmented Animals

(L.*annelus* = ring, *eidos* = form)

Brief History : Linnaeus (1758) included all soft-bodied worms in "*Vermes*". Lamarck (1801) established phylum annelida for higher types of worms.

General characters

(1) Annelids are bilaterally symmetrical animals.

(2) They have organ-system grade of organization.

(3) They are coelomate (schizocoelomate) animals.

(4) They have triploblastic body wall.

(5) The muscle layers are thick in the body wall. Hence the body wall is said to be dermomuscular.

(6) The body is divided into a numerous segments called the metameres or somites. The segmentation is known as metamerism.

(7) The body is covered with a thin cuticle.

(8) Locomotory organs are setae.

(9) Digestive system is well developed. These have tube-within-a-tube body plan.

(10) Blood vascular system is a closed type

(11) Excretory system is formed of segmentally arranged nephridia.

(12) These always show cutaneous or skin respiration.

(13) Nervous system is formed of a pair of cerebral ganglia (brain) and a double ventral nerve cord.

(14) Mostly annelids are hermaphrodites. Fertilization is generally cross and may be external or internal.

(15) The gonoducts are formed from coelom (coelomoducts). The coelomoducts have connection with nephridia.

(16) Regeneration is common character in this phylum.

(17) Their development is direct or indirect and includes a free-swimming trochophore larva.

Classification of annelida : On the basis of position and arrangement of setae when present, absence and presence of sense organ, phylum annelida has been divided into four classes –

Class 1. Polychaeta (Gr. polus, many, chaite, hair)

(1) Polychaeta are marine and carnivorous.

(2) Body is elongated and segmented.

(3) Head consists of prostomium and peristomium and bear eyes, tentacles, cirri and palps, etc.

(4) Setae are numerous and are borne upon lateral prominances of the body wall known as parapodia.

(5) Locomotory organs are parapodia.

(6) Clitellum is absent.

(7) Cirri or branchiae or both may be present for respiration.

(8) Coelom is spacious usually divided by inter segmented septa.

(9) Alimentary canal is provided with an eversible buccal region and protrusible pharynx.

(10) Excretory organs are segmentally paired nephridia.

(11) Sexes are separate.

(12) Fertilization is external; free swimming larval stage is trochophore.

(13) Asexual reproduction occurs by budding.

Examples : *Nereis, Aphrodite, Polynae, Chaetopterus, Glycera, Arenicola, Amphitrite, Terebella, Sabella, Eunice*, etc.

❑ *Arenicola, Amphitrite* and *Terebella* have external gills.

❑ *Chaetopterus* exhibits luminescence and great power of regeneration.

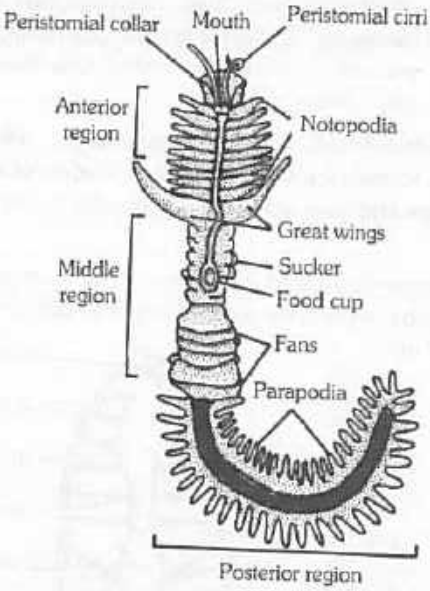


Fig : 1.7-23 *Chaetopterus*

Class 2. Oligochaeta (Gr. oligi, few)

(1) They are mostly terrestrial or some fresh water forms.

(2) Body has conspicuous external and internal segmentation.

(3) Distinct head, eyes and tentacles are absent.

(4) Parapodia are absent.

(5) Locomotory organs are setae.

(6) Setae are usually arranged segmentally.

(7) Clitellum is usually present.

(8) Pharynx is not eversible and without jaws.

(9) They are hermaphrodites.

(10) Development is direct and takes place within cocoons secreted by clitellum.

(11) No free larval stage

Examples : *Tubifex, Dero, Pheretima,* (Indian earthworms), *Lumbricus* (European earthworm).

❑ *Tubifex* and *Dero* are fresh water forms. *Tubifex* can live in polluted water where oxygen availability is poor because its has a large amount of haemoglobin in blood.

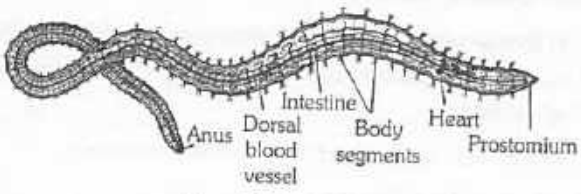


Fig : 1.7-24 *Tubifex*

Class 3. Hirudinea (L. hirudo, a leech)

(1) This class includes mostly ectoparasitic and fresh water forms, while few are marine, feeding upon fishes and other animals.

(2) Body is elongated usually flattened dorso–ventrally or cylindrical.

(3) Body consists or definite number of segments, each segments breaks up into 2 to 4 rings or annuli.

(4) Parapodia and setae are absent.

(5) Body is provided with an anterior and a posterior sucker, both situated ventrally.

(6) Coelom is reduced by botryoidal tissue.

(7) Mouth opens on the ventral surface in the anterior sucker, while anus opens dorsal to the posterior sucker.

(8) Locomotory organs are suckers.

(9) Hermaphrodite *i.e.*, sexes united.

(10) Reproduction sexual. Asexual reproduction is unknown.

(11) Eggs are usually laid in cocoons.

(12) Development is direct without free swimming larval stage.

Examples : *Acantobdella, Glossiphonia* (Fresh water leeches), *pontobdella, Haemodipsa,* etc.

❑ *Haemodipsa* is terrestrial leech.

❑ *Pontobdella* is a ectoparasite on elasmobranchi fishes.

❑ *Acanthobdella* is a ectoparasite of salmon fish.

Class 4. Archiannelida (Gr. archi, primitive)

(1) They are exclusively marine forms.

(2) Body elongated and worm-like.

(3) Setae and parapodia are usually absent.

(4) External segmentation is slightly marked by faint while internal segmentation is marked by coelomic septa.

(5) Prostomium bears two or three tentacles.

(6) Unisexual or hermaphrodite.

(7) Larva is typical trochophore.

Examples : *Polygordius, Protodrillus, Nerilla, Saccocirrus,* etc.

❑ *Polygordius* is a primitive Archiannelid or living fossil.

Some representative animals

Pheretima posthuma

(1) The common Indian earthworm, *Pheretima posthuma* belong to the class oligochaeta of the phylum Annelida. It is found in every part of the world. It lives in damp soil and burrow in lawns, fields, garden etc. rich in humus. Earthworm is nocturnal i.e., active during night.

(2) The generic name *Pheretima* was first used by Kinberg in 1867. Our knowledge of *Pheretima* is mainly due to the work of Karm Narayan Bahl (1926).

(3) Body is cylindrical, bilaterally symmetrical, elongated with metameric segmentation. Earthworm shows both external and internal segmentation. The number of segments is about 100-120, the length is about 150 mm.

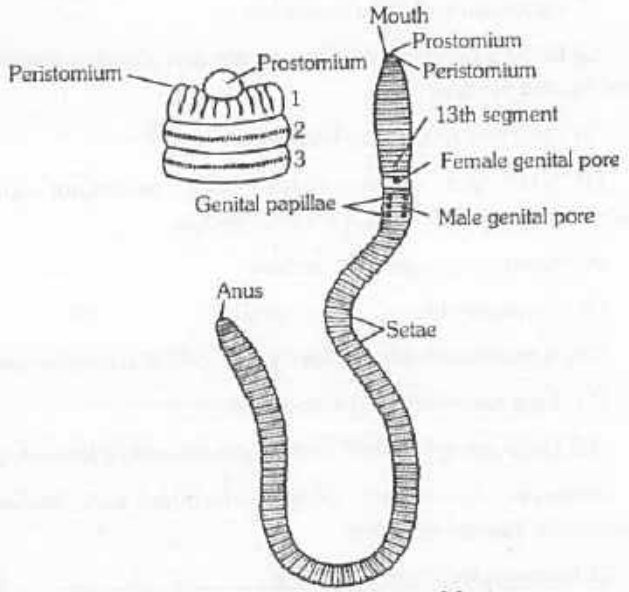


Fig : 1.7-25 *Pheretima* external features

(4) Earthworm is brown or clay-coloured. This is because of the pigment porphyrin. Numerous granules of porphyrin pigment are found scattered in the circular muscle layer of body wall. Porphyrin protects the body from the injurious effects of bright light.

(5) The first segment is peristomium or buccal segment which bears mouth. Anus is located on the last segment.

(6) Three regions in body of earthworm are – Preclitellar region (1 – 13), Clitellar region (14, 15, 16) and Postclitellar region (17 – last).

(7) Nephridiopores of integumentary nephridia 200-250 per segment are found in all segments except the first six. Clitellar segment contains 2000 nephridiopores per segment, so called 'forest of nephridia'.

(8) In the body wall 11 pores are concerned with reproduction. They are – Spermathecal pores in the intersegmental grooves of 5/6, 6/7, 7/8 and 8/9 (4 pairs). Female genital pore midventral on segment 14th. Male genital pores ventrolaterally (1 pair) on segment 18th.

(9) Male genital papillae are present on segments 17 and 19 (2 pairs).

(10) Body wall is dermomuscular, consisting of cuticle, epidermis, muscular layers and coelomic epithelium. Epidermis consists of tall, columnar cells of four types – Supporting cells (major part), Glandular cells (Goblet and albumin), Basal cells and Sensory cells.

(11) All segments except the first, last and clitellar segment contain setae (perichaetine arrangement). Setae are 'S'-shaped, yellowish and chitinous, 80-120 segment. Setae and contraction of muscles help in locomotion.

(12) The body cavity of earthworm is true coelom (schizocoel) as it is formed by the division of mesoderm. The coelom is filled with milky white alkaline coelomic fluid. Coelomic fluid contains different types of carpuscles. These are granulocytes (phagocytes), most numerous mucocytes, circular nucleated cells (leucocytes) and chloragogen cells (yellow cells).

(13) Chloragogen cells are small, star-shaped, yellow cells concerned with storage of reserve food, deamination of proteins, formation of urea and also excretory (analogous to the liver of vertebrates).

(14) The alimentary canal of earthworm is a straight tube, representing a 'tube within tube plan, Location of different part of alimentary canal are –

Buccal chamber : $1-2\frac{1}{2}$

Pharynx : $2\frac{1}{2}-4$

Oesophagus : 5-7

Gizzard : 8

Stomach : 9-14

Intestine : 15 onwards

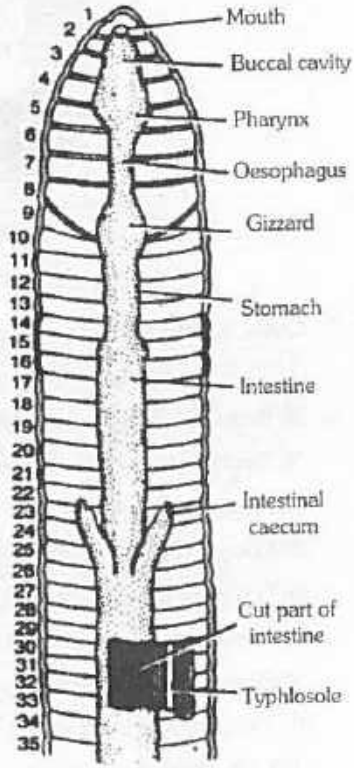


Fig : 1.7-26 Alimentary canal - *Pheretima*

Roof of pharynx contains pharyngeal glands containing chromophil cells secreting mucus and proteases. Gizzard is a thick muscular organ, cavity lined by tough cuticle for grinding. Wall of stomach contains 'calciferous glands' the secretion of which neutralizes the acidity of soil.

(15) Due to presence of typhlosole the intestine is divided into three region – Pretyphlosolar region, typhlosolar region, post typhlosolar region. Intestinal caeca arise from segment 26 and extend forward upto segments 22 or 23.

(16) Typhlosole is a highly glandular, vascular longitudinal ridge increasing the area for absorption of digested food.

(17) Earthworms are omnivorous. Undigested particles as faeces are called as 'casting'.

(18) Blood vascular system of earthworm is closed type. Blood is red in colour, respiratory pigment haemoglobin is dissolved in the blood plasma .

(19) The main longitudinal blood vessels are three –

(i) The dorsal blood vessel

(ii) The ventral blood vessel

(iii) The subneural blood vessel

(20) Important transverse vessels in first 13 segments are –

Lateral hearts (segments 7 and 9), Anterior loops (segments 10 and 11) and, Lateral oesophageal hearts (segments 12 and 13).

(21) Dorsal blood vessel is distributive in segments 1 to 13. Flow of blood in dorsal vessel is from posterior to anterior direction.

(22) Ventral vessel is found below alimentary canal, single, blood flows anterior to posterior direction.

(23) Blood glands are three in number and present on 4th, 5th and 6th segments. These produce blood cells and haemoglobin.

(24) Lymph glands are present on both sides of dorsal blood vessel from segment 26th and those behind it (one pair per segment, small and whitish). Lymph glands are supposed to produce certain phagocytic cells.

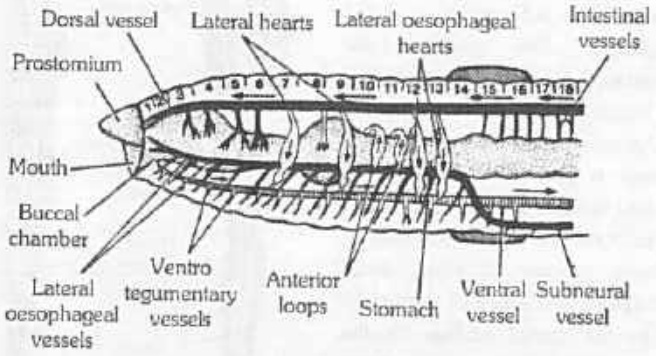


Fig : 1.7-27 Blood vascular system - *Pheretima* (After 13th segments)

(25) Earthworm respires, but has no respiratory organs, exchange of gases takes place through moist skin. The absorptive area of earthworm is more than its volume, so earthworm does not require any respiratory organ. If the skin of the earthworm dries, it cannot respire. it dies due to asphyxia.

(26) Excretory organs of earthworm are segmental nephridia ectodermal in origin, analogous to vertebrate kidney.

(i) Pharyngeal nephridia are situated in the segments 4, 5 and 6. They open in the anterior part of alimentary canal, i.e. buccal cavity and pharynx. They are without nephrostome and are enteronephric type.

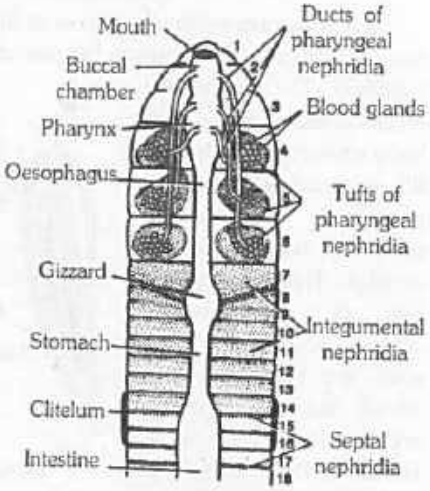


Fig : 1.7-28 Pharyngeal nephridia - *Pheretima*

(ii) Integumentary nephridia are scattered in the body wall. They are smallest, V-shaped without nephrostome and are exonephric type.

(iii) Septal nephridia are the largest, attached to both facees of each intersegment septum behind 15th segment.

(27) Septal nephridia are the only nephridia with nephrostome or funnel. The terminal duct opens into septal excretory canal. Septal nephridia are enteronephric finally excretory products are poured into intestine. Earthworms are mainly ureotelic.

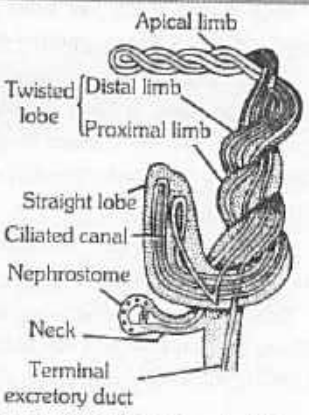


Fig : 1.7-29 Septal nephridium - *Pheretima*

(28) Earthworm has a well developed nervous system; it has a brain but no head. Brain lies above pharynx, made up of a pair of suprapharyngeal (cerebral) ganglia.

(29) Earthworm has no eyes, photoreceptors are used to judge intensity and duration of light, do not have the capacity of vision.

(30) Earthworm are hermaphrodite (monoecious) but fertilization is cross type due to protandrous condition.

(31) In earthworm reproductive system consist of the following organs –

Male organs –	Testes two pairs	(segments 10 and 11)
	Seminal vesicles	(segments 11 and 12)
	Accessory gland	(segments 17 and 19)
	Genital papillae	(segments 17 and 19)
	Male genital apertures	(segments 18)
	Prostate gland	(segments 17-20)
Female organs –	Ovary one pair	(segment 13)
	Female genital pore	(segment 14)
	Spermatheca 4 pairs	(segments 6, 7, 8, 9)

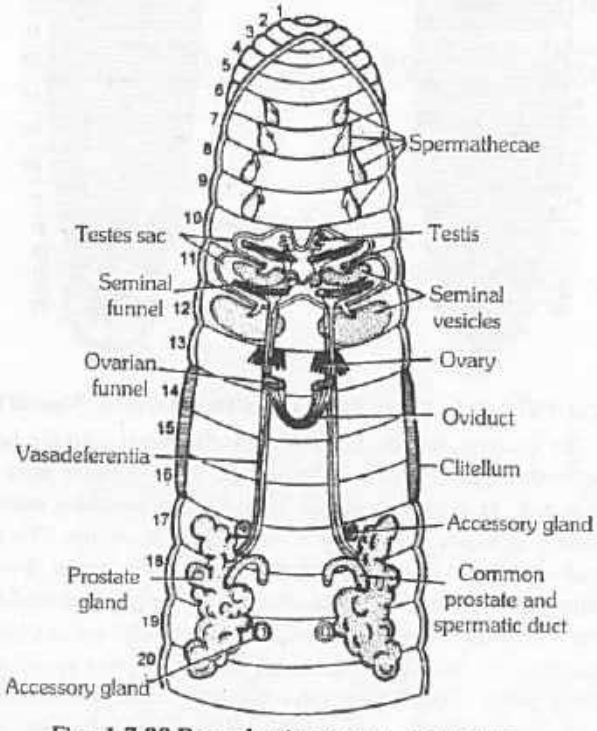


Fig : 1.7-30 Reproductive organs - *Pheretima*

(32) Spermatheca are used to store sperms after copulation (open outside on intersegmental groove 5/6, 6/7, 7/8, 8/9).

(33) Copulation occurs between two earthworms generally at night during rainy season. Fertilization is external and occurs in cocoon. Cocoons are formed by glandular clitellum. A cocoon may contain many fertilized eggs, but only one embryo develops, other eggs serve as nurse cells.

(34) Cleavage is holoblastic and unequal, development is direct without any larval stage.

(35) One of the oldest use of earthworm; it is used as bait for catching fish. Earthworms are friends of farmers because they enrich the soil by nephridial excretion, it increases the fertility of soil.

Hirudinaria granulosa

It is commonly known as Indian cattle leech. It is sanguivorous (feed on blood) segmented animal that live in ponds, streams, rice fields etc. It is ectoparasite on cattle and human. The body is soft, flattened and slimy. The dorsal side is yellowish green while the ventral side is orange. Botryoidal tissue is present in coelomic space.

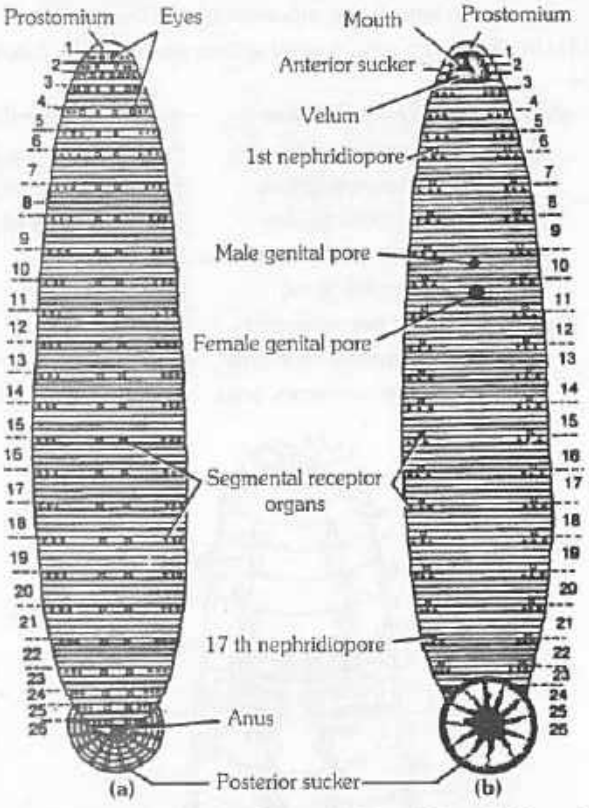


Fig : 1.7-31 *Leech* - External features (a) Dorsal View (b) Ventral View

The body is divisible into 33 segments. Each segment further appear subdivided superficially by annuli. Each segment from 6-22 bear a pair of ventral nephridiopore. During breeding season a temporary clitellum develps on 9, 10 and 11 segments. The leech bears two suckers. The anterior sucker encloses the mouth. It acts as a feeding locomotory and prehensile organ. The posterior end bears a large disc-shaped sucker that helps in locomotion and anchorage. It comprises the last seven uniannulate segments. Anus lies ahead of posterior sucker. Triradiate mouth is present at its bottom. The saliva of the leech contains an anti-coagulant, called hirudin which prevents clotting of blood during blood meal. There are present five pairs of eyes on the dorsal surface. It is hermaphrodite but cross-fertilisation occurs. Development is direct. Prof. M.L. Bhatia has given a detailed morphology of *H. granulosa*.

Nereis

It is commonly called clam worm or sand worm or rag worm which is found on the sea shore in the tubular burrow. *Nereis* is unisexual and its reproductive phase is called *Heteronereis*. Heteroneresis have two regions – epitoke or posterior sexual region and atoke or anterior region without masses of developing gametes. The phenomenon of transformation of nereis into heteronereis is called epitocky. The gametes are liberated through mixonephridia. Fertilization occurs in sea water. During development trochophore larva is present. The prominent head consists of prostomium and peristomium. The prostomium bears a pair of small tactile tentacles and a pair of stout palp. On the dorsal surface of the peristomium there are present two pair of black eyes. Peristomium has four pairs of long tentacles (cirri). Pharynx is everted for ingestion of food. Each segment bears laterally one pair of fleshy projection, the parapodia, used in swimming. The last segment has an anus. The anal segment is devoid of parapodia but bears a pair of elongated anal cirri.

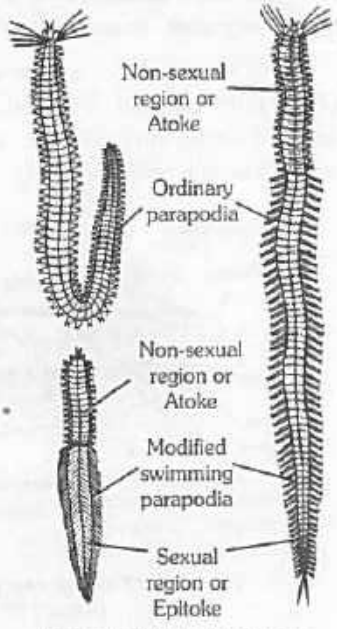


Fig : 1.7-32 *Heteronereis*

Bonellia

It is a marine worm which lives in the crevices of the rocks. It has only traces of segmentation but sexual dimorphism is extremely exhibited. The female has an ovoid and unsegmented body covered with papillae. It is provided with a prostomial bifurcated proboscis homologous to annelids. There is only one pair of large ventral chitinous setae. The male is small and is reduced to a minute size of *Turbellaria* and lives in the body of the female. The larva of *Bonellia* has the potentialities of both male and female. If they develop independently they become females, but if they come in contact with female, they develop into males.

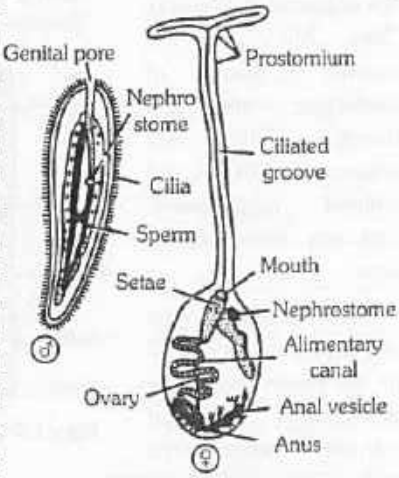


Fig : 1.7-33 *Bonellia*

Aphrodite

The *Aphrodite* is a marine polychaete which is commonly called the 'sea mouse'. It is found burried in the mud or sand or crawling on the sea bed. The body is oval, broad and dorso-ventrally flat and consists of 30-35 metameres. The body is covered with scales or elytra which are modifications of dorsal cirri of parapodia and are respiratory in function. The head is small and consists of a peristomium and a prostomium. The prostomium bears a pair of eyes, a short tentacle and a pair of long palps. During movement the animal changes colour from golden to peacock blue. The animal is commonly found in Atlantic and Mediterranean seas.

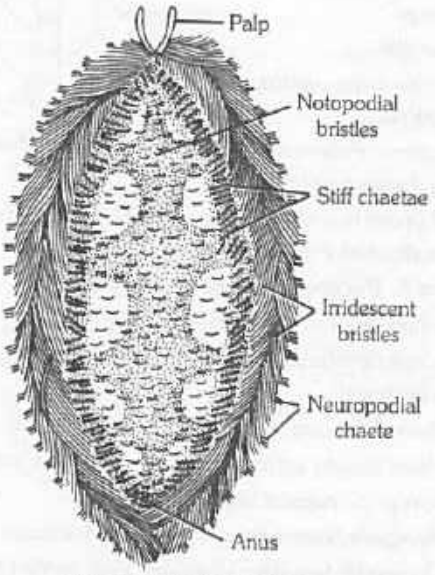


Fig : 1.7-34 *Aphrodite*

Table : 1.7-6 Common Names

Nereis	–	Ragworm
Aphrodite	–	Sea mouse
Polynoe	–	Scale worm
Chaetopterus	–	Paddle worm
Arenicola	–	Lugworm
Glycera	–	Smooth blood worm
Eunice	–	Palolo-worm
Sabella	–	Peacock-worm
Serpula	–	Fan-worm
Pheretima	–	Earthworm
Pontobdella	–	Skate-sucker
Hirudo	–	Medicinal leech
Hirudinaria	–	Cattle leech
Sipunculus	–	Pea-nut worm
Tubifex	–	Blood worm

Phylum Arthropoda – The animals with jointed feet

(Gk. *Arthron* = joint; *Podos* = foot)

Brief History : Aristotle described a few crabs and other arthropods. Linnaeus included all such animals in his group "Insecta". Lamarck divided this group into three classes – Crustacea, Hexapoda and Arachnida. Finally, Von seibold (1845) established the phylum Arthropoda for these animals.

General characters

(1) Occur widely on land, in air, and in all sorts of water, from snowy tops of high mountains to the depths of ocean. Many are parasites of other animals and plants. Hence, the phylum is of great economic importance.

(2) Bilateral, triploblastic, body segmented and also divided into head, thorax and abdomen. Segmentation marked only externally; number of segments or somites fixed and each has its separate exoskeleton of thick and hard, chitinous cuticle secreted by epidermis of body wall. Head somites always fused.

(3) Each segment basically bears a pair of lateral jointed appendages adapted for food ingestion, locomotion, respiration, copulation, etc.

(4) Muscular system well-developed; muscle fibres always striated.

(5) Digestive tract is complete. Most head appendages forms mouth parts with lateral jaws for chewing or sucking. Anus is terminal.

(6) Coelom is reduced to small cavities in excretory and reproductive organs; replaced elsewhere by blood sinuses which merge together to form a large perivisceral cavity – the haemocoel–around viscera. Sinuses form an "open blood vascular system" filled with haemolymph which may contain haemocyanin. Haemocoel communicates with a long tubular and pulsatile, mid–dorsal heart.

(7) Respiration by gills (aquatic forms), or trachea or book lungs (terrestrial forms); by diffusion through body surface in some.

(8) Excretion by coelomoducts or specialized green or coxal glands, or by malpighian tubules. Excretory product is uric acid.

(9) Nervous system is basically similar to the typical annelid plan; head with a brain-ring which is connected to a double ventral nerve cord, having paired segmental ganglia which represent true metamerism. Well–developed sensory organs of various types.

(10) Cilia completely absent. Muscles mostly striated and capable of rapid contraction.

(11) Sexes mostly separate with sexual dimorphism. Paired reproductive organs and ducts.

(12) Fertilization typically internal, in female's body. Eggs megalecithal. Oviparous or viviparous

(13) Life–cycle includes one or more larval stages that metamorphose into adults.

Classification of Arthropoda : On the basis of body shape, degree of segmentation and regionation, and presence or absence of certain appendages (antennae, mandibles and chelicerae), phylum Arthropod is divided into four subphyla; Biggest phylum in regard to the number of species is Arthropoda.

Subphylum (I) Onychophora (Gr. Oychos = claw, phoros = bearing)

(1) Terrestrial walking worms.

(2) Body cylindrical with indistinct external segmentation.

(3) Unjointed 14-43 pairs of legs.

(4) Head not distinct, Oviparous/Viviparous

(5) A pair of eyes, short antennae and blunt oral papillae.

(6) Excretory organs are metanephridia which are segmentally arranged.

(7) A living connecting link forming a transitional link between Annelida and Arthropoda.

Example : *Peripatus, Ophisthopatus, Ooperipatus*, etc.

Subphylum (II) Trilobitomorpha (Gr. TRIA = Three; LOBOS = lobe; MORPHE = form)

(1) Most primitive, extinct, marine arthropods of Cambrian to Permian rocks.

(2) 10 to 675 mm. Long body covered by a hard segmented shell; distinct head of four fused somites bearing a pair of antennae, four pairs of appendages and often a pair of eyes.

(3) Trunk divided, by two longitudinal furrows, into 3 lobes.

(4) Abdominal region of 2 to 29 somites and a fused caudal plate or pygidium.

(5) Each segment, except the last one, bears a pair of biramous jointed appendages.

Example – *Triarthrus, Dalmenites*.

Subphylum (III) Chelicerata (Gr. CHELA = Claw; CEROS = Horn; ATA = Group)

(1) Mostly terrestrial, free-living and small-sized.

(2) Body distinguished into head, thorax and abdomen (= opisthosoma). Head and thorax fused to form a cephalothorax or prosoma.

(3) Cephalothorax with eyes and six pairs of appendages – One pair of clawed and jointed chelicerae in place of mandibles, one pair of pedipalps, and four pairs of walking legs. Antennae absent. Abdomen with or without appendages, but distinguished into a large and broader mesosoma, a small metasoma and a long and narrow, tail-like telson.

(4) Respiration by gills book-lungs or tracheae.

(5) Excretion by malpighian tubules or coxal glands, or both.

(6) Sexes mostly separate; females oviparous; development direct or through a larval stage. Divided into three classes on the basis of respiratory organs

Class 1. Merostoma

(1) They are Marine.

(2) Respiration by gills.

(3) Cephalothorax with lateral compound eyes median simple eyes and six pairs of usual appendages.

(4) Abdomen with 5 to 6 pairs of gill-bearing appendages.

(5) Hind end forms a long bayonet-like telson.

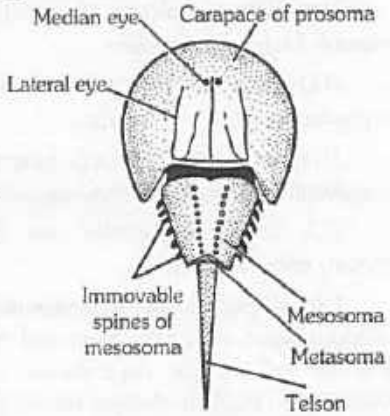


Fig : 1.7-35 *Limulus*

Example– *Limulus* (The king-crab).

❑ Limulus is a living fossil.

Class 2. Arachnida

(1) Mostly terrestrial; spiders, scorpions, mites, ticks, etc.

(2) Respiration by book-lungs or trachea.

(3) Eyes simple.

(4) Abdomen without appendages.

(5) Many with poison glands and poison fangs, jaws of stings.

(6) No gills.

(7) Life-cyle without metamorphosis.

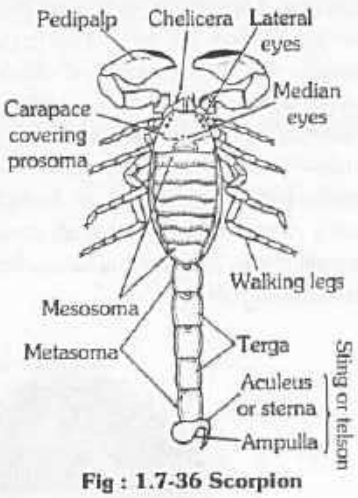


Fig : 1.7-36 Scorpion

Examples– *Palamnaeus* (scorpion), *Lycosa*, mites, ticks.

❑ *Lycosa* is a common web-spinning spider; web-spinning glands are situated in posterior part of abdomen.

Class 3. Pycnogonida or Pentapoda

(1) Small-sized marine sea-spiders.

(2) Cephalothorax 3-segmented; forms major part of body; abdomen vestigeal.

(3) Suctorial mouth on top of a long proboscis.

(4) Head usually with 4 pairs of appendages and 4 eyes.

(5) 5, 6 or 12 pairs of long walking legs.

(6) No special respiratory and excretory organs.

(7) Unisexual; females oviparous. Eggs carried by males.

Example – *Nymphon*.

Subphylum (IV) Mandibulata or Antennata (L.MANDIBULA = Mandible; ATA =group)

(1) Body divided into head and trunk, or head, thorax and abdomen.

(2) Segmentation distinct.

(3) 1 or 2 pairs of antennae, 1 pair of mandible in place of chelicerae, one or more pairs of maxillae and 3 or more pairs of walking legs.

(4) Eyes mostly compound.

(5) Respiration by gills or trachea.

(6) Excretion by malpighian tubules or antennal glands.

(7) Unisexual; life cycle usually with larval forms. Divided into six classes.

Class 1. Crustacea

(1) Mostly aquatic.

(2) Body divided into cephalothroax and abdomen.

(3) Dorsally, cephalothorax covered by a thick exoskeletal carapace.

(4) Head of 5 segments, with 2 pairs of antennae, one pair of mandibles and 2 pairs of maxillae; thorax of 2 to 60 distinct or variously fused somites; abdominal somites usually distinct with a posterior telson.

(5) Appendages mostly biramous.

(6) Respiration through body surface or by gills.

(7) Excretion by special coxal glands in antennae or maxillae.

(8) Mostly unisexual; genital ducts and pores paired; females oviparous.

(9) Life-cycle usually with larval forms.

Examples – *Palaemon*, *Cancer*, *Cyclops*, *Astacus*, *Sacculina*, *Cypris*, *Daphnia*, etc.

❑ Tiny crustaceans such as Daphnia and cyclops act as zooplankton which form important link in the food chain in water.

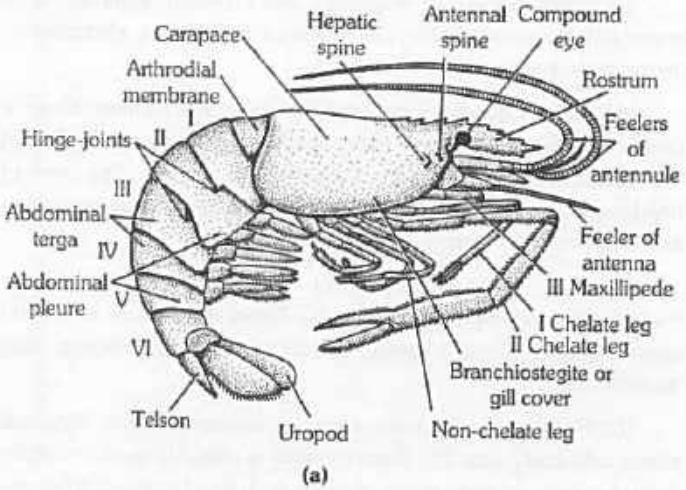


Fig : 1.7-37 (a) Prawn-External features (b) Sacculina (on host body) (c) Hermit crab (*Commensalism*)

Class 2. Insecta

(1) Aquatic, terrestrial or aerial.

(2) Body divided into head, thorax and abdomen.

(3) Segments 6 in head, 3 in thorax and 11 or less in abdomen.

(4) Legs typically 3 pairs (Hexapoda); aerial forms with one or two pairs of wings.

(5) Head with 1 pair of large, compound eyes, 1 pair of antennae and variously modified mouth-parts.

(6) Respiration by branched tracheae.

(7) Excretion by specialized malpighian tubules.

(8) Unisexual; females oviparous.

(9) Life-cycle simple or complicated.

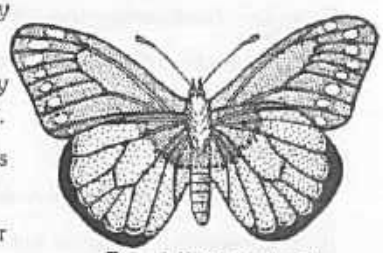


Fig : 1.7-38 *Butterfly*

Examples – *Periplaneta*, *Musca*, Mosquitoes, locusts, butterflies, bees, wasps, termites, silverfish, beetles, etc.

❑ Insects are of great economic importance to mankind.

❑ Silverfish is not a fish.

Class 3. Diplopoda

(1) Terrestrial.

(2) Body long, cylindrical, worm-like.

(3) 5-segmented head with 1 pair each of short antennae, mandibles and maxillae; 2 groups of simple eyes.

(4) Thorax of 4 segments, each except the first with a pair of joined legs.

(5) Abdomen of 9 to 100 or more segments, but each apparent segment is formed by fusion of two and, hence, bears 2 pairs of legs, spiracles, ostia and nerve ganglia.

(6) Respiration by tracheae.

(7) Excretion by malpighian tubules.

(8) Unisexual; gonad single; females oviparous.

Example – *Thyroglutus* (millipede)

❑ *Thyroglutus* damages the root of crop plants.

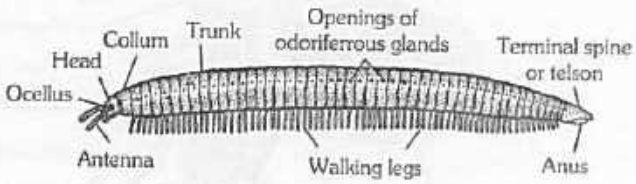


Fig : 1.7-39 *Julus* (millipede)

Class 4. Chilopods

(1) Terrestrial.

(2) Body long, worm-like, somewhat dorso-ventrally flattened and divided into head and trunk.

(3) Segments 15 to 181; not fused in pairs; each with a single pair of legs; first pair of legs claw like and each contains a poison gland.

(4) Head with a pair each of long antennae and mandibles, and 2 pairs of maxillae.

(5) Respiration by tracheae.

(6) Unisexual; females oviparous or viviparous. Genital openings mid ventral on last but one segment.

(7) Excretion by malpighian tubules.

Example – *Scolopendra* (centipede).

❑ Diplopoda and chilopoda are together kept in myriapoda.

Class 5. Symphyla

(1) Terrestrial.

(2) Body upto 6 mm. Long; divided into head and trunk.

(3) Head like that of insects, but without eyes.

(4) Trunk of 15 to 22 somites; bears 10 to 12 pairs of legs.

(5) Genital pores mid ventral between legs of 4th pair.

Example – *Scutigerella* (the garden centipede).

Class 6. Pauropoda

(1) Terrestrial.

(2) Minute, soft and cylindrical, worm like body divisible into head and trunk.

(3) Head with one pair each of branched antennae and unbranched mandibles and maxillae; no eyes.

(4) Trunk of 11 or 12 somites which are dorsally fused in pairs.

(5) Legs 9 to 10 pairs.

(6) Genital pores ventral on 3rd trunk segment.

Example – *Pauropus*.

Some representative animals

Cockroach (*Periplaneta Americana*)

(1) Cockroach belong to the class insecta of the phylum Arthropoda.

(2) Two species of cockroaches commonly found in India are– *Periplaneta americana* and *Blatta orientalis*. *Periplaneta americana* is the largest and most common species. The generic name periplaneta was given by Burmeister in 1838.

(3) Cockroaches are nocturnal and cursorial (running). It is cosmopolitan in distribution, but cockroach are more abundant in warm, humid areas.

(4) Body is divided into head, thorax and abdomen. Head is derived by the fusion of six embryonic segments. The part of head between and behind the eyes is epicranium (vertex). The front of head capsule is made up of three unpaired flattened sclerites called frons, clypeus and labrum.

(5) The thorax consist of three segments–prothorax, mesothorax and metathorax. Thorax bears three pairs of jointed appendages and two pairs of wings on mesothorax and metathorax.

(6) Exoskeleton of each segment consists of four chitinous plates called sclerites. The dorsal sclerite is called tergum or tergite, ventral sclerite is sternum or sternite and two lateral sclerites are called pleura or pleurites. The dorsal plate of the thorax is called notum

(7) The antenna is made of many segments, podomeres. The first segment is scape (largest), second pedicel and rest many jointed flagellum. Antenna is a thigmoreceptor which is sensitive to touch.

(8) Mouthparts of cockroaches are mandibulate type or cutting and chewing type. Mouthparts consists of labrum (upper lip), labium (lower lip), maxillae (segmented and resemble to a leg), mandibles and hypopharynx (tongue).

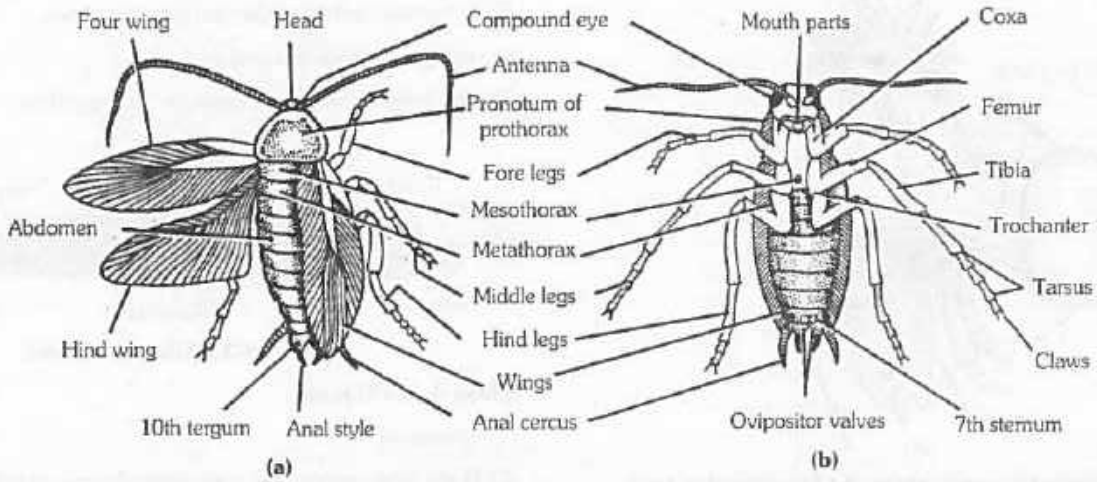


Fig : 1.7-40 *Periplaneta* - External features (a) Dorsal view (b) Ventral view

(9) The main structures of mastication (chewing) are mandibles which are short with teeth.

(10) Maxilla consists of cardo, stipes, galea, lacinia and 5-segmented maxillary palp.

(11) Labium (= second maxilla) consists of submentum, mentum, prementum, palpiger, paraglossa, glossa and three jointed labial palp.

(12) Glossa and paraglossa are together called lingula. They push the masticated food into buccal cavity.

(13) A common salivary duct opens at the base of the hypopharynx.

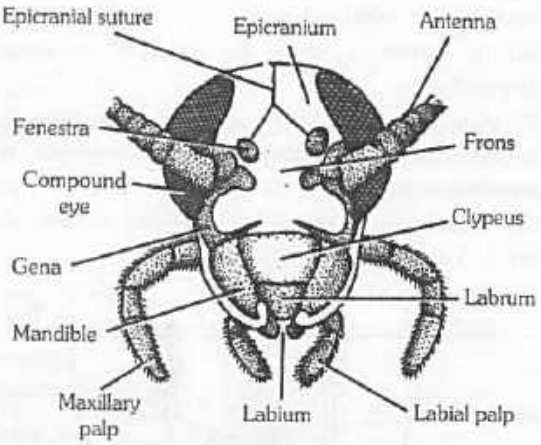


Fig : 1.7-41 *Periplaneta* - head

(14) Each leg is formed by five segments, viz, coxa, trochanter, femur, tibia and tarsus (tarsus is made by five tarsomeres). Attached to the last tarsomere called pretarsus and it bears, a soft lobe called arolium or pulvilus and a pair of claws is present. They are helpful in moving on smooth surfaces. Plantulae are present on tarsus and act as thermoreceptors.

(15) The most swollen segment in the leg of cockroach is coxa. The longest segment in the leg of cockroach is tibia.

(16) In adult cockroach abdomen is made up of ten segments. But in embryonic stage eleven segments are present. The 11th segment of embryo is represented in adult by podical plates.

(17) In male cockroach, eighth and ninth terga are overlapped by seventh tergum. In female seventh, eighth and ninth sterna are fused to form a brood pouch. Seventh sternum of brood pouch forms a pair of gynavalvular plates.

(18) Anal cerci bear minute sensory hairs which are sensitive to sound and other vibrations.

(19) Anal cerci, a pair of many jointed structures are present on the tergite of 10th segment in both sexes.

(20) Anal styles, a pair of small, spine-like unjointed structures are present on sternite of 9th segment in males only.

(21) Cockroach has two pairs of wings. The first pair (mesothoracic) are thick, hard and leathery, protective in function called tegmina (= elytra). Second pair (metathoracic) are thin, soft and membranous.

(22) Cockroach does not fly, but the wings help in escaping from danger.

(23) Body wall of cockroach is made up of two layers, outer cuticle and inner hypodermis.

(24) Cuticle is invaginated forming endoskeletal elements like tentorium in head and apodemes in thorax. They provide sites for attachment of muscles. The cuticle has three distinct layers, outer primary cuticle or epicuticle, middle thick exocuticle and inner thick endocuticle.

(25) Hypodermis is a single layered epithelium. Some of its cells are modified into large oval trichogen cells concerned with secretion of movable bristles on the body of cockroach.

(26) The body cavity of cockroach is a haemocoel, filled with blood.

(27) The alimentary canal of cockroach is divisible into three parts, viz, foregut, midgut and hindgut.

(28) Foregut (stomodaeum) is differentiated into five parts – buccal chamber, pharynx, oesophagus, crop and gizzard. Gizzard is muscular and internally provided with six cuticular teeth which crush the food.

(29) Midgut (mesenteron or ventriculus) is short, tubular, lined with glandular endoderm. At anterior end of mesenteron there are eight blind glandular hepatic caecae which secrete digestive enzymes. Internally mesenteron is not lined by cuticle but it is covered by a very thin and transparent peritrophic membrane formed of chitin and proteins.

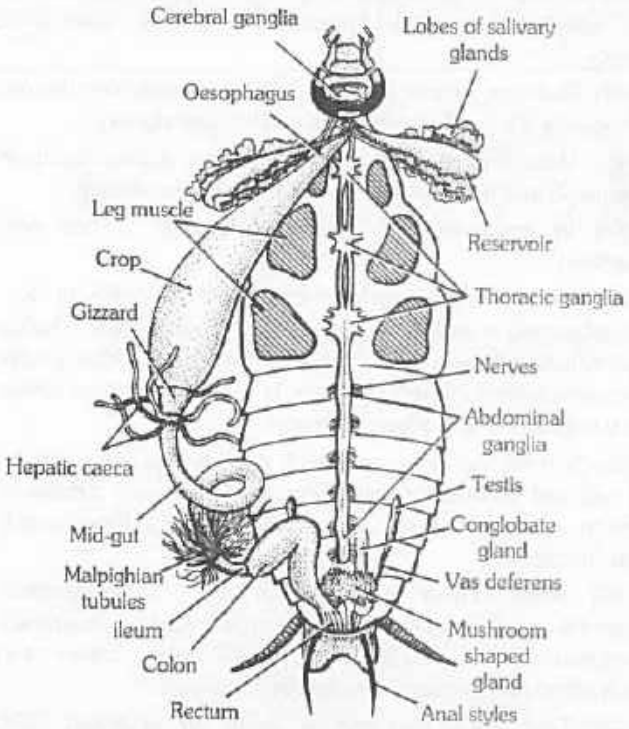


Fig : 1.7-42 *Periplaneta* - Alimentary canal

(30) A stomodaeal valve is present between gizzard and mesenteron.

(31) Hindgut (proctodaeum) comprises ileum, colon and rectum. The wall of rectum is provided with six rectal papillae, which help in the absorption of water and salts.

(32) At the junction of foregut and midgut seven or eight finger like structure are present called hepatic caecae.

(33) Cockroach is omnivorous, feeds on all sorts of organic debris. The digestive enzymes of saliva are mainly zymase and amylase. Most of the nutrients of food are digested in the crop Digested food is absorbed in the mesenteron and hepatic caecae.

(34) Circulatory system in cockroach is of open type or lacunar type. In this type blood is always in direct contact with tissues. The blood flow through haemocoelic system.

(35) The heart is situated in pericardial sinus over the dorsal diaphragm.

(36) Heart of cockroach is neurogenic and longitudinaly beaded with 13 chambers perforated by ostia having valves.

(37) The blood circulation is maintained by 13 pairs of wing-shaped involuntary alary muscles.

(38) Blood (or haemolymph) is colourless due to the absence of respiratory pigment. Hence it does not take part in respiration. Blood is composed of plasma and colourless blood cells called haemocytes.

(39) In cockroach oxygen is carried to individual cell without participation of blood. All body tissue receive oxygen directly.

(40) Respiratory system of cockroach consists of tracheal system. The tracheal system opens outside by ten pairs of spiracles (two pairs thoracic and eight pairs of abdominal). The spiracles are with valves.

(41) The first thoracic and first abdominal spiracles remain open all the times. The trachea is lined with spiral thickening of cuticle called intima which prevents the tracheal tubes from collapsing.

(42) Excretory organs of cockroach are Malpighian tubules which open at the junction of midgut and hindgut (ileum).

(43) Malpighian tubules absorb excretory substances from haemolymph and fat bodies and pass into the proctodaeum.

(44) In cockroach chief excretory product is uric acid (uricotelism).

(45) Fat body of cockroach contains mainly four types of cells. viz., trophocytes, mycetocytes, oenocytes and urate cells. The fat body is functionally analogous to liver of vertebrates. Mycetocytes contain symbiotic bacteria which help in synthesis of some amino acids, vitamins and of glycogen from glucose.

(46) Nervous system of cockroach consists of a nerve ring (in the head) and a double ventral nerve cord. The total number of ganglia in ventral nerve cord of cockroach is nine (Three thoracic and six abdominal).

(47) Sense organs in cockroach are – Photoreceptors (compound and simple eyes), thigmoreceptors (antennae), chemoreceptors (on maxillary and labial palps, labium and hypopharynx) and auditory receptors on anal cerci.

(48) Each compound eye is made up of about 2000 functional units called ommatidia.

(49) Each ommatidium is composed of a cuticular lens, two corneagen cells, a crystalline cone surrounded by four cone cells, a rhabdome surrounded by seven retinular cells and a basement membrane.

(50) There are two types of vision in insects, mosaic vision or apposition image during day time and superposition or dull image in dim light.

(51) The vision in cockroach is called mosaic vision because in cockroach, pigment sheath of ommatidia is non-contractile so capable of only mosaic vision even during night.

(52) Simple eye of cockroach is mainly concerned with light collecting rather than image forming.

(53) In cockroach the endocrine organs are cardiac, corpora allata and prothoracic glands.

(54) Corpora cardica and corpora allata are attached to the brain. Corpora allata is neurosecretory and secretes juvenile hormone or neotinin.

(55) Intercerebral glands in brain secrete the brain hormone. Brain hormone stimulates the prothoracic glands to secrete a moulting hormone called ecdysone.

(56) In cockroach, sexes are separate, so dioecious or unisexual animal.

(57) Male organs consist of testes, vasa deferentia, ejaculatory duct, mushroom or utricular gland, phallic or conglobate gland and male gonaphophysis.

(58) Testes of cockroach are located in the abdominal segments 4, 5 and 6. They produce sperms.

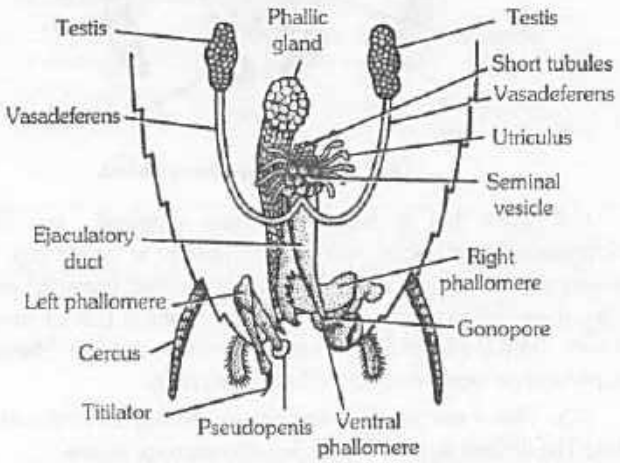


Fig : 1.7-43 *Periplaneta* - Male reproductive organs

(59) All sperms of a seminal vesicle are glued together into a large bundle called spermatophore. Spermatophore has three-layered wall. Inner layer secreted by utriculi majores; middle layer secreted by ejaculatory duct and outer layer secreted by phallic gland.

(60) There are three asymmetrical chitinous structures called male gonapophyses or phallomeres. Right phallomere has serrated edges and a hook; left phallomere has an asperate lobe, pseudopenis and a hooked titillator and ventral phallomere is simple.

(61) Female organs consist of ovaries, oviducts, vagina, genital chamber, spermathecae, colleterial glands and female gonapophysis (ovipositor processes). Ovaries of cockroach are located in the abdominal segments 2 to 6. Each ovary is made up of eight ovarioles.

(62) Oviducts fuse to form a common oviduct or vagina. It opens into gynatrium. Gynatrium opens out through female gonopore.

(63) Collaterial glands opens into gynatrium through a common pore. Left collaterial gland secrete HCl and scleroprotein and right gland secrete hydroxy phenol. Ootheca of cockroach is formed of a protein secreted by collaterial glands.

(64) A pair of spermathecae (left larger pyriform sac) are present near female genital pore. They store spermatophores received during copulation.

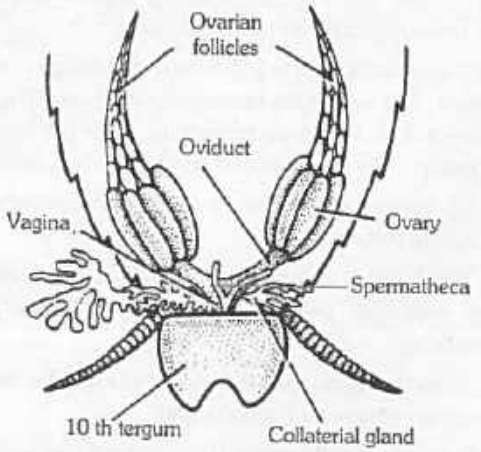


Fig : 1.7-44 Cockroach -Female reproductive organs

(65) Near the female gonopore three pairs of gonapophyses are present. They are helpful in copulation and in oviposition.

(66) Ootheca of cockroach contains 16 fertilized eggs in two rows (8 + 8). The egg of cockroach is centrolecithal type.

(67) Nymph of cockroach emerges out from ootheca.

(68) Metamorphosis in cockroach is incomplete or paurometabolous type. Metamorphosis is regulated by two hormones, ecdysone secreted by prothoracic glands and juvenile hormone secreted by corpora allata.

Mosquito (*Anopheles*)

(1) Mosquito are inhabitants of damp and marshy places.

(2) The common genera of mosquito are –

Culex (body held parallel to surface while sitting),

Aedes (= *Stegomyia*) (body held parallel to surface while sitting, with black and white striped body),

Anopheles (Body held at an angle to the surface, dark spotted wing).

(3) The body of mosquito is divided into head, thorax and abdomen. Head bears a pair of antennae, compound eyes and mouth parts.

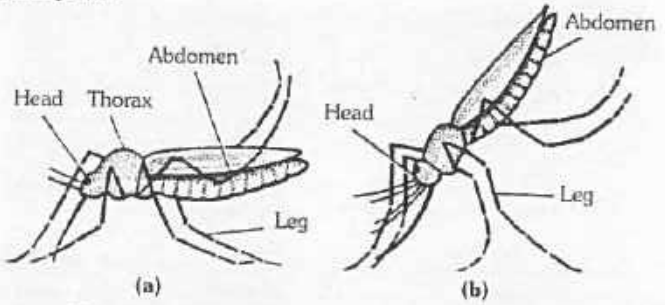


Fig : 1.7-45 Mosquitoes (a) *Culex* (b) *Anopheles*

(4) In adult mosquito, ocelli (simple eyes) are totally absent (in cockroach and housefly, ocelli are present).

(5) Thorax is three-segmented with only one pair of wings (mesothoracic). Metathoracic wings are modified into halteres which are balancing and sound producing structures.

(6) Mosquito shows sexual dimorphism. Sex differentiation can be done on the basis of antennae and maxillary palps. Antenna of a male mosquito is plumose (more hairy or brushy) and female is pilose (with few short hairs).

(7) Female mosquitoes are blood suckers. They have piercing and sucking mouthparts. Males feed on nectar and have only sucking mouthparts.

(8) Mouthparts found in both sexes are – Labrum, epipharynx forming upper lip and labium and proboscis.

(9) The puncturing elements in the mouthparts of female mosquito are maxillae and mandibles.

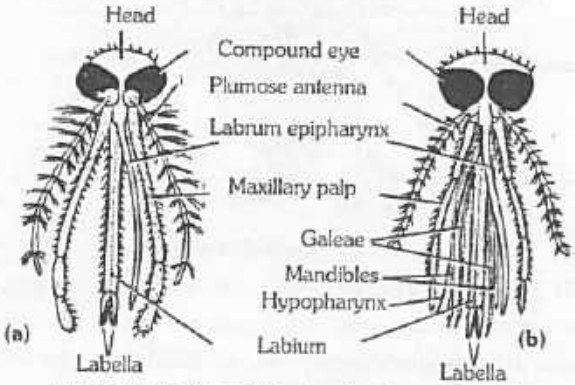


Fig : 1.7-46 *Anopheles* head and mouth parts
(a) Male (b) Female

(10) Mandible are totally absent in male mosquito.

(11) Male and female mosquito copulate while in flight. The eggs are laid by the female in clusters on stagnant water of ponds, ditches, tanks, pools marshy places etc. The eggs develops and from each egg a small transparent larva called wriggler comes out into the water.

(12) Wriggler is a free swimming, active and aquatic larva performing wriggling movements. The body has head, thorax (without legs) and abdomen (9-segmented). Head bears a pair of compound eyes, a pair of simple eyes (absent in adult mosquito), a pair of small antennae.

(13) Wriggler has a lifespan of 3-4 days. During this period it undergoes four moults to give rise to five instar larva.

(14) 5th instar larva changes into a pupa (nonfeeding), it is comma-shaped. The pupa of mosquito is known as tumbler. It has a pair of respiratory trumpets.

(15) After completion of metamorphosis (complete metamorphosis), it will transform into an adult called 'Imago'.

(16) Johnston's organ lies in the second segment of antennae. In male mosquito, it helps to locate females by flight tone.

(17) Spraying of oil on stagnant water controls malaria because mosquito larvae cannot breath and die.

(18) Fish which can be used in biological control of mosquitoes is *Gambusia*.

Housefly (*Musca domestica*)

(1) Housefly belong to the class insecta of the phylum Arthropoda. *Musca domestica* is the most common housefly in Europe and America. The common Indian species in *musca nebulo*.

(2) The body of housefly is divided into head, thorax and adbomen.

(3) Head is large with a pair of compound eyes, each made up about 4000 ommatidia, three ocelli and two antennae.

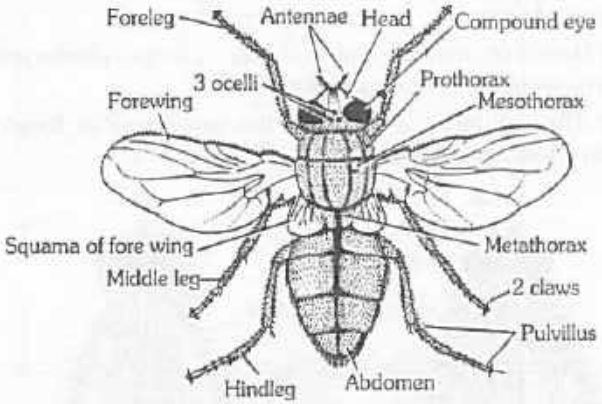


Fig : 1.7-47 *Musca domestica*

(4) Thorax is three segmented with three pairs of legs, one pair of wings (mesothoracic) and a pair of halteres. The halteres are present on metathorax and they are balancing organs during flight and also receive sound stimuli.

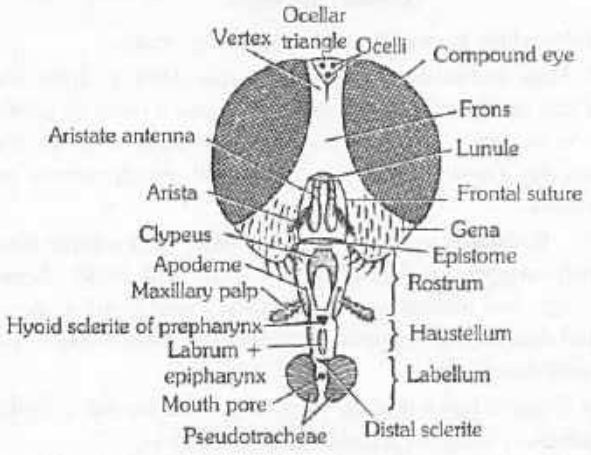


Fig : 1.7-48 Housefly-Head and mouth parts in frontal view

(5) Housefly differs from mosquito in having hindlegs resting on surface while sitting.

(6) The mouth parts of the common housefly are sponging type which are adapted for sucking liquid or semiliquid.

(7) Labium is the most developed part of mouthparts forming the proboscis. The proboscis consists of three region – Rostrum, Haustellum, Labellum.

(8) Oral groove is found on haustellum cantaining blade-like hypopharynx and flattened labrum and epipharynx.

(9) Pseudotracheae are found in labellum.

(10) In the mouth parts of housefly, mandibles are totally absent.

(11) House flies are saprophagus, feed upon all sorts of dead organic matter.

(12) The breeding season of housefly lasts from march to october (summer and rainy season).

(13) Housefly lays eggs on decaying organic matter such as cow dung, horse manure, human faeces etc.

(14) A larval stage occurs in housefly that lives in dung and is called maggot. This larva undergoes moulting twice. The period in between two moults is known as stadium while the form of larva are called instar. Thus there are two moult and three instars.

(15) The first instar has only one pair of posterior abdominal spiracles. So it is metapneustic.

(16) The second instar larva of housefly has one pair of abdominal and one pair of prothoracic spiracles. So it is amphipneustic.

(17) Different stages in the life history of housefly are – Egg → Larva (maggot) → pupa → Imago (adult).

(18) Larva of housefly respires by means of tracheae.

(19) An imago (young one of housefly) will come out after 4-5 days.

(20) Housefly shows a complete metamorphosis (holometabolous type).

Table : 1.7-7 Common Names

Limulus	–	King carb
Palamnaeus	–	Scorpion
Lycosa	–	Spider
Astacus	–	Crayfish
Daphnia	–	Waterflea
Palaemon	–	Freshwater prawn
Palinurus	–	Lobster
Lucifer	–	Shrimp
Carcinus	–	Crab
Eupagurus	–	Hermit crab
Balanus	–	Rock barnacle
Julus	–	Millipede
Scolopendra	–	Centipede
Lepisma	–	Silverfish
Carasius	–	Stick insect
Phyllium	–	Leaf insect
Pediculus	–	Louse
Cimex	–	Bedbug
Xenopsylla	–	Rat flea
Drosophila	–	Fruitfly
Musca	–	Housefly
Phlebotomus	–	Sandfly
Glossina	–	Testse fly
Bombyx	–	Silkmoth

Phylum Mollusca – The soft bodied animals

(L., *Mollis* or *Molluscus* = Soft bodied)

Brief History : Aristotle described a number of molluscs. Johnston (1650) proposed the name of the phylum.

General characters

(1) Molluscs are multicellular organisms.

(2) They are mostly marine.

(3) They have a bilateral symmetry, but snails are asymmetrical.

(4) They are triploblastic animals.

(5) They are coelomate animals. True coelom is reduced and haemocoel is well developed in them.

(6) They have organ system grade of organization.

(7) The body is soft and unsegmented.

(8) The soft body is covered by a fleshy fold of the body wall. It is called mantle.

(9) The molluscs are provided with one or two calcareous shells. The shells may be external or internal, univalve or bivalve.

(10) Respiration is carried out by the gills or pulmonary chambers.

(11) The digestive system is well developed. It contains a radula and a hepatopancreas.

(12) The circulatory system is of an open type. Blood with amoebocytes, respiratory pigment is copper containing haemocyanin dissolved in plasma.

(13) The excretory organ is the kidney (organ of Bojanus).

(14) The nervous system is well developed with paired ganglia, commissures and connectives.

(15) The sensory organs are eyes, statocysts and osphradia (a chemoreceptor to test chemical nature of water).

(16) Reproduction is sexual. Sexes are separate in them, or they are hermaphrodites.

(17) The development in their case is either direct or indirect with free larval forms like trochophore, veliger, glochidium, etc.

Classification of Mollusca : On the basis of body shape and symmetry and characteristics of foot mantle, respiratory organs, nervous system, etc. phylum mollusca are divided into seven classes :

Class 1. Monoplacophora

(1) The body is bilaterally symmetrical and segmented.

(2) The shell is formed of a single valve.

(3) The head is without eyes and tentacles.

(4) The gills are external and serially arranged.

(5) The nephridia are five pairs.

Example : *Neopilina galathea*

❑ Neopilina is a living fossil and connecting link between Annelida and Mollusca.

Class 2. Aplacophora or Solenogasters

(1) The body is worm–like, bilaterally symmetrical and cylindrical.

(2) The head, mantle, foot, shell and nephridia are absent.

(3) The body is covered with spicule–bearing cuticle.

(4) The digestive tract is straight with radula.

(5) A mid dorsal longitudinal keel or crest is often present .

Example : *Neomenia, Chaetoderma*, etc.,

Class 3. Polyplacophora

(1) These molluscs are bilaterally symmetrical, and dorsoventrally flattened.

(2) Head small, without eyes and tentacles.

(3) The shell is composed of a longitudinal series of 8 plates.

(4) The foot is flat and ventral.

(5) The radula is well developed.

(6) Respiration by 8 to 60 pairs of gills.

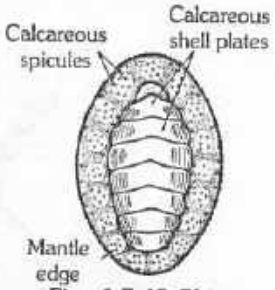


Fig : 1.7-49 *Chiton*

(7) Unisexual; only one gonad; trochophore larval stage.

Example : *Chiton, Cryptochiton*, etc.

❑ On the dorsal surface of chiton is a convex shell composed of 8 transversely elongated calcareous plates arranged in a longitudinal manner.

Class 4. Gastropoda

(1) It is the largest class of Mollusca.

(2) It seems that these animals are moving on their stomach, hence the name gastropoda.

(3) Gastropods are marine, fresh water or terrestrial animals. A few are parasitic.

(4) The body is unsegmented and asymmetrical.

(5) The shell is univalve and spirally coiled due to torsion.

(6) The head is distinct. It bears tentacles, eyes and a mouth.

(7) The foot is ventral and muscular.

(8) The buccal cavity is provided with a radula.

(9) The circulatory system is open.

(10) Respiratory organs are gills (ctinidia), or pulmonary sac or both.

(11) Nervous system usually with four pairs of ganglia.

(12) The sexes are mostly separate, while some forms are hermaphrodite.

(13) The development includes veliger and trochophore larvae.

Examples : *Haliotis, Cypraea, Pila, Murex, Aplysea, Doris, Limax, Patella*, etc.

❑ *Limax* is a terrestrial gastropod. It creeps on a self-secreted tract.

❑ *Doris* is a marine gastropod, commonly called true limpet. It has an aspidobranch gill.

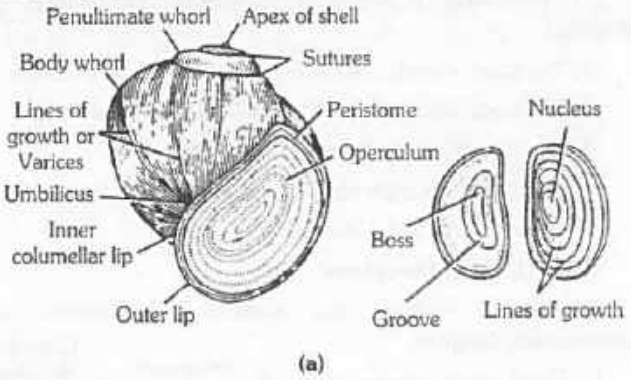


Fig : 1.7-50 (a) *Pila globosa* (b) *Aplysia*

Class 5. Scaphopoda

(1) It is the small group of marine molluscs.

(2) The foot is boat–shaped.

(3) The eyes, the tentacles and ctenidia are absent.

(4) Marine, bilaterally symmetrical molluscs.

Examples : *Siphonodentalium Dentalium*, and *Pulsellum*

❑ Dentalium is commonly called tusk shells.

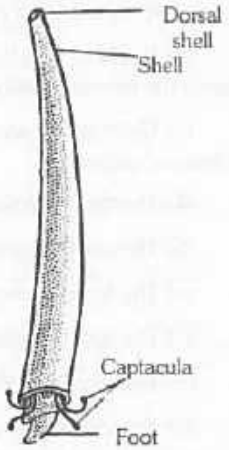


Fig : 1.7-51 *Dentalium*

Class 6. Pelecypoda or Bivalvia or Lamellibranchiata

(1) Pelecypoda are aquatic in habit.

(2) The body is bilaterally symmetrical and laterally compressed.

(3) The shell is formed of two distinctive shell plates.

(4) The head is not distinct.

(5) The alimentary canal shows a crystalline style.

(6) The gills, excretory organs and the other structures are paired.

(7) The sexes are separate or united.

(8) The development is indirect having a glochidium larva.

Example : *Mytilus, Unio, Teredo, Lamellidens, Solen, Pecten, Punctada*, etc.

❑ *Teredo* bores through wood of ship but is without segmentation.

❑ Pearl oysters belongs to the class pelecypoda.

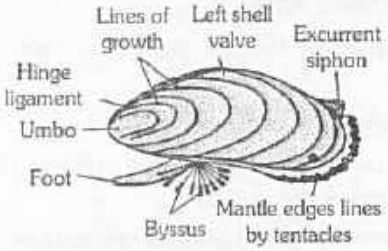


Fig : 1.7-52 *Mytilus*

Class 7. Cephalopoda or Siphonopoda

(1) Most developed, marine and actively swimming by ejecting jets of water through exhalent siphon of mantle.

(2) The body is bilaterally symmetrical.

(3) The foot is modified into arms and funnel.

(4) The shell may be either absent or rudimentary; it may be internal or external.

(5) Nervous system is highly developed.

(6) The odonotophore with a radula is present.

(7) The ink-gland is present.

(8) The sexes are separate.

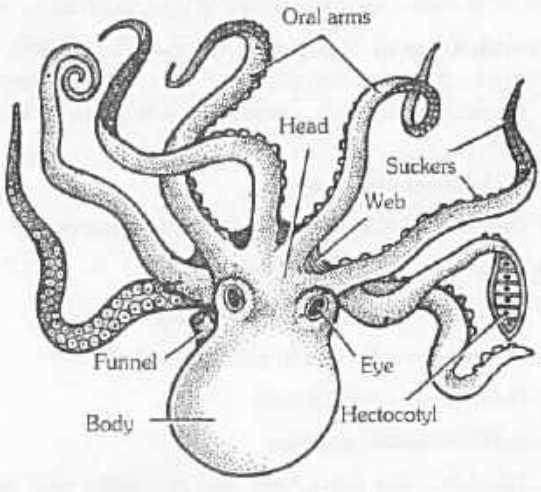
(9) The development is direct hence no metamorphosis and larval stage.

Example : *Nautilus, Loligo Sepia, Octopus*, etc.

❑ *Nautilus* has an external coiled and chambered shell.

❑ *Octopus* has good learning power and can be trained.

❑ Members of genus Architeuth are known as giant squid and are largest living invertebrates.



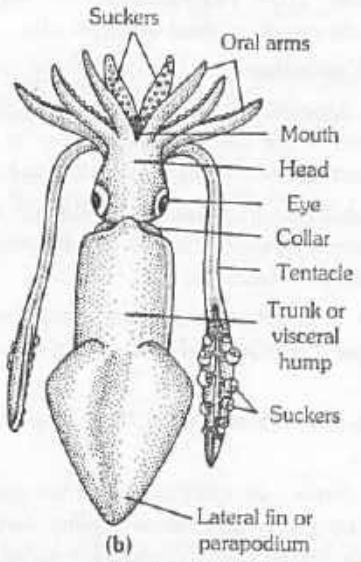


Fig : 1.7-53 (a) *Octopus* (b) *Sepia*

Table : 1.7-8 Common Names

Chiton	–	Sea mica (Mail shell)
Dentalium	–	Tusk shell
Patella	–	Limpet
Fissurella	–	Key-hole limpet
Trochus	–	Top shell
Pila	–	Apple snail
Crepidula	–	Slipper shell
Cypraea	–	Cowrie
Natica	–	Star shell
Buccinum	–	Whelk
Doris	–	Sea lemon
Aplysia	–	Sea hare
Turbo	–	Cat's eyes
Vermetes	–	Worm shell
Nassa	–	Mud shell
Conus	–	Cone shell
Bulla	–	Bubble shell
Helix	–	Land snail
Limax	–	Slug
Pteropod	–	Sea butterfly
Unio	–	Freshwater mussel
Mytilus	–	Sea mussel
Spondylus	–	Edible oyster
Pinctada	–	Pearl oyster
Pecten	–	Scallop
Teredo	–	Shipworm
Solen	–	Razor clam
Sepia	–	Cuttlefish
Loligo	–	Squid (sea arrow)
Octopus	–	Devilfish
Spirula	–	Spiral shell
Architeuthis	–	Giant squid

Phylum Echinodermata – The spiny skinned animals

(Gk. *echinos* = spines; *derma* = skin/covering)

Brief History : Although Jacob Klein (1738) had earlier coined the name "Echinodermata", yet Linnaeus included these animals under "Mollusca", and Lamarck under his class "Radiata" as "Echinodermes". Finally, Leuckart (1847) raised the group to the status of a separate phylum.

General characters

(1) Echinoderms are exclusively marine beings.

(2) They are triplobalstic and coelomate (enterocoetomate) animals.

(3) They have radially symmetrical body. The radial symmetry is due to sedentary or sessile mode of life and it is a secondary character in echinoderms.

(4) They have organ system grade of organization.

(5) They have well developed endoskeleton formed of calcareous ossicles and spines.

(6) They have a water-vascular system (Ambulacral system) with tube-feet for locomotion, feeding and respiration.

(7) Circulatory system is of the open-type.

(8) Respiratory organs include dermal branchiae, tube feet, respiratory tree and bursae.

(9) Nervous system is complex and contains both central and peripheral components, but no brain.

(10) The sensory organs are poorly developed.

(11) The excretory organs are absent.

(12) They have pedicellariae.

(13) Development is indirect.

(14) The larval forms are bilaterally symmetrical.

(15) Regeneration power is well developed in Echinoderms.

Classification of Echinodermata : On the basis of body shape, position of madreporite and kind of larval form, echinoderms are classified into two subphylum.

Subphylum (I) Eleutherozoa : Free-living echinoderms with ventral mouth.

Class 1. Asteroidea

(1) Starfishes or sea stars.

(2) Arms 5 or more and not sharply marked off from the central disc.

(3) Tube feet in orally placed ambulacral grooves; with suckers.

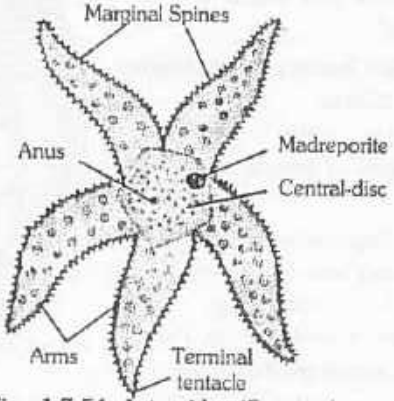


Fig : 1.7-54 Asteroidea (Sea star)

(4) Anus and madreporite aboral.

(5) Pedicellariae present.

(6) Free-living, slow-creeping, predaceous and scavengerous.

Examples : *Astropecten, Luidia, Goniaster, Oreaster* (= *Pentaceros*), *Asterina, Solaster, Pteraster, Echinaster, Asterias, Heliaster*, etc.

Class 2. Ophiuroidea

(1) Brittle-stars and allies.

(2) Body star-like with arms sharply marked off from the central disc.

(3) Pedicellariae absent.

(4) Stomach sac-like; no anus.

(5) Ambulacral grooves absent or covered by ossicles; tube feet without suckers.

(6) Madreporite oral.

Examples : *Ophiura, Ophiothrix, Ophioderma, Ophiopholis, Gorgonocephalus, Asteronyx.*

Class 3. Echinoidea

(1) Body not divided into arms; globular (sea urchins), or flattened disc-like (sea-cakes).

(2) Mouth at lower pole, covered by 5 strong and sharp teeth, forming a biting and chewing apparatus called "Aristotle's Lantern".

(3) Tube-feet slender with suckers.

(4) Skin ossicles fused to form a rigid globular, disc like, or heart-shaped shell or test with movable spines.

(5) 3-jawed pedicellariae present in skin.

(6) Gut long, cylindrical and coiled. Anus present.

(7) Larval forms pluteus and Echinopluteus.

Examples : *Echinus, Clypeaster, Echinarachinus, Echinocardium*, etc.

❑ Members of Echinoidea are also known as Floating stone.

Class 4. Holothuroidea

(1) Body massive, long and cylindrical like a cucumber; elongated in oral-aboral axis; no arms.

(2) Mouth at anterior and anus at posterior ends.

(3) Mouth surrounded by many hollow retractile tentacles.

(4) Tube feet usually present; sucker-like.

(5) Skin leathery, but relatively soft, without spines or pedicellariae; may have an endoskeleton of minute calcareous ossicles.

(6) Respiration and excretion by two long and highly branched tubes (= respiratory tree) extending into coelom from cloaca.

(7) Larval form Auricularia.

Examples – *Holothuria, Cucumaria etc.*

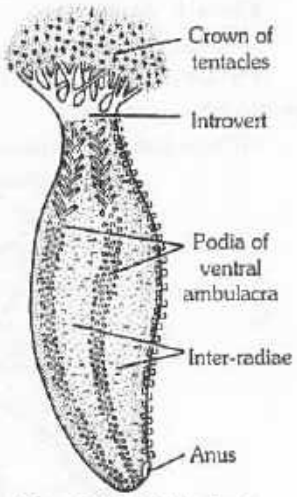


Fig : 1.7-55 *Holothuria*

Subphylum (II) Pelmatozoa : Stalked, sedentary echinoderms, with mouth situated on upper side.

Class 1. Crinoidea

(1) Body flattened and pentamerous; distinguished into a small and circular central disc and five or more (in multiples of five) long, then, branched and flexible arms radiating from the disc.

(2) Disc enclosed in a hard, cup-shaped calyx formed of calcareous plates; calyx attached to a substratum by a stalk or simply by its aboral surface.

(3) Mouth in middle and anus excentral upon a cone, both upon oral surface. 5 ambulacral grooves run from mouth upto the tips of the arms.

(4) Tube feet sucker-like; restricted to central disc; can help in food-collection.

(5) Some forms (sea-lilies) permanently sessile and attached to sea-bottom by a long stalk; others (feather stars) free-swimming, but have flexible cirri for gripping objects in water.

(6) Spines and pedicellariae absent in skin.

Examples : *Antedon, Neometra*, etc.

Table : 1.7-9 Common Names

Asterias	–	Starfish
Astropecten	–	Starfish
Pentaceros	–	Sea pentagon
Ophiothrix	–	Brittle star
Gorgonocephalus	–	Basket star
Echinus	–	Sea urchin
Echinocardium	–	Heart urchin
Clypeaster	–	Sand dollar
Cucumaria	–	Sea cucumber
Antedon	–	Feather star

Phylum Chordata

General Characters

(1) Aquatic, aerial or terrestrial. All free-living with no fully parasitic forms.

(2) Body small to large, bilaterally symmetrical and metamerically segmented.

(3) A post anal tail usually projects beyond the anus at some stage and may or may not persist in the adult.

(4) Exoskeleton often present; well developed in most vertebrates.

(5) Body wall triploblastic with 3 germinal layers : ectoderm, mesoderm and endoderm.

(6) Coelomate animals having a true coelom, enterocoelic or schizocoelic in origin.

(7) A skeletal rod, the notochord, present at some stage in life cycle.

(8) A cartilaginous or bony, living and jointed endoskeleton present in the majority of members (vertebrates).

(9) Pharyngeal gill slits present at some stage; may or may not be functional.

(10) Digestive system complete with digestive glands.

(11) Blood vascular system closed. Heart ventral with dorsal and ventral blood vessels. Hepatic portal system well developed.

(12) Excretory system comprising proto-or meso- or meta-nephric kidneys.

(13) Nerve cord dorsal and tubular. Anterior end usually enlarged to form brain.

(14) Sexes separate with rare exceptions.

Classification of chordata : Phylum chordata can be divided into two groups: Acrania (Protochordata) and Craniata (Euchordata) having contrasting characters.

Group A. Acrania (Protochordata) : (Gk. *a* = absent; *kranion* = head,) or, (Gk. *protos* = first; *chorde* = cord). All marine, small, Primitive or lower chordates. Lacking a head, a skull or cranium, a vertebral column, jaws and brain. About 2,000 species. The Acrania is divided into three subphyla: *Hemichordata, Urochordata* and *Cephalochordata*, chiefly on the character of notochord present.

Subphylum I. Hemichordata : (Gk. *hemi* = half; *chorde* =cord). Body divided into 3 regions: Proboscis, collar and trunk. Notochord doubtful, short, confined to proboscis and non–homologous with that of chordates.

Class 1. Enteropneusta : (Gk. *enteron* = gut; *pneustos* = breathed). Body large and worm-like. Gill slits numerous. Intestine straight. Acorn or tongue worms. 70 species. *e.g. Balanoglossus, Saccoglossus*.

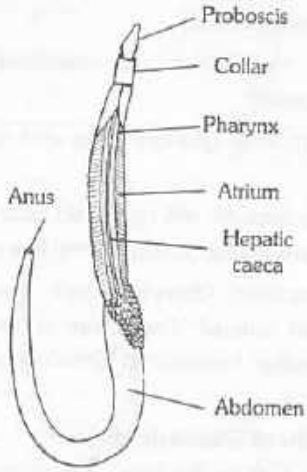


Fig : 1.7-56 Balanoglossus

Class 2. Pterobranchia : (Gk. *pteron* = feather; *branchion* = gill). Body small and compact. Gill-slits one pair or none. Intestine U-shaped. Pterobranchs. 20 species. *e.g. Cephalodiscus, Rhabdopleura*.

Subphylum II. Urochordata or Tunicata : (Gk. *oura* = a tail;) (L. *chorda* = cord). Notochord and nerve cord only in tadpole-like larva. Adult sac-like, often sessile and encased in a protective tunic. Tunicates.

Class 1. Ascidiacea : Sessile tunicates with scattered muscles in tunic. Solitary, colonial or compound. Gill-clefts numerous. Ascidians or sea squirts. 1,200 species. *e.g. Herdmania, Ciona, Molgula*.

❑ Retrogressive metamorphosis present in Herdmania.

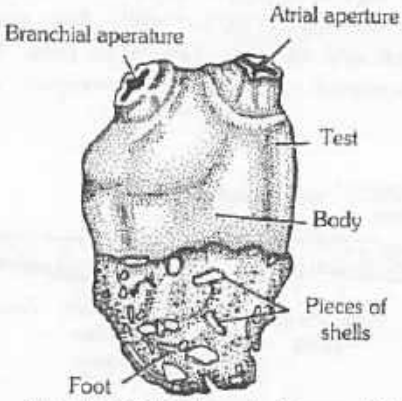


Fig : 1.7-57 Herdmania (Sea-squirt)

Class 2. Thaliacea : Free-swimming or pelagic tunicates with circular muscles in tunic. Sometimes colonial. Salps or chain tunicates. 30 species. *Salpa, Doliolum, Pyrosoma*.

Subphylum III. Cephalochordata : (Gk. *kephale* = head;) or (L. *chorda* = cord). Notochord and nerve cord present throughout life along entire length of body.

Class Leptocardii : Body fish-like, segmented with distinct myotomes and numerous gill-slits. Free swimming and burrowing. Lancelets. 30 species. *e.g. Branchiostoma* (= *Amphioxus*), *Asymmetron*.

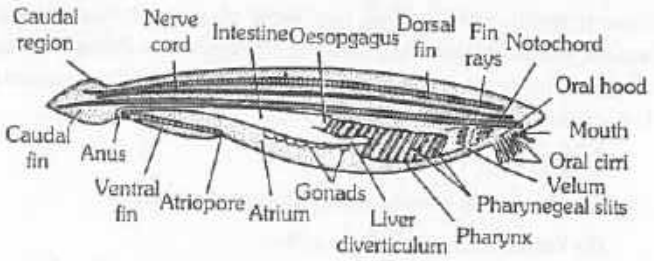


Fig : 1.7-58 *Amphioxus*

Group B. Craniata (Euchordata) : Aquatic or terrestrial, usually large-sized, higher chordates or vertebrates with distinct head. Notochord is embryonic, in adult replaced by vertebral column. Jaws and brain protected by a skull or cranium. The Craniata includes a single subphylum, the vertebrata.

Subphylum IV. Vertebrata : (L. *vertebratus* = backbone). Notochord supplemented or replaced by a vertebral column or backbone composed of overlapping vertebrae. Body divisible into head, neck, trunk and tail. Usually dioecious. Vertebrates, largest chordate subphylum including about 46,500 species. The subphylum Vertebrata is divided into two divisions: Agnatha and Gnathostomata, with contrasting characters as follows;

Division I. Agnatha : (Gk. *a*, not; gnathos, jaw). Jaw less primitive fish-like vertebrates without true jaws and paired limbs.

Class 1. Ostracodermi. (Gk. *ostrakon* = shell; *derma* = skin). Several extinct orders of ancient primitive heavily armoured, Palaeozoic, world's first vertebrates, collectively called the ostracoderms. *e.g. Caphalaspis, Drepanaspis.*

Class 2. Cyclostomata. (Gk. *cyklos* = circular; *stoma* = mouth). Body eel-shaped, without scales, jaws and lateral fins. Mouth rounded and suctorial. Gills 5–16 pairs. Parasites and scavengers. 45 species. *e.g.* Lampreys (*Petromyzon*) and hagfishes (*Myxine*).

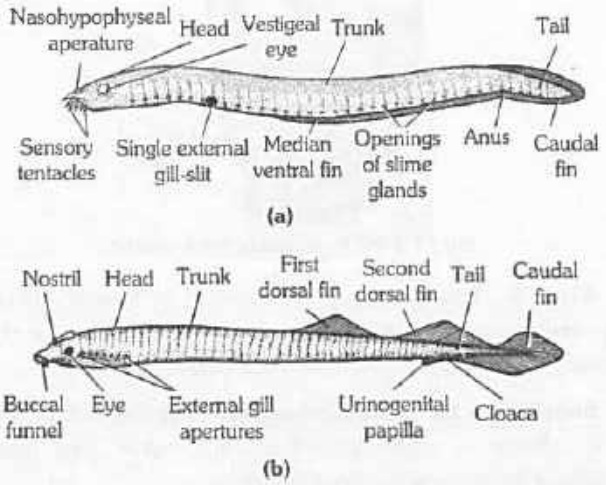


Fig : 1.7-59 (a) *Myxine* (b) *Petromyzon*

Division II. Gnathostomata : (Gk. *gnathos* = jaw; *stoma* = mouth). Jawed vertebrates having true jaws and paired limbs.

For convenience, some taxonomists further divide Gnathostomata division into two super classes. All the fishes like aquatic gnathostomes are placed in the superclass Pisces, whereas all the four-footed terrestrial gnathostomes in the superclass Tetrapoda. Their contrasting features are as follows:

Superclass 1. Pisces

(1) Exclusively aquatic gnathostome vertebrates.

(2) Paired limbs, if present, as fins.

(3) Median fins present

(4) Skin usually moist and scaly

(5) Respiration aquatic, by gills

(6) Sense organs functional in water

(7) It consist of fishes only.

Superclass 2. Tetrapoda

(1) Aquatic or terrestrial. Some arboreal and aerial

(2) Paired pentadactyle limbs present

(3) Median fins absent

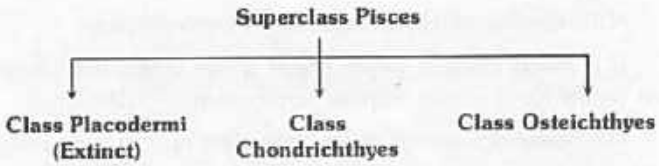
(4) Skin usually dry and cornified

(5) Respiration aerial, by lungs

(6) Sense organs functional in air.

(7) It consist of classes Amphibia, Reptilia, Aves and Mammals.

Superclass Pisces



Class 1. Chondrichthyes (The Cartilaginous Fishes)

(Gk. *chondros* = cartilage; *ichthys* = fish)

General characters.

(1) Mostly marine and predaceous.

(2) Body fusiform or spindle shaped.

(3) Fins both median and paired, all supported by fin rays. Pelvic fins bear claspers in male. Tail heterocercal.

(4) Skin tough containing minute placoid scales and mucus glands.

(5) Endoskeleton entirely cartilaginous, without true bones. Notochord persistent. Vertebrae complete and separate. Pectoral and pelvic girdles present.

(6) Mouth ventral. Jaws present. Teeth are modified placoid scales. Stomach J-shaped. Intestine with spiral valve.

(7) Respiration by 5 to 7 pairs of gills. Gill-slits separate and uncovered (except, *chimaeras*). Operculum absent. No air bladder and lungs.

(8) Heart 2–chambered (1 auricle and 1 ventricle). Sinus venosus and conus arteriosus present. Both renal and portal systems present. Temperature variable (poikilothermous or cold blooded or ectothermal animal.

(9) Kidneys mesonephric or opisthonephric. Excretion ureotelic. Cloaca present.

(10) Brain with large olfactory lobes and cerebellum. Cranial nerves 10 pairs.

(11) Olfactory sacs do not open into pharynx. Membranous labyrinth with 3 semicircular canals. Lateral line system present.

(12) Sexes separate. Gonads paired. Gonoducts open into cloaca. Fertilization internal. Oviparous or ovoviviparous. Eggs large, yolky. Cleavage meroblastic. Development direct, without metamorphosis.

Classification of Chondrichthyes

(a) Subclass I. Selachii : (Gk., selachos, a shark)

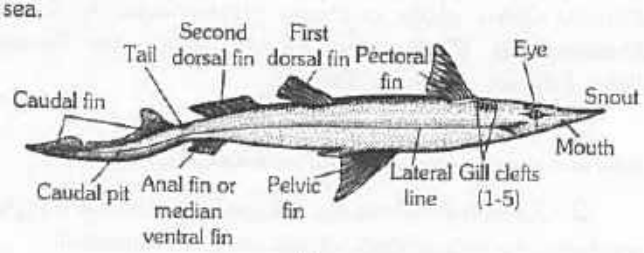
(1) Multiple gill slits on either side protected by individual skin flaps.

(2) A spiracle behind each eye.

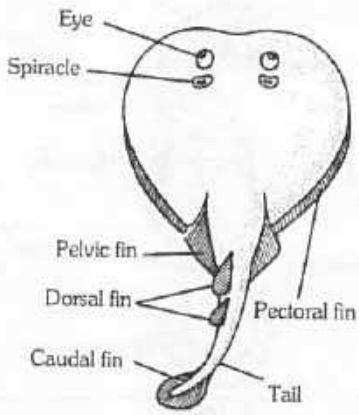
(3) Cloaca present.

Examples : True sharks. Dogfishes (*Scoliodon, Chiloscyllium, Mustelus, Carcharinus*), spiny dogfish (*Squalus*) seven gilled shark (Heptanchus), *Stegostoma, Sphyrna, Rhineodon*. Skates and rays. Skate (*Raja*) *Trygon, Torpedo, Myliobatis, Rhinobatus, Pristis.*

❑ Zebra shark (*Stegostoma*) is the most beautiful fish in the sea.



(a)



(b)

Fig : 1.7-60 (a) *Scoliodon* (b) *Torpedo*

(b) Subclass II. Holocephali : (Gk., holos, entire + kephale, head)

(1) Single gill opening on either side covered by a fleshy operculum.

(2) No spiracles, cloaca and scales.

(3) Jaws with tooth plates.

(4) Single nasal opening.

(5) Lateral line system with open groove. It serves to detect waves in water current.

Examples : *Hydrolagus* (= *Chimaera*).

Class 2. Osteichthyes–(The Bony fishes)

(Gk. osteon = bone; *ichtyes* = fish)

General Characters

(1) Inhabit all sorts of water-fresh, brackish or salt; warm or cold.

(2) Body spindle-shaped and streamlined.

(3) Fins both median and paired, supported by fin rays of cartilage or bone. Tail usually homocercal.

(4) Skin with may mucus glands, usually with embedded dermal scales of 3 types; ganoid, cycloid or ctenoid. Some without scales. No placoid scales.

(5) Endoskeleton chiefly of bone. Cartilage in sturgeons and some other. Notochord replaced by distinct vertebrae Pelvic girdle usually small and simple or absent. Claspers absent.

(6) Mouth terminal or sub terminal. Jaws usually with teeth. Cloaca lacking, anus present.

(7) Respiration by 4 pairs of gill on body gill arches, covered by a common operculum on either side.

(8) An air (swim) bladder often present with or without duct connected to pharynx. Lung-like in some (Dipnoi).

(9) Ventral heart 2-chambered (1 auricle + 1 ventricle). Sinus venosus and conus arteriosus present. Aortic arches 4 pairs. Erythrocytes oval, nucleated. Temperature variable (poikilothermous).

(10) Adult kidneys mesonephric. Excretion ureotelic.

(11) Brain with very small olfactory lobes, small cerebrum and well developed optic lobes and cerebellum. Cranial nerves 10 pairs.

(12) Well developed lateral line system. Internal ear with 3 semicircular canals.

(13) Sexes separate. Gonads paired. Fertilization usually external. Mostly oviparous, rarely ovoviviparous or viviparous. Eggs minute to 12 mm. Cleavage meroblastic. Development direct, rarely with metamorphosis.

Classification of Osteichthyes

(a) **Subclass I. Sarcopterygii :** (Gk., sarcos = fleshy; pterygium = fin)

(1) Paired fins leg-like or lobed. With a fleshy, bony central axis covered by scales.

(2) Dorsal fins 2. Caudal fin heterocercal with an epichordal lobe.

(3) Olfactory sacs usually connected to mouth cavity by internal nostrils or choanae, hence the previous name of subclass, choanichthyes (Gk. *choana* = funnel; *ichthyes* = fish).

(4) Popularly called fleshy or lobe-finned, or air breathing fish. Divided into 2 superorders or orders: Crossopterygii and Dipnoi.

Order 1. **Crossopterygii :** (Gk. crossoi = a fringe ; *pteryx* = fin)

(1) Paired fins lobate. Caudal fin 3–lobed.

(2) Premaxillae and maxillae present.

(3) Internal nares present or absent. Spiracles present.

(4) Air bladder vestigeal.

Example : Primitive fleshy-finned extinct fishes. Single living genus *Latimeria*.

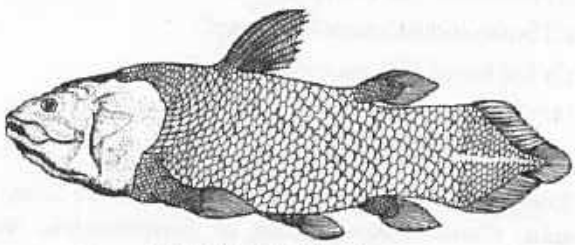


Fig : 1.7-61 *Latimeria*

Order 2. **Dipnoi** : (Gk. *di* = double ; *pnoe* = breathing)

(1) Median fins continuous to form diphycercal tail.

(2) Premaxillae and maxillae absent.

(3) Internal nares present and spiracles absent.

(4) Air bladder single or paired, lung-like

Examples : Lung fishes. Only 3 living genera : *Epiceratodus (Neoceratodus)*, *Protopterus* and *Lepidosiren*

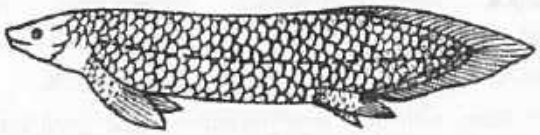


Fig : 1.7-62 *Neoceratodus*

(b) **Subclass II. Actinopterygii** : (Gr. actis = ray; pteryx = fin)

(1) Paired fins thin, broad, without fleshy basal lobes, and supported by dermal fin rays.

(2) One dorsal fin, may be divided.

(3) Caudal fin without epichordal lobe.

(4) Olfactory sacs not connected to mouth cavity.

(5) Popularly called ray-finned fishes. Divided into 3 infraclasses or superorders: Chondrostei, Holostei and Teleostei.

Superorder A. **Chondrostei** : (Gk. chondros = cartilage ; osteon = bone)

(1) Mouth opening large.

(2) Scales usually ganoid.

(3) Tail fin heterocercal.

(4) Primitive ray-finned fish or cartilaginous ganoids.

Examples : *Acepenser* (Sturgeon), *Polyodon* (paddlefish)

Superorder B. **Holostei** : (Gk. holos = entire ; *osteon* = bone)

(1) Mouth opening small.

(2) Ganoid or cycloid scales.

(3) Tail fin heterocercal.

(4) Intermediate ray-finned fish, transitional between Chondrostei and Teleostei

Examples : *Lepisosteus* (garpike)

Superorder C. **Teleostei** – (Gk. *teleos* = complete; *osteon* = bone)

(1) Mouth opening terminal, small.

(2) Scales cycloid, ctenoid or absent.

(3) Tail fin mostly homocercal.

(4) A hydrostatic swim bladder usually present.

(5) Advanced or modern ray-finned fishes

Examples – *Harpodon*, *Cyprinus*, *Labeo rohita*, *Catla*, *Botia*, *Carassius*, *Clarius*, *Heteropneustes* or *Saccobranchus*, *Wallago*, *Mystus*, *Electrophorus*, *Anguilla*, *Muraena* (moray) *Hemirhamphus* (half beak), *Belone* (garfish), Hippocampus (sea horse), *Syngnathus*, *Fistularia Ophiocephalus* or *channa Amphipbnous*, *Symbranchus*. *Mastacembelus*, *Macrognathus*, *Pterois*, *Pleuronectes*, *Synaptura*, *Solea*, *Echeneis* or *Remora*, *Tetrodon*

❑ *Hippocampus* (Sea horse) shows parental care. On the belly of male is a brood pauch for incubating eggs.

❑ *Remora* (*Echeneis*) has modified dorsal fin into a sucker. It attaches to the body of shark, whales, etc. (commensalism).

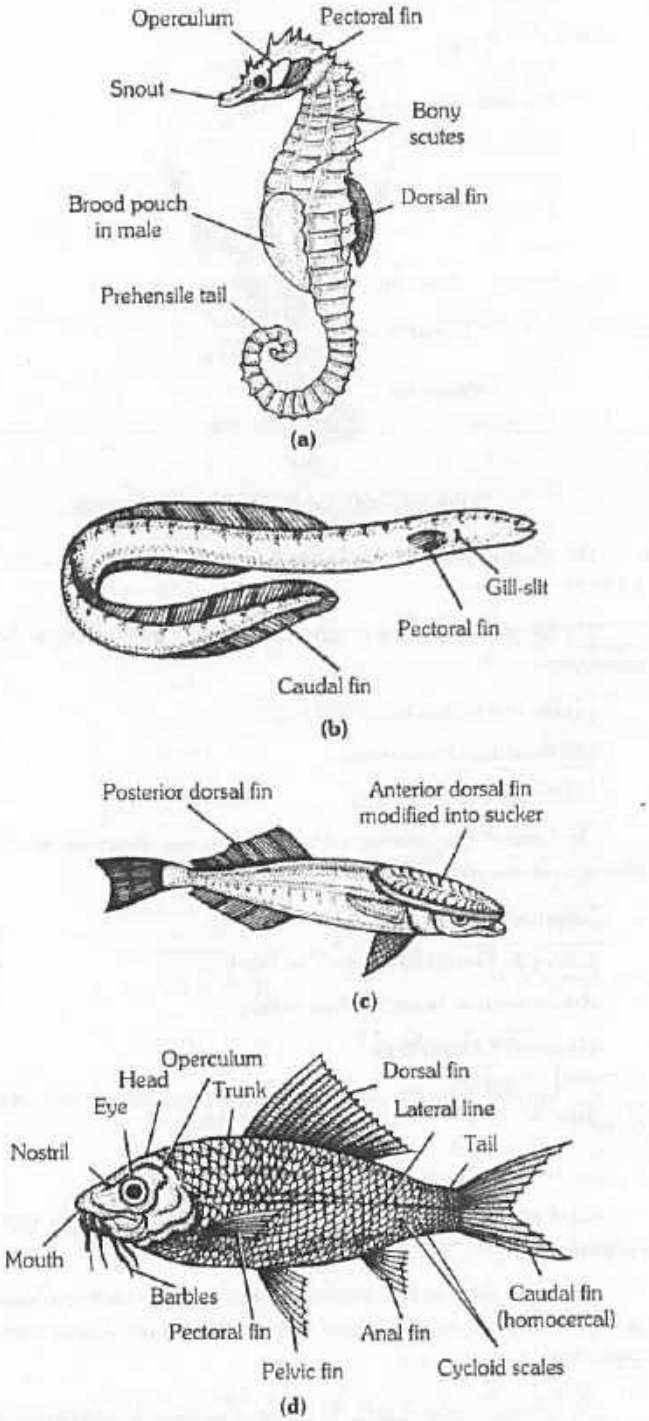


Fig. 1.7-63 : (a) *Hippocampus* (b) *Anguilla* (c) *Echeneis* (d) *Labeo*

Table : 1.7-10 Common Names

Cartilaginous Fishes		
Scoliodon	–	Dogfish (Shark)
Stegostoma	–	Zebra shark (Tigerfish)
Trygon	–	Sting ray
Torpedo	–	Electric ray
Rhinobatus	–	Guitar fish
Pristis	–	Sawfish
Chimaera	–	Rat fish
Bony Fishes		
Clarius	–	Catfish
Echeneis	–	Sucker fish
Hippocampus	–	Sea horse
Gambusia	–	Mosquito fish
Exocoetus	–	Flying fish
Tetradon	–	Globe fish
Diodon	–	Porcupine fish
Cynoglossus	–	Flatfish
Anabas	–	Climbing fish
Labeo rohita	–	Indian carp
Syngnathus	–	Pipe fish
Fistularia	–	Flute fish
Carassius	–	Goldfish
Anguilla	–	Freshwater eel
Oncorhynchus	–	Pacific salmon

Table : 1.7-11 False Fishes

Common Names	Genus	Phylum
1. Jellyfish	*Aurelia*	Coelenterata
2. Silverfish	*Lepisma*	Arthropoda
3. Crayfish	*Astacus*	Arthropoda
4. Razorfish	*Solen*	Mollusca
5. Cuttlefish	*Sepia*	Mollusca
6. Devilfish	*Octopus*	Mollusca
7. Starfish	*Asterias*	Echinodermata
8. Hagfish	*Myxine*	Chordata

Class Amphibia – The vertebrates with Dual life

(Gk. *Amphi* = both; *bios* = Life)

General characters

(1) Aquatic or semi aquatic (freshwater), air and water breathing, carnivorous, cold-blooded, oviparous, tetrapod vertebrates.

(2) Head distinct, trunk elongated. Neck and tail may be present or absent.

(3) Limbs usually 2 pairs (tetrapod), some limb less toes 4-5 (pentadactyle) or less. Paired fins absent. Median fins, if present, without fin rays.

(4) Skin soft, moist and glandular. Pigment cells (chromatophores) present.

(5) Exoskeleton absent. Digits claw less. Some with concealed dermal scales.

(6) Endoskeleton mostly bony. Notochord does not persist. Skull with 2 occipital condyles. *i.e.* Dicondylic skull.

(7) Mouth large. Upper or both jaws with small homodont teeth. Tongue often protrusible. Alimentary canal terminates into cloaca.

(8) Respiration by lungs, skin and mouth lining. Larvae with external gills which may persist in some aquatic adults.

(9) Heart 3-chambered (2 auricles + 1 ventricle). Sinus venosus present. Aortic arches 1-3 pairs. Renal and hepatic portal systems well developed Erythrocytes large, oval and nucleated. Body temperature variable (poikilothermous).

(10) Kidneys mesonephric. Urinary bladder large. Urinary ducts open into cloaca. Excretion ureotelic.

(11) Brain poorly developed. Cranial nerves 10 pairs.

(12) Nostrils connected to buccal cavity. Middle ear with a single rod-like ossicle, columella. Larval forms and some aquatic adults with lateral line system.

(13) Sexes separate. Male without copulatory organ Gonoducts open into cloaca. Fertilization mostly external. Females mostly oviparous.

(14) Development indirect. Cleavage holoblastic but unequal. No extra-embryonic membranes. Larva a tadpole which metamorphoses into adult.

Classification of Amphibia : The living amphibians belong to only 2,500 species, a very much smaller number than that of other principal classes of vertebrates. Ranging from mid-Palaeozoic (Devonian) to early Mesozoic (Triassic). They dominated the World during Carboniferous, but most of them have become extinct since long. The classification most generally followed nowadays was provided by G. Kingsley Noble (1924).

(a) **Subclass I. Stegocephalia (Extinct)** : Limbs pentadactyle. Skin with scales and bony plates. Skull with a solid bony roof leaving openings for eyes and nostrils. Permian to Triassic.

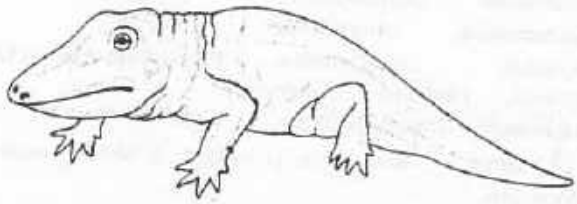


Fig : 1.7-64 Stegocephalia

Order 1. **Labyrinthodontia** : Oldest known tetrapods called stem Amphibia. Carboniferous to Triassic.

Example : *Eryops*.

Order 2. **Phyllospondyli** : Small salamander-like. Carboniferous to permian.

Example : *Branchiosaurs (Ichthyostega)*.

Order 3. **Lepospondyli** : Small salamander or eel-like.Carboniferous to Permian.

Examples – *Diplocaulus, Lysorophus*.

(b) **Subclass II. Lissamphibia (living)** : Modern Amphibia lacking dermal bony skeleton. Teeth small, simple.

Order 1. **Gymnophiona or Apoda** : (Gk. gymnos = naked ; ophioneos = serpet-like).

(1) Limb less, blind, elongated worm like, burrowing tropical forms known as caecilians or blind worms.

(2) Tail short or absent, cloaca terminal.

(3) In some dermal scales embedded in skin which is transversely wrinkled.

(4) Skull compact, roofed with bone.

(5) Limb girdle absent.

(6) Males have protrusible copulatory organs.

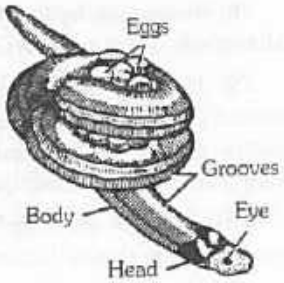


Fig : 1.7-65 *Ichthyophis*

Examples : *Ichthyophis, Uroaeoryphlus, Rhinatremam, Typhlonectes.*

❑ Ichthyophis is a Limb less amphibian showing parental care. It has no tongue.

Order 2. **Urodela or Caudata** : (Gk. Ura = tail ; *delos* = visible) or (L. = cauda = tail).

(1) Lizard-like amphibians with a distinct tail.

(2) Limbs 2 pairs, usually weak, almost equal.

(3) Skin devoid of scales and tympanum.

(4) Gills permanent or lost in adult.

(5) Males without copulatory organs.

(6) Larvae aquatic, adult-like, with teeth.

(7) It mainly includes Newts and Salamanders.

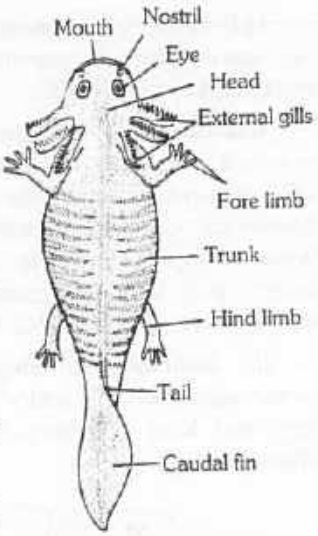


Fig : 1.7-66 *Axolotl* Larva

Examples : *Cryptobranchus, Megalobatrachus, Ambystoma, Salamandra, Desmognathus, Amphiuma, Plethodon. Siren, Pseudobranchus, Triturus,* Necturus.

❑ Larva of *Ambystoma* is axolotl. It shows neoteny or paedogenesis.

❑ The main difference between gymnophiona and urodela is that urodela have smooth moist skin.

Order 3. **Salientia or Anura** : (L., saliens = leaping) or (Gk., an = without ; *nura* = tail)

(1) Specialized amphibia without tail in adults.

(2) Hind limbs usually adapted for leaping and swimming.

(3) Adults without gills or gill openings.

(4) Eyelids well-formed. Tympanum present.

(5) Skin loosely-fitting, scale less; mandible toothless.

(6) Pectoral girdle bony. Ribs absent or reduced. Vertebral column very small of 5–9 pre sacral vertebrae and a slender urostyle.

(7) Fertilization always external.

(8) Fully metamorphosed without neotenic forms.

(9) It mainly includes frogs and toads.

Examples : *Alytes, Bombinator, Discoglossus, Pipa, Xenopus, Pelobates, Scaphiopus, Bufo, Rhinoderma, Dendrobates, Hyla, Gastrotheca, Rana, Polypedates* or *Rhacophorus.*

❑ *Bufo* is a poisonous amphibian.

❑ *Bombinator* is famous for warning colouration.

❑ Xenopus is used as a test in diagnosis of human pregnancy.

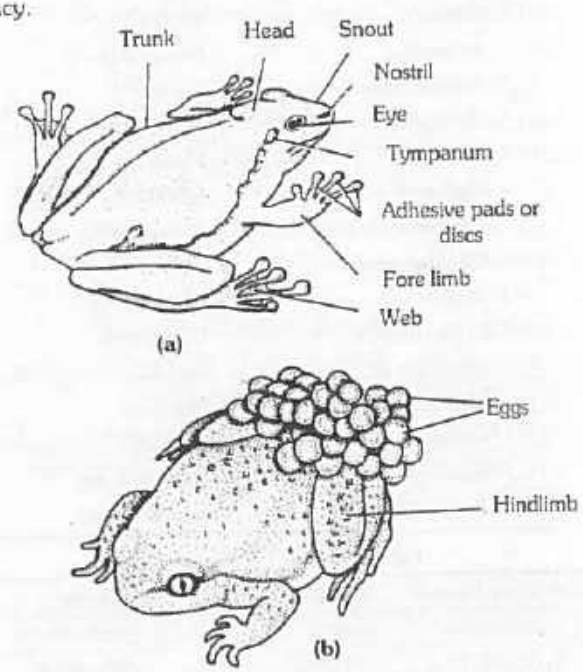


Fig : 1.7-67 (a) *Hyla* (b) *Alytes*

Table : 1.7-12 Common Names

Uraeotyphlus	–	Blindworm
Ichthyophis	–	Caecilian
Ambystoma	–	Tiger salamander
Amphiuma	–	Congo eel
Cryptobranchus	–	Hellbender
Necturus	–	Mud puppy
Proteus	–	Cave salamander
Siren	–	Mud eel
Triton	–	Newt
Salamandra	–	Salamander
Rana tigrina	–	Indian bull frog
Alytes	–	Midwife toad
Bufo melanostictus	–	Indian toad
Pipa	–	Surinam toad
Hyla	–	Tree frog
Rhacophorus	–	Flying frog
Bombinator	–	Fire bellied toad
Xenopus laevis	–	African clawed toad
Ascaphus	–	Bell toad
Astylosternus	–	Hairy frog
Nototrema (Gastrotheca)	–	Marsupial frog

Class Reptilia –The creeping vertebrates

(L. reptare = to creep)

General Characters

(1) Predominantly terrestrial, creeping or burrowing, mostly carnivorous, air–breathing, cold–blooded, oviparous and tetrapodal vertebrates.

(2) Body bilaterally symmetrical and divisible into 4 regions- head, neck, trunk and tail.

(3) Limbs 2 pairs, pentadactyle. Digits provided with horny claws. However, limbs absent in a few lizards and all snakes.

(4) Exoskeleton of horny epidermal scales, shields, plates and scutes.

(5) Skin dry, cornified and devoid of glands.

(6) Mouth terminal. Jaws bear simple conical teeth. In turtles teeth replaced by horny beaks.

(7) Alimentary canal terminates into a cloacal aperture.

(8) Endoskeleton bony. Skull with one occipital condyle (monocondylar). A characteristic T–shaped inter clavicle present.

(9) Heart usually 3–chambered, 4–chambered in crocodiles. Sinus venosus reduced. 2 systemic arches present. Red blood corpuscles oval and nucleated. Cold–blooded.

(10) Respiration by lungs throughout life.

(11) Kidney metanephric. Excretion uricotelic.

(12) Brain with better development of cerebrum than in Amphibia. Cranial nerves 12 pairs.

(13) Lateral line system absent. Jacobson's organs present in the roof of mouth.

(14) Sexes separate. Male usually with a muscular copulatory organ.

(15) Fertilization internal. Mostly oviparous. Large yolky meroblastic eggs covered with leathery shells, always laid on land. Embryonic membranes (amnion, chorion, yolk sac and allantois) appear during development. No metamorphosis. Young resemble adults.

(16) Parental care usually absent

Classification of Reptilia : According to Bogert, there are more than 7,000 living and several extinct species of reptiles, grouped into approximately 16 orders of which only 4 are living.

(a) **Subclass I Anapsida** – Primitive reptiles with a solid skull roof. No temporal openings.

Order 1. **Chelonia or Testudinata** : (Gk. *chelone* = turtle) or (L. *testudo* = turtle)

(1) Body short, broad and oval.

(2) Limbs clawed and/or webbed, paddle-like.

(3) Body encased in a firm shell of dorsal carapace and ventral plastron, made of dermal bony plates. Thoracic vertebrae and ribs usually fused to carapace.

(4) Skull anapsid, with a single nasal opening and without a parietal Foramen. Quadrate is immovable.

(5) No sternum is found.

(6) Teeth absent. Jaws with horny sheaths.

(7) Cloacal aperture a longitudinal slit.

(8) Heart incompletely 4–chambered with a partly divided ventricle.

(9) Copulatory organ single and simple.

(10) About 400 species of marine turtles, freshwater terrapins and terrestrial tortoises.

Examples : *Chelone*, *Chrysemys*, *Testudo*, *Trionyx*, *Dermochelys*.

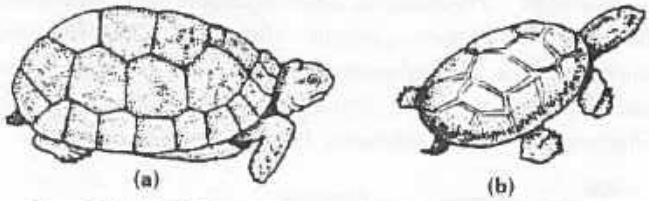


Fig : 1.7-68 (a) Giant tortoise, (b) Snake necked turtle

(b) **Subclass II Euryapsida (extinct)** : Skull with a single dorso–lateral temporal opening on either side bounded below by postorbital and squamosal bones.

(c) **Subclass III Parapsida (extinct)** : Skull with a single dorso–lateral temporal opening on either side bounded below by the supra temporal and post frontal bones.

(d) **Subclass IV Synapsida (extinct)** : Skull with a single lateral temporal opening on either side bounded above by the postorbital and squamosal bones.

(e) **Subclass V Diapsida (Living)** : Skull with two temporal openings on either side separated by the bar of postorbital and squamosal bones.

Order 2. **Rhynchocephalia** : (L. *rhynchos* = snout ; Gk. *kephale* = head)

(1) Body small, elongated, lizard-like.

(2) Skull diapsid. Parietal foramen with vestigeal pineal eye present. Quadrate is fixed.

(3) Vertebrae amphicoelous or biconcave. Numerous abdominal ribs present.

(4) Teeth acrodont. Cloacal aperture transverse.

(5) Heart incompletely 4–chambered.

(6) No copulatory organ is male.

Example : Represented by a single living species, the "Tuatara" or *Sphenodon punctatum* of New Zealand.

❑ Sphenodon is referred to a "living fossil" because it has retained many primitive characteristics of fossil or stem reptiles.

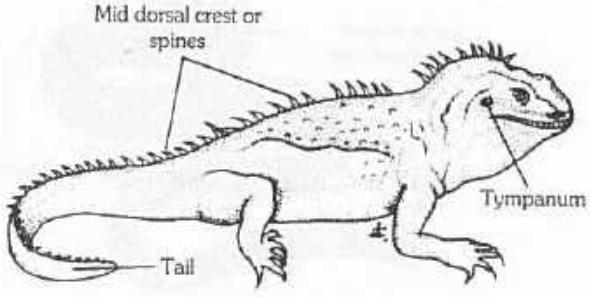


Fig : 1.7-69 Tuatara

Order 3. **Squamata** : (L. *squama* = scale or squamatus = scaly)

(1) Advanced, small to medium, elongated.

(2) Skull diapsid. Quadrate movable.

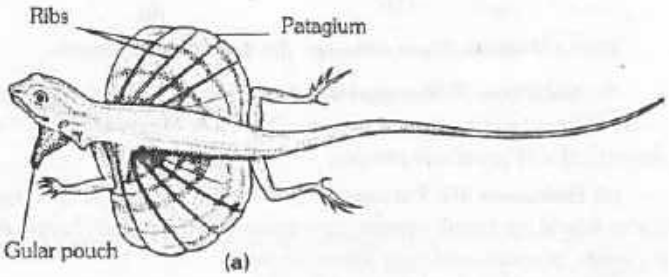
(3) Vertebrae procoelous. Ribs single – headed.

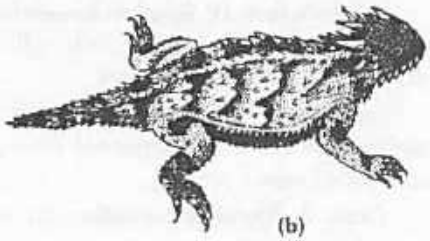
(4) Heart incompletely 4–chambered.

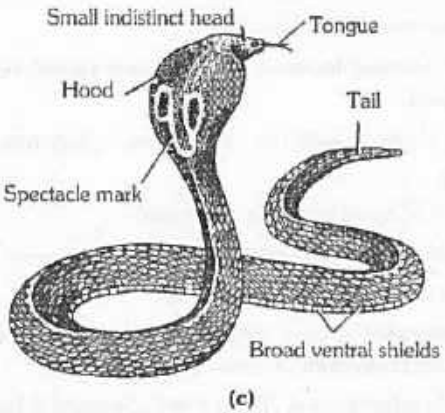
(5) Cloacal aperture is transverse.

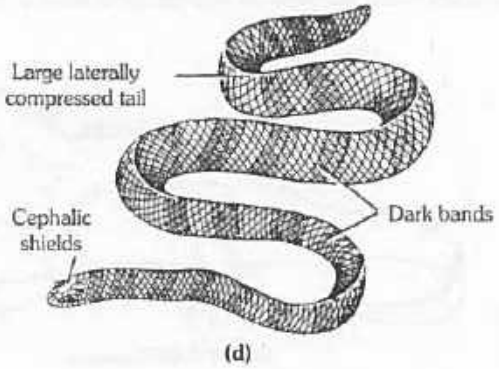
(6) It includes snakes and lizards.

Examples : *Phrynosoma, Draco Hemidactylus, Heloderma, Chameleon, Ophisaurus, Anguis, Rhineura, Barkudia Geko, Iguana, Varanus komodoeusis, Python, Typhlops, Eryx johuli, Naja, Bungarus caeruleus, Dryophis, Vipera russelli. Hydrophis, Enhydrina, Crolatus, Ancistrodon, Micrurus, Lachesis,* etc.









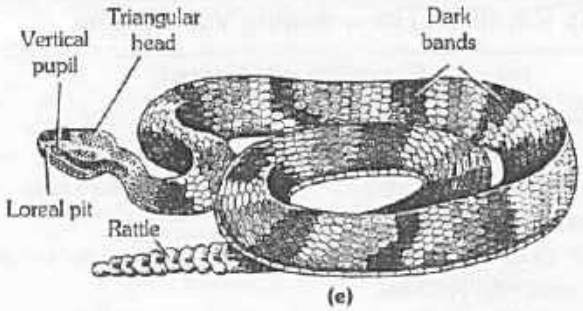


Fig : 1.7-70 (a) *Draco* (b) *Phrynosoma* (c) Indian cobra-*Naja naja* (d) Sea snake-*Hydrophis* (e) Rattle snake *Crotalus horridus*

Order 4. **Crocodilia** : (Gk. *krokodeilos* = Crocodile)

(1) Skin thick with scales bony plates and scutes.

(2) Skull diapsid. Quadrate immovable. No parietal foramen. A pseudopalate present. Pineal gland absent.

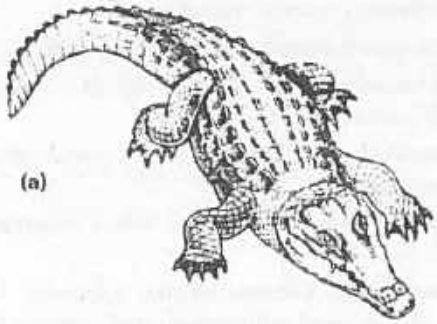
(3) Ribs bicephalous. Abdominal ribs present.

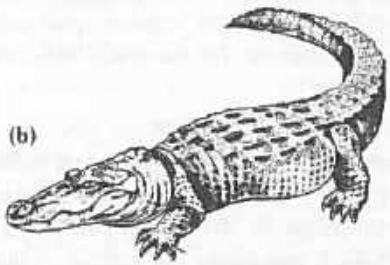
(4) Heart completely 4–chambered.

(5) Cloacal aperture is a longitudinal slit.

Examples : *Crocodylus, Gavialis, Alligator*

❑ The lung cavity of crocodile is separated from rest of body cavity by a muscular diaphragm, analogous to that of mammals.





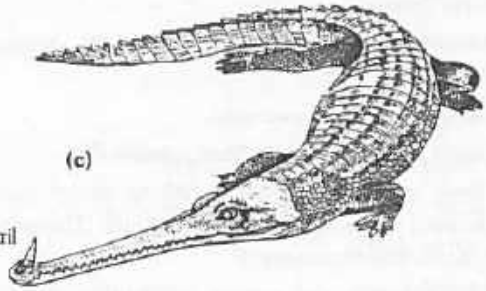


Fig : 1.7-71 (a) *Crocodylus palustris* (Indian freshwater crocodile) (b) *Alligator missisiplensis* (American alligat) (c) *Gavialis gangeticus* (Gavial or gharial)

Table : 1.7-13 Common Names

Testudo	–	Tortoise
Dermochelys	–	Leather back turtle
Trionyx	–	Soft shelled turtle
Chelonia mydas	–	Green turtle
Kachuga	–	Terrapin
Sphenodon	–	Tuatara
Crocodylus	–	Maggar
Alligator	–	Alligator
Gavialis	–	Gharial
Lizards		
Hemidactylus	–	Wall/house lizard
Uromastix	–	Spiny tailed lizard
Calotes	–	Garden lizard
Draco	–	Flying dragon
Phrynosoma	–	"Horned toad"
Mabouia	–	Skink
Varanus	–	Monitor lizard
Heloderma	–	Gila monster
		Beaded lizard
Ophisaurus	–	Glass snake
Anguis	–	Slow worm
		Blindworm
Rhineura	–	Worm lizard
Iguana	–	Collared lizard
Snakes (Nonpoisonous)		
Typhlops	–	Blind snake
Ptyas (Zamenis)	–	Rat snake
Tropidonotus	–	Grass snake
		Pond snake
Lycodon	–	Wolf snake
Dendrophis	–	Tree snake
Dryophis	–	Whip snake
Eryx johnii	–	Sand Boa
Snakes (Poisonous)		
Naja naja	–	Cobra
Naja hannah	–	King cobra
Bungarus	–	Krait
Viper russelli	–	Pitless viper
Ancistrodon	–	Pit viper
Crotalus	–	Rattle snake
Hydrophis	–	Sea snake
Enhydrina	–	Sea snake
Micrurus	–	Coral snake

Class Aves – The Birds

(L. *avis* = bird) or (Gk. ornis = bird)

General Characters

(1) Feather-clad, air-breathing, warm-blooded, oviparous, bipedal flying vertebrates.

(2) Limbs are two pairs. Forelimbs are modified as wings for flying. Hind limbs or legs are large, and variously adapted for walking, running scratching, perching, food capturing, swimming or wading, etc.

(3) Exoskeleton is epidermal and horny.

(4) Skin is dry and devoid of glands except the oil or preen gland at the root of tail.

(5) Pectoral muscles of flight are well developed.

(6) Skull smooth and monocondylic, bearing a single occipital condyle. Cranium large and dome-like. Sutures indistinct.

(7) Vertebral column short. Centra of vertebrae heterocoelous (saddle-shaped).

(8) Sternum large, usually with a vertical, mid ventral keel for attachment of large flight muscles.

(9) Ribs double-headed (bicephalous) and bear posteriorly directed uncinate processes.

(10) Both clavicles and single inter clavicle fused to form a V–shaped bone, called furcula or wishbone or merry-thought bone.

(11) Heart completely 4–chambered. There are neither sinus venosus or truncus arteriosus. Only right aortic (systemic) arch persists in adult. Renal portal system vestigeal. Blood corpuscles nucleated.

(12) Birds are the first vertebrates to have warm blood. Body temperature is regulated (homoiothermous).

(13) Respiration by compact, spongy, nondistensible lungs continuous with thin air-sacs.

(14) Larynx without vocal cords. A sound box or syrinx, producing voice, lies at or near the junction of trachea and bronchi.

(15) Kidneys metanephric and 3–lobed. Ureters open into cloaca. Urinary bladder absent. Birds are urecotelic. Excretory substance of urates eliminated with faeces.

(16) Sexes separate. Sexual dimorphism is well marked in some birds like peacock and parrot.

(17) Fertilization internal, preceded by copulation and courtship. Females oviparous.

(18) Eggs develop by external incubation. Cleavage discoidal, meroblastic. Development direct, Extra-embryonic membranes (amnion, chorion, allantois and yolk-sac) present (Amniota).

(19) Parental care is well marked.

Classification of Aves : Birds show less diversification than any other group of vertebrate animals. 25 to 30 avian orders are recognized depending on the taxonomist. Class Aves is first divided into two subclasses.

(a) **Sub-Class I. Archaeornithes** : (Gk. *archios* = ancient ; *ornithos* = bird)

(1) Extinct, archaic, Jurassic birds of Mesozoic Age, about 155 million years ago.

(2) Wings primitive, with little power of flight.

(3) Vertebrae amphicoelous.

(4) Sternum without a keel.

(5) Thoracic ribs slender, without uncinate processes. In Archaeopteryx beak in toothed.

This sub-classes includes a single order

Order **Archaeopterygiformes** : Example : *Archaeopteryx lithographica*, from Jurassic or Bavaria, Germany; one specimen lying in the British museum, London, the other lying in the Berlin.

(b) **Sub-class II. Neornithes** : (Gk. *neos* = modern ; *ornithos* = Birds)

(1) Modern as well as extinct post-Jurassic birds.

(2) Wings usually well-developed and adapted for flight, with few exceptions.

(3) Teeth absent except in some fossil birds.

(4) Vertebrae heterocoelous in living forms.

(5) Sternum usually with a keel.

(6) Thoracic ribs usually with uncinate processes.

(7) Abdominal ribs absent

This sub-class is divisible into 4 super-orders:

Super-order 1. Odontognathae : (Gk. *odontos* = teeth)

(1) Extinct, Upper Cretaceous birds.

(2) Jaws bear teeth, "so advantageous for catching fish".

Order 1. **Hesperornithiformes**

Example – *Hesperornis, Enaliornis, Baptornis,* etc.,

Order 2. **Ichthyornithiformes**

Examples – *Ichthyornis, Apatornis.*

Super-order 2. Palaeognathae or Ratitae : (Gk. *palaios* = *old*; gnathos = jaw) or (L. *ratis* = raft).

(1) Modern big-sized, flightless, running birds, without teeth.

(2) Wings vestigeal or rudimentary; feathers devoid of interlocking mechanism.

(3) Rectrices absent or irregularly arranged.

(4) Oil gland is absent, except in Tinamus and Kiwi.

(5) Skull is dromaeognathous or palaeognathous that is, vomer is large and broad and interpolated between palatines.

(6) Sternal keel vestigeal, absent or flat, raft-like.

(7) Uncinate processes are vestigeal or absent.

(8) Clavicles are small or absent.

(9) Pectoral muscles poorly developed.

(10) Syrinx is absent

The flightless birds or ratites are not represented in India. They are grouped in 7 orders as follows;

Order 1. **Struthioniformes** : (Gk. *struthio* = ostrich + form)

(1) Legs strongly developed, each with two toes (3rd and 4th) with stunted nails.

(2) Pubes form a ventral symphysis.

Examples : True ostriches (Struthio camelus) of Africa and western Asia (Arabia).

Order 2. **Rheiformes** : (Gk. *Rhea* = mother of Zeus + form)

Examples : American ostriches or common rhea (*Rhea americana*) represented by two species in South American pampas; Darwin's rhea (*Pteroncemia pennata*).

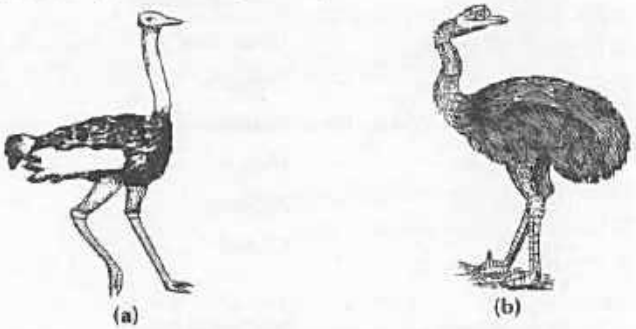


Fig : 1.7-72 (a) Ostrich (b) Rhea

Order 3. **Casuariformes**

Examples : Cassowaries (*Casuarius*) of australia, and New Guinea and Emus (*Dromaius novaehollandiae*) of New Zealand.

Order 4. **Apterygiformes**

Examples : Kiwis (*Apteryx*) of New Zealand.

Order 5. **Dinornithiformes**

Examples : Moas (*Dinornis maximus*) of New Zealand

Order 6. **Aepyornithiformes**

Examples : Giant Elephant-birds (*Aepyornis titan*) *Mulleornis* of Africa and Madagascar.

Order 7. **Tinamiformes**

Examples : Tinamou (*Tinamus*), *Eudromia*

Super-order 3. Impennae

Order 1. **Sphenisciformes**

Examples : Penguins (*Aptenodytes*) Southern Hemisphere.

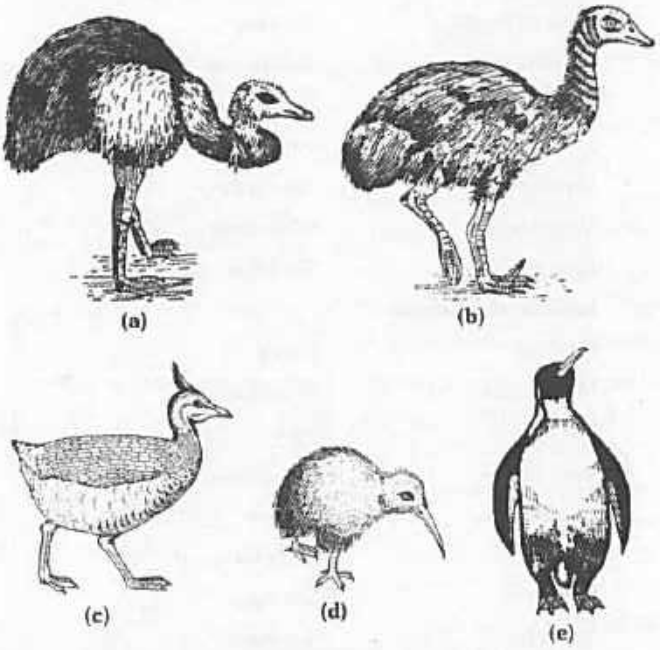


Fig : 1.7-73 (a) Cassowary (b) Emus (c) Tinamou (d) Kiwi (e) Penguin

Super order 4. Neognathae

(1) Most modern, usually small-sized. Flying birds.

(2) Wings well-developed; feathers with interlocking mechanism.

(3) Rectrices present and arranged regularly.

(4) Pterylae are regular.

(5) Oil gland is present.

(6) Skull is neognathous, that is, vomer is short allowing palatines to meet.

(7) Sternum with a well-developed keel.

(8) Uncinate processes are present.

(9) Pygostyle is present

The super-order Neognathae includes several orders. For the sake of study they may be grouped into at least 6 homogenous ecological groups, as follows :

Group A. Arboreal Birds : Under this group may be placed the majority of birds spending most of their lives in and around shrubs and trees.

Order 1. **Passeriformes** : (L. *passer* = sparrow + form)

This is the largest of all the bird orders including half of the known species. Feet are adapted for perching, while beaks are adapted for cutting.

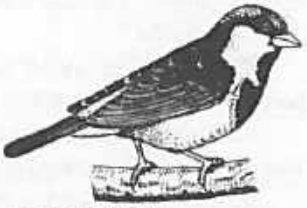


Fig : 1.7-74 House sparrow

Examples : *Passer domesticus*, *Corvus splendens*, common myna (*Acridotheres tristis*).

Order 2. **Piciformes** : (L. *picus* = wood pecker + form) It includes woodpeckers, toucans, sap-suckers and their allies.

Examples : Yellow fronted pied woodpecker (*Dendrocopos mahrattensis*).

Order 3. **Columbiformes** : (L. = *columba* = dove + form) It includes doves and pigeons.

Examples : Blue rock pigeon (*Columba livia*). Green pigeon (*Crocopus*), extinct dodo (*Raphus*).

Order 4. **Psittaciformes** : (L. = *psitacus* = parrot + form)

It includes parrots, parakeets, cockatoos, macaws, love-birds, etc., denizens of the equatorial jungles.

Fig : 1.7-75 Parrot

Examples : Large Indian parakeet (*Psittacula eupatria*), green parrot (*psittacula krameri*).

Group B. Terrestrial Birds : These birds are perfectly able to fly but spend most of their time walking or running on ground.

Order 5. **Galliformes** : (L. *gallus* = a cock + form) It includes gamebirds notable for their palatability, massive scratching feet, short and powerful flight and largely graminivorous diet.

Fig : 1.7-76 Peacock

Examples : Red jungle fowl (*Gallus*), peafowl (*Pavo cristatus*).

Order 6. **Cuculiformes** : (L. = *cuculus* = cuckoo + form) It includes cuckoos and their allies.

Examples : Cuckoo (*Cuculus canorus*), Koel (*Eudynamis scolopaeous*), Crow-pheasant (*Centropus sinensis*).

Group C. Swimming and Diving Birds

Order 7. **Anseriformes** : (L. *anser* = goose + form) Aquatic birds such as geese, swans and ducks belong to this order.

Examples : Wild duck or mallard (Anas), common teal (Nettion crecca), bar-headed goose (*Anser indica*)

Order 8. **Coraciiformes** : (Gk. *korax* = crow or raven + form) It includes kingfishers and their allies.

Fig : 1.7-77 Hoopoe

Examples : White breasted kingfisher (*Halcyon smyrnensis*), *pied kingfisher* (Ceryle rudis), bee eater (*Hoopoe*).

Order 9. **Gaviformes** : (L. *gavia* = sea mew + form) It includes marine birds, called loons (gavia) represented by only four species.

Order 10. **Podicipediformes or Colymbiformes** (Gk. *kolymbos* = diving bird).

It includes grebes (Podicipes), often called divers because of their habits.

Order 11. **Procellariformes** : (L. *Procella* = a tempest + form).

Fig : 1.7-78 Albatross

It includes tube-nosed, long and oily winged seabirds such as albatrosses (Diomedea), Petrels (Procellaria), shearwaters.

Order 12. **Pelecaniformes** : (L. *pelicanus* = pelican + form) It includes pelicans, darters, gannets and cormorants.

Examples : Pelicans (Pelecanus), little cormorant (Phalacrocorax niger)

Group D. Shore Birds and Wading Birds

These aquatic birds seldom swim or dive beneath the water to any great extent.

Order 13. **Charadriiformes** : (NL. *charadrius* = genus of plovers + form) This order includes a rather diverse group of water frequenting shore birds characterized by long wading legs, webbed toes and mudprobing beaks.

Examples : Red wattled lapwing (*Lobivanellus indicus*)

Order 14. **Ciconiiformes** : (L. *ciconia* = a stork + form)

It includes long-legged, marshy wading birds with long snake-like neck and javelin or pincer-like beak for piercing their aquatic prey.

Examples : Cattle egret (*Bubulcus ibis*), heron (*Ardea herodias*), spoonbil (*Platalea leucorodia*), strok (*Ciconia*), flamingo (*Phonicopterus*).

Order 15. **Gruiformes** : (L. grus = crane + form) It includes crane-like wading birds with long legs and partially webbed feet.

Examples : Common coot (*Fulica atra*),

Group E. Birds of Prey

Order 16. **Falconiformes** : (L. falco = falcon + form)

The diurnal birds of prey with sharp hooked beaks and strong curved claws.

Table : 1.7-14 Flightless Birds

Common Names	Genus	Distribution
1. **African ostrich**	*Struthio*	Africa and Arabia
2. **South American**	*Rhea*	South America
3. **Cassowary**	*Casuarius*	Australia and New Guinea
4. **Emu**	*Dromaius*	Australia
5. **Tinamou**	*Tinamus*	South America
6. **Kiwi**	*Apteryx*	New Zealand

Table : 1.7-15 Types of Beaks in Birds

	Type	Example
1.	Seed eating	Sparrow
2.	Cutting	Crow
3.	Fruit eating	Parrot
4.	Insect eating	Hoopoe
5.	Fish eating	Kingfisher
6.	Flower probing	Humming bird
7.	Spatulate	Spoonbill
8.	Water and mud straining	Duck
9.	Tearing and piercing	Eagle and owl

Table : 1.7-16 Types of Feet in Birds

	Type	Example
1.	Perching	Sparrow
2.	Raptorial	Owl
3.	Scratching	Fowl
4.	Swimming	Duck
5.	Running or cursorial	Ostrich
6.	Climbing and clinging	Woodpecker
7.	Wading	Jacana and Heron

Table : 1.7-17 Common Names

Passer domesticus	–	House sparrow
Corvus splendens	–	House crow
Eudynamis scolopaceus	–	Koel
Upupa epops	–	Hoopoe
Pseudogyps bengalensis	–	Bengal vulture
Psittacula eupatria	–	Indian parrot
Psittacula krameri	–	Rose ringed parakeet
Phoenicopterus roseus	–	Flamingo
Pavo cristatus	–	Peacock or Mor
Milvus migrans	–	Kite
Bubo bubo	–	Great horned owl
Dinopium benghalensis	–	Woodpecker
Columba livia	–	Common rock pigeon

Class-Mammalia

(L. *mamma* = *breast*)

General characters

(1) Hair-clad, mostly terrestrial, air-breathing, warm blooded, viviparous, tetrapod vertebrates.

(2) Limbs 2 pairs, pentadactyle, each with 5 or fewer digits. Hind limbs absent in cetaceans and sirenians.

(3) Exoskeleton includes lifeless, horny, epidermal hairs, spines, scales, claws, nails, hoofs, horns, bony dermal plates, etc.

(4) Skin richly glandular containing sweat, sebaceous (oil) and sometimes scent glands in both the sexes. Females also have mammary glands with teats producing milk for suckling the young.

(5) Endoskeleton thoroughly ossified. Skull dicondylic having 2 occipital condyles. Cranium large. A single zygomatic arch present. Pterygoids small, scale-like. Otic bones fused into periotic which forms tympanic bulla with tympanic. Each half of lower jaw made of a single bone, the dentary, articulating with squamosal of skull Vertebrae with terminal epiphyses and flat centra (acoelous). Cervical vertebrae usually 7. Ribs bicephalous. Coracoid vestigial.

(6) Teeth are of several types (heterodont), borne is sockets (thecodont) and represented by two sets (diphyodont).

(7) Respiration always by lungs (pulmonary). Glottis protected by a fleshy and cartilaginous epiglottis. Larynx contains vocal cords.

(8) Heart 4-chambered with double circulation.

(9) Kidneys metanephric.

(10) Brain highly evolved. Both cerebrum and cerebellum large and convoluted. Optic lobes small and 4 in number called corpora quadrigemina. Corpus callosum present connecting both cerebral hemispheres. Cranial nerves 12 pairs.

(11) Senses well developed. Eyes protected by lids, the upper of which is movable. External ear opening protected by a large fleshy and cartilaginous flap called pinna. Middle ear cavity with 3 ear ossicles–malleus, incus and stapes. Cochlea of internal ear spirally coiled.

(12) Sexes separate.

(13) Fertilization internal preceded by copulation.

(14) Except egg-laying monotremes, mammals are viviparous, giving birth to living young ones.

(15) Development uterine.

Classification of Mammalia : Mammals have been thoroughly described and adequately classified. The main characters forming the basis of their classification into orders include :

(1) Mode of caring of their young,

(2) Nature of dentition

(3) Foot posture,

(4) Nails, claws and hoofs,

(5) Complexity of nervous system and

(6) Systematics.

(a) **Subclass I prototheria** : (Gk. protos = first ; therios = beast).

(1) Primitive, reptile-like, oviparous or egg-laying mammals.

(2) Mammary gland without nipples.

(3) External pinna absent.
(4) Corpus callosum not found.
(5) Adult without teeth, they bear horny beak.
(6) Testes abdominal.
(7) Female without uterus and vagina.

It has only one order :

Order **Monotremata** : (Gk. monos = single ; trema = opening), Cloacal opening present Confined to Australian Tasmania and New Guinea region.

Examples : *Monotremes*. Platypus or duckbill (*ornith orhynchus*) spiny anteater (*Tachyglossus* = Echidna).

(a) (b)

Fig : 1.7-79 (a) *Echidna*, (b) *Ornithorhynchus*

(b) **Sub class II. Theria** : (Gk. *ther*, = animal)

Subclass Theria is divided into two infraclasses : Metatheria and Eutheria.

Infraclass 1. Metatheria : (Gk. meta = between or after)

(1) Metatherians are pouched mammals; young born in very immature state.
(2) Corpus collosum absent.
(3) Ovoviviparous.
(4) Epipublic bone present.
(5) Vagina and uterus are double.

Order 2. **Marsupialia** : (Gk. *marsypion* = pouch).

(1) Born in a very immature state, and complete their development attached to teats or nipples in the abdominal pouch or marsupium. (2) Usually 3 premolars and 4 molars in each jaw on either side. (3) Vagina double

Examples : Opossum (*Didelphis*). Kangaroo (*Macropus*), koala (*Phascolarctos*)

❑ Kangaroo is the native of Australia.

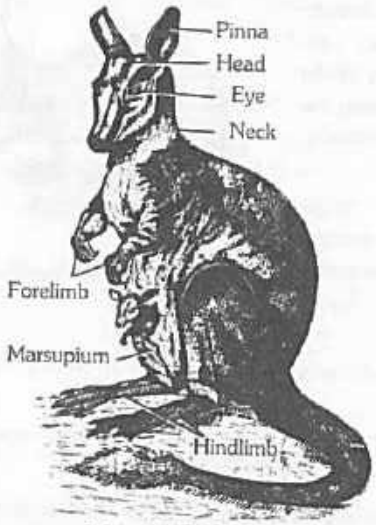


Fig : 1.7-80 Kangaroo

Infraclass 2. Eutheria : (Gk. eu = true ; *therios* ; *beast*)

(1) Higher viviparous placental mammals without marsupium.
(2) Corpus callosum present in brain.
(3) Nipples are present in mammary gland.
(4) Young born in a relatively advanced stage.
(5) Cloaca absent but anus present.
(6) Dentition never exceeds $\frac{3.1.4.3}{3.1.4.3} = 44$. On the basis of characteristics like skull, teeth and limbs, eutheria is arranged into 16 orders.

Order 1. **Insectivora** : (L. insectum = insect ; *vorare* = to eat)

(1) Small mammals with long pointed snout.
(2) Feet plantigrade, usually 5–toed, with claws.
(3) Molars with pointed, peg-like cusps for insect feeding.

Examples : *Talpa, Sorex, Solenodon, Erinaceus, Paraechinus*

Order 2. **Dermaptera** : (Gk. derm = skin ; *pteron* = wing).

(1) Nocturnal in trees.

(2) A gliding mammal called flying lemur, resembling a flying squirrel. Membranous skin fold is present which help the animals in gliding from one tree to another.

Examples : One living genus *Cynocephalos* (= *Galaeolthecus*) with 2 species from South eastern Asia.

Order 3. **Chiroptera** : (Gk. Cheiros = hand ; *pteron* = wing)

(1) Flying mammals or bats in which forelimbs are modified into wings.
(2) Hind legs short and included in wing membrane.
(3) Second and third digits greatly longated supporting the skin fold forming the flight membrane.
(4) Eyes are small and vision weak.
(5) Ears have large pinnae.
(6) Radar system present.
(7) Nocturnal
(8) These may be food eating, insect eating or blood sucking in feeding habit.

Examples : *Pteropus, Rhinolophus, Desmodus*

Order 4. **Edentata** : (L. edentatus = toothless) Teeth absent or reduced to molars. Without enamel. These are nocturnal and herbivorous. Testes are abdominal.

Examples : *Myrmecophaga, Dasypus, Bradypus.*

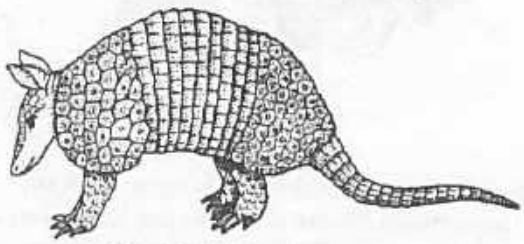


Fig : 1.7-81 Armadillo

Order 5. **Pholidota** : (Gk. pholis = a scale)

(1) Body covered with large overlapping scales with sparse hair in between. No teeth.

(2) Tongue long and protrusible, used to capture insects.

Examples : Single genus of scaly anteaters pangolins (*Manis*)

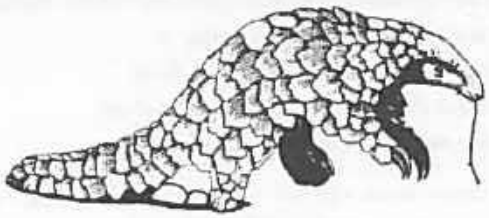


Fig : 1.7-82 Pangolin

Order 6. **Rodentia** : (L. rodo = gnaw).

(1) Largest order including usually small gnawing mammals.

(2) Each jaw with one pair of long, rootless, chisel-like incisors growing throughout life.

(3) Canine absent.

Examples : *Rattus* (House rat), *Mus*, *Funambulus* (Squirrel).

Order 7. **Lagomorpha** : (Gk. logos = hare ; *morphe* = form)

With a second pair of small upper incisors behind first pair of large chisel like incisors. No canines.

Examples : *Oryctolagus* (Hare), *Lepus* (Rabbit), *Ochotona*.

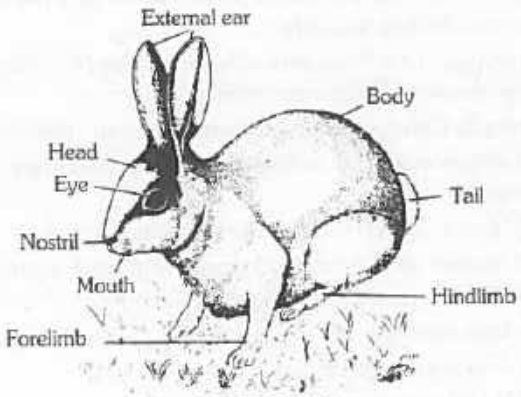


Fig : 1.7-83 Rabbit

Order 8. **Carnivora** : (L. caro = flesh ; *vorare* = to eat) Small to large predatory, flesh-eating mammals.

Examples : *Canis familiaris*, *C. lupus*, *C. aureus*, *Odobenus*, *Phoca*, *Panthera tigeris*.

Fig : 1.7-84 Tiger

Order 9. **Cetacea** : (Gk. ketos or L. cetus =a whale)

(1) Large marine fish-like mammals well adapted for aquatic life pectoral limbs modified into broad paddle-like flippers.

(2) Tail divided in two broad horizontal fleshy flukes with a notch, used in propulsion.

(3) No claws, no hind limbs and no external ears.

(4) Mostly gregarious and carnivorous. The living Cetacea are divided into two suborders Odontoceti (toothed whales) and Mysticeti or Mystacoceti (whalebone whales).

Examples : *Phocaena*, *Orcinus* (Killer whale), *Delphinus* (Dolphins), *Platanista Physeter*, *Balenoptera* (Blue whale).

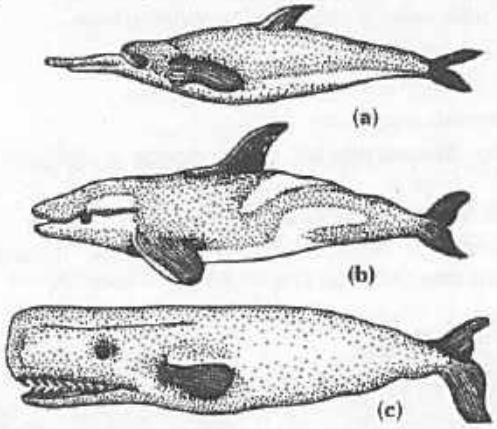


Fig : 1.7-85 (a) Dolphin, (b) Whale, (c) Sperm Whale

Order 10. **Sirenia** : (Gk. siren = sea nymph).

(1) Large, clumsy herbivorous, aquatic mammals with paddle-like forelimbs, no hindlimbs and a flattened tail with horizontal lateral fleshy flukes with or without a notch.

(2) No external ears.

(3) Muzzle blunt. Hairs few.

(4) Stomach complex.

(5) Inhabit estuaries and coastal sea.

Examples : *Trichechus* (Manatees), *Dugong* (*Halicore*), recently extinct Steller's sea-cow (Rhytina).

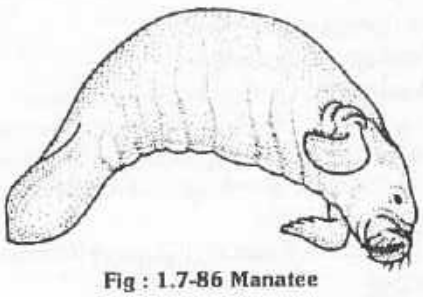


Fig : 1.7-86 Manatee

Order 11. **Tubulidentata** : (L. tubulus Tube like ; dens = tooth) With tubular mouth tongue protrusible, no incisor or conines, limbs clawed and adapted for digging ant and termites nests.

Examples : Single genus of pig-like aardvark or Cape anteater (Orycteropus) of South Africa.

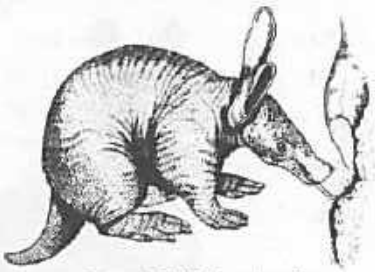


Fig : 1.7-87 Aardvark

Order 12. **Proboscidea** : (Gk. pro = in front ; *boskein* = to eat)

(1) Largest living land animals having large heads, massive ears, thick practically hairless skins (pachyderm).

(2) Bulky straight legs and 3 to 5 toes with small, nail like hoofs.

(3) Conspicuous feature is the nose and upper lip modified as an elongated flexible proboscis or trunk. 2 upper incisors elongated as ivory tusks.

(4) Cheek teeth lophodont.

Examples : *Elephas maximus* (Indian elephant), *Loxodonta africana* (African elephant), Elephas cyclotis.

Order 13. **Hyracoidea** : (Gk. hyrax = shrew ; *eidos* = form)

Small, guinea-pig like mammals distantly related to elephants. No canines. Cheek teeth lophodont.

Example : *Hyrax* (*Procavia*) from S. Africa, Syria and Arabia.

Order 14. **Perissodactyla** : (Gk. perissos = odd ; *dactylos* = toes)

The odd-toed hoofed mammals or ungulates have an odd number of toes (1 or 3) incisors present in both jaws.

Examples : *Equus cabalus* (Horse), *Equus asinus* (Ass), *Equus zebra* (Zebra)

Order 15. **Artiodactyla** : (Gk. artios = even ; *dactylos* = digit)

(1) The even-toed hoofed mammals having an even number of toes (2 or 4)

(2) Incisors and canines in upper jaw usually lacking.

(3) Stomach 4 – chambered.

(4) Many with antlers or horns.

Examples : *Sus, Hippopotamus amphibius, Camelus, Cervus, Moschus, Ovis.*

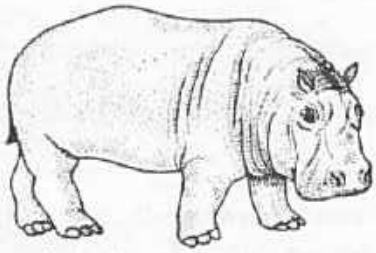


Fig : 1.7-88 *Hippopotamus*

Order 16. **Primates** : (L. primus = of the first rank)

(1) Generalized or primitive mammals except for the great development of brain.

(2) Mostly arboreal.

(3) First digit usually opposable, an adaptation for grasping.

(4) Eyes typically large and turned farward.

Example – *Gibbon, Mandrillus, Chimpanzee, Ateles*, etc.

(a) (b)

Fig : 1.7-89 (a) Gibbon, (b) Chimpanzee

Table : 1.7-18 Common Names

Canis familiaris	–	Dog
Felis domestica	–	Cat
Panthera leo	–	Lion
Panthera tigris	–	Tiger
Acinonyx jubatus	–	Cheetah
Lutra	–	Otter
Herpestes	–	Mongoose
Trichechus	–	Manatee
Halicore	–	Dugong
Equus caballus	–	Horse
Equus asinus	–	Ass
Rhinoceros unicornis	–	Indian rhinoceros
Diceros bicornis	–	African rhinoceros
Tapirus Indicus	–	Malayan Tapir
Hippopotamus amphibius	–	Hippopotamus
Camelus dromedarius	–	Arabian camel
Cervus	–	Red deer
Giraffa camelopardalis	–	Giraffe
Sus scrofa	–	Wild boar
Bubalus bubalis	–	Water buffalow
Ateles paniscus	–	Spider monkey
Macaca mulatta	–	Rhesus monkey
Macaca silenus	–	Lion-tailed macaque
Hylobates lar	–	Gibbon
Papio	–	Baboon
Presbytis	–	Langur
Pongo	–	Orang-utan
Pan	–	Chimpanzee

Tips & Tricks

- Pelagic animals : Animals living in open water and include both zooplanktons and nektons.
- Nektons are those animals which actively swim in open water while neustons are those animals which float or swim in surface water. Neritic are the animals found in coastal water.
- Archaeocyte cells of sponges are totipotent cells.
- Dermal ostia of sponges are analogous to mouth, while osculum is analogous to anus.
- Olynthus stage : It is a stage present during the development of all syconoid sponges. It is a hypothetical ancesters of sponges.
- Hilsa is the only Indian fish that migrates from the seas to the river for breeding.

- Stone fish is the most poisonous fish.
- Bombay duck is a bony fish.
- Seabass (Diploprion) is hermaphrodite fish.
- Ampullae of Lorenzini are peculiar sense organs on their snout to note the thermal change in water.
- Lateral line is with neuromast organs which have rheoreceptors and note changes in water currents.
- Electric organs of Torpedo are modified muscles. These produce an electric current of 50-60 volts.
- All the cartilaginous fishes are marine, while bony fishes are either marine or fresh-water.
- Pectoral fins of fishes act as balancers, pelvic fins as brakes and caudal fin as steering organ in locomotion.
- Echeneis (Sucker fish or Remora) : Dorsal fin is modified into sucker. It shows commensalism with sharks, whale, etc. as is attached on their ventral side by its sucker for dispersal.
- Latimeria (Coelacanth) : A lobe-finned bony fish and is about 70 million years old. First reported by Miss Latimer. Called living fossil.
- The Arrow poison frogs secrete a powerful poison from their skin which can cause instant death.
- Golden dart poison frog from South America is the most poisonous frog. One adult frog contains enough poison to kill 2200 people.
- Largest amphibians. Japanese Giant Salamander which grows to a length of 1.6 m. Smallest amphibian. One of the South American arrow poison frogs, which measures upto 1.3 cm.
- Amphiuma (Congo-eel) – Has largest sized RBCs (75 μm). It has gill slits but no gills, called derotremetons condition.
- Rhacophorus (Flying frog) – Glides on the support of webs. Also has adhesive discs on digits.
- Hyla (Tree frog) – Climbs up the tree with adhesive discs on the tips of digits. Skin is with hygroscopic glands.
- Salamandra (Spotted Salamander) – Viviparous amphibian.
- The king cobra of India is the only snake in the world that builds a nest.
- Most poisonous snake-king cobra.
- Fangs of poisonous snake are maxillary teeth.
- Largest snake-python/Anaconda, may grow upto 10 meter in length.
- Smallest snakes. Thread snake, less than 2 cm. in length.
- Seymouria It was one such ancestral reptile which probably started laying eggs on land in the permian period. It was a lizard like sluggish creature. It was a "connecting link" between amphibian and reptiles.
- Anguis (European glass snake-limbless-lizzard), chameleon pumilus, russelli (the Russell's viper), Hydrophis (sea snake)-All are viviparous.
- T.H. Huxley said "birds are glorified reptiles". The feathers are highly modified reptilian scales. Birds have scales on their legs. Their eggs resemble reptilian eggs in general but have a calcareous shell.
- Humming bird is the only bird which can fly backward as well as forward.
- Kiwi lays the largest egg in proportion to its own size.
- Vision and hearing are the most highly developed senses in a bird.
- Famous Indian Ornithologist – Dr. Salim ali. He was known as "Bird man of India".
- Keoladeo Ghana National Park, Bharatpur, Rajasthan and Chilka lake Bird sanctuary Balagaon, Orissa are famous of birds.
- The Indian one horned Rhinoceros is the second largest land animal in India.
- Walrus – Marine carnivore. Its tusks are upper canines and are used for digging to locate molluscs.
- Koala Bear lives without water on Eucalyptus leaves. The water in the leaves meets its requirement of water.
- Kangaroo rat never drinks water in its entire life.
- Giant panda is one of the rarest animals in the world. Pandas rarely breed in captivity. Giant pandas live only in high mountains of China.

Ordinary Thinking

Objective Questions

Important terms and classification of animals

1. Larva is found in **[Odisha JEE 2008]**
(a) Vertebrates (b) Invertebrates
(c) Both (a) and (b) (d) None of these

2. Poikilotherms are also known as **[Odisha JEE 2008]**
(a) Isotherm (b) Ectotherm
(c) Endotherm (d) Heterotherm

3. Animals/organisms floating on the surface of water are **[CBSE PMT 1998; BHU 1998, 2001]**
(a) Plankton (b) Pelagic
(c) Benthon (d) Neritic

4. The body of the animal can be divided into identical halves in only one plane is **[J & K CET 2010]**
(a) Asymmetry (b) Bilateral symmetry
(c) Radial symmetry (d) Biradial symmetry

5. Radial symmetry occurs in **[HPMT 1995; Chd. CET 2003; MP PMT 2006]**
(a) Fishes (b) Molluscs
(c) Star Fishes (d) Sponges

6. The space between body wall and alementary canal lined by mesoderm is called **[J & K CET 2010]**
(a) Acoelom (b) Pseudocoelom
(c) Coelom (d) None of these

7. In coelomates, the problem of diffusion of food from gut to tissues is solved by **[EAMCET 2009]**
(a) The presence of coelomic fluid
(b) Churning the food within the body cavity
(c) Developing a circulatory system
(d) Developing gut associated glands

8. Trochophore larva occurs in **[BHU 1995; Odisha JEE 2005]**
(a) Annelida and Porifera
(b) Coelenterata and Annelida
(c) Mollusca and Coelenterata
(d) Annelida and Mollusca

9. An animal which comes out at night and hides during day time is **[CPMT 1998]**
(a) Diurnal (b) Nocturnal
(c) Cursorial (d) Arboreal

10. Parasites capable of living without a host are called **[Odisha JEE 2005]**
(a) Facultative (b) Permanent
(c) Obligate (d) None of these

11. Enterocoelous coelom is found in **[Odisha JEE 2005]**
(a) Deuterostomia (b) Astomia
(c) Protostomia (d) Blastostomia

12. Non-chordates have **[BCECE 2005]**
(a) Notocord
(b) Dorsal tubular nerve chord
(c) Pharyngeal gills cleft
(d) Absence of hepatic portal system

13. Cell aggregate plan is found in **[AFMC 1997]**
(a) Cnidarians (b) Sponges
(c) Roundworms (d) Flatworms

14. Which of the following statements is false **[Kerala CET 2005]**
(a) Male roundworm is smaller than female
(b) Earthworms are hermaphrodite
(c) Echinoderms are protostomous coelomates
(d) Human teeth are anatomically comparable to scales of shark
(e) Hair is derivative of skin

15. Which of the following phylum are included in enterozoa **[RPMT 2001]**
(a) Annelida, Mollusca, Porifera
(b) Echinodermata, Hemichordata, Porifera
(c) Mollusca, Arthropoda, Hemichordata
(d) Porifera, Mollusca, Arthropoda

16. Tube-within-a-Tube body plan is shown by
(a) Coelenterates
(b) Platyhelminthes
(c) Aschelminthes (Nemethelminthes)
(d) Porifers

17. Cold-blooded animals fall under the category of **[DUMET 2010]**
(a) Ectotherms (b) Psychrotherms
(c) Endotherms (d) Thermophiles

18. Blind sac body plan is shown by
(a) Roundworms (b) Annelids
(c) Coelenterates (d) Arthropods

19. What is characteristic of deuterostomes **[DPMT 2001]**
(a) Spiral cleavage, blastopore becoming mouth
(b) Radial cleavage, blastopore becoming anus
(c) Spiral cleavage, blastopore becoming anus
(d) Radial cleavage, blastopore becoming mouth

20. Mouth develops first in the embryo and anus is formed later in **[BHU 2012]**
(a) Deuterostomes (b) Protostomes
(c) Echinoderms (d) Chordates

21. Which of these statements are incorrect
(i) Parapodia are lateral appendages in arthropods used for swimming
(ii) Radula in molluscs are structures involved in excretion
(iii) Aschelminthes are dioecious
(iv) Enchinoderm adults show radial symmetry
(v) Ctenophorans are diploblastic **[Kerala PMT 2011]**
(a) (i) and (ii) (b) (i) and (iii)
(c) (i), (iv) and (v) (d) (iii) and (v)
(e) (ii), (iii) and (iv)

22. In which triploblastic animal coelom is absent **[WB JEE 2008, 11]**
(a) Platyhelminthes (b) Aschelminthes
(c) Annelida (d) Arthropoda

23. On the basis of organisation, animals are grouped into **[MP PMT 1997]**
(a) Metazoa and Eumetazoa (b) Protozoa and Metazoa
(c) Protozoa and Parazoa (d) Parazoa and Metazoa

24. Radial symmetry occurs in **[Chd. CET 1997; AFMC 2000; Kerala CET 2007]**
(a) Porifera and Coelenterata
(b) Coelenterata and Echinodermata
(c) Coelenterata and Platyhelminthes
(d) Arthropoda and Mollusca

25. Coelom produced by splitting of mesoderm is **[CPMT 1997]**
(a) Hydrocoel (b) Enterocoel
(c) Schizocoel (d) None of the above

26. Which one of the following does not have larvae in its life cycle **[Pb. PMT 1997]**
(a) Prawn (b) Earthworm
(c) Crab (d) Cockroach

27. Coelom is cavity between alimentary canal and body wall enclosed by **[CBSE PMT 1996; JIPMER 1997; JKCMEE 2002; J & K CET 2005]**
(a) Ectoderm and endoderm (b) Mesoderm and ectoderm
(c) Ectoderm on both sides (d) Mesoderm on both sides

28. Tiny free living animals on the surface of water constitute **[KCET 1999]**
(a) Zooplankton (b) Phytoplankton
(c) Benthon (d) Symbionts

29. From the following statements select the wrong one **[CBSE PMT 2005]**
(a) Millipedes have two pairs of appendages in each segment of the body
(b) Prawn has two paris of antennae
(c) Animals belonging to phylum porifera are exclusively marine
(d) Nematocysts are characteristic of the phylum cnidaria

30. An enterocoelomate invertebrate group is **[APMEE 1999]**
(a) Annelida (b) Echinodermata
(c) Arthropoda (d) Mollusca

31. Schizocoelomates and enterocoelomates are **[AFMC 2006]**
(a) Acoelomates (b) True coelomates
(c) Invertebrates (d) Echinoderms only

32. Metameric segmentation is the characteristic of **[NCERT; [HPMT 1993; CBSE PMT 2006]**
(a) Annelida and Arthropoda
(b) Mollusca and chordata
(c) Platyhelminthes and Arthropoda
(d) Echinodermata and Annelida

33. A radially symmetrical diploblastic animal is **[AFMC 1993]**
(a) Roundworm (b) Earthworm
(c) *Hydra* (d) Liver Fluke

34. Radial symmetry is often exhibited by animals having **[CBSE PMT 1994, 96, 97]**
(a) One opening of alimentary canal
(b) Aquatic mode of living
(c) Benthos/sedentary nature
(d) Ciliary mode of feeding

35. Arboreal mammals have **[Pb. PMT 1999]**
(a) Jumping character (b) Burrowing character
(c) Climbing character (d) Flying character

36. In contrast to annelids the Platyhelminthes show **[NCERT; CBSE PMT 2005]**
(a) Radial symmetry (b) Presence of pseudocoel
(c) Bilateral symmetry (d) Absence of body cavity

37. Animal with pseudocoelom is **[RPMT 2000; DPMT 2001; Kerala PMT 2006]**
(a) *Amia*/Leech (b) *Lepisma*/Liver Fluke
(c) Dragon Fly/Jelly Fish (d) *Wuchereria*/Hookworm

38. Pseudocoelom develops from **[CBSE PMT 1994; CPMT 2002; RPMT 2005]**
(a) Blastopore lip (b) Archenteron
(c) Embryonic mesoderm (d) Blastocoel

39. A true coelom is absent in phylum
Or
Which of the following is pseudocoelomate **[Odisha JEE 2009]**
(a) Nematoda (b) Annelida
(c) Echinodermata (d) Mollusca

40. True coelom or body cavity occurs in **[NCERT]**
(a) *Hydra* (b) *Taenia*
(c) *Pheretima* (d) *Sycon*

41. Veliger larva occurs in phylum **[DPMT 2001]**
(a) Mollusca (b) Echinodermata
(c) Arthropoda (d) Cnidaria

42. Cell-tissue organisation occurs in **[CBSE PMT 2000]**
(a) Liver fluke (b) Sponge
(c) *Hydra* (d) Starfish

43. A list of animals is given below. Identify the animals with open circulatory system and choose the correct answer.
(A) *Ascidia* (B) Cockroach
(C) Earthworm (D) Prawn
(E) Silverfish (F) Snail
(G) Squid
[Kerala CET 2002, 05; AMU (Med.) 2005]
(a) B, D, F (b) A, B, D, F
(c) C, D, E, G (d) B, D, E, F
(e) A, B, D, F, G

44. Besides Annelida and Arthropoda metamerism is found in **[NCERT; CBSE PMT 1995]**
(a) Cestoda (b) Acanthocephala
(c) Chordata (d) Mollusca

45. Organisms attached to substratum generally possesses **[CBSE PMT 1995; AIIMS 1999]**
(a) Asymmetrical body
(b) Radial symmetry
(c) One single opening of digestive canal
(d) Cilia on the surface to create water current

Phylum-Porifera

1. Which one of the following categories of animals, is correctly described with no single exception in it **[NCERT; CBSE PMT (Mains) 2012]**
(a) All reptiles possess scales, have a three chambered heart and are cold blooded (poikilothermal)
(b) All bony fishes have four pairs of gills and an operculum on each side
(c) All sponges are marine and have collared cells
(d) All mammals are viviparous and possess diaphragm for breathing

2. Tissues are absent in the body of [CPMT 2009]
(a) Sponge (b) Annelida
(c) Platyhelminthes (d) Arthropoda

3. Which is not correct for sponges [Odisha JEE 2009]
(a) Internal fertilization
(b) External fertilization
(c) Gemmule formation
(d) Gametes are formed from epidermal cells

4. Ostia is present in [Odisha JEE 2011]
(a) Poriferans (b) Coelenterates
(c) Annelids (d) Molluscs

5. In porifera, skeleton forming cells are [MP PMT 2000; Odisha JEE 2012]
(a) Sclerocytes (b) Archaeocytes
(c) Thesocytes (d) Amoebocytes

6. Glass Rope sponge is [BVP 2000]
(a) *Hyalonema* (b) *Euplectella*
(c) *Scypha* (d) *Spongilla*

7. Sponges structure corresponding to mouth of other animals is [BHU 1999]
(a) Incurrent canal (b) Ostium
(c) Osculum (d) Excurrent canal

8. The most distinctive character of sponge is [EAMCET 1998]
(a) Presence of choanocytes (b) Unicellular
(c) Marine (d) Asexual reproduction

9. Canal system is a characteristic of [CPMT 1996; CBSE PMT 1999; RPMT 1999; BHU 2000, 02; Odisha JEE 2011]
(a) *Hydra* (b) Sponge
(c) Sea anemone (d) Sea urchin

10. Common bath sponge is [CBSE PMT 1995; MP PMT 2002]
(a) Spongilla (b) Euspongia
(c) Leucosolenia (d) Sycon

11. Body having meshwork of cell, internal cavities lined with food filtering flagellated cells and indirect development are the characteristics of phylum
(a) Porifera (b) Mollusca
(c) Protozoa (d) Coelenterate

12. In *Leucosolenia*, digestion takes place in the
(a) Paragastric cavity (b) Stomach
(c) Osculum (d) Food vacuole

13. *Parenchymula* (sponges free swimming larva) is the larva of [EAMCET 1998; CPMT 2000]
(a) *Hydra* (b) *Ascaris*
(c) *Pheretima* (d) *Leucosolenia*

14. Sponges are [BVP 2003]
(a) Sessile (b) Planktonic
(c) Free-swimming (d) Pelagic

15. Which sponge is given as a gift in Japan [CPMT 1998]
(a) *Hyalonema* (b) *Euplectella*
(c) *Tethya* (d) *Leucosolenia*

16. Water currents in *Leucosolenia* are produced by [AIIMS 1999; BHU 1999; DPMT 1999; HPMT 2002]
(a) Choanocytes (b) Pinacocytes
(c) Archaeocytes (d) Thesocytes

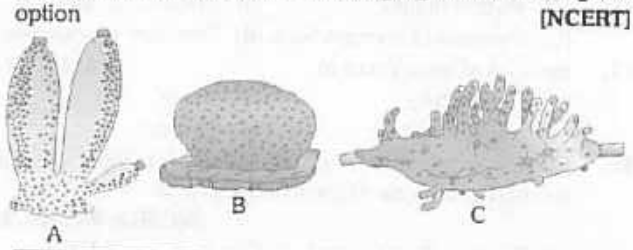
17. Members of phylum porifera are [CBSE PMT 2000; AFMC 2000; MH CET 2003]
(a) Exclusively marine animals
(b) Exclusively fresh water animal
(c) Mostly fresh water animals but few are marine animals
(d) Mostly marine animals but few are fresh water animals

18. Which sponge is found in the river [NCERT; RPMT 1999]
(a) *Cliona* (b) *Spongilla*
(c) *Sycon* (d) *Hyalonema*

19. What is found in a sponge [RPMT 1995; CPMT 1996, 2002, 10]
(a) Choanocytes (b) Nematocysts
(c) Amoebocytes (d) Both (a) and (c)

20. Which of the following is boring sponge [CPMT 1999]
Or
A sponge harmful to oyster industry is [AFMC 1997]
(a) *Cliona* (b) *Chalina*
(c) *Euplectella* (d) *Hyalonema*

21. Identify the names of the following figure from the given option [NCERT]



	A	B	C
(a)	*Euspongia*	*Sycon*	*Spongilla*
(b)	*Spongilla*	*Sycon*	*Eusporangia*
(c)	*Euspongia*	*Spongilla*	*Sycon*
(d)	*Sycon*	*Euspongia*	*Spongilla*

22. Classification of Phylum Porifera is based on [CBSE PMT 1991; WB JEE 2012]
(a) Nutrition (b) Spicules
(c) Locomotion (d) Reproduction

23. *Amphiblastula* is the larva of [AFMC 2001; CPMT 2002; RPMT 2005]
(a) *Hydra* (b) Sycon
(c) *Planaria* (d) *Leucosolenia*

24. What is left, when bathsponges dries up [AIIMS 2002]
(a) Spicules (b) Holdfast
(c) Tentacles (d) Spongin fibres

25. What will happen if a sponge is cut into maximum possible pieces [RPMT 2001]
(a) These will die
(b) These will differentiate
(c) Every piece will form a sponge
(d) Some pieces will develop in organs

26. Which of the following cell type is capable giving rise to other cell type in sponges [CPMT 1993; MH CET 2002; Pb. PMT 2004]
Or
Reproductive cells of sponges are formed from [CBSE PMT 1991]
(a) Archaeocytes (b) Collenocytes
(c) Thesocytes (d) Pinacocytes

27. Spongin fibres are secreted by **[BVP 2000]**
(a) Choanocytes (b) Pinacocytes
(c) Amoebocytes (d) Spongioblasts

28. The middle layer in body wall of porifera is **[AIIMS 1999]**

Or

The non-cellular layer present between pinacoderm and choanoderm in body wall of poriferans is known as **[Odisha JEE 2012]**
(a) Mesoderm (b) Mesenchyme
(c) Mesogloea (d) Mesentery

29. Sponges capture food particles with the help up **[BVP 2001; MHCET 2002; RPMT 2005]**

Or

Feeding in sponges takes place through **[BHU 1999; CPMT 1999, 2005]**
(a) Choanocytes (b) Pinacocytes
(c) Thesocytes (d) Trophocytes

30. Which of the following features is universally present in all sponges **[MP PMT 2013]**
(a) Marine habitat (b) Presence of spicules
(c) Presence of spongin fibres (d) Presence of spongiocoel

31. Spicules of silica occur in **[APMEE 2001]**
(a) *Hyalonema* (b) *Sycon*
(c) *Leucosolenia* (d) *Grantia*

32. In most simple type of canal system of porifera, water flows through which one of the following ways **[NCERT; WB JEE 2012]**
(a) Ostia → Spongocoel → Osculum → Exterior
(b) Spongocoel → Ostia → Osculum → Exterior
(c) Osculum → Spongocoel → Ostia → Exterior
(d) Osculum → Ostia → Spongocoel → Exterior

33. One of the following is not a characteristic feature of sponges **[NCERT; Kerala PMT 2010]**
(a) Cellular level of organization
(b) Presence of ostia
(c) Intracellular digestion
(d) Body supported by chitin
(e) Indirect development

34. Internal asexual propagule of some fresh water sponges is **[Kerala PMT 2006]**

Or

Internal bud for overcoming unfavourable conditions in *Leucosolenia* is **[CPMT 1996]**
(a) *Gemmule* (b) *Planula*
(c) *Stereoblastula* (d) *Amphiblastula*

35. Skeleton made of spongin fibres occurs in **[CPMT 2001; RPMT 2001]**
(a) Calcarea (b) Demospongiae
(c) Hexactinellida (d) Both (a) and (b)

36. Digestion of food occurs in sponges *Leucosolenia* in
(a) Spongocoel
(b) Choanocytes followed by amoebocytes
(c) Amoebocytes
(d) Choanocytes

37. Venus Flower Basket belongs to Phylum
(a) Porifera (b) Coelenterata
(c) Echinodermata (d) Mollusca

38. Spicules are found in **[J & K CET 2010]**
(a) *Hydra* (b) *Planaria*
(c) *Sycon* (d) *Obelia*

39. Sponges are porifers because their bodies have **[CPMT 1994; RPMT 2002]**
(a) Spicules in skeleton (b) Several pores
(c) Canal system (d) All the above

40. Nerve cells do not occur in **[NCERT; AMU (Med.) 2012]**
(a) Nematodes (b) Mosquitoes
(c) Sponges (d) Coelenterates

41. Bath sponges is generally found in **[CPMT 1992]**
(a) Red Sea (b) Gulf Mexico
(c) Pacific Islands (d) Mediterranean sea

42. The simplest type of canal system in Porifera **[CBSE PMT 1992]**

Or

Type of spongocoel found in Leucosolenia is **[CPMT 2001]**
(a) Ascon type (b) Leucon type
(c) Sycon type (d) Radial type

43. Thesocytes serve as **[CPMT 1992]**
(a) Sex cells (b) Slime secreting cells
(c) Food reserve (d) Embryonic cells

44. Animals devoid of respiratory, excretory and circulatory organs are **[HPMT 1993; DPMT 2002, 04]**
(a) Tapeworms (b) Sponges(Porifera)
(c) Thread worms (d) Liver Fluke

45. Collar cells occur in **[CPMT 1992, 93]**
(a) Sponges (b) *Hydra*
(c) Sandworm (d) Star fish

46. Nutrition in sponges is
(a) Extracellular
(b) Intracellular
(c) First extracellular and then intracellular
(d) First intracellular and then extracellular

47. Carmine particle put above osculum of a sponge would be **[CPMT 1993]**
(a) Left there
(b) Ingested and digested
(c) Thrown away
(d) Ingested and thrown away by ostia

48. Canal system in porifera is not concerned with **[AFMC 2005]**
(a) Respiration (b) Nutrition
(c) Sexual reproduction (d) None of these

49. Which of the following are 'multicellular grade' organisms **[AFMC 1997; BVP 2004]**
(a) Sponges (b) Coelenterates
(c) Prokaryotes (d) Vertebrates

50. Sponges have evolved from **[RPMT 1996]**
(a) Ciliates (b) Flagellates
(c) Protozoans (d) Choanoflagellates

51. Which is universal for sponges **[CBSE PMT 1996]**
(a) Marine (b) Calcareous spicules
(c) Radial symmetry (d) High regenerative power

52. In sponges, canal system develops due to **[CBSE PMT 1996]**
(a) Gastrovascular system (b) Folding of inner walls
(c) Porous walls (d) Reproduction

53. Osculum occurs in **[BHU 1997]**
(a) Star Fish (b) Ray Fish
(c) *Hydra* (d) Sponge

54. Incurrent canals are lined by **[CPMT 1998]**
(a) Choanocytes (b) Pinacocytes
(c) Porocytes (d) None of the above

55. Choanocytes in Ascon-type of canal system form lining of **[NCERT; CPMT 1998]**
(a) Spongocoel (b) Porocyte
(c) Apopyle (d) Incurrent canal

56. In case of poriferans, the spongocoel is lined with flagellated cells called **[NEET 2017]**
(a) Ostia (b) Oscula
(c) Choanocytes (d) Mesenchymal cells

Phylum-Coelenterata

1. Larva of jelly fish (*Aurelia*) **[Odisha JEE 2008]**
(a) Planula (b) Polyp
(c) Medusa (d) Blastula

2. Highest degree of polymorphism is found in **[J & K CET 2008]**
(a) Protozoa (b) Cnidaria
(c) Platyhelminthes (d) Arthropoda

3. The dioecious animal is **[J & K CET 2008]**
(a) Liverfluke (b) Aurelia
(c) Tapeworm (d) Earthworm

4. Metagenesis referes to **[AIPMT 2015]**
(a) Alternation of generation between asexual and sexual phases of an organisms
(b) Occurrence of a drastic change in form during post embryonic development
(c) Presence of a segmented body and parthenogenetic mode of reproduction
(d) Presence of different morphic forms

5. Which of the following do not have polyp form **[RPMT 1995]**
(a) Hydrozoa (b) Scyphozoa
(c) Anthozoa (d) All the above

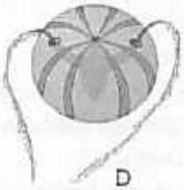
6. Which shows polymorphism **[CPMT 1998; MP PMT 2009; BHU 2012]**
(a) Physalia (b) Trypanosoma
(c) Termite (d) All of the above

7. Select the right option in which all the following figures are correctly identified **[NCERT]**


A


B


C


D

	A	B	C	D
(a)	*Adamsia*	*Aurelia*	*Pleurobrachia*	*Cnidoblast*
(b)	*Cnidoblast*	*Pleurobrachia*	*Adamsia*	*Aurelia*
(c)	*Aurelia*	*Adamsia*	*Cnidoblast*	*Pleurobrachia*
(d)	*Pleurobrachia*	*Cnidoblast*	*Aurelia*	*Adamsia*

8. Most appropriate term to designate the life cycle of *Obelia* is **[NCERT; BHU 2002]**
(a) Neoteny (b) Metagenesis
(c) Metamorphosis (d) None of these

9. Which of the following does not belong to phylum Coelenterata **[MP PMT 2002]**
(a) Sea pen (b) Sea feather
(c) Sea cucumber (d) Sea fan

10. Sea anemone belongs to class **[CPMT 1998]**
(a) Hydrozoa (b) Anthozoa
(c) Scyphozoa (d) None of these

11. Primitive nervous system is formed in **[CPMT 2009]**
(a) Sponge (b) Cnidaria (Coelenterata)
(c) Echinodermata (d) Annelida

12. Corals belong to the phylum **[MP PMT 1994]**
(a) Protozoa (b) Porifera
(c) Cnideria (d) Mollusca

13. The phylum of comb jelly is **[NCERT; RPMT 1999]**

Or

Which one of the following groups of animals reproduces only by sexual means **[NEET (Kamataka) 2013]**
(a) Mollusca (b) Echinodermata
(c) Coelenterata (d) Ctenophora

14. *Hydra* is **[RPMT 1999, 2002]**
(a) Herbivorous (b) More developed
(c) Carnivorous (d) Omnivorous

15. Polyp phase is absent in **[BHU 2006]**
(a) *Hydra* (b) *Aurelia*
(c) *Physalia* (d) *Obelia*

16. Jelly fish is placed in which class of coelenterata **[RPMT 1995]**
(a) Anthozoa (b) Scyphozoa
(c) Hydrozoa (d) None of the above

17. One of the special characters of coelenterata only is the occurrence of **[CBSE PMT 1994; CPMT 1999; BHU 1999; MP PMT 2002, 06]**
(a) Hermaphroditism (b) Flame cells
(c) Polymorphism (d) Nematocysts

18. Organ pipe coral is
(a) *Astrea* (b) *Tubipora*
(c) *Fungia* (d) *Meandrina*

19. Nematoblast of *Hydra* are **[RPMT 2006]**
(a) Sensory
(b) Complicated
(c) With nematocyst apparatus
(d) All of the above

20. The nitrogeneous metabolic waste in *Hydra* mostly **[AFMC 2006]**
(a) Ammonia and is removed from whole surface of body
(b) Urea and is removed mainly by tentacles
(c) Urea and is removed from whole surface of body
(d) Uric acid and is removed from whole surface of body

21. A mature *Hydra* usually bears **[CPMT 2002; RPMT 2005]**
(a) One testis and several ovaries
(b) One testis and one ovary
(c) Several testes and one ovary
(d) Several testes and several ovaries

22. Main cavity in the body of *Hydra* is called **[CPMT 1998]**
(a) Gastrovascular cavity (b) Schizocoel
(c) Haemocoel (d) Pseudocoelom

23. Pneumatophore helps in **[RPMT 1999]**
(a) Feeding (b) Reproduction
(c) Protection (d) Floating

24. Which of the following statements is incorrect **[CPMT 2010]**
(a) Cnidocil is for defence in *Hydra*
(b) Nerve cells are absent in *Hydra*
(c) *Hydra is a coelentrate*
(d) *Hydra* shows budding

25. A coral island with a central shallow lake is known as **[BHU 2001]**
(a) Coral reef (b) Atoll
(c) Corallite (d) Diatomaceous sheath

26. Why does the Ctenophora is a minor phylum **[RPMT 2001]**
(a) It includes small sized animals
(b) It includes only few genera
(c) It does not include animals of economic importance
(d) It was included earlier in cnidaria

27. The larva of *hydra* is **[RPMT 1999]**
(a) Planula (b) Rhabditoid
(c) Trochophore (d) None of these

28. The true statement regarding corals is **[AIIMS 1999]**
(a) They form branched colonies
(b) Are solitary or colonial polypoid
(c) They grow as massive bodies
(d) All of these

29. *Hydra* is **[CPMT 1993; RPMT 1999, 2000; Pb. PMT 2000; Odisha JEE 2012]**

Or

Coelenterates generally include animals which are **[CMC Vellore 1993]**
(a) Triploblastic, radial symmetry and acoelomate
(b) Triploblastic, radial symmetry and coelomate
(c) Diploblastic, radial symmetry and acoelomate
(d) Diploblastic, radial symmetry and coelomate

30. Symmetry in Cnidaria is **[CBSE PMT 2005]**
(a) Radial (b) Bilateral
(c) Pentamerous (d) Spherical

31. How many ova are formed in the ovary of *hydra* **[RPMT 1999]**
(a) 2 (b) 4
(c) 1 (d) 3

32. Which one of the following animals is a coelenterate **[MP PMT 2003; CPMT 2005]**
(a) Sea cow (b) Sea horse
(c) Sea cucumber (d) Sea pen

33. *Hydra* receives impulses and stimuli through **[CBSE PMT 2000; AIIMS 2002]**
(a) Nerve net (b) Sensory cells
(c) Nematocytes (d) All of these

34. In which class of coelenterata the polyp and medusa both are found in one animal **[RPMT 2001]**
(a) Hydrozoa (b) Scyphozoa
(c) Anthozoa (d) None of them

35. Which of the following belongs to anthozoa **[CPMT 1999]**
(a) *Aurelia* (b) *Fungia*
(c) *Stercularia* (d) *Dugesia*

36. Match the following and choose the correct option

i. Physalia	A. Sea anemone
ii. Meandrina	B. Brain coral
iii. Gorgonia	C. Sea fan
iv. Adamsia	D. Portuguese man of war

[Bihar MDAT 1995; Kerala PMT 2002,12]
(a) i-C; ii-B; iii-A; iv-D (b) i-D; ii-C; iii-B; iv-A
(c) i-D; ii-B; iii-C; iv-A (d) i-B; ii-C; iii-A; iv-D
(e) i-A; ii-B; iii-C; iv-D

37. Statocysts are sense organs of **[CPMT 1999]**
(a) *Ascaris* (b) *Paramecium*
(c) *Taenia solium* (d) *Obelia medusa*

38. 'Ephyra' is the stage in the life cycle of **[AFMC 2000, 09]**
(a) Frog (b) *Obelia*
(c) *Aurelia* (d) Sea anemone

39. Choose the correct pair **[MP PMT 2010; Kerala PMT 2012]**
(a) Radial symmetry – Coelenterates
(b) Coelomates – Aschelminthes
(c) Metamerism – Molluscs
(d) Triploblastic – Sponges
(e) Metagenesis – Echinoderms

40. The characteristic larva of phylum 'Coelentrata' is **[CPMT 2000; BHU 2006]**
(a) Planula (b) Cysticercus
(c) Rhabdiform (d) Wriggler

41. Among the following organisms point out a completely non-parasitic form **[CBSE PMT 1994]**
(a) Sea anemone (b) Leech
(c) Tape worm (d) Mosquito

42. Which of the following is not found in vertebrates **[MP PMT 1998]**
(a) Bilateral symmetry (b) Gill opening
(c) Body scales (d) Cnidoblasts

43. In which phylum nerve cells are found but nerves are absent **[RPMT 2001]**
(a) Porifera (b) Coelenterata
(c) Platyhelminthes (d) Nemathelminthes

44. Which of the following is not found in *Hydra* **[DPMT 2004]**
(a) Epithelio-muscular cells (b) Cnidocyte
(c) Choanocyte (d) Nerve cells

45. Which of the following animals has a nervous system but no brain **[CBSE PMT 1993, 2002; BVP 2002]**
(a) *Pheretima* (b) *Hydra*
(c) *Amoeba* (d) *Periplaneta*

46. Penetrant, valvent and glutinant are types of
(a) Nematocysts of *Hydra* (b) Tentacles of *Hydra*
(c) Zooids of *Obelia* (d) Tentacles of *Obelia*

47. Tentacles of *Hydra* appear to be **[Odisha JEE 2012]**
(a) 2 (b) 15
(c) 8 (d) 14

48. The gastrovascular cavity of *Hydra* provides for
(a) Digestion and storage (b) Storage and circulation
(c) Excretion and storage (d) Digestion and circulation

49. Testes are located in *Hydra* at
(a) Proximal half (b) Distal half
(c) Middle (d) Tentacles

50. Zoochlorellae and zooxanthallae present in *Hydra* are **[CPMT 1994; RPMT 1996]**
(a) Symbionts in nutritive cells
(b) Symbionts in the gut
(c) Symbionts in cnidoblasts
(d) Organisms that provide hypnotoxin

51. Body cavity of *Hydra* is called **[JIPMER 1998; Odisha JEE 2012]**
(a) Enterocoel (b) Coelenteron
(c) Gastrovascular cavity (d) Both (b) and (c)

52. Precious Red Coral is/Coral used in ornaments is **[MP PMT 1993]**
(a) *Astraea* (b) *Fungia*
(c) *Corallium* (d) *Tubipora*

53. Gonads of *Obelia occur*
(a) In hydrula stage and indefinite in number
(b) Bases of tentacles of medusa and 8 in number
(c) On blastostyles and 8 in number
(d) On radial canals, oral surface of medusa and four in number

54. Gastrodermis of *Hydra* takes part in digestion of
(a) Carbohydrates and fats
(b) Proteins and fats
(c) Proteins, fats and some carbohydrates
(d) Proteins and carbohydrates

55. The cells absent in gastrodermis of *Hydra* are
(a) Nutritive cells (b) Stinging cells
(c) Gland cells (d) Nerve cells

56. Muscles of *Hydra* are
(a) Smooth (b) Skeletal
(c) Both (a) and (b) (d) None of the above

57. Budding is a normal mode of asexual reproduction in **[CBSE PMT 1993; CPMT 1996; HP PMT 2005; Kerala PMT 2009; Odisha JEE 2009, 10]**
(a) Starfish and Hydra (b) Hydra and sponges
(c) Tapeworm and Hydra (d) Sponges and starfish

58. Which of the following is not present in the body wall of *Hydra* **[CPMT 2010]**
(a) Sensory cell (b) Glial cell
(c) Cnidoblasts (d) Nerve cell

59. Nematocysts take part in **[MP PMT 1993]**
(a) Locomotion (b) Offence and defence
(c) Food capture (d) All the above

60. Which is wrongly matched **[Odisha JEE 2004]**
(a) Euglinoidae → Myonemes (b) Ciliophora → Axonemes
(c) Annelida → Notopodia (d) Cnidaria → Parapodia

61. Nematocysts are activated by **[Bihar MDAT 1994]**
(a) Water (b) Touch
(c) Brain (d) None of the above

62. Which one of the following living organisms completely *lacks* a cell wall **[CBSE PMT 2014]**
(a) *Saccharomyces* (b) Blue – green algae
(c) Cyanobacteria (d) Sea – fan (*Gorgonia*)

63. Which pair of cells is present in epidermis of *Hydra* but not in its endoderm **[Bihar MDAT 1995]**
(a) Stinging cells and interstitial cells
(b) Gland cells and germ cells
(c) Stinging cells and germ cells
(d) Stinging cells and gland cells

64. If *Hydra* is broken into pieces **[RPMT 1995, 96; CPMT 1996]**
(a) *Hydra* will die
(b) Every fragment will grow into complete *Hydra*
(c) Some fragments will form complete
(d) *Hydra* will undergo sexual reproduction

65. Testes/gonads are formed in *Hydra* from **[RPMT 1995; Bihar MDAT 2001]**
(a) Interstitial cells (b) Epithelio-muscular cells
(c) Nerve cells (d) All the above

66. Food of *Hydra* is **[RPMT 1995]**
(a) Aquatic plants
(b) Aquatic animals
(c) Algae and aquatic animals
(d) Some crustaceans

67. A number of buds have developed on *Hydra* **[APMEE 1996; Pb. PMT 1999]**
(a) Oldest bud is towards oral region
(b) Oldest bud is towards aboral region
(c) Both (a) and (b)
(d) There is no order

68. Mesogloea of *Hydra* is made of **[RPMT 1996]**
(a) Mucopolysaccharides (b) Protein
(c) Protein and fat (d) Reticulate tissue

69. Characteristic feature of coelenterata is **[CPMT 1996]**
(a) All are marine
(b) Presence of tentacles around mouth
(c) Polyp
(d) Gastrovascular cavity

70. Which of the following during respiration obtain water dissolved oxygen by diffusion through their body surface **[HP PMT 2005]**
(a) Cnidarians (b) Fishes
(c) Amphibians (d) Reptiles

71. *Hydra* recognises its prey by **[BVP 2001; MHCET 2003]**
(a) Nematocyst (b) Chemical stimulus
(c) Smell (d) Sensitivity

72. Common name of *Fungia* is **[Bihar MDAT 1996]**
(a) Mushroom Coral (b) Red Coral
(c) Brain Coral (d) Organ Pipe Coral

73. In *Hydra* new nematocysts develop from **[BHU 1996]**
(a) Cnidocils (b) Glandular cells
(c) Germ cells (d) Interstitial cells

74. Polymorphism occurs in **[BHU 1997]**
(a) Anthozoa (b) Scyphozoa
(c) Rhizopoda (d) Hydrozoa

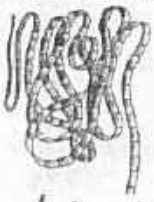
75. Medusa of *Obelia* is **[AIIMS 1999]**
(a) Carnivorous (b) Herbivorous
(c) Detritus feeder (d) Omnivorous

76. Sense organs of *Aurelia* are **[AIIMS 1999]**
(a) Tentilla (b) Tentaculocyst
(c) Nematocyst (d) Otolith

77. Germ cells of *Hydra* are derived from **[BHU 2000]**
(a) Ectoderm (b) Endoderm
(c) Mesoderm (d) Mesogloea

78. Looping and somersaulting types of locomotion are seen in **[Odisha JEE 2011]**
(a) Leech (b) *Amoeba*
(c) Snail (d) *Hydra*

79. The figure shows four animals (A), (B), (C) and (D). Select the correct answer with respect to a common characteristics of two of these animals

(A)  (B) 

(C)  (D) 

[CBSE PMT (Mains) 2011]
(a) (A) and (B) have cnidoblasts for self- defence
(b) (C) and (D) have a true coelom
(c) (A) and (D) respire mainly through body wall
(d) (B) and (C) show radial symmetry

80. In *Hydra*, cnidoblasts employed during looping are **[APMEE 2000]**
(a) Volvents (b) Stenoteles
(c) Atrichous isorhizas (d) Desmonemes

81. Animal showing thigmotaxis is **[CPMT 2000]**
(a) *Ascaris* (b) *Taenia*
(c) *Fungia* (d) *Hydra*

82. Which of the following symmetry is found in adult sea-anemone **[CPMT 2004; Odisha JEE 2009]**
(a) Biradial (b) Spherical
(c) Bilateral (d) None of these

83. Which is correct about nematocyst in *Hydra* **[AFMC 2001]**
(a) It is re-used
(b) Ejection is conditioned reflex
(c) Ejection occurs in response to contact and pierces the prey
(d) Prevents coming in contact with other *Hydra*

84. *Hydra* will regenerate from a fragment, if it contain **[AFMC 2001]**
(a) Tentacles
(b) Epidermis and gastrodermis
(c) Tentacles, epidermis and gastrodermis
(d) Epidermis, hypodermis and gastrodermis

85. Bilateral symmetry does not occur in **[Pb. PMT 2001]**
(a) Frog (b) *Octopus*
(c) Mammal (d) *Obelia*

86. Ctenophores have similarities with members **[RPMT 2002]**
(a) Porifera (b) Coelenterata
(c) Arthropoda (d) Annelida

87. Larva like stage of *Hydra* is **[RPMT 2002]**
(a) Hydrula (b) Hydratuba
(c) Scyphula (d) Planula

Phylum-Platyhelminthes

1. Solenocytes and nephridia are respectively found in **[RPMT 2002]**
(a) Platyhelminthes and Annelids
(b) Annelids and Nematoda
(c) Cnidaria and Mollusca
(d) Mollusca and Echinodermata

2. Which of the following is a free living flat worm **[NCERT; RPMT 2001; AMU (Med.) 2005]**
(a) *Planaria* (b) *Taenia*
(c) *Fasciola* (d) *Pheretima*

3. In which of the following organisms, self fertilization is seen **[KCET 2007; AFMC 2012]**
(a) Fish (b) Roundworm
(c) Earthworm (d) Liver fluke

4. Which one of the following kinds of animals are triploblastic **[AIIMS 2010; CBSE PMT (Pre.) 2010]**
(a) Corals (b) Flat worms
(c) Sponges (d) Ctenophores

5. Cestodes are distinguished from other flatworms by the absence of **[CPMT 2001]**
(a) Nervous System (b) Digestive system
(c) Excretory system (d) Reproductive system

6. Which one of the following is an example of platyhelminthes **[CBSE PMT 1994; AIIMS 1999]**
(a) *Trypanosoma* (b) *Schistosoma*
(c) *Plasmodium* (d) *Wuchereria*

7. *Fasciola hepatica* is **[AFMC 2008]**
(a) Hermaphrodite, self fertilising
(b) Hermaphrodite, cross fertilising
(c) Unisexual
(d) Both (a) and (b)

8. Which of the following animals does not have a body composed of many segments **[Odisha JEE 2009]**
(a) Flatworm (b) Grass hopper
(c) Earthworm (d) Lobster

9. Cysticercus is the larva of **[AFMC 2001; WB JEE 2010]**
(a) Liver fluke (b) Tapeworm (*Taenia*)
(c) Ascaris (d) Mollusca

10. Planaria, liver fluke and taenia solium are **[NCERT; CBSE PMT 1993]**
(a) All segmented (b) All found in the gut
(c) All have coelom (d) All are flatworms

11. All flatworms differ from all roundworms in having **[DUMET 2009]**
(a) Triploblastic body
(b) Solid mesoderm
(c) Bilateral symmetry
(d) Matamorphosis in the life history

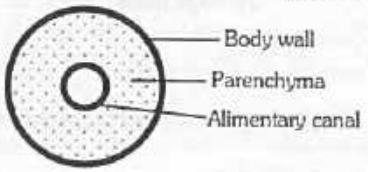
12. Which stage in the life cycle of *Taenia solium*, insects the intermediate host **[EAMCET 2009]**
(a) Hexacanth larva (b) Oncosphere
(c) Cysticercus larva (d) Miracidium

13. Flame cells are excretory organ of **[JIPMER (Med.) 2002; J & K CET 2005; Manipal 2005; BHU 2005, 08; Odisha JEE 2012]**
(a) Planaria (b) *Flatworms*
(c) *Taenia* (d) All of the above

14. Laurer's canal is found in **[CPMT 1998; BHU 2012]**
(a) Amoeba (b) Paramecium
(c) Fasciola (d) Hydra

15. Turbellarians are free living **[CPMT 2000; BHU 2006]**
(a) Nematodes (b) Annelids
(c) Trematodes (d) Flatworm

16. The cross-section of the body of an invertebrate is given below. Identify the animal which has this body plan **[NCERT; KCET 2009]**

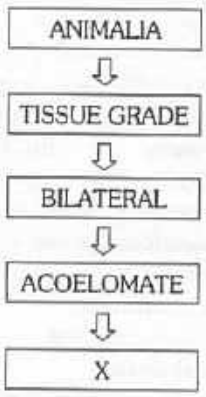


(a) Cockroach (b) Round worm
(c) *Planaria* (d) Earthworm

17. Locomotory organs in *Taenia* are called **[AIIMS 2001; MH CET 2002]**
(a) Setae (b) Parapodia
(c) Flagella (d) None of these

18. To which of the following Phylum class Trematoda belongs **[MP PMT 2001]**
(a) Platyhelminthes (b) Arthropoda
(c) Mollusca (d) Annelida

19. Identify the phylum X **[KCET 2015]**



(a) Hemichordata (b) Aschelminthes
(c) Platyhelminthes (d) Ctenophora

20. Flatworms are **[EAMCET 1998]**
(a) Acoelomates (b) Pseudocoelomates
(c) Haemocoelomates (d) Coelomates

21. Rhabdites occur in **[AIIMS 1999; RPMT 2000]**
(a) *Planaria/Dugesia* (b) *Fasciola*
(c) *Taenia* (d) *Echinococcus*

22. "Triploblastic, unsegmented, acoelomate exhibiting bilateral symmetry and reproducing both asexually and sexually with parasitic forms." The above description is characteristic of phylum **[Kerala CET 2005; MP PMT 2011]**
(a) Platyhelminthes (b) Annelida
(c) Ctenophora (d) Cnidaria
(e) Porifera

23. The contrast to Annelids the Platyhelminthes show **[CBSE PMT 2005]**
(a) Absence of body cavity (b) Bilateral symmetry
(c) Radial symmetry (d) Presence of pseduocoel

24. The greatest ability of regeneration amongst the animals is found in **[HP PMT 2005; Kerala PMT 2010; CBSE PMT 2014]**
(a) *Ascaris* (b) *Pheretima*
(c) *Hirudinia* (d) *Planaria* (Dugesia)

25. A metozoan covered by cilia is **[APMEE 2000]**
(a) *Paramecium* (b) *Dugesia*
(c) *Fasciola* (d) *Ascaris*

26. Chloragogen cells resemble the following in function **[Manipal 2005]**
(a) Collared cells (b) Flame cells
(c) Plasma cells (d) Mesophyll cells

27. Pseudocoelom is not found in **[DPMT 2004]**
(a) *Ascaris* (b) *Ancylostoma*
(c) *Fasciola* (d) None of these

28. One example of animals having a single opening to the outside that serves both as mouth as well as anus is **[CBSE PMT (Pre.) 2010]**
(a) Fasciola (b) Octopus
(c) Asterias (d) Ascidia

29. Which of the following show anaerobic respiration **[MP PMT 2006]**
(a) Earthworms (b) Rabbit
(c) Echinoderms (d) Tapeworms

30. Bilaterally symmetrical but acoelomate animal is **[DPMT 2003; BVP 2004]**
(a) Liver fluke (b) Jelly fish
(c) Round worms (d) Crab

31. Sometimes parasites themselves are parasitised by other organism, such parasites known as **[AFMC 2003]**
(a) Symbionts (b) Endoparasites
(c) Ectoparasites (d) Hyperparasites

32. Mehlis's glands of Tapeworm are associated with **[BHU 2002]**
(a) Reproduction (b) Excretion
(c) Respiration (d) Circulation

33. Malpighian tubules are analogous to **[AFMC 2010]**
(a) Trachea of cockroach (b) Gills
(c) Flame cells (d) None of these

34. Tapeworm does not possess digestive system as it **[BHU 1994]**
(a) Does not require solid food
(b) Obtains food through general surface
(c) Does not require food
(d) Lives in intestine

35. Intermediate host of Liver Fluke is
(a) Pig (b) Man
(c) Snail (d) Mosquito

36. The embryo of *Taenia* present in ripe proglottids is
(a) Tetracanth (b) Hexacanth
(c) Miracidium (d) Bladderworm

37. *Schistosoma* is a parasite found in
(a) Blood (b) Liver
(c) Lungs (d) Intestine

38. Onchosphere occurs is **[CBSE PMT 1990]**
(a) *Ascaris* (b) *Fasciola*
(c) *Taenia* (d) *Planaria*

39. *Hymenolepis nana* is **[APMEE 2001]**
(a) Dog Tapeworm (b) Dwarf Tapeworm of Man
(c) Pork Tapeworm (d) Dead Man's Finger

40. *Fasciola hepatica* lives in **[AFMC 2000; BHU 2001]**
(a) Liver of sheep (b) Blood of sheep
(c) Intestine of sheep (d) Spleen of sheep

41. The intermediate host of *Schistosoma* is **[BHU 2006]**
(a) Snail (b) Mosquito
(c) Housefly (d) Sheep

42. Larva of *Schistosoma* is
(a) Cercaria (b) Planula
(c) Cysticercus (d) Muller's larva

43. What is correct about *Taenia* **[CBSE PMT 1992; RPMT 1995, 98]**
(a) The animal has no mouth, alimentary canal and anus
(b) Presence of hooks for adhesion, externally divided body
(c) Mature proglottides contain both male and female organs
(d) All of the above

44. What is true about *Taenia saginata* **[CBSE PMT 1993]**
(a) Life history has pig as intermediate host
(b) There are two large suckers on scolex
(c) Rostellar hooks are absent
(d) Rostellum has double circle of hooks

45. Cysticercus of *Taenia* develop in **[AFMC 2001]**
(a) Man (b) Goat
(c) Sheep (d) Pig

46. Which constitutes the correct pairing **[CPMT 1994]**
(a) Flatworm-Planaria (b) Dogfish-Sea Urchin
(c) Fish-Snail (d) None of the above

47. Anus is absent in **[BHU 1994]**
(a) *Fasciola* (b) *Pheretima*
(c) *Periplaneta* (d) *Unio*

48. Pick up the correctly matched **[BHU 1994]**
(a) Water vascular system-Sponge
(b) Blubber-Kangaroo
(c) Marsupium-Platypus
(d) Flame cell-Flatworm

49. Cysticerci in pig muscles can remain viable upto **[AFMC 1994]**
(a) One year (b) Six months
(c) Six years (d) One month

50. In life history of liver fluke are present (1) Cercaria (2) Metacercaria (3) Sporocyst (4) Redia (5) Miracidium. What is their proper sequence **[AIIMS 1999]**
(a) 21354 (b) 53412
(c) 54213 (d) 54312

51. Both alternation of generations and alternation of hosts are present in **[APMEE 1995; BVP 2001]**
(a) *Wuchereria* (b) *Fasciola*
(c) *Taenia* (d) *Ascaris*

52. Give the correct match in the following

	Column I		Column II
A.	Flame Cells	*p.*	Sponges
B.	Collar Cells	*q.*	*Hydra*
C.	Stinging Cells	*r.*	*Planaria*
–	–	*s.*	*Ascaris*

[KCET 1997]
(a) A = r, B = p, C = q (b) A = r, B = p, C = s
(c) A = r, B = s, C = p (d) A = r, B = q, C = s

53. Solenocytes/flame cells are excretory structures of **[AFMC 1997; CBSE PMT 1998; CPMT 1998; DPMT 2006]**
(a) Echinoderms (b) Annelids
(c) Platyhelminthes (d) Molluscs

54. Lung Fluke is **[APMEE 2002]**
(a) *Hymenolepis nana*
(b) *Paragonimus westermani*
(c) *Schistosoma haematobium*
(d) *Echinococcus granulosus*

55. Alimentary canal is absent in **[RPMT 1998; CPMT 1999; JIPMER (Med.) 2001, 02; J & K CET 2002]**
(a) *Taenia* and *Schistosoma* (b) *Ascaris* and *Fasciola*
(c) *Taenia* and *Echinococcus* (d) *Tricuris* and *Fasciola*

Phylum-Nemathelminthes

1. Pin worm is called as **[EAMCET 1998; BHU 2012; MP PMT 2013]**
(a) *Schistosoma haematobium*
(b) *Wuchereria bancrofti*
(c) *Ancylostoma duodenale*
(d) *Enterobius vermicularis*

2. Pineal setae in male *Ascaris* are found in **[RPMT 1999]**
(a) Cloaca (b) Rectum
(c) Anus (d) Mouth

3. Which one of the following groups of animals is bilaterally symmetrical and triploblastic **[CBSE PMT 2009]**
(a) Coelenterates (Cnidarians)
(b) Aschelminthes (round worms)
(c) Ctenophores
(d) Sponges

4. The parasite which completes its life cycle in a single host (only man) is **[RPMT 1999; WB JEE 2008]**
(a) *Fasciola hepatica* (b) *Plasmodium vivax*
(c) *Taenia solium* (d) *Ascaris lumbricoides*

5. Which of the following groups have one or more animals which are not pseudocoelomate **[AFMC 1993]**
(a) Ascaris, taenia
(b) Enterobius, wuchereria
(c) Ancylostoma, dracunculus
(d) Ascaris, ancylostoma

6. *Ancylostoma* infection spreads through **[AFMC 2001]**
(a) Contaminated food (b) Kissing
(c) Skin (d) Blood

7. In *Ascaris* 3rd moulting takes place in **[CPMT 2002; RPMT 2005]**
(a) Intestine (b) Lung
(c) Liver (d) Egg

8. Excretory pore of *Ascaris* is present **[CPMT 2010]**
(a) Behind the mouth (b) On the posterior end
(c) On the dorsal side (d) In the middle of the body

9. A rhabditiform larva is formed in the life cycle of **[CPMT 1998; RPMT 2001]**
(a) *Ascaris* (b) *Tapeworm*
(c) *Hydra* (d) *Leucosolenia*

10. Choose the correct statement with reference to *Ascaris* **[CPMT 2004]**
(a) Hatching of embryos takes place in the stomach due to lytic enzyme
(b) Adulthood is reached inside the body of the host in ten days time
(c) Development and moulting takes place in the alveoli of lungs
(d) Hatching of embryo takes places within ten hours

11. In nemathelminthes the coelom is not lined by peritoneum is **[AFMC 2004]**
(a) A coelom (b) Pseudocoelom
(c) Enterocoelom (d) Haemocoel

12. Which of the following sense organs present in *Ascaris* are chemoreceptors and are located in ventrolateral lips **[CPMT 1999]**
(a) Amphids (b) Pineal setae
(c) Pineal spicules (d) Copulatory bursa

13. One of the following is pseudocoelomate **[DPMT 2001]**
(a) Leech (b) Liver fluke
(c) Hookworm (d) Jelly fish

14. *Ascaris* performs **[RPMT 1999]**
(a) Aerobic respiration (b) Anaerobic respiration
(c) Both (a) and (b) (d) None of these

15. Filariform is larva of **[AFMC 2001]**
(a) Platyheminthes (b) Aschelminthes
(c) Annelids (d) Arthropods

16. Thigmotaxis is not shown by **[BHU 2006]**
(a) *Paramecium* (b) *Amoeba*
(c) *Ascaris* (d) *Hydra*

17. The adult *Wuchereria bancrofti* lives in or attacks **[EAMCET 1998; AIIMS 2000, 02; CPMT 2009; NEET (Karnataka) 2013]**
(a) Human subdermal spaces
(b) Muscles of culex
(c) Salivary glands of culex
(d) Human lymph glands

18. Musculature of *Ascaris* consists of
(a) Circular muscles only
(b) Outer longitudinal and inner circular
(c) Outer circular and inner longitudinal
(d) Longitudinal muscles only

19. Which is the monogenetic in following **[AFMC 2003]**
(a) *Tapeworm* (b) *Ascaris*
(c) *Fasciola* (d) Hookworm

20. All worms are **[MP PMT 2003]**
(a) Triploblastic (b) Segmented
(c) Endo-parasites (d) Free-living

21. Which of the following is metazoan parasite transmitted through contaminated food or water **[APMEE 1995; DPMT 1999; MH CET 2000]**
(a) *Ascaris* (b) *Entamoeba*
(c) Guinea worm (d) Worm

22. The anterior V – spot in microfilaria of *Wuchereria* represents **[WB JEE 2011]**
(a) Nerve ring (b) Cervical papilla
(c) Excretory system (d) Reproductive system

23. Syncytial epidermis occurs in **[BHU 1994, 2001; DPMT 1999, 2001; Bihar MDAT 2002; CBSE PMT 2002]**
(a) *Ascaris* (b) *Hydra*
(c) *Taenia* (d) *Leucosolenia*

24. Male *Ascaris* is differentiable from female *Ascaris* in
(a) Presence of post-anal papillae
(b) Presence of pre-anal papillae
(c) Presence of penial setae
(d) All the above

25. Female *Ascaris* is differentiable from male in
(a) Presence of cloaca (b) Presence of penial setae
(c) Shorter size (d) Straight posterior end

26. Ascaris is characterized by **[CBSE PMT 2008]**
(a) Presence of true coelom but absence of metamerism
(b) Presence of true coelom and metamerism (metamerisation)
(c) Absence of true coelom but presence of metamerism
(d) Presence of neither true coelom nor metamerism

27. An intermediate host is absent in case of parasite
(a) Liver fluke (b) Tapeworm
(c) *Ascaris* (d) *Plasmodium*

28. *Ascaris* protects itself against digestive enzymes of the host by
(a) Mucus (b) Antienzymes
(c) Antienzymes and cuticle (d) Cuticle

29. Which is true of *Ascaris*
(a) Host (b) Aquatic
(c) Unisexual (d) Bisexual

30. Alcopar is drug useful for
(a) Taeniasis (b) Amoebiasis
(c) Ascariasis (d) Schistosomiasis

31. *Cyclops* is intermediate host of **[HPMT 1993]**
(a) *Planaria/Dugesia* (b) *Echinococcus*
(c) *Dracunculus* (d) *Ancylostoma*

32. Differentiating trait of *Ascaris* is **[RPMT 2002]**
(a) Sexual dimorphism and rhabditiform larva
(b) Unisexual and digenetic parasite
(c) Pseudocoelom and metameric segmentation
(d) Hermaphrodite and pseudocoelom

33. Microfilariae are carried by **[CPMT 1993]**
(a) Sandfly (b) *Culex* mosquito
(c) *Anopheles* mosquito (d) Housefly

34. The first and last moults of *Ascaris* occur in **[CPMT 1993]**

Or

Fourth moulting of *Ascaris* occur in **[Odisha JEE 2012]**

(a) Heart (b) Kindey
(c) Liver (d) Intestine

35. Which one is used in treatment of ascariasis **[CPMT 1994]**

(a) Chenopodium oil (b) Paludrin
(c) Terramycin (d) None of the above

36. A thick layer of cuticle on the surface of *Ascaris* indicates **[CPMT 1994]**

(a) Reproduction (b) Growth
(c) Parasitism (d) Evolution

37. Embryonated egg of *Ascaris* is **[BHU 1994]**

(a) An egg with gastrula (b) An egg with blastula
(c) An egg with juvenile (d) An egg within an egg

38. Sensory structures in *Ascaris* are **[RPMT 1995]**

(a) Phasmids (b) Amphids
(c) Papillae (d) All the above

39. Excretory pores present in *Ascaris* are **[RPMT 1995]**

(a) One (b) Two
(c) One pair (d) Two pairs

40. *Ascaris lumbricoides* is commonly called **[Kerala PMT 2002]**

(a) Roundworm (b) Hookworm
(c) Seat worm (d) Pinworm
(e) Filarial worm

41. Pseudocoelom develop from **[CPMT 2002]**

(a) Blastopore lip (b) Archenteron
(c) Embryonic mesoderm (d) Blastocoel

42. Which is secondary/intermediate host of Hookworm **[Bihar MDAT 1995]**

(a) Bed Bug (b) Sandfly
(c) Mosquito (d) None of the above

43. *Wuchereria* causes a disease in parts of India **[BHU 1996]**

(a) Filariasis-South India (b) Elephantiasis-Bihar
(c) Elephantiasis-Karnataka (d) None of the above

44. Which larval stage of *Ascaris* is infective **[RPMT 1996]**

(a) First and fourth (b) Second and third
(c) First and second (d) Third and fourth

45. Which is not true of *Ascaris* infection **[RPMT 1996]**

(a) More common in childern
(b) Does not produce tonsilitis
(c) Number can be 500-5000
(d) Infection is cured even without medication

46. Life span of *Ascaris* is **[RPMT 1996; AFMC 2010]**

(a) 6-9 months (b) 9-12 months
(c) 4-10 months (d) 10-12 months

47. *Ascaris* has three lips **[APMEE 1996; Odisha JEE 2012]**

(a) One median dorsal and two ventrolateral
(b) All dorsal
(c) Two lateral and one ventral
(d) Two dorso-lateral and one median ventral

48. Number of juvenile stages found during development of *Ascaris* **[RPMT 1998]**

(a) 1 (b) 2
(c) 3 (d) 4

49. *Enterobius* infection occurs through **[Pb. PMT 1999]**

(a) Mosquito (b) Contamination
(c) Inoculation (d) Piercing

50. Microfilaria occurs in peripheral blood of human beings during **[Pb. PMT 1999]**

(a) Morning (b) Evening
(c) Night (d) Day time

51. Animal group with pseudocoelom is **[MP PMT 2001; CPMT 2002; Kerala PMT 2002, 10; DPMT 2002, 06; Odisha JEE 2004; RPMT 2005]**

(a) Echinoderms
(b) Molluscs
(c) Aschelminthes/Nematodes
(d) Annelids

52. Which one of the following statements about certain given animals is correct **[BHU 2006, 12; AMU (Med.) 2006; CBSE PMT (Pre.) 2010]**

(a) Flat worms (Platyhelminthes) are coelomates
(b) Round worms (Aschelminthes) are pseudocoelomates
(c) Molluses are acoelomates
(d) Insects are pseudocoelomates

53. Coenocytic condition is found in **[HP PMT 2005]**

(a) *Ulothrix* (b) *Chlamydomonas*
(c) *Spirogyra* (d) *Wuchereria*

54. Size of female *Ascaris lumbricoides* is **[RPMT 2000]**

(a) 50-80 mm (b) 100-150 mm
(c) 150-250 mm (d) 200-350 mm

55. An ovoviviparous parasite is **[APMEE 2001]**

(a) Taenia (b) Wuchereria
(c) Ascaris (d) Plasmodium

56. Larvae of *Ascaris* hatch out in **[CPMT 2001]**

(a) Soil (b) Intestine
(c) Liver (d) Lungs

Phylum-Annelida

1. Which one of the following correctly describes the location of some body parts in the earthworm *Pheretima* **[CPMT 1994; Odisha JEE 1997; CBSE PMT 2009]**

(a) Two pairs of accessory glands in 16-18 segments
(b) Four pairs of spermathecae in 4 – 7 segments
(c) One pair of ovaries attached at intersegmental septum of 14th and 15th segments
(d) Two pairs of testes in 10th and 11th segments

2. If a live earthworm is pricked with a needle on its outer surface damaging its gut, the fluid that comes out is **[CBSE PMT 2009]**

Or

Earthworms have no skeleton but during burrowing, the anterior end becomes turgid and acts as a hydraulic skeleton. It is due to **[CBSE PMT 2008]**

(a) Excretory fluid (b) Coelomic fluid
(c) Haemolymph (d) Slimy mucus

3. Male genital aperture of earthworms is located in the segment **[NCERT; CPMT 1999]**

(a) 13 (b) 14
(c) 19 (d) 18

4. Annelids are **[CMC Vellore 1993]**
(a) Radially symmetrical (b) Externally segmented
(c) Triploblastic (d) Pseudocoelomate

5. The parasite found in the seminal vesicle of earthworm **[RPMT 1999, 2006]**
(a) *Monocystis* (b) *Nosema*
(c) *Sarcocystis* (d) *Nyctotherus*

6. Which one of the following is *NOT* a characteristic of phylum Annelida **[DPMT 2003; BVP 2004; CBSE PMT 2008]**
(a) Pseudocoelom (b) Ventral nerve cord
(c) Closed circulatory system (d) Segmentation

7. Which one of the following is not hermaphrodite animal **[HP PMT 2005; Odisha JEE 2008]**
(a) Leeches (b) Polychaetes
(c) Flatworms (d) Earthworm

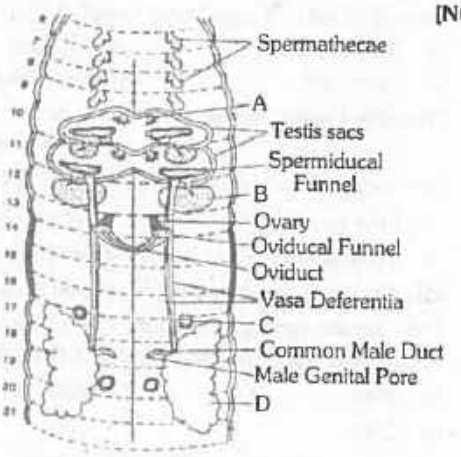
8. *Pheretima posthuma and Periplanata* are similar in which aspect **[CPMT 1995]**
(a) Both have nephredia as excretory organs
(b) Both have ventral nerve cord
(c) Both belong to same taxonomical group
(d) All the above

9. Which of the following belongs to the phylum annelida **[Odisha JEE 1997]**
(a) *Octopus* (b) *Ant*
(c) *Nereis* (d) *Crab*

10. Specialized chemoreceptors located on the anterior part of earthworms are **[Kerala PMT 2012]**
(a) Heat receptors (b) Photo receptors
(c) Taste receptors (d) Pressure receptors
(e) Auditory receptors

11. Closed blood vascular system, liver cells in the blood and chitinous setae or parapodia are the characteristics of **[AFMC 2009]**
(a) Arthropoda (b) Nematoda
(c) Annelida (d) None of these

12. See the figure given below and identify A to D respectively **[NCERT]**



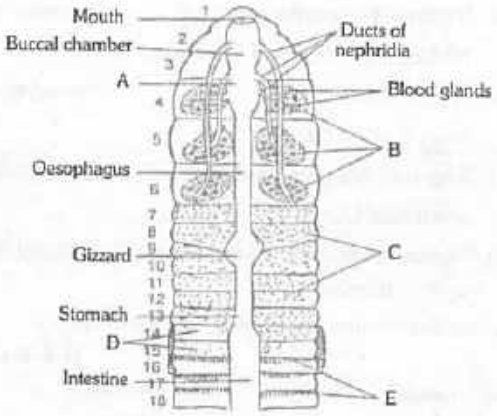
(a) A – Seminal vesicle, B – Testis, C – Prostate gland, D – Accessory gland
(b) A – Testis, B – Seminal vesicle, C – Prostate gland, D – Accessory gland
(c) A – Seminal vesicle, B – Testis, C – Accessory gland, D – Prostate gland
(d) A – Testis, B – Seminal vesicle, C – Accessory gland, D – Prostate gland

13. In which of the following, clitellum is absent **[BHU 2000]**
(a) Polychaeta (b) Oligochaeta
(c) *Hirudinea* (d) All the above

14. One very special feature in the earthworm pheretima is that **[NCERT; AFMC 1999; CBSE PMT (Pre.) 2011]**
(a) It has a long dorsal tubular heart
(b) Fertilisation of eggs occurs inside the body
(c) The typhlosole greatly increases the effective absorption area of the digested food in the intestine
(d) The S-shaped setae embedded in the integument are the defensive weapons used against the nemies

15. Botryoidal tissue is found in **[BHU 2002]**
(a) Rabbit (b) *Ascaris*
(c) *Hirudinaria* (d) Earthworm

16. Identify the following structures labelled A to E in the diagram given below from the list I to V



I. Septal nephridia
II. Pharynx
III. Forest of integumentary nephridia
IV. Integumentary nephridia
V. Tufts of Pharyngeal nephridia **[NCERT]**

	A	B	C	D	E
(a)	II	III	IV	I	V
(b)	II	IV	V	I	III
(c)	II	V	IV	III	I
(d)	II	I	III	IV	V

17. In Pheretima, there are red coloured round bodies in 4th, 5th and 6th segments above the alimentary canal. They are believed to be involved in **[NCERT; BHU 1999]**
(a) Excretion (b) Digestion
(c) Reproduction (d) Leucocyte production

18. Which one of the following exhibits concentric "tube within tube" plan **[MP PMT 1999]**
(a) Arthropoda (b) Oligochaeta
(c) Mollusca (d) Echinodermata

19. The colour of the body in earthworm is brown due to the presence of **[CPMT 2001]**
(a) Porphyrin (b) Haemoglobin
(c) Blood (d) Haemocyanin

20. The famous Indian Zoologist who wrote a memoir upon Pheretima posthuma is **[CBSE PMT 2001]**
(a) J.C. Bose (b) M.L.Bhatia
(c) K.N.Bahl (d) Beni Prasad

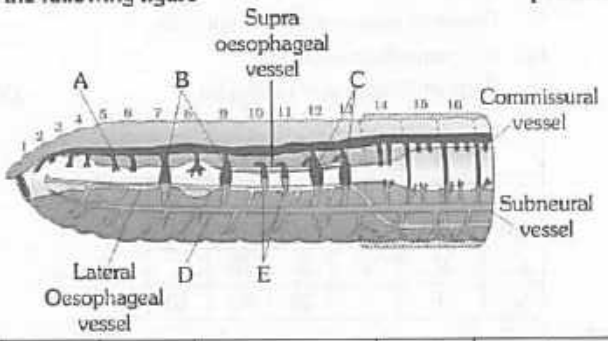
21. The highly degraded organic matter rich in nitrogen and potassium in particular, resulting from the activity of earthworms, is called **[NCERT; KCET 2006]**
(a) Worm castings (b) Vermicompost
(c) Compost bedding (d) Humus

22. In which of the following class of Annelida, one pair ovaries and several pair testes are found **[MP PMT 2003]**
(a) Archiannelida (b) Hirudinea
(c) Oligochaeta (d) Polychaeta

23. Which one of the following pairs of items correctly belongs to the category of organs mentioned against it **[CBSE PMT 2008]**
(a) Nephridia of earthworm and malpighian tubules of Cockroach - Excretory organs
(b) Wings of honey bee and wings of crow - Homologous organs
(c) Thorn of Bougainvillea and tendrils of Cucurbita - Analogous organs
(d) Nictitating membrane and blind spot in human eye - Vestigial organs

24. Aphrodite, commonly known as sea mouse is a **[J & K CET 2008]**
(a) Annelid (b) Mollusca
(c) Insect (d) Mammal

25. Observe the blood vascular system of earthworm given in the following figure **[NCERT]**



	A	B	C	D	E
(a)	Ventral vessel	Lateral hearts	Anterior loop	Dorsal vessel	Lateral-oesopharyngeal hearts
(b)	Dorsal vessel	Lateral hearts	Anterior loop	Ventral vessel	Lateral-oesopharyngeal hearts
(c)	Ventral vessel	Lateral hearts	Lateral-oesopharyngeal hearts	Dorsal vessel	Anterior loop
(d)	Dorsal vessel	Lateral hearts	Lateral-oesopharyngeal hearts	Ventral vessel	Anterior loop

26. The two organisms which breathe only through their moist skin are **[Odisha JEE 2009; J & K CET 2012]**
(a) Fish and frog (b) Frog and earthworm
(c) Leech and earthworm (d) Fish and earthworm

27. Earthworms are **[CBSE PMT 2006]**
(a) Uricotelic under conditions of water scarcity
(b) Ammonotelic when plenty of water is available
(c) Ureotelic when plenty of water is available
(d) Uricotelic when plenty of water is available

28. In the 4th, 5th and 6th segments of earthworm, lying above pharyngeal mass and connected with pharyngeal glands are found small, red coloured follicular bodies called **[NCERT; APMEE 2002; Kerala PMT 2006]**
(a) Septal glands (b) Blood glands
(c) Salivary glands (d) Nephridia
(e) Intestinal caecae

29. Region of Earthworm which is forest of nephridia is **[NCERT; CPMT 2002]**
(a) Clitellar region (b) Pharyngeal region
(c) Typhlosolar region (d) Intestinal region

30. Chloragogen cells are present in **[RPMT 1998]**
(a) Body wall of Leucosolenia
(b) Blood of Earthworm
(c) Coelomic fluid of Earthworm
(d) Blood of Cockroach

31. Leech is **[J & K CET 2005]**
(a) Carnivorous (b) Sanguivorous
(c) Ectoparasite (d) Both (b) and (c)

32. In Earthworm, genital papillae occur in segments **[NCERT]**
(a) 16 and 17 (b) 16 and 18
(c) 17 and 19 (d) 17 and 18

33. Flow of blood in dorsal blood vessel of Earthworm is
(a) Backward (b) Forward
(c) Sideward (d) Downward

34. The lateral hearts in earthworm have **[NCERT; AMU (Med.) 2010]**
(a) Four pairs of valves and are situated in segments 7 and 9
(b) Four pairs of valves and are situated in segments 6 and 8
(c) Three pairs of valves and are situated in segments 8 and 10
(d) Two pairs of valves and are situated in segments 6 and 11

35. The female genital aperture in earthworm is present ventrally on the segment **[NCERT; CPMT 2000; BHU 2006]**
(a) 10th (b) 12th
(c) 14th (d) 18th

36. In earthworm, the characteristic internal median fold of dorsal wall of the intestine called typhlosole is present in **[Kerala PMT 2008]**
(a) 5 to 9 segments (b) 9 to 14 segments
(c) 26 to 35 segments (d) 15 to last segment
(e) 35 to last segment

37. Hearts of Pheretima are situated in the segments **[NCERT]**
(a) 10, 13, 16 and 17 (b) 7, 9, 12 and 13
(c) 4, 5, 10 and 13 (d) 11, 14, 17 and 18

38. In earthworm fertilization occurs in **[NCERT; CPMT 2005; Bihar CECE 2006]**
(a) Oviduct (b) Spermatheca
(c) Clitellum (d) Coccon

39. The main function of clitellum is **[RPMT 2002; BCECE 2005]**
(a) Coccon formation (b) Locomotion
(c) Excretion (d) Copulation

40. Pheretima is **[NCERT]**
(a) Sterile (b) Hermaphrodite
(c) Radially symmetrical (d) Dioecious

41. In *Pheretima*, gizzard, buccal cavity, pharynx, oesophagus, pharyngeal nephridia receive the blood from this blood vessel **[EAMCET 2009]**
(a) Supra oesophageal (b) Lateral oesophageal
(c) Dorsal Blood (d) Subneural

42. Major nitrogenous excretory material of Earthworm is
(a) Uric acid (b) Ammonia
(c) Urea (d) Amino acids

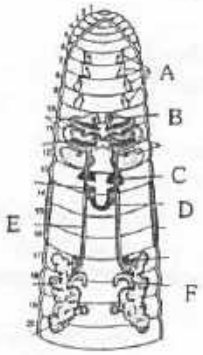
43. Occurrence of Earthworm in soil is indicated by
(a) Heaps of small rounded pellets
(b) Heaps of dry powder soil
(c) Holes
(d) Cast skin

44. Clitellum of *Pheretima* is thick girdle that is **[NCERT; BHU 1996; MHCET 2003; AFMC 2010]**
(a) Nonglandular around 14-16 segments
(b) Glandular around 14-16 segments
(c) Glandular around 16-18 segments
(d) Nonglandular around 16-18 segnments

45. The location of lymph glands in *Pheretima* is **[NCERT; EAMCET 2009]**
(a) 4^{th}, 5^{th} and 6^{th} segments (b) 10^{th} to 20^{th} segments
(c) 26^{th} to the last segments (d) 13^{th} segment

46. Trochophore larva is found in **[CPMT 2005]**
(a) *Chiton* (b) *Nereis*
(c) *Aphrodite* (d) All of these

47. Choose the correct combination of labelling from the options given **[NCERT; Kerala PMT 2009, 11]**

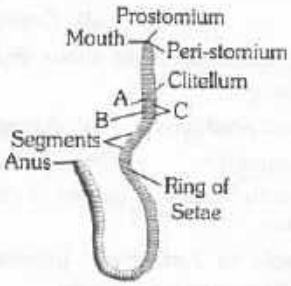


(a) A – testis, B – spermatheca, C – seminal vesicle, D – ovary, E – vas deferens, F – accessory gland
(b) A – spermatheca, B – testis, C – ovary, D – seminal vesicle, E – vas deferens, F – accessory gland
(c) A – spermatheca, B – testis, C – seminal vesicle, D – ovary, E –vas deferens, F – accessory gland
(d) A – spermatheca, B – testis, C – accessory gland, D – ovary, E – vas deferens, F – seminal vesicle
(e) A – spermatheca, B – ovary, C – seminal vesicle, D – testis, E – vas deferens, F – accessory gland

48. Earthworm has **[NCERT]**
(a) Two eyes (b) Many eyes
(c) No eyes (d) One eyes

49. Photoreceptors of Earthworm occur on
(a) Clitellum (b) Anal segment
(c) Dorsal surface (d) Lateral sides

50. Examine the ventral view of earthworm and identify A, B and C **[NCERT]**



	A	B	C
(a)	Female genital pore	Male genital pore	Genital papilla
(b)	Female genital pore	Genital papilla	Male genital pore
(c)	Male genital pore	Female genital pore	Genital papilla
(d)	Excretory pore	Female genital pore	Male genital pore

51. *Pheretima posthuma* (earthworm) is highly useful as **[NCERT]**

Or

Most important use of earthworm is **[CBSE PMT 1990; AFMC 2000]**
(a) Their burrows make the soil loose
(b) They make the soil porous, leave their castings and take organic debris in the soil
(c) They are used as fish meal
(d) They kill the birds due to biomagnification of chlorinated hydrocarbons

52. Earthworm possesses hearts **[NCERT; CBSE PMT 1991; RPMT 2000; AFMC 2006]**
(a) 6 pairs (b) 4 pairs
(c) 2 pairs (d) 1

53. The septal and pharyngeal nephridia open into alimentary canal and are of enteronephric type. It is an adaptation for **[NCERT; CPMT 1993; MP PMT 2004; AMU (Med) 2009]**
(a) Conservation of water (b) Conservation of heat
(c) Regulation of temperature (d) Regulation of amino acids

54. In earthworm, gizzard is found in **[CPMT 2009]**
(a) 8 – 10 Segment (b) 8^{th} segment
(c) 27^{th} segment (d) 8 – 11 segment

55. In earthworm, ovary is situated in segment **[NCERT; AFMC 1993; AIIMS 1993; BHU 2012]**
(a) 13 (b) 9
(c) 10 (d) 26

56. Blood of *Pheretima* is **[NCERT; CBSE PMT 1990; Odisha JEE 2005]**
(a) Blue with haemocyanin in corpuscles
(b) Blue with haemocyanin in plasma
(c) Red with haemoglobin in corpuscles
(d) Red with haemoglobin in plasma.

57. Suctorial mouth occurs in **[AFMC 2000]**
(a) Butterfly (b) Leech
(c) *Taenia* (d) Cockroach

58. The animal which does not show any metamorphosis of larval stage is **[Pb. PMT 1997]**
(a) *Pheretima posthuma* (b) Asterial
(c) *Musca domestica* (d) Butterfly

59. Which one of the following groups of structures/organs have similar function **[AIIMS 2005]**
(a) Typhlosole in earthworm, intestinal villi in rat and contractile vacuole in *Amoeba*
(b) Nephridia in earthworm, Malpighian tubules in cockroach and urinary tubules in rat
(c) Antennae of cockroach, tympanum of frog and clitellum of earthworm
(d) Incisors of rat, gizzard (proventriculus) of cockroach and tube feet of starfish

60. Earthworms have how many segments **[NCERT; HPMT 2005]**
(a) 85 - 400 (b) 100 - 200
(c) 20 - 95 (d) 115 – 120

61. Specialised respiratory organs are absent in **[CPMT 2000]**
Or
In which of the following respiration occurs without any respiratory organ **[BHU 2006]**
(a) Mosquito larva (b) Tadpole
(c) Cockroach (d) Earthworm

62. Blood of Earthworm is red because its haemoglobin is **[RPMT 1995]**
(a) Intracellular (b) Intercellular
(c) Oxidised (d) Reduced

63. Earthworm found in India is **[NCERT; RPMT 1995]**
(a) Lumbricus (b) Pheretima
(c) Drawida (d) Megascolex

64. Which one assists in locomotion **[CBSE PMT 1993; DPMT 1995]**
(a) Trichocysts in *Paramecium*
(b) Pedicellariae of Star Fish
(c) Clitellum in *Pheretima*
(d) Posterior sucker in *Hirudinaria*

65. Trait common amongst Earthworm, Leech and Centipede is **[CBSE PMT 1993]**
(a) Absence of legs (b) Hermaphrodite nature
(c) Ventral nerve cord (d) Malpighian tubules

66. Leech secretes which of the following anticoagulant **[AFMC 2005]**
(a) Hirudin (b) Heparin
(c) Serotonin (d) Histamine

67. In Earthworm, arrangment of blood vessels is **[BHU 1994, 2000, 01]**
(a) Different in last fifteen segments
(b) Different in first thirteen segments
(c) Same throughout
(d) Different in middle thirteen segments

68. Chloragogen cells are involved in **[RPMT 1995; APMEE 1995; DPMT 1999]**
(a) Digestion (b) Excretion of water
(c) Respiration (d) Fat storage

69. Excretory organs of Earthworm are **[NCERT; RPMT 1995; Manipal 1995, 99]**
(a) Coelom (b) Flame cells
(c) Nephridia (d) Gizzard

70. Spermathecae in earthworm is **[NCERT; AFMC 2005]**
(a) For producing sperm
(b) For storage of sperm obtained from male earthworm during copulation and used in future
(c) Both (a) and (b)
(d) None of these

71. In Earthworm, the effective organ for food digestion is **[RPMT 1995]**
(a) Pharynx (b) Buccal cavity
(c) Mouth (d) Stomach

72. Life span of Earthworm is **[RPMT 1996]**
(a) 1 – 3 years (b) 2 – 8 years
(c) 3.5 – 10.5 years (d) 6 – 8 years

73. Copulation period of Earthworm is **[APMEE 1996]**
(a) One hour (b) Two hours
(c) Four hours (d) About one week

74. In *Pheretima* nephridia occur in **[APMEE 1996]**
(a) All segment except 1 – 4 and 10 – 14
(b) 1 – 2, 4 – 6, 15 to last segments
(c) Meganephridia in pre-clitellar and micronephridia in post-clitellar segments
(d) Micronephridia in all segments meganephridia from clitellar region to end

75. In Earthworm **[APMEE 1996]**
(a) Ovaries are larger than testes
(b) Testes are larger than ovaries
(c) Both are equal
(d) Right testes are larger the ovaries

76. Trochophore larva is found in **[DPMT 2004]**
(a) Annelida (b) Platyhelminthes
(c) Coelenterate (d) Prawn

77. Name the animal having both setae and nephridia **[DPMT 1996]**
(a) Sea Urchin (b) Sea Mouse
(c) Sea Anemone (d) Sea Pen

78. Spermathecal pores of *Pheretima* are present in **[NCERT; CPMT 1996, 98; AMU (Med.) 2005; Kerala PMT 2010]**
(a) 5/6, 6/7 7/8 and 8/9
(b) 6/7, 7/8. 8/9 and 9/10
(c) 1/2, 2/3, 3/4 and 4/5
(d) 14/15, 15/16, 16/17 and 17/18

79. Typhlosole found in *Pheretima* occurs in **[CPMT 1996]**
(a) Oesophagus (b) Stomach
(c) Gizzard (d) Intestine

80. Chromophil cells present on pharynx of Earthworm take part in secretion of **[RPMT 1996]**
(a) Mucus (b) Lipases
(c) Carbohydrases (d) All the above

81. Nephrostome occurs in **[RPMT 1998]**
(a) Septal nephridia
(b) Integumentary nephridia
(c) Pharyngeal and septal nephridia
(d) Pharyngeal and integumentary nephridia

82. Animals having multiple or numerous setae are included under **[RPMT 1998]**
(a) Polychaeta (b) Oligochaeta
(c) Hirudinea (d) Onychophora

83. Movement of coelomic fluid helps in locomotion of **[JIPMER 1999]**
(a) *Hydra* (b) Frog
(c) Starfish (d) Earthworm

84. Which of the following annelids is a parasite on snails and frogs **[MP PMT 2013]**
(a) Acanthobdella (b) Pontobdella
(c) Branchellion (d) Glossiphonia

85. Which one is not deuterostome **[AFMC 1999]**
(a) Chordata (b) Cephalochordata
(c) Annelida (d) Echinodermata

86. In Earthworm, mouth is situated on **[NCERT; APMEE 1999]**
(a) Prostomium (b) Peristomium
(c) Stomium (d) Protostomium

87. A mismatch is **[Chd. CET 2000]**
(a) Odd toe–Horse (b) *Pheretima*–parapodia
(c) *Hydra*–Cnidaria (d) Cartilaginous Fish–Shark

88. The nerve chord in earthworm originates from **[NCERT; AMU (Med.) 2012]**
(a) Supra-pharyngeal ganglia and has a fused pair of ganglia in each segment from the 3rd to the last
(b) Supra-pharyngeal ganglia and has a fused pair of ganglia in each segment from the 4th to the last
(c) Sub-pharyngeal ganglia and has fused pair of ganglia in each segment from the 5th to the last
(d) Sub-pharyngeal ganglia and has a fused pair of ganglia in each segment from the 6th to the last

89. *Pheretima* and its close relatives derive nourishment from **[NCERT; CBSE PMT (Pre.) 2012]**
(a) Sugarcane roots
(b) Decaying fallen leaves and soil organic matter
(c) Soil insects
(d) Small pieces of fresh fallen leaves of maize, etc

90. In Earthworm, neurons are **[CPMT 2000; BHU 2006]**
(a) Sensory (b) Motor
(c) Both (a) and (b) (d) Mixed

91. In *Pheretima*, septa are absent **[CPMT 2000]**
(a) 5/6, 10/11 (b) 5/6, 7/8
(c) 6/7, 7/8 (d) First four segments

92. Enteronephric nephridia of earthworm are concerned with **[CBSE PMT 2000]**
(a) Excretion (b) Respiration
(c) Digestion (d) Osmoregulation

93. Blood vessel in *Pheretima* having valves is **[AIIMS 2000]**
(a) Dorsal (b) Ventral
(c) Lateral (d) Integumentary

94. Oxygen carrying blood pigment of Earthworm is **[Kerala PMT 2000]**

Or

Which of the follwoing is absent in the coelomic fluid of earthworm **[AFMC 2012]**
(a) Haemocyanin (b) Haemoglobin
(c) Haemoerythrin (d) Chlorocruorin
(e) Pinnaglobin

95. Nephridia of *Pheretima* are **[RPMT 2000]**
(a) Protonephridia (b) Solenocytes
(c) Micrometanephridia (d) Meganephridia

96. In Earthworm the dorsal wall of the intestine from the 26th segment to 95th segment forms a median internal fold called **[Kerala CET 2005, 07]**
(a) Trochophore (b) Typhlosole
(c) Clitellum (d) Trachea
(e) Nephridium

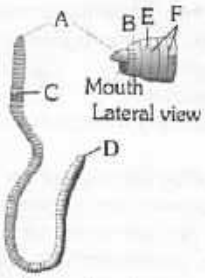
97. Which is not correct for Earthworm **[CPMT 2001]**
(a) It walks with a speed of 25 cm/min
(b) It can remain without oxygen for 6-30 hrs
(c) Life span is 3.5 – 10 years
(d) Setae easily dissolve in KOH

98. In *Pheretima* coelomic fluid contains **[BHU 2001]**
(a) Dissolved haemoglobin (b) Dissolved RBC
(c) Broken WBC (d) Watery plasma

99. Locomotory organ of annelida is **[Odisha JEE 2011]**
(a) Sucker (b) Parapodia
(c) Setae (d) All of these

100. External segmentation is absent but internal segmentation is present in **[APMEE 2001]**
(a) Polychaeta (b) Oligochaeta
(c) Archiannelida (d) Hirudinea

101. See the following figure and identify A to F **[NCERT]**



Dorsal view of earthworm

	A	B	C	D	E	F
(a)	Prostomium	Peristomium	Endo-steum	Cloaca	Metamer es	Ring of setae
(b)	Prostomium	Peristomium	Endo-steum	Anus	Metamer es	Ring of setae
(c)	Prostomium	Peristomium	Clitellu m	Anus	Metamer es	Ring of setae
(d)	Peristomium	Prostomium	Clitellu m	Anus	Metamer es	Ring of setae

102. Phaosome in Earthworm is **[APMEE 2002]**
(a) Lens (b) Pigment
(c) Nephridium (d) Hormone

103. In earthworms setae are present in all segments except **[NCERT; CPMT 1993; RPMT 1994; Kerala PMT 2011]**
(a) First and the last segments
(b) First and the clitellum
(c) First segment
(d) Clitellum and last segments
(e) First clitellum and last segments

104. Which one will excrete silicates consumed by Earthworm alongwith food **[APMEE 2002]**
(a) Intestinal cells (b) Basal cells
(c) Chloragogen cells (d) Flame cells

105. Pharyngeal nephridia of Earthworm *Pheretima* occur in segments **[NCERT; CMC 2002]**
(a) 3, 4 and 5 (b) 4, 5 and 6
(c) 5, 6 and 7 (d) 6, 7 and 8

106. Bilateral symmetry, blastopore mouth and true coelom occur in **[CMC 2002]**
(a) Echinodermata (b) Chordata
(c) Annelida (d) Platyhelminthes

107. Which one is correct **[Odisha JEE 2002]**
(a) Flatworms are eucoelomates
(b) Fishes are radially symmetrcial
(c) Birds are poikilothermic
(d) Earthworm is metamerically segmented

108. Pick up the mismatched **[Odisha JEE 2002]**
(a) Annelida – *Hydra*
(b) Nemathelminthes – *Ascaris*
(c) Arthropoda – *Cockroach*
(d) Echinodermata – Starfish

109. Locomotion occurs is Earthworm with the help of **[RPMT 2002]**
(a) Setae
(b) Setae and circular muscles
(c) Parapodia
(d) Setae, circular muscles and longitudinal muscles

110. Which of the following nephridia does not found in earthworm **[AFMC 2004]**
(a) Septal nephridia (b) Macro nephridia
(c) Integumentary nephridia (d) Pharyngeal nephridia

111. In which phylum the body is segmented **[MP PMT 2010]**
(a) Porifera (b) Coelenterata
(c) Annelida (d) Mollusca

112. Which one of the following species of earthworm is not recommended for vermicomposting **[KCET 2010]**
(a) *Eudrilus eugeniae* (b) *Eisenia fetidae*
(c) *Perionyx excavatus* (d) *Pheretima posthuma*

113. Which of the following is incorrect for *Pheretima* **[CPMT 2010]**
(a) Genital papillae are present on 17^{th} and 19^{th} segment
(b) Male genital pores are present on 18^{th} segment
(c) Clitellum is present on segments 24, 25 and 26
(d) Segments of earthworm are called somites

114. The breakdown of detritus into smaller particles by earthworm is a process called **[CBSE PMT (Mains) 2011; NEET 2013; KCET 2015]**
(a) Mineralisation (b) Catabolism
(c) Humification (d) Fragmentation

115. Which one of the following structures in *Pheretima* is correctly matched with its function **[CBSE PMT (Mains) 2011]**
(a) Setae – defence against predators
(b) Typhlosole – storage of extra nutrients
(c) Clitellum – secretes cocoon
(d) Gizzard – absorbs digested food

Phylum-Arthropoda

1. Which of the following features is not present in *periplaneta Americana* **[NEET (Phase-I) 2016]**
(a) Schizocoelom as body cavity
(b) Indeterminate and radial cleavage during embryonic development
(c) Exoskeleton composed of N-acetylglucosamine
(d) Metamerically segmented body

2. The presence of compound eyes is characteristics of the phylum **[VITEEE 2008; WB JEE 2008]**
(a) Nematoda (b) Mollusca
(c) Echinodermata (d) Arthropoda

3. Which of the following is not an arachnid **[AFMC 2008]**
(a) Spider (b) Itchmite
(c) Louse (d) Tick

4. The process of conversion of a small cockroach into an adult cockroach is called as **[RPMT 1999]**
(a) Moulting (b) Metamorphosis
(c) Ecdysis (d) Transformation

5. 'Hexapoda' is another name of **[RPMT 1999]**
(a) Crustacea (b) Arachnida
(c) Insecta (d) Archiannelid

6. Glow worm is
(a) Annelid (b) Helminthes
(c) Insect (d) Mollusca

7. Which thing is common in leech, mosquito bed bug and rat **[AIIMS 1993]**
(a) All have anticoagulatin
(b) All have nucleus
(c) All have no cellular membrane
(d) All have sexual phase

8. Cockroach belongs to class **[RPMT 1999]**
(a) Hexapoda (b) Apoda
(c) Myriapoda (d) Cephalopoda

9. The image formed in the eyes of cockroach is **[RPMT 1999]**
(a) Apposition (b) Superposition
(c) Both (a) and (b) (d) None of these

10. What is common among silver fish, scorpion, crab and honey bee **[CBSE PMT 1998; AIIMS 2007]**
(a) Compound eyes (b) Poison glands
(c) Jointed legs (d) Metamorphosis

11. Which one of the following groups of three animals each is correctly matched with their one characteristic morphological feature **[CBSE PMT 2008]**

	Animals	Morphological feature
(a)	Scorpion, Spider, Cockroach	Ventral solid central nervous system
(b)	Cockroach, Locust, Taenia	Metameric segmentation
(c)	Liver fluke, Sea anemone, Sea cucumber	Bilateral symmetry
(d)	Centipede, Prawn, Sea urchin	Jointed appendages

12. A moth is closely related to
(a) Butterfly (b) Cricket
(c) Beetle (d) Wasp

13. Which one of the following is the true description about an animal concerned **[NCERT; Manipal 2005; CBSE PMT 2008]**
(a) Rat – Left kidney is slightly higher in position than the right one
(b) Cockroach – 10 pairs of spiracles (2 pairs on thorax and 8 pairs on abdomen)
(c) Earthworm – The alimentary canal consists of a sequence of pharynx, oesophagus, stomach gizzard and intestine
(d) Frog – Body divisible into three regions – head, neck and trunk

14. The biggest phylum in regard to the number of species is **[NCERT; CPMT 1994]**

Or

Which one of the following have the highest number of species in nature **[CBSE PMT (Pre.) 2011]**

(a) Arthropoda (b) Platyhelminthes
(c) Chordata (d) Protozoa

15. The arthropods do not possess **[EAMCET 1998]**

(a) True coelom (b) Exoskeleton
(c) Haemocoel (d) Malpighian body

16. The number of abdominal segments in male and female cockroach is **[NCERT; Kerala PMT 2008]**

(a) 10, 10 (b) 9, 10
(c) 10, 11 (d) 8, 10
(e) 9, 9

17. Which of the following is absent in the mouth part of housefly **[APMEE 1995; CPMT 1999; MH CET 2003]**

(a) Labrum (b) Epipharynx
(c) Mandibles (d) Maxillary palps

18. Which of the following animals is unisexual **[Kerala PMT 2008]**

(a) Tapeworm (b) Leech
(c) Sponge (d) Earthworm
(e) Cockroach

19. Which of the following is not a characteristic features of arthropods **[J & K CET 2012]**

(a) Jointed appendages (b) Unsegmented body
(c) Moulting (d) Articulated exoskeleton

20. Note the following :

(A) Fenestra (B) Pedical (C) Lacinia
(D) Flagellum (E) Gelea (F) Mentum
(G) Palpifer (H) Cando (I) Glossa

Which of the above found in the first pair of maxillae in the case of Cockroach **[EAMCET 2009; AMU (Med.) 2010, 12]**

(a) C, E G and H (b) A, C, E and I
(c) A, F, G and I (d) B, E, G and I

21. In cockroach, which of the following is the principal motor centre **[EAMCET 2009]**

(a) Supraoesophageal ganglia
(b) Suboesophageal ganglia
(c) Metathoracic ganglia
(d) Abdominal ganglia

22. The terga, sterna and pleura of cockroach body are joined by **[AIPMT (Cancelled) 2015]**

(a) Muscular tissue (b) Arthrodial membrane
(c) Cartilage (d) Cementing glue

23. Spiders and scorpions are included in class **[CBSE PMT 1993; CPMT 2010]**

(a) Arachnida (b) Echarida
(c) Actinozoa (d) Anthozoa

24. Book-lungs are respiratory organs which are found in **[AFMC 2009]**

(a) Insects (b) Crustaceans
(c) Arachnids (d) Onychophores

25. Stink gland is found in **[CPMT 2009]**

(a) 4th and 5th terga of cockroach
(b) 5th and 6th terga of cockroach
(c) 5th and 6th sterna of cockroach
(d) 4th and 5th sterna of cockroach

26. Maximum number of economically important species are in the class **[MP PMT 2006]**

Or

Which of the following classes has largest number of animals **[MP PMT 1998]**

(a) Diplopoda (b) Chilopoda
(c) Crustacea (d) Insecta

27. Which of the following is not an insect **[RPMT 1995, 99; AFMC 1996; KCET 1997; RPMT 1999; BVP 2002]**

(a) Cockroach, beetle (b) Bed bug
(c) Mosquito, wasp (d) Spider, Tick

28. Which of the following features is **not** present in the phylum – Arthropoda **[NEET (Phase-I) 2016]**

(a) Chitinous exoskeleton
(b) Metameric segmentation
(c) Parapodia
(d) Jointed appendages

29. What is the similarity between cockroach, anopheles and housefly **[CPMT 1996]**

(a) Cuticle covering the body
(b) Two pair wings
(c) Three pair legs
(d) Presence of cephalothorax

30. The common characters found in centipede, cockroach, and crab are **[CBSE PMT 2006]**

(a) Green gland and tracheae
(b) Book lungs and antennae
(c) Compound eyes and anal cerci
(d) Jointed legs and chitinous exoskeleton

31. Crayfish is a **[MP PMT 1998]**

(a) Crustacean animal (b) Edible fish
(c) Poisonous fish (d) None of the above

32. Which one of the following has an open circulatory system **[CBSE PMT 2006]**

(a) Hirudinaria (b) Octopus
(c) Pheretima (d) Periplaneta

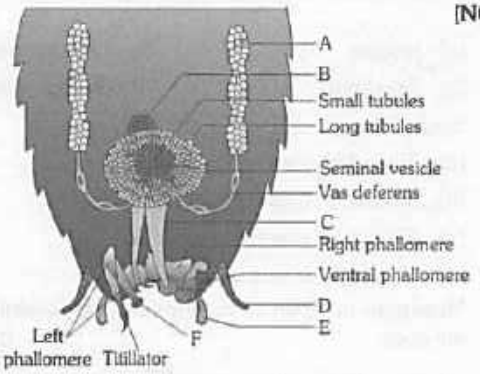
33. In which of the following sets all are vectors **[NCERT; CPMT 1998]**

(a) *Physalia, Musca domestica, Anopheles*
(b) *Amoeba, Physalia, Musca*
(c) *Anopheles, Musca, Culex*
(d) All of the above

34. *Phlebotomus argentipus* is a vector for **[EAMCET 1998]**

(a) *Trypanosoma evansi* (b) *Trypanosoma gambiense*
(c) *Leishmania donovani* (d) *Trypanosoma cruzi*

35. See the following figure and identify A to F in given diagram **[NCERT]**



	A	B	C	D	E	F
(a)	Testis	Phallic gland	Ejaculatory duct	Caudal style	Anal cercus	Pseudo penis
(b)	Testis	Phallic gland	Ejaculatory duct	Anal cercus	Caudal style	Pseudo penis
(c)	Testis	Collaterial gland	Ejaculatory duct	Terga	Caudal style	Pseudo penis
(d)	Testis	Collaterial gland	Ejaculatory duct	Anal cercus	Caudal style	Pseudo penis

36. Respiration pigment of blood in cockroach is **[RPMT 2006]**
(a) Haemozoine (b) Haemocyanin
(c) Haemoglobin (d) Absent

37. Which is a matching set in taxonomy **[CMC Vellore 1993]**
(a) Leech, locust, sea urchin, lobster
(b) Star fish, jelly fish, cuttle fish, octopus
(c) Milliped, crab, centipede, cockroach
(d) Nereis, planaria, round worm, earthworm

38. Book lungs are the respiratory organs in **[NCERT; RPMT 2006]**
(a) Protozoans (b) Cnidarians
(c) Arthropodes (d) Amphibians

39. The taste receptors of cockroach are **[DPMT 2006]**
(a) Compounds eyes
(b) Companiform sensillae
(c) Palps of maxillary and labium
(d) Tactile hairs

40. Bilateral symmetry, metameric segmentation coelom and open circulatory system are the characters of **[MP PMT 2009]**
(a) Annelida (b) Arthropoda
(c) Mollusca (d) Echinodermata

41. *Pasteurella/Yersinia pestis* (causal agent of Bubonic Plague) is transmitted by **[APMEE 1995]**
(a) Bed bug/*Cimex* (b) Rat flea/*Xenopsylla*
(c) Louse/*Pediculus* (d) Mosquito/*Aedes*

42. Among the following, colonial insects are **[BHU 2006]**
(a) Locusts (b) Mosquitoes
(c) White ants (d) Bed bug

43. Complete metamorphosis is observed in
(a) Silver Fish (b) Gypsy Moth
(c) Bed Bug (d) Grasshopper

44. Basic unit in the eye of Cockroach/insect is **[NCERT; APMEE 1995; Pb. PMT 1999; HPMT 2002]**
(a) Retina (b) Rhabdome
(c) Corneal facet (d) Ommatidium

45. Malpighian tubules are **[NCERT; BHU 2006]**
(a) Excretory organs of insects
(b) Excretory organs of frog
(c) Respiratory organs of insects
(d) Endocrine glands of insects

46. Structure common between Earthworm and Cockroach is **[NCERT; CPMT 1994; AFMC 1994; RPMT 2005]**

Or

Which one of the following features is common to earthworm, butterfly, spider and prawn **[WB JEE 2016]**

Or

Which one feature is common to leech Cockroach and scorpion **[AIIMS 2004, 08]**
(a) Cocoon (b) Ommatidia
(c) Dorsal nerve cord (d) Ventral nerve cord

47. Tumbler is pupa of
(a) Housefly (b) Mosquito
(c) Butterfly (d) Beetle

48. What is common between earthworm and *Periplaneta* **[AIIMS 2012]**
(a) Both have red coloured blood
(b) Both possess anal styles
(c) Both have Malpighian tubules
(d) Both have segmented body

49. In cockroach, larval and nymphal characters are maintained by **[BHU 2006]**
(a) Ecdysone (b) Salivary glands
(c) Parotid gland (d) Juvenile hormone

50. The correct sequence of arrangements of segments in the leg of cockroach is **[Kerala PMT 2006]**
(a) Tibia, Trochanter, Femur, Tarsus and Coxa
(b) Trochanter, Coxa, Tibia, Femur and Tarsus
(c) Coxa, Femur, Trochanter, Tibia and Tarsus
(d) Coxa, Trochanter, Femur, Tibia and Tarsus
(e) Trochanter, Coxa, Femur, Tarsus and Tibia

51. Mouth parts of a butterfly are of type
(a) Sponging (b) Siphoning
(c) Piercing and sucking (d) Chewing and sucking

52. Conglobate gland occurs in **[BCECE 2005; BHU 2008]**
(a) Female cockroach (b) Male cockroach
(c) Anopheles mosquito (d) Culex mosquito

53. Similarity between *Anopheles* and *Culex* is **[AFMC 2010]**
(a) Eggs are laid in floating raft
(b) Respiratory siphon is present
(c) Eggs have lateral air floats
(d) Males of both suck juices of flowers and fruits

54. In Housefly the larva lives in **[BHU 1995]**
(a) Water (b) Muddy soil
(c) Dung (d) Vegatation

55. In *Pheretima*, septa are absent between which segments **[BHU 2006]**
(a) 3/4 and 9/10 (b) 4/5 and 8/9
(c) 5/6 and 7/8 (d) 7/8 and 6/7

56. The ingrowth of exoskeleton in the head of cockroach is called **[AFMC 2012]**
(a) Notum (b) Apodemes
(c) Pleura (d) Tentorium

57. An insect without pupa stage is
(a) Mosquito (b) Silk Moth
(c) Bed Bug (d) Butterfly

58. Young Housefly/Mosquito is known as
(a) Maggot (b) Caterpillar
(c) Nymph (d) Imago

59. Which set includes pathogenic Arthropods **[AFMC 2006]**
(a) *Tse-tse* fly, mosquito, flea-plague
(b) Crab, *Culex*, spider
(c) *Anopheles*, *Culex*, cray fish
(d) Silver fish, house fly, sandfly

60. Which of the following causes parasitic castration of crab **[BHU 2012]**
(a) *Sacculina* (b) *Adamsia*
(c) *Spongilla* (d) None of these

61. Ecdysone is produced by
(a) Prothoracic gland (b) Corpora allata
(c) Corpora cardiaca (d) Abdominal gland

62. Cockroach is
(a) Carnivorous (b) Herbivorous
(c) Omnivorous (d) Sanguivorous

63. Johnston's organ found in **[Bihar MDAT 2002]**
(a) Antenna of Mosquito (b) Head of Cockroach
(c) Abdomen of Housefly (d) Abdomen of Spider

64. Which disease is spread by Housefly **[CPMT 1993]**
(a) Dengue fever (b) Encephalitis
(c) Filariasis (d) Gangrene

65. Halteres in Mosquitoes and Housefly develop from
(a) Prothorax (b) Metathorax
(c) Mesothorax (d) Head

66. Mouth parts of Cockroach are of **[NCERT; BHU 1999; RPMT 2000; CPMT 2001]**
(a) Piercing and sucking (b) Sucking and siphoning
(c) Cutting and biting type (d) Sucking and rasping

67. In insect, oxygen is carried to different tissues by

Or

In Insects, respiratory gas exchange occurs through **[HPMT 2002]**
(a) Diffusion through surface
(b) Tracheal tubes
(c) Respiratory pigment through blood
(d) Gills

68. Wings are vestigeal in Cockroach **[CPMT 1997]**
(a) Female *Blatta orientalis*
(b) Male *Blatta orientalis*
(c) Male *Periplanata americana*
(d) Female *Periplanata americana*

69. Anal cerci occur in
(a) Both male and female cockroaches
(b) Male Cockroach
(c) Female Cockroach
(d) Female *Ascaris*

70. In the life cycle of mosquito, comma-shaped stage is **[DPMT 2004]**
(a) Larval stage (b) Pupal stage
(c) Imago stage (d) None of these

71. The order of metamorphosis in Housefly is **[AIIMS 1999; JIPMER 2000]**
(a) Egg, nymph, pupa and adult
(b) Egg, larva, nymph and adult
(c) Egg, larva, pupa and adult
(d) Egg, pupa, larva and adult

72. An aquatic living fossil, with ancient origin and many primitive characters which respires through book gills is **[NCERT; AMU (Med.) 2012]**
(a) *Limulus* (b) *Cancer*
(c) *Lucifer* (d) *Daphnia*

73. Hormone produced by corpora allata in insects is **[APMEE 1996; AIIMS 1997; Manipal 2001; AMU (Med.) 2009]**
(a) Growth hormone (b) Moulting hormone
(c) Inhibiting hormone (d) Juvenile hormone

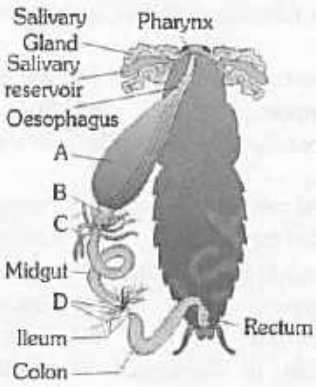
74. Male and female Cockroaches can be distinguished externally through **[CBSE PMT 1991; Pb. PMT 1994, 97; RPMT 1995, 98, 2001; CPMT 1996, 98; Kerala PMT 2007; Odisha JEE 2012; NEET (Karnataka) 2013]**
(a) Anal styles in male
(b) Anal cerci in female
(c) Anal style and antennae in females
(d) Both (a) and (c)

75. *Periplaneta* shows **[RPMT 1995; AFMC 2002]**
(a) Complete metamorphosis
(b) Incomplete metamorphosis
(c) No metamorphosis
(d) Gradual metamorphosis

76. Housefly feeds on sugar by
(a) Crushing its crystals and then sucking the power
(b) Crushing and eating
(c) Sucking
(d) Dissolving in saliva and sucking

77. Metamorphosis of insects is regulated through hormone **[CBSE PMT 1991; BHU 1998, 2001; RPMT 1998; Pb. PMT 1999]**
(a) Pheromone (b) Thyroxine
(c) Ecdysone (d) All the above

78. See the following figure and identify structure A, B, C and D **[NCERT]**



	A	B	C	D
(a)	Gizzard	Crop	Malpighian tubules	Hepatic caecae
(b)	Crop	Gizzard	Malpighian tubules	Hepatic caecae
(c)	Crop	Gizzard	Hepatic caecae	Malpighian tubules
(d)	Gizzard	Crop	Hepatic caecae	Malpighian tubules

79. In Cockroach, the number of ganglia are **[AFMC 1993]**
(a) Two pairs thoracic and four pairs abdominal
(b) Three pairs thoracic and six pairs abdominal
(c) Three pairs thoracic and five pairs abdominal
(d) Two pairs thoracic and six pairs abdominal

80. Mouth part present in female *Anopheles* but absent in male is
(a) Maxillae (b) Antennae
(c) Proboscis (d) Mandibles

81. An insect regarded as greatest mechanical carrier of disease is **[CBSE PMT 1991]**
(a) *Pediculus* (b) *Cimex*
(c) *Musca* (d) *Xenopsylla*

82. Which insect is called 'Horn Beetle' **[CPMT 2005]**
(a) *Tribolium* (b) *Corcyra*
(c) *Trogoderma* (d) None of these

83. Which of the following is an *r* – strategist **[DUMET 2010]**
(a) Human (b) Insect
(c) Rhinoceros (d) Whale

84. The major excretory product of arthropods is **[NCERT; Bihar MDAT 1994]**
(a) Ammonia (b) Urea
(c) Uric acid (d) Trimethylamine oxide

85. Common feature between housefly and honey bee is **[Pb. PMT 2004]**
(a) Head (b) Mouthparts
(c) Abdomen (d) Three pairs of jointed legs

86. Adult *Culex* and *Anopheles* can be distinguished with the help of **[CBSE PMT 1992, 93; KCET 1998]**
(a) Mouth parts/colour (b) Sitting posture
(c) Antennae/wings (d) Feeding habits

87. A larval stage occurs in the life history of all members of the group **[CBSE PMT 1993]**
(a) Frog, Lizard and Cockroach
(b) Ascaris, Housefly and Frog
(c) Housefly, Earthworm and Mosquito
(d) Butterfly, frog and Mosquito

88. Difference between male and female *Anopheles* occurs in **[CBSE PMT 1993]**
(a) Proboscis (b) Wings
(c) Antennae (d) Size

89. Tracheae of Cockroach and Mammal are similar in having **[CBSE PMT 1993]**
(a) Paired nature (b) Noncollapsible walls
(c) Ciliated inner lining (d) Origin from head

90. Pupa occurs in the life cycle of **[CPMT 1994]**
(a) Cockroach (b) Housefly
(c) Honey Bee (d) Both (b) and (c)

91. Which part of Cockroach has both exoskeleton and endoskeleton **[RPMT 1995]**
(a) Head (b) Thorax
(c) Abdomen (d) All the above

92. In Cockroach, wings are absent from **[NCERT; RPMT 1995]**
(a) Prothorax (b) Mesothorax
(c) Metathorax (d) None of the above

93. The first animals to fly were **[RPMT 1995]**
(a) Mammals (b) Lizards
(c) Birds (d) Insects

94. Which is nonpoisonous **[MP PMT 1995]**
(a) Scorpion (b) Centipede
(c) Crab (d) Spider

95. Which one is a tracheate group **[MP PMT 1995]**
(a) King Crab – scorpion – Housefly
(b) Crab – Centipede – Cockroach
(c) Spider – Peripatus - Mosquito
(d) Bed Bug – Sandfly – Silkworm

96. In Cockroach, metamorphosis requires **[RPMT 1996]**
(a) Three weeks (b) 40-70 days
(c) 10-30 days (d) 5-13 days

97. Male cockroach can be distinguished from female cockroach through **[RPMT 1996]**
(a) Longer antennae (b) Longer abdomen
(c) Wingless body (d) All the above

98. Cockroach blood does not contain respiratory pigment. It means **[RPMT 1996; AFMC 1998]**
(a) It does not respire
(b) Cockroach respires anaerobically
(c) Oxygen passes to all the tissues through diffusion
(d) Oxygen reaches tissue through tracheoles

99. Which is common amongst Fly, Mosquito and Cockroach **[CPMT 1996]**
(a) Open excretory system (b) Two pairs of wings
(c) All belong to class insecta (d) 13-chambered heart

100. *Periplaneta* differs from *Blatta* in **[CPMT 1996]**
(a) Reduced wings in *Blatta* and developed wings in *Periplaneta*
(b) Reverse of (a)
(c) Anal styles
(d) Anal cerci

101. Which is characteristic of Cockroach **[NCERT; BHU 1996, 98, 2001; CPMT 1996, 2009; HP PMT 2005]**
(a) 13-chambered heart (b) Reduced wings
(c) Cocoon formation (d) Segmented body

102. Arrhenotoky is parthenogenetic development found in **[AIIMS 1996]**
(a) All insects
(b) Mosquitoes
(c) Butterflies
(d) Honey bees, Wasps and Ants

103. Sandfly is **[Bihar MDAT 1996]**
(a) *Ancyclostoma* (b) *Musca*
(c) *Phlebotomus* (d) *Drosophila*

104. In Cockroach the longest podomere is **[Bihar MDAT 1996]**
(a) Coxa (b) Trochanter of Femur
(c) Tibia (d) Tarsus

105. Tick the correct matching **[DPMT 1996]**
(a) Arachnida — Ticks, Mites
(b) Prototheria — Scaly Anteater
(c) Prokaryotes — Green Algae
(d) Annelida — *Ascaris*, *Taenia*

106. Which one possess larval stages **[DPMT 1996]**
(a) Cockroach and Housefly
(b) Housefly and Butterfly
(c) Cockroach and Honey Bee
(d) Grasshopper and Dragonfly

107. In Butterfly, long coiled siphoning tubes is formed from **[APMEE 1996]**
(a) Labrum (b) Maxilla
(c) Labium (d) Mandibles

108. If juvenile hormone is absent when silkworm moults, it will **[CBSE PMT 1997]**
(a) Moult into another larval stage
(b) Moult into pupa
(c) Moult into adult
(d) Die

109. Which is absent in arthropoda **[JIPMER 1997]**
(a) Compound eye
(b) Chitinous exoskeleton
(c) Closed blood vascular system
(d) Malpighian tubules

110. Swarming is found in **[MP PMT 1998]**
(a) Houseflies (b) Mosquitoes
(c) Locusts (d) *Pyrilla*

111. Complete metamorphosis present in **[CPMT 2002; RPMT 2006]**
(a) House fly and mosquito
(b) House fly and cockroach
(c) Mosquito and cockroach
(d) None of the above

112. Pseudotrachea of Housefly is formed by **[CPMT 1998]**
(a) Labella (b) Rostrum
(c) Haustellum (d) Basiproboscis

113. Spiracles of Cockroach which are larger and always kept open are **[RPMT 1998]**
(a) First and second pairs (b) First and third pairs
(c) First and tenth pairs (d) Second and third pairs

114. Corpora allata are removed from a nymph. It will **[RPMT 1998]**
(a) Remain nymph for life
(b) Become adult
(c) Change to next nymph immediately but will remain in that state
(d) Die after some time

115. *Aedes* is vector of **[RPMT 1998]**
(a) Plague (b) Malaria
(c) Filaria (d) Encephalitis and Dengue

116. Antennae of Cockroach have **[RPMT 1998]**
(a) Gustatory receptors
(b) Auditory receptors
(c) Tactile receptors
(d) Tactile and olfactory receptors

117. Which is wrong for an insect **[RPMT 1998]**
(a) Cephalization and unjointed appendages
(b) Chitinous exoskeleton and wings
(c) Cephalisation and complete metamorphosis
(d) Well developed sensory organs and haemocoel

118. Millipede (*Julus*) and Centipede (*Scolopendra*) are both included under **[RPMT 1998]**
(a) Arachnida (b) Myriapoda
(c) Scaphopoda (d) Pelecypoda

119. Spider prepares the web with the help of **[JIPMER 1999]**
(a) Legs (b) Mouth
(c) Spinnerets (d) Salivary glands

120. Open circulatory system is not of physiological hindrance in Cockroach because **[AIIMS 1999]**
(a) Heart is simple but chambered
(b) Blood is colourless
(c) Circulatory and respiratory systems are not connected
(d) Excretion occurs through malpighian tubules

121. In cockroaches, digestive juice is secreted by the **[NCERT; Kerala PMT 2012]**
(a) Gizzard (b) Malpighian tubules
(c) Crop (d) Oesophagus
(e) Hepatic caeca

122. Number of fertilized eggs in ootheca of Cockroach is **[NCERT; BHU 1999; Kerala PMT 2000; Manipal 2001]**
(a) 16 pairs in two rows (b) 16 in two rows
(c) 10 in one rows (d) 8 in two rows

123. In Cockroach, ootheca is produced by secretion of **[APMEE 1999]**
(a) Conglobate gland (b) Phallic gland
(c) Collaterial gland (d) Mushroom gland

124. Hard exoskeleton cephalothorax and gills for respiration are characteristics of **[AFMC 2000]**
(a) Insecta (b) Myriapoda
(c) Polychaeta (d) Crustacea

125. *Palaeomon* (Prawn) is a **[J & K CMEE 2000]**
(a) Insect (b) Crustacean
(c) Soft shelled mollusc (d) Fish

126. Arachnida contains **[J & K CMEE 2000]**
(a) Wasps (b) Insects
(c) Spiders (d) Beetles

127. *Ascaris* and Cockroach resemble each other in **[CBSE PMT 2000]**
(a) Pseudocoel (b) Sexual dimorphism
(c) Nephridia (d) Dorsal tubular nerve cord

128. Which among the following is a social insect **[CPMT 2000]**
(a) White Ants (b) Locusts
(c) Bed Bugs (d) Mosquitoes

129. *Periplaneta* belongs to phylum **[NCERT; Odisha JEE 2012]**
(a) Annelida (b) Mollusca
(c) Echinodermata (d) Arthropoda

130. Select the correct statement from the ones given below with respect to *Periplaneta americana* **[CBSE PMT (Pre.) 2012]**
(a) Nervous system located dorsally, consists of segmentally arranged ganglia joined by a pair of longitudinal connectives
(b) Males bear a pair of short thread like anal styles
(c) There are 16 very long Malpighian tubules present at the junctions of midgut and hindgut
(d) Grinding of food is carried out only by the mouth parts

131. A female *Anopheles* mosquito can be recognized by **[WB JEE 2011]**
(a) Proboscis and palpi are long and more or less of equal length
(b) Proboscis long and palpi short
(c) Proboscis short and palpi long
(d) Both proboscis and palpi are short

132. The open circulatory system is found in **[Odisha JEE 2011]**
(a) Earthworm (b) Cockroach
(c) Snail (d) Both (b) and (c)

133. Holometaboly is found in **[Kerala PMT 2000]**
(a) Lady Bird Beetle (b) Bed Bug
(c) Cockroach (d) Grass Hopper
(e) Silver Fish

134. Number of malpighian tubules present in Cockroach is **[RPMT 2000]**
(a) 50-60 (b) 80-90
(c) 100-150 (d) 200-250

135. Arthropoda is differentiated from annelids by **[BHU 2000]**
(a) Segmented body (b) Absence of nephridia
(c) Eyes (d) None of the above

136. An arthropod belonging to onychophora which possesses nephridia is **[BHU 2001]**
(a) *Limulus* (b) *Peripatus*
(c) *Daphnia* (d) *Lepisma*

137. Paurometaboly is **[KCET 2001]**
(a) Complete metamorphosis
(b) Gradual metamorphosis
(c) Incomplete metamorphosis
(d) Complete metabolism

138. About how many times does the nymph of the *Periplaneta americana* undergo moulting before becoming an adult **[NCERT; Kerala PMT 2011]**
(a) 4 (b) 2
(c) 17 (d) 3
(e) 13

139. Number of moults undergones by caterpillar of *Bombyx mori* is **[APMEE 2001]**
(a) 2 (b) 4
(c) 6 (d) 8

140. Tripedal locomotion occurs in **[APMEE 2001]**
(a) Kangaroo (b) Cockroach
(c) Snail (d) Earthworm

141. Which one of the following sets of animals shows a close taxonomic relationship **[MP PMT 2001]**
(a) Jelly fish, Cuttle fish, Cat fish
(b) Honey bee, Crayfish, Spider
(c) Alligator, Nautilus, Turtle
(d) Kangaroo, Octopus, Salamander

142. Class crustacea have which of the following feature **[AIIMS 2001]**
(a) Cephalothorax, biramous appendages and gills
(b) Cephalothorax, book lungs and chitinous exoskeleton
(c) Head and thorax, book lungs and chitinous exoskeleton
(d) Head and thorax, biramous appendages and book lungs

143. To which of the following class Limulus belongs **[CPMT 2000; BVP 2001]**
(a) Chilopoda (b) Arachnida
(c) Crustacea (d) Merostomata

144. Which of the following belongs to Phylum *Arthropoda*/insecta **[RPMT 2001; DPMT 2004; NEET 2013]**
(a) Star fish (b) Gold fish
(c) Silver fish (d) Cuttle fish

145. Caterpillar and maggot are **[CPMT 2001]**
(a) Larvae (b) Nymphs
(c) Adults (d) Pupa

146. The larva of Housefly lacks **[BVP 2001]**
(a) Eyes (b) Wings
(c) Spiracles (d) All of the above

147. Mouth parts of housefly are called as **[BVP 2001; DPMT 2006]**
(a) Biting & sucking type (b) Sponging & sucking type
(c) Biting & chewing type (d) None of these

148. Which one of the following is not a correct pair **[RPMT 2001]**
(a) Trochophore-Annelida (b) Bipinnaria-Echinodermata
(c) Tornaria-Arthropoda (d) Planula-Coelenterata

149. Crustacean fishery involves **[MH CET 2002]**
(a) Lobster and Prawn (b) Shells of Cuttle fish
(c) Mussels and Squids (d) Oysters and Crab

150. Wriggler is the larva of **[JIPMER 2002]**
(a) Cockroach (b) Mosquito
(c) Butterfly (d) Housefly

151. Superficial meroblastic cleavage occurs in **[AFMC 2006]**
(a) Reptiles (b) Birds
(c) Mammals (d) Insects

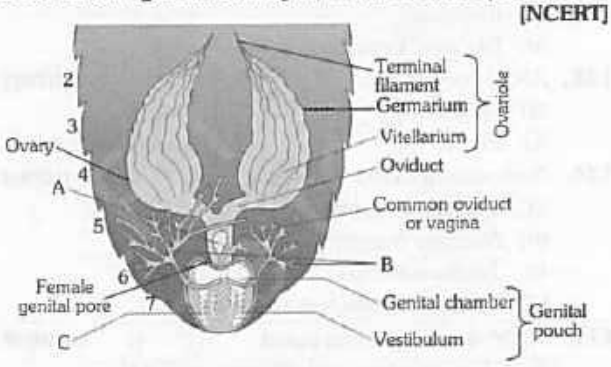
152. Which of the following respires by gills **[J & K CET 2002, 05]**
(a) Prawn (b) Frog
(c) Crocodile (d) Whale

153. Chitin is found in **[J & K CET 2002]**
(a) Mollusca (b) Arthropoda
(c) Echinodermata (d) Coelenterata

154. What distinguishes an insect from crustacean **[J & K CET 2002, 05]**
(a) Number of eyes
(b) Arrangement of nerve cords
(c) Number of appendages
(d) Presence of wings

155. Common feature in earthworm and cockroach is **[NCERT; CPMT 2002]**
(a) Cuticle (Exoskeleton)
(b) Solid and ventral nerve cord
(c) Nephridia
(d) Malpighian tubules

156. The given figure is of repr. System of femal cockroach. The correct labellings indicated by A, B and C are respectively **[NCERT]**



(a) A – Spermatheca, B – Collaterial glands, C – Tegmina
(b) A – Spermatheca, B – Seminal vesicle, C – Gonapophyses
(c) A – Phallic gland, B – Collaterial glands, C – Gonapophyses
(d) A – Spermatheca, B – Collaterial glands, C – Gonapophyses

157. Organ of mastication in cockroach is **[NCERT; CPMT 2002; RPMT 2005; KCET 2012]**
(a) Labrum (b) Labium
(c) Mandibles (d) Maxilla

158. Which of the following is an insect **[CPMT 2002; RPMT 2005]**
(a) Moth (b) Mites
(c) Prawn (d) Scorpion

159. In cockroaches during the digestion of food, the enzyme cellulase in synthesised by **[HP PMT 2005]**
(a) Saliva
(b) Lining cells of midgut
(c) Bacteria in the midgut
(d) Cellulase is never synthesised

160. In crustaceans, respiration takes place by **[RPMT 2002]**
(a) Gills (b) Book lungs
(c) Ctenidia (d) Trachea

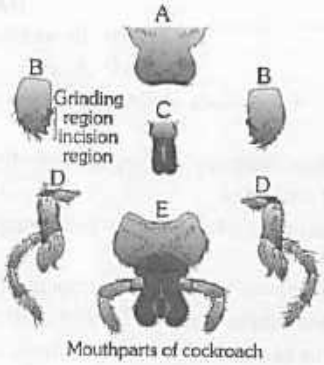
161. Which of the following is correctly stated as happens in the common cockroach **[CBSE PMT (Pre.) 2011]**
(a) The food in ground by mandibles an gizzard
(b) Malpighian tubules are excretory organ projecting out from the colon
(c) Oxygen is transported by haemoglobin blood
(d) Nitrogenous excretory product is urea

162. Cray Fish belongs to **[BHU 1998; AMU (Med.) 2002]**
(a) Pisces (b) Mollusca
(c) Arthropoda (d) Anthozoa

163. Which one does not occur in Cockroach leg **[DPMT 2002]**
(a) Tibia (b) Femur
(c) Fibula (d) Coxa

164. Hind wings of mosquitoes are termed as **[CPMT 1999; BHU 2002]**
(a) Coxa (b) Elytra
(c) Halteres (d) Tentorium

165. The given figures are related with mouth parts of cockroach. Identify A to E



Mouthparts of cockroach

[NCERT]

	A	B	C	D	E
(a)	Labium	Hypopharynx	Labrum	Maxilla	Mandible
(b)	Labrum	Mandible	Hypopharynx	Maxilla	Labium
(c)	Mandible	Labium	Maxilla	Labrum	Hypopharynx
(d)	Maxilla	Hypopharynx	Labium	Mandible	Labrum

166. Match the columns and choose the exact combination

(A)	Ommatidia	(i)	Articulation with thorax
(B)	Trochanter	(ii)	For vision
(C)	Coxa	(iii)	Forming exoskeleton
(D)	Sclerites	(iv)	Fused with large and stout femur

[Manipal 2002]
(a) A—(iv), B—(iii), C—(i), D—(ii)
(b) A—(i), B—(ii), C—(iii), D—(iv)
(c) A—(ii), B—(iv), C—(i), D—(iii)
(d) A—(iii), B—(i), C—(ii), D—(iv)

167. Ommatidia serve the purpose of photoreception in **[CBSE PMT 2003; BHU 2012]**
(a) Sunflower (b) Cockroach
(c) Frog (d) Humans

168. Mouth part of mosquito is **[CPMT 2002; MH CET 2003; RPMT 2005]**
(a) Sucking and piercing type (b) Sponging type
(c) Biting and chewing type (d) None of these

169. Vision in cockroach is **[BVP 2003]**
(a) Monocular (b) Binocular
(c) Ultrasonic (d) Mosaic

170. Which one of the following is a matching pair of an animal and a certain phenomenon it exhibits **[CBSE PMT 2003]**
(a) Taenia – Polymorphism
(b) Pheretima – Sexual dimorphism
(c) Musca – Complete metamorphosis
(d) Chamaeleon – Parthenogenesis

171. Haemocoel is found in **[CPMT 1999; DPMT 2004; Odisha JEE 2011]**
(a) *Hydra* and *Aurelia*
(b) *Taenia* and *Ascaris*
(c) *Balanoglossus* and *Herdmania*
(d) Cockroach and *Pila*

172. Universal character of insect is **[MP PMT 2002; MH CET 2004; AFMC 2005; Odisha JEE 2008]**
(a) Two pair of wings (b) Compound eyes
(c) Three pair of legs (d) Both (b) and (c)

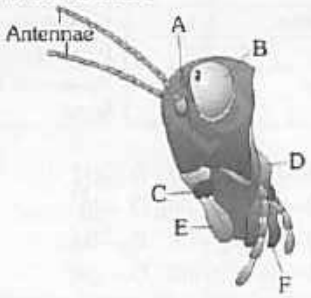
173. Larvae of beetles are known as **[Kerala PMT 2004]**
(a) Caterpillars (b) Grubs
(c) Maggots (d) Naids

174. Scorpion belongs to a class to which one of the following also belong **[DPMT 2003; BVP 2004]**
(a) Ticks (b) Crab
(c) Barnacles (d) Cockroach

175. Blood of which of the following is colourless **[HPMT 2005]**
(a) Earthworm (b) Leech
(c) Cockroch (d) Frog

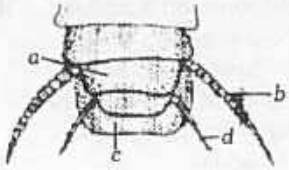
176. In Arthropoda, head and thorax are often fused to form cepalothorax, but one of the following classes is the body divide into head, thorax and abdomen **[CBSE PMT 2004]**
(a) Crustacea
(b) Arachnida and Crustachea
(c) Insecta
(d) Myriapoda

177. The given figure is associated with head region of cockroach. Identify A to F **[NCERT]**



	A	B	C	D	E	F
(a)	Ocellus	Compound eye	Maxilla	Mandible	Labium	Labrum
(b)	Ocellus	Compound eye	Mandible	Maxilla	Labium	Labrum
(c)	Ocellus	Compound eye	Mandible	Maxilla	Labrum	Labium
(d)	Compound eye	Ocellus	Maxilla	Mandible	Labrum	Labium

178. The diagram represents the reproductive organs of male cockroach. Choose the correct combination of labelling. **[Kerala CET 2005]**



(a) *a*-8th sternum, *b*-anal cercus, *c*-10th tergum, *d*-anal style
(b) *a*-10th tergum, *b*-anal cercus, *c*- anal style, *d*-8th sternum
(c) *a*-anal style, *b*-anal cercus, *c*-10th tergum, *d*-8th sternum
(d) *a*-8th sternum, *b*-anal style, *c*-10th tergum, *d*-anal cercus
(e) *a*-anal cercus, *b*-8th sternum, *c*-10th tergum, *d*-anal style

179. What is common between an earthworm, a cockroach and a centipede **[AIEEE Pharmacy 2004]**
(a) Sexual dimorphism (b) Metamorphism
(c) Chitinous exoskeleton (d) Haemocoel

180. What is common between a moth, a frog and a mosquito **[AIEEE Pharmacy 2004]**
(a) The body is clearly differentiated into head, thorax and abdomen
(b) The life history is carried out in water
(c) The skin acts as the main respiratory organ
(d) Their larvae feed on a food different from that of the adult

181. The peculiar pungent smell of cockroach is produced by the secretions of **[CPMT 2004]**
(a) Pheromones (b) Flame cells
(c) Abdominal glands (d) Cervical glands

182. The cockroach of genus *Blatta* is also called **[CPMT 2004]**
(a) German cockroach (b) Australian cockroach
(c) Orient cockroach (d) American cockroach

183. The young one of cockroach is called **[NCERT; KCET 2004]**
(a) Caterpillar (b) Nymph
(c) Fingerling (d) Maggot

184. Which one of following feature is possessed by crustaceans and not by insects **[CPMT 2005]**
(a) Paired limbs (b) Two pairs of antenna
(c) Chitinous exoskeleton (d) Bilateral symmetry

185. The head of cockroach lacks **[CPMT 2010]**
(a) Cardo (b) Gena
(c) Trochanter (d) Frons

186. The adhesive pads (soft-pads) present in legs of cockroach are **[AFMC 2005; KCET 2010]**
(a) Galea (b) Lacinea
(c) Glossa (d) Plantulae

187. Which of the following are examples of arthropoda **[Odisha JEE 2010; NEET 2013]**
(a) Silver fish, star fish, prawn
(b) Clam worm, apple snail, honeybee
(c) Sea star, tongue worm, scorpion
(d) Cockroach, scorpion, prawn

188. Insects are **[HPMT 2005; MP PMT 2006]**
(a) Amminotelic (b) Ammonotelic
(c) Ureotelic (d) Uricotelic

189. Gizzard of cockroach is a part of **[HPMT 2005]**
(a) Respiratory system (b) Digestive system
(c) Immune system (d) Circulatory system

190. Which one of the following features is common in silverfish, scorpion, dragonfly and prawn **[AIIMS 2005]**
(a) Three pairs of legs and segmented body
(b) Chitinous cuticle and two pairs of antennae
(c) Jointed appendages and chitinous exoskeleton
(d) Cephalothorax and tracheae

191. From the following statements select the wrong one **[CBSE PMT 2005]**
(a) Prawn has two pairs of antennae
(b) Nematocysts are characteristics of the phylum cnidaria.
(c) Millepedes have two pairs of appendages in each segment of the body
(d) Animals belonging to phylum porifera are exclusively marine

192. Which structure of man is similar to the spiracle of cockroach **[Odisha JEE 2005]**
(a) Nostril (b) Bronchiole
(c) Lungs (d) Alveoli

193. How do you differentiate a butterfly from a moth **[KCET 2010]**
(a) Moth has feathery antennae but butterfly has club shaped antennae
(b) Moth has one pair of wings but butterfly has two pairs of wings
(c) Moth is diurnal but butterfly is nocturnal
(d) Moth has simple eyes but butterfly has compound eyes

194. Tubular heart of cockroach has how many chambers **[AFMC 2005]**
(a) 10 (b) 13
(c) 12 (d) 11

195. Which of the following animal belongs to class crustacea **[WB JEE 2010]**
(a) Cockroach (b) Cyclops
(c) Grasshopper (d) Mosquito

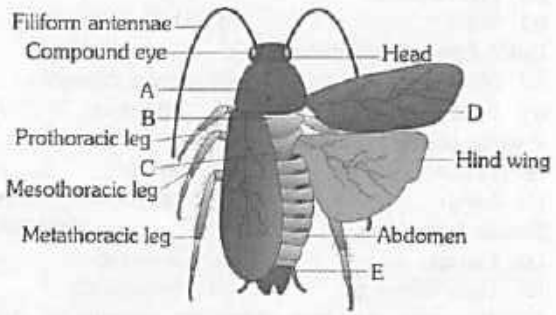
196. Which of the following statements is correct regarding cockroach **[CPMT 2010]**
(a) Ventral nerve cord is present
(b) Spiracles help in excretion
(c) Phallomere is present in female cockroach
(d) Compound eye is also called as ocellus

197. Mushroom gland is a part of **[CPMT 2010]**
(a) Male reproductive system of cockroach
(b) Female reproductive system of cockroach
(c) Male reproductive system of rabbit
(d) Female reproductive system of rabbit

198. What external changes are visible after the last moult of a cockroach nymph **[NEET 2013]**
(a) Labium develops
(b) Mandibles become harder
(c) Anal cerci develop
(d) Both fore wings with hind wings develop

199. Which one of the following is one of the paths followed by air/O_2 during respiration in an adult male *Periplaneta americana* as it enters the animal body **[NEET (Karnataka) 2013]**
(a) Spiracle in metathorax, trachea, tracheoles, oxygen diffuses into cells
(b) Mouth, bronchial tube, trachea, oxygen enters cells
(c) Spiracles in prothorax, tracheoles, trachea, oxygen diffuses into cells
(d) Hypopharynx, mouth, pharynx, trachea, tissues

200. See the following figure and identify A to E **[NCERT]**



	A	B	C	D	E
(a)	Pronotum	Mesothorax	Metathorax	Tegmina	Anal style
(b)	Pronotum	Mesothorax	Metathorax	Tegmina	Anal cerci
(c)	Pronotum	Mesothorax	Metathorax	Tegmina	Sternum
(d)	Pronotum	Mesothorax	Metathorax	Tegmina	Pleura

201. Match **Column-I** with **Column-II** for housefly classification and select the correct option using the codes given below **[NEET (Phase-II) 2016]**

Column-I	Column-II
(A) Family	(i) Diptera
(B) Order	(ii) Arthropoda
(C) Class	(iii) Muscidae
(D) Phylum	(iv) Insecta

Codes	(A)	(B)	(C)	(D)
(a)	(iv)	(ii)	(i)	(iii)
(b)	(iii)	(i)	(iv)	(ii)
(c)	(iii)	(ii)	(iv)	(i)
(d)	(iv)	(iii)	(ii)	(i)

202. In male cockroaches, sperms are stored in which part of the reproductive system **[NEET (Phase-II) 2016]**
(a) Vas deferens (b) Seminal vesicles
(c) Mushroom glands (d) Testes

Phylum-Mollusca

1. Which one of the following is not used in organic farming **[BHU 2006; AMU (Med.) 2006; CBSE PMT (Pre.) 2010]**
(a) Snail (b) *Glomus*
(c) Earthworm (d) *Oscillatoria*

2. The devil fish and sea hare are **[NCERT; J & K CET 2008; AMU (Med.) 2012]**
(a) Molluscs (b) Crustaceans
(c) Coelenterates (d) Marine fish and mammal

3. Which one of the following phyla is correctly matched with its two general characteristics **[CBSE PMT 2008]**
(a) Echinodermata – Pentamerous radial symmetry and mostly internal fertilization
(b) Mollusca – Normally oviparous and development through a trochophore or veligerlarva
(c) Arthropoda – Body divided into head, thorax and abdomen and respiration by tracheae
(d) Chordata – Notochord at some stage and separate anal and urinary opening to the outside

4. Foot is displaced to the neighbourhood of mouth and divided into arms in **[AIIMS 1999]**
(a) *Ostrea* (b) *Pila*
(c) *Sepia* (d) *Chiton*

5. Most mollusc are **[BVP 2003]**
(a) Terrestrial (b) Fresh water
(c) Marine (d) None of these

6. The elephant tusk shell is **[RPMT 1999]**
(a) *Dentalium* (b) *Nautilus*
(c) *Limax* (d) *Octopus*

7. Cilia of gills of bivalve molluscs help in **[DPMT 2006]**
(a) Feeding (b) Digestion
(c) Reproduction (d) Excretion

8. Which among the following is not a class of phylum mollusca **[JIPMER 1993; AFMC 1997]**
(a) Gastropoda (b) Trematoda
(c) Decapoda (d) Both (b) and (c)

9. Which one is not correctly matched **[Odisha JEE 2005]**
(a) Mollusca – Pseudocoel
(b) Cnidaria – Nematocyst
(c) Annelida – Chloragogen cells
(d) Echinodermata – Water vascular system

10. Ospharidium is meant for **[CPMT 2005]**
(a) Excretion
(b) Nutrition
(c) Selection and rejection of food
(d) Grinding of food

11. Which one belongs to the class of sea hare **[MP PMT 1995]**
Or
Which of the following belongs to the class gastropoda **[J & K CET 2012]**
(a) Sea cow (b) Sea squirt
(c) Snail (d) Sepia

12. Asymmetry in gastropoda is due to **[MH CET 2003]**
(a) Torsion (b) Coiling
(c) Twisting (d) Abdomen

13. The mollusc which is considered to be a living fossil and also shows characters of annelids like nephridia and internal segmentation is **[AIIMS 1993]**
(a) *Pinctada vulgaris* (b) Nautilus
(c) *Neopilina galatheca* (d) None of these

14. Pila is the example of which class **[RPMT 2001]**
(a) Gastropoda (b) Pelecypoda
(c) Cephalopoda (d) Scaphopoda

15. In which one of the following, the genus name, its two characters and its phylum are not correctly matched, whereas the remaining three are correct
[NCERT; CBSE PMT (Pre.) 2012]

	Genus Name		Two characters	Phylum
(a)	*Pila*	(a)	Body Segmented	Mollusca
		(b)	Mouth with Radula	
(b)	*Asterias*	(a)	Spiny Skinned	Echinodermata
		(b)	Water vascular system	
(c)	*Sycon*	(a)	Pore bearing	Porifera
		(b)	Canal system	
(d)	*Periplaneta*	(a)	Jointed appendages	Arthropoda
		(b)	Chitinous exoskeleton	

16. Visceral mass undergo torsion in
[DPMT 2003; AMU (Med.) 2010]
(a) Gastropoda (b) Cephalopoda
(c) Palacopoda (d) None of these

17. Cephalopoda is a class of animals in which **[MP PMT 1994]**
(a) Notochord extends upto head
(b) Foot is located on head
(c) Head is located on foot
(d) Head is fused with thorax

18. In mollusca, eye is present over a stalk called
[CPMT 2000; BHU 2006]
(a) Ostracum (b) Operculum
(c) Osphradium (d) Ommatophores

19. "Shell of mollusc is produced by its **[BHU 2000; MH CET 2003]**
(a) Radula (b) Thorax
(c) Mantle (d) Abdomen

20. Which set is correct **[CPMT 1998]**
(a) Euglena--cilia (b) *Paramecium*-Flagella
(c) Snail-Foot (d) *Amoeba*-Foot

21. Which of the following is the oldest living fossil
[CMC Vellore 1993]
(a) Architeuthis (b) Neopilina
(c) Nautilus (d) Limulus

22. Which of the following is correct **[AIIMS 2001]**
(a) Mollusca - bivalvia-pila
(b) Annelida - hirudinea - silver fish
(c) Mollusca - cephalopoda - octopus
(d) Arthropoda - arachnida – grasshopper

23. Phylum mollusca can be distinguished from other invertebrates by the presence of **[RPMT 1998; DUMET 2010]**
(a) Bilateral symmetry and exoskeleton
(b) A mantle and gills
(c) Shell and non-segmented body
(d) A mantle and non-segmented body

24. As per classification which of the following is correct
[MP PMT 2003]
(a) Ascaris, Pheretima, Grasshopper
(b) Hydra, Pterido, Leucosolenia
(c) Starfish, Grasshopper, Solen
(d) Pila, Dentalium, Octopus

25. Mantle, foot and shell are the character of **[BHU 2003]**
Or
Which of the following is a living fossil **[MP PMT 2013]**
(a) Nautilus (b) Echinus
(c) Limulus (d) Euplectella

26. Match the columns and choose the correct combination.

A.	Polychaeta	*p.*	Scorpion
B.	Trematoda	*q.*	Pila
C.	Arachnida	*r.*	Liver Fluke
D.	Gastropoda	*s.*	Nereis
		t.	Star Fish

[KCET 2003]
(a) A–*s*, B–*r*, C–*p*, D–*q* (b) A–*q*, B–*s*, C–*t*, D–*p*
(c) A–*r*, B–*s*, C–*p*, D–*t* (d) A–*t*, B–*q*, C–*s*, D– *r*

27. Which of the following mollusc is formed by a larva which have torsion **[RPMT 2002]**
(a) Lamelledens (b) *Pila*
(c) Sepia (d) Octopus

28. Cuttle Fish is a member of
(a) Mollusca (b) Echinodermata
(c) Pisces (d) Amphibia

29. A wood boring mollusca/Shipworm is
(a) *Chiton* (b) *Teredo*
(c) *Limax* (d) *Patella*

30. Radula is found in **[WB JEE 2010]**
(a) Pila sp (b) Chiton sp
(c) Lamellidens sp (d) Pinctada sp

31. Haemocyanin, the blue colouring pigment of molluscan blood contains
(a) Iron (b) Magnesium
(c) Copper (d) Manganese

32. Filter feeding occurs in
(a) *Dentalium* (b) *Unio*
(c) *Pila* (d) *Amoeba*

33. An animal without segmentation is
(a) Tapeworm (b) Earthworm
(c) Glow Worm (d) Shipworm

34. Closed circulatory system occurs in **[CBSE PMT 1994]**
(a) Snail (b) Cockroach
(c) Cuttle Fish (d) All the above

35. *Pila* shows summer **[APMEE 1995]**
(a) Hibernation (b) Aestivation
(c) Emigration (d) Immigration

36. *Octopus*, Squid and Cuttle Fish belong to class
[BHU 1998; RPMT 2001; AFMC 2001]
(a) Cephalopoda (b) Apoda
(c) Decapoda (d) Scaphopoda

37. Which one occurs in mollouscs but not in echinoderms [AFMC 2001; DUMET 2010]
(a) Flame cells (b) Malpighian tubules
(c) Kidney (d) None of the above

38. In which of the following group of animals the trochophore larva becomes the veliger larva [MP PMT 2013]
(a) Mollusca (b) Arthropoda
(c) Annelida (d) Platyhelminthes

39. Shell is internal in [Pb. PMT 1999]
(a) *Loligo* (b) *Chiton*
(c) *Dentalium* (d) *Unio*

40. Sepia and Octopus swim swiftly by means of [MP PMT 2013]
(a) Arms
(b) Lateral fins
(c) Suckers
(d) Jet propulsion through siphon

41. Ammonites are fossil shell remains of [CPMT 2000]
(a) Pelecypods (b) Cephalopods
(c) Gastropods (d) Scaphopods

42. Scaphopoda are commonly called [CPMT 2000]
(a) Whelks (b) Periwinkles
(c) Oysters (d) Tusk shells

Phylum-Echinodermata

1. Aristotle's lantern is found in [JIPMER 1993; RPMT 1999, 2000; AFMC 2001; AIIMS 2001]
(a) Jelly fish (b) Sea anemone
(c) Sea lily (d) Sea urchin

2. Secondary radial symmetry is found in [MP PMT 2009]
(a) Cnidaria (b) Jelly fish
(c) Echinodermata (d) Hemichordata

3. Which trait is not the characteristic of echinodermata [Odisha JEE 2009]
(a) Water vascular system
(b) Trochophore larva
(c) Aristotle's lantern
(d) Radial and indeterminate cleavage

4. Main function of pedicellariae in Asterias is [CPMT 1999]
(a) Digestion
(b) Excretion
(c) Respiration
(d) Capture of prey and removal of debris

5. Sea lilies are the members of class [CBSE PMT 1993]
(a) Ophiuroidea (b) Asteroidea
(c) Crinoidea (d) Echinoidea

6. In Ophiuroidea, branched arms are seen in [EAMCET 2009]
(a) *Gorgonocephalus* (b) *Clypeaster*
(c) *Salmacis* (d) *Gorgonia*

7. The Presence of tube feet is the characteristic feature of phylum [NCERT; Kerala PMT 2009; AMU (Med.) 2010]
(a) Arthropoda (b) Annelida
(c) Nemathelminthes (d) Echinodermata
(e) Mollusca

8. In which phylum is water vascular system found [NCERT; MP PMT 1999, 2011; BHU 2008; WB JEE 2008, 10]
(a) Protozoa
(b) Arthropoda
(c) Porifera
(d) Echinodermata (Sea-cucumber)

9. Starfish belongs to class [KCET 1998; BHU 2000, 02; CBSE PMT 2002; MP PMT 2012]
(a) Pisces (b) Cephalopoda
(c) Asteroidea (d) Ophiuroidea

10. Ambulacral grooves are absent in the living forms of the class [Pb. PMT 1999; AIIMS 2002]
(a) Crinoidea (b) Ophiuroidea
(c) Asteroidea (d) Echinodermata

11. Aristotle's lantern is a characteristic of the following class of echinodermata [KCET 1998; BVP 2001]
(a) Echinoidea (b) Ophiuroidea
(c) Holothuroidea (d) Asteroidea

12. A special feature of Eviscereton (Autoformy) is found in [CPMT 1998]
(a) Chordata (b) Echinodermata
(c) Annelida (d) Coelentrata

13. Enterocoelic type of coelom is present in the [CPMT 1999; Pb. PMT 2004]
(a) Echinodermata (b) Mollusca
(c) Arthropoda (d) Chordata

14. Animals of which group are not fresh water [RPMT 1999; DPMT 2003]
(a) Crustacea (b) Insecta
(c) Echinodermata (d) Sponge

15. Which phylum belongs to *Duterostomia* [EAMCET 1998; CPMT 1999; BHU 2001; CBSE PMT 2001]
(a) Echinodermata (b) Mollusca
(c) Arthropoda (d) Annelida

16. An animal that transforms from bilateral to radial symmetry in its life history is [KCET 1998; HP PMT 2005; Kerala CET 2005; Odisha JEE 2012]
(a) Hydra (b) Obelia
(c) Starfish (d) Sponge

17. Absence of excretory organs, great power of regeneration and exclusively marine animals belong to the phylum [NCERT; AIIMS 1993; BVP 2004; AIEEE Pharmacy 2004; Odisha JEE 2012]
(a) Mollusca (b) Echinodermata
(c) Fishes (d) Arthropoda

18. The pentaradial symmetry is seen in [Odisha JEE 2011]
(a) Echinodermata (b) Arthropoda
(c) Mollusca (d) Annelida

19. Mark the correct one [CPMT 1996]

	Phylum	Class	Example
(a)	Annelida	Oligochaeta	*Nereis*
(b)	Mollusca	Pelecypoda	Cuttle fish
(c)	Reptillia	Ophidia	Lizard
(d)	Echinodermata	Holothuroidea	Cucumaria

20. Which one of the following pairs of animals is correctly matched with the kind of their body symmetry [AIEEE Pharmacy 2003]
(a) *Hydra* and shark - Bilateral symmetry
(b) Tapeworm and octopus - Radial symmetry
(c) *Amoeba* and sea urchin - Asymmetry
(d) Jellyfish and starfish - Radial symmetry

21. Absence of head, unsegmented body and endoskeleton of dermal calcareous plate are the characters of [J & K CET 2005]
(a) Mollusca (b) Arthropoda
(c) Echinodermata (d) None of these

22. An animal phylum having radially symmetrical adults but bilateral symmetrical larvae is **[NCERT; BVP 2001; DPMT 2004; CBSE PMT 2004; Kerala PMT 2008; KCET 2012]**
(a) Porifera (b) Coelenterata
(c) Echinodermata (d) Annelida

23. Cephalization is absent in
(a) Molluscs (b) Arthropods
(c) Both (a) and (b) (d) Echinoderms

24. Which is unrelated **[RPMT 1996]**
(a) Sea Cucumber (b) Sea Star
(c) Sea Urchin (d) Sea Squid

25. Echinodermata is a group of animals which are **[MP PMT 2004]**
(a) Coelomate, horny, marine
(b) Coelomate, spiny, marine
(c) Acoelomate, spiny, fresh water
(d) Joint legged, marine

26. Aristotle's lantern is connected with **[AIIMS 1999; APMEE 2002]**
(a) Respiration (b) Mastication
(c) Excretion (d) Support

27. Echinoderms are headless, brainless and heartless. Yet they are placed at the top of invertebrates because of presence of **[MP PMT 2000]**
(a) Enterocoel
(b) Exclusive marine forms
(c) High power of regeneration
(d) Great power of reproduction

28. Tube feet are the characteristic structures of **[CBSE PMT 2000; MHCET 2001; BHU 2005; CPMT 2009; Odisha JEE 2010]**
(a) Jellyfish (b) Cuttlefish
(c) Starfish (Echinodermata) (d) Crayfish

29. Match the animals list with names under Column-I with the animals listed with regular zoological name given under Column-II; choose the answer which gives the correct combination of the alphabets of the two columns

Column-I Animals with common name		Column-II Animals with zoological name	
A.	Starfish	p.	Sepia
B.	Jellyfish	q.	Astropecten
C.	Devilfish	r.	Aurelia
D.	Cuttlefish	s.	Octopus

[KCET 2000, 09]
(a) A = r, B = s, C = p, D = q
(b) A = r, B = p, C = s, D = q
(c) A = q, B = r, C = s, D = p
(d) A = q, B = p, C = s, D = r

30. *Antedon* belongs to the class **[AIIMS 2000]**
(a) Crinoidea (b) Asteroidea
(c) Ophiuroidea (d) Echinoidea

31. Basket star belongs to class **[AIIMS 1999; AFMC 2000]**
(a) Ophiuroidea (b) Echinoidea
(c) Asteroidea (d) Crinoidea

32. Box like calcareous test occurs in **[HPMT 2001]**
(a) Sea Lily (b) Sea Star
(c) Sand Dollar (d) Sea Cucumber

33. In which class of echinodermata stalk is found for attachment with substratum **[RPMT 2001]**
(a) Asteroidea (b) Echinoidea
(c) Ophiuroidea (d) Crinoidea

34. Bipinnaria is the larva of **[BHU 2001; Odisha JEE 2004]**
(a) Pila (b) Lemellidens
(c) Sepia (d) Star fish (Asteroidea)

35. Which one of the following statement is true about an organism and its classification **[AIEEE Pharmacy 2004; AMU (Med.) 2005]**
(a) Blue green alga is kind of fungus
(b) Sea horse is closely related to dolphin
(c) Maiden hair tree is a kind of angiosperm
(d) Sea lily is a kind of echninoderm

36. In echinodermata, tube feet are related with **[BVP 2003]**
(a) Excretory system (b) Ambulacral system
(c) Reproductive system (d) Respiratory system

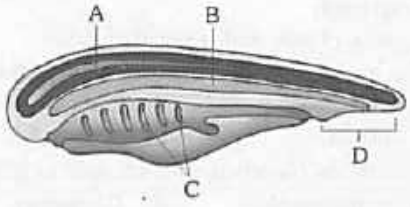
Phylum-Chordata

1. Which one of the following pairs of animals comprises 'jawless fishes' **[NCERT; CBSE PMT 2009]**
(a) Lampreys and eels (b) Mackerals and Rohu
(c) Lampreys and hag fishes (d) Guppies and hag fishes

2. The number of gills present in Osteichthyes is **[Kerala PMT 2008]**
(a) 2 pairs (b) 6 – 15 pairs
(c) 5 pairs (d) 4 pairs
(e) 12 pairs

3. At retrogressive metamorphosis the urochordate larva **[AFMC 2006]**
(a) Loss notochord
(b) Loss tail
(c) Experience reduction of nervous system to a visceral genglion
(d) All of the above

4. Animals belonging to phylum Chordata are fundamentally characterized by the presence of structure noted as A, B, C and D. Identify the names of A, B, C and D **[NCERT]**



(a) A – Nerve cord, B – Gill slits, C – Notochord, D – Post-anal part
(b) A – Nerve cord, B – Notochord, C – Post-anal part, D – Gill slits
(c) A – Nerve cord, B – Notochord, C – Gill slits, D – Post-anal part
(d) A – Notochord, B – Nerve Cord, C – Gill Slits, D – Post-anal part

5. In which of the following jaws are found **[RPMT 1999]**
(a) Herdmania (b) Fish
(c) Petromyzon (d) Amphioxus

6. Temperature changes in the environment affect most of the animals which are **[CBSE PMT 1999; CPMT 2001]**
(a) Aquatic (b) Desert living
(c) Poikilothermic (d) Homoiothermic

7. The animal who possesses notochord throughout life is **[EAMCET 1998; CPMT 1999; CBSE PMT 2000; MH CET 2003; BHU 2005; Odisha JEE 2010]**

Or

Which of the following animals is not a vertebrate **[NCERT]**
(a) Fish (b) *Amphioxus*
(c) Bird (d) Snake

8. Which of the following statements is / are not true
A. In Urochordata, notochord is present only in larval tail.
B. In Cephalochordata, notochord extends from head to tail region.
C. Branchiostoma belongs to Hemichordata
D. Only one Class of living members, Class Cyclostomata represents the Super Class Agnatha **[NCERT; Kerala PMT 2006]**
(a) A, B and D only (b) C, D and A only
(c) C only (d) A and D only
(e) C and D only

9. Blood vascular system in hemichordata is **[AFMC 2006]**
(a) Open (b) Reduced
(c) Closed (d) Absent

10. The most important distinctive character of chordata is the presence of **[CBSE PMT 1991]**
(a) Vertebral column (b) Hairy skin
(c) Notochord (d) All the above

11. Retrogressive metamorphosis is found in **[RPMT 1999, 2006; WB JEE 2010]**
(a) *Balanoglossus* (b) *Branchiostoma*
(c) *Herdmania* (Urochordata) (d) All of these

12. The lamprey (*Petromyzon*) is included in the same taxonomic class as the
(a) Chamaeleon (*Anolis*) (b) Hag fish (*Myxine*)
(c) Salamander (*Ambystoma*) (d) Lung fish (*Neoceratodus*)

13. The portal system seen in all vertebrates is **[JIPMER 1993]**
(a) Hepatic (b) Renal
(c) Both (a) and (b) (d) Pulmonary

14. Which one of the following is not a characteristic feature of the sub phylum vertebrata **[NCERT; Kerala PMT 2007]**
(a) Dorsal tubular nerve cord
(b) Ventral muscular heart
(c) Presence of notochord in the adult
(d) Presence of kidneys
(e) Two pairs of lateral appendages, fins or limbs

15. Notochord is restricted to the anterior part of body proboscis in animals of which group **[RPMT 1995]**
(a) Hemichordata (b) Urochordata
(c) Cephalochordata (d) Chordata

16. Animals having a built-in thermostat to maintain constant body temperature are known as **[KCET 1999; CPMT 2003; BHU 2006; AFMC 2012]**
(a) Biothermic (b) Poikilothermic
(c) Oligothermic (d) Homoeothermic

17. Which of the following groups has no member having gliding or flying appendages
(a) Arthropoda (b) Cyclostomata
(c) Mammals (d) Fishes

18. In some chordates, the notochord is modified as the vertebral column. Such animals are called vertebrates. Which one of the following statements make sense **[NCERT; KCET 2003, 11]**
(a) All chordates are vertebrates but all vertebrates are not chordates
(b) All vertebrates are chordates and all chordates are vertebrates
(c) All vertebrates are chordates but all chordates are not vertebrates
(d) Chordates are not vertebrates and vertebrates are not chordates

19. *Petromyzon* belongs to **[MH CET 2004]**
(a) Agnatha (b) Gnathostomata
(c) Protochordata (d) Euchordata

20. The echinoderms, hemichordates and chordates had which of the following larva as common ancestral form **[APMEE 1996; BHU 1999; CBSE PMT 2001]**
(a) Tornaria (b) Trochophore
(c) Dipleurula (d) Bipinnaria

21. Which among the following is the only vertebrate osmoconformer **[DPMT 2004]**
(a) Rabbit (b) Hagfish
(c) Bird (d) None of these

22. Which one of the following feature is found in chordates but not in non-chordates **[KCET 2007]**
(a) Gills (b) Spiracles
(c) Post anal tail (d) Chitinous exoskeleton

23. Which of the following show relationship of echinoderms and chordates **[DPMT 1993]**
(a) Balanoglossus (b) Archaeopteryx
(c) Peripatus (d) None of these

24. Crocodile and penguin are similar to Whale and Dogfish in which one of the following features **[NCERT; CBSE PMT (Mains) 2010]**
(a) Possess a solid single stranded central nervous system
(b) Lay eggs and guard them till they hatch
(c) Possess bony skeleton
(d) Have gill slits at some stage

25. Which of the following sets of animals belong to class cyclostomata **[NCERT; DPMT 1993; BHU 2000; J & K CET 2008]**
(a) Herdmania and petromyzon
(b) Petromyzon and myxine
(c) Amphioxus and balanoglossus
(d) Herdmania and myxine

26. The jawless vertebrate is **[Kerala PMT 2004]**

Or

A jawless fish, which lays eggs in fresh water and whose ammocoetes larvae after metamorphosis return to the ocean, is **[AIPMT 2015]**
(a) Crocodile (b) *Loris*
(c) *Hyla* (d) Fox
(e) *Petromyzon*

27. *Herdmania* belongs to which subphyla **[DPMT 2004]**
(a) Cephalochordata (b) Hemichordata
(c) Urochordata (d) Protochordata

28. All chordates at one or the other stage possess **[MP PMT 2004]**

(a) Vertebral column
(b) Pharyngeal gills-slits
(c) Two pairs of pentadactyle limb
(d) A movable jaw

29. Which one feature is common to Amphioxus, frog, sea horse and crocodile **[AIEEE Pharmacy 2003]**

(a) Pharyngeal gill slits, at least in the developmental stages
(b) A three-chambered heart
(c) Dorsal solid nerve chord
(d) Skeleton formed of cartilage and bones

30. Larva of *Balanoglossus* is

(a) Tornaria (b) Muller's larva
(c) Kentrogen larva (d) Tadpole

31. Which of the following is a distinct character **[Wardha 2005]**

(a) Chorda dorsalis (b) Cephalization
(c) Claws (d) Pharyngotomy

32. Vertebral column is derived from

(a) Notochord (b) Dorsal nerve cord
(c) Ventral nerve cord (d) Outgrowth of cranium

33. Match items in column I with those give in column II

	Column I		Column II
(A)	Limbless reptile	(i)	Lamprey
(B)	Jawless vertebrate	(ii)	Salamander
(C)	Amphibian	(iii)	Snake
(D)	Cartilaginous fish	(iv)	Shark
(E)	Flightless bird	(v)	Ostrich

[Kerala CET 2005]

(a) (A) – (i), (B) – (ii), (C) – (iii), (D) – (iv), (E) – (v)
(b) (A) – (ii), (B) – (i), (C) – (iii), (D) – (iv), (E) – (v)
(c) (A) – (iii), (B) – (i), (C) – (ii), (D) – (iv), (E) – (v)
(d) (A) – (v), (B) – (ii), (C) – (iii), (D) – (iv), (E) – (i)

34. Common characteristic of all vertebrates without exception is **[CBSE PMT 1994]**

(a) Exoskeleton
(b) Presence of well developed skull
(c) Two pairs of functional apendages
(d) Division of body into head, neck, trunk and tail

35. Which of the following is the smallest taxonomic group of animals having a cranium, vertebral column, ventral heart, pulmonary respiration and two pairs of limbs **[AFMC 1998]**

(a) Gnathostomata (b) Tetrapoda
(c) Vertebrata (d) Chordata

36. The vertebrate does not have **[Odisha JEE 2011]**

(a) Epidermal scale (b) Claw
(c) Tail (d) Cnidoblast

37. Ancestors of cyclostomes are **[BHU 1993]**

(a) Myxinoides (b) Arthropods
(c) Ostracoderms (d) Urochordates

38. See the following diagram and identify the name of the animal and the phylum to which it belong correctly **[NCERT]**

(a) *Nereis*, Annelida
(b) *Balanoglossus*, Urochordata
(c) *Balanoglossus*, Cephalochordata
(d) *Balanoglossus*, Hemichordata

39. Birds and mammals have **[NCERT; MH CET 2000]**

(a) Three chambered heart
(b) Four chambered heart
(c) Six chambered heart
(d) None of the above

40. Homeothermic animals is **[MH CET 2000]**

(a) Toad (b) Lizard
(c) Rabbit (d) Frog

41. Which of the following are Anamniotes **[RPMT 2001]**

(a) Chondrichthyes, Osteichthyes, Amphibia
(b) Reptilia, Aves, Amphibia
(c) Amphibia, Aves, Mammals
(d) Reptilia, Mammals, Aves

42. In Urochordata notochord is found in **[RPMT 2001]**

(a) Head of adult (b) Tail of adult
(c) Tail of larva (d) Test of adult

43. In which of the following notochord is absent **[RPMT 2001]**

(a) Adult *Herdmania* and *Balanoglossus*
(b) Adult *Herdmania* and adult *Branchiostoma*
(c) Larva of *Herdmania* and *Branchiostoma*
(d) Larva of *Herdmania* and *Balanoglossus*

44. The correct classification of *Balanoglossus* is **[RPMT 2001]**

(a) Chordata → Vertebrata → Enteropneusta
(b) Chordata → Vertebrata → Pterobranchia
(c) Chordata → Hemichordata → Pterobranchia
(d) Chordata → Hemichordata → Enteropneusta

45. In which of the following the notochord is present in embryonic stage **[CBSE PMT 2002]**

(a) Vertebrates (b) Some chordates
(c) All chordates (d) Non-chordates

46. Which of the following is not a character of Chordata **[NCERT; MH CET 2002; CPMT 2010]**

(a) Dorsal tubular nerve cord
(b) Pharyngeal gill slits
(c) Presence of notochord
(d) Presence of spinal cord

47. Which animal is "Non-chordate-protochordata" **[RPMT 2002; CPMT 2010]**

Or

Which of the following is a hemichordate **[Odisha JEE 2010]**

(a) Herdmania (b) Balanoglossus
(c) Branchiostoma (d) Botryllus

48. Mode of feeding in tunicates is **[EAMCET 2002]**

(a) Parasitic (b) Macrophagus
(c) Ciliary filter (d) Myxotrophic

49. Which one of the following statements is totally wrong about the occurrence of notochord, while the other three are correct **[NCERT; CBSE PMT (Mains) 2011]**

(a) It is absent throughout life in humans from the very beginning
(b) It is present throughout life in *Amphioxus*
(c) It is present only in larval tail in Ascidians
(d) It is replaced by a vertebral column in adult frog

50. Match the following and select the correct option

A.	Cyclostomes	1.	Hemichordata
B.	Aves	2.	Urochordata
C.	Tunicates	3.	Agnatha
D.	*Balanoglossus*	4.	Pisces
E.	Osteichthyes	5.	Tetrapod

[Kerala PMT 2011]

(a) A–1, B–2, C–3, D–4, E–5
(b) A–2, B–3, C–4, D–1, E–5
(c) A–3, B–5, C–2, D–1, E–4
(d) A–3, B–1, C–5, D–2, E–4
(e) A–5, B–3, C–2, D–1, E–4

51. *Echidna* and *Ornithorhynchus* are the connecting links between **[AIIMS 2009]**

(a) Amphibians and aves
(b) Mammals and amphibians
(c) Reptiles and mammals
(d) Reptiles and amphibians

52. Column I contains larval stages and column II contains the groups to which they belong. Match them correctly and choose the right answer

	Column I		Column II
A.	Planula	1.	Annelida
B.	Tornaria	2.	Mollusca
C.	Trochophore	3.	Arthropoda
D.	Bipinnaria	4.	Chordata
E.	Glochidium	5.	Echinodermata
		6.	Coelenterata

[KCET 2011]

(a) A – 6, B – 4, C – 1, D – 5, E – 2
(b) A – 2, B – 5, C – 1, D – 4, E – 6
(c) A – 5, B – 4, C – 3, D – 2, E – 1
(d) A – 4, B – 3, C – 2, D – 1, E – 5

53. Stomochord is found in **[Odisha JEE 2011]**

(a) Urochordata (b) Hemichordata
(c) Cephalochordata (d) Both (a) and (b)

54. Match the name of the animal (**column I**), with one characteristics (**column II**), and the phylum/class (**column III**) to which it belongs **[NEET 2013]**

	Column I	Column II	Column III
(a)	*Adamsia*	Radially symmetrical	Porifera
(b)	*Petromyzon*	Ectoparasite	Cyclostomata
(c)	*Ichthyophis*	Terrestrial	Reptilia
(d)	*Limulus*	Body covered by chitinous exoskeleton	Pisces

Super Class-Pisces

1. Lateral line system is present in **[BHU 1995; Wardha 2005]**

(a) Fish (b) Frog
(c) Reptiles (d) Man

2. Which one of the following is a cartilaginous fish

(a) Silver fish (b) Dog fish
(c) Cray fish (d) Star fish

3. Which of the following has a cartilagenous endoskeleton **[RPMT 1995]**

(a) Elasmobranch (b) Dipnoi
(c) Mollusca (d) Bony fishes

4. Electric organs are found in **[MP PMT 1995; EAMCET 1998; BHU 1999; MH CET 2000; BVP 2003]**

(a) Sharks (b) Porpoises
(c) Goldfish (d) Rays (Torpedo)

5. A fish is characterised by the presence of

(a) Dermal scales (b) Paired fins
(c) Pharyngeal gills (d) All the above

6. Which one of the following is an example of a lung-fish **[AIEEE Pharmacy 2003]**

(a) Scoliodon (b) Coelacanth
(c) Labeo (d) Protopterus

7. Which one of the following is exotic Indian fish **[CBSE PMT 1996]**

(a) *Clarias* (b) *Labeo*
(c) *Cypris* (d) *Dephnia*

8. Which of the following represents the correct combination without any exception **[AIPMT (Cancelled) 2015]**

	Characteristics	Class
(a)	Mouth ventral; gills without operculum; skin with placoid scales; persistent notochord	Chondrichthyes
(b)	Sucking and circular mouth; jaws absent, integument without scales; paired appendages	Cyclostomata
(c)	Body covered with feather; skin moist and glandular; fore-limbs form wings; lungs form wings; lungs with air sacs	Aves
(d)	Mammary gland; hair on body; pinnae; two pairs of limbs	Mammalia

9. In sharks, one of the following is absent **[NCERT; J & K CET 2008]**

(a) Claspers
(b) Placoid scales
(c) Cartilaginous endoskeleton
(d) Air bladder

10. Which of the following fish first injures its prey **[AFMC 2008]**

(a) Clarius (b) Gambusia
(c) Heteropneustes (d) Solea

11. Which of the following animals is a fish **[Odisha JEE 2009]**

(a) Shark (b) Star fish
(c) Silver fish (d) Jelly fish

12. *Pristis* belongs to the class **[JIPMER 1994]**

(a) Dipnoi (b) Telostomi
(c) Elasmobranchii (d) Holocephali

13. Bony plates and scutes are found in addition to scales in

(a) Hag fish (b) Eel
(c) Flying fish (d) Sea horse

14. Which one of the following pairs of animals are similar to each other pertaining to the feature stated against them **[NCERT; CBSE PMT (Mains) 2012]**

(a) *Pteropus* and *Ornithorhyncus*-Viviparity
(b) Garden lizard and Crocodile-Three chambered heart
(c) *Ascaris* and *Ancylostoma*-Metameric segmentation
(d) Sea horse and Flying fish-Cold blooded (poikilothermal)

15. Ampullae of Lorenzini are present in **[DUMET 2009]**

(a) Fish (b) Lizard
(c) Frog (d) Rabbit

16. True fishes possess gills and fins. Which of the following is not a true fish **[DPMT 1993; MP PMT 1994]**

(a) Silver fish (Lepisma)
(b) Gold fish (Carassius)
(c) Silver carp (Hythalamictyes)
(d) Sea horse (Hippocampus)

17. Which of following is a true fish **[Bihar MDAT 1995; JIPMER (Med.) 2002]**

(a) Dog fish (b) Cat fish
(c) Both (a) and (b) (d) Whale

18. Which of the following is a viviparous fish **[DUMET 2009]**

(a) *Exocoetus* (b) *Gambusia*
(c) *Clarias* (d) *Labeo*

19. Heart of fishes is **[Kerala PMT 2009]**

(a) One chambered (b) Two chambered
(c) Three chambered (d) Four chambered

20. *Hippocampus* (Sea Horse) belongs to the class **[HP PMT 2005]**

(a) Agnatha (b) Chondrichtyes
(c) Osteichthyes (d) Mammalia

21. Fishes are **[RPMT 1999]**

(a) Homoiothermic (b) Poikilothermic
(c) Both (a) and (b) (d) None of these

22. Which of the following is characteristic feature of fishes **[KCET 2001; CBSE PMT 2002; Pb. PMT 2004; Odisha JEE 2012]**

(a) Tail and venous heart (b) Venous heart and gills
(c) Epidermal scales and tail (d) Epidermal scales and gills

23. Sea horse is **[NCERT; RPMT 1995; CPMT 2003]**

(a) Fish (b) Reptile
(c) Mammal (d) Bird

24. Placoid scales are found in **[BHU 2008]**

(a) Reptiles (b) Bony fishes
(c) Cartilaginous fishes (d) Amphibians

25. Swim bladder is present in **[BHU 2008]**

(a) Scoliodon (b) Labeo
(c) Chimaera (d) Trygon

26. Connecting link between cartilaginous and bony fishes is **[BHU 2008]**

(a) Catla (b) Chimaera
(c) Protopterus (d) Torpedo

27. With respect to mode of excretion, which type of organism bony fishes are [GUJCET 2007]
(a) Osmoconformers (b) Ammonotelic
(c) Uricotelic (d) Uriotelic

28. Which fins are paired in fishes [BHU 2001]
(a) Dorsal fin and anal fin (b) Pelvic fin and ventral fin
(c) Pectoral fin and pelvic fin (d) Caudal fin and dorsal fin

29. Salmon is [DPMT 2004]
(a) Anadromous fish (b) Catadromous fish
(c) Mollusca (d) Insect

30. Choose the cat fish from the following [KCET 2004]
(a) *Cirrhina mrigala* (b) *Wallago attu*
(c) *Labeo rohita* (d) *Catla catla*

31. At present, the Dipnoans are distributed over [Manipal 2003]
(a) Europe and North America
(b) Latin America and Australia
(c) Europe and Latin America
(d) North America and Australia

32. One of the world's most poisonous fish toxins is released by [AIIMS 2012]
(a) Clown fish (b) Sword fish
(c) Eel fish (d) Puffer fish

33. *Hemicyclaspsis* belongs to the class [EAMCET 2003]
(a) Pisces (b) Ostracodermi
(c) Cyclostomata (d) Gnathostomata

34. Association between suckerfish (Remora) and shark is
(a) Symbiosis (b) Commensalism
(c) Parasitism (d) Predation

35. Which one is a true fish
(a) Whale (b) Cuttlefish
(c) Silverfish (d) Flying fish

36. Anadromous fishes move [CBSE PMT 1992]
(a) From sea to freshwater (b) From sea to estuary
(c) From river to sea (d) From estuary to sea

37. Cartilaginous fishes do not have [CBSE PMT 1992]
(a) Operculum (b) Scales
(c) Gill stits (d) Pelvic fins

38. Which is viviparous [JIPMER 1998]
(a) Bony fish (b) Lung fish
(c) Frog (d) Shark

39. Common name of fish Anguilla is [MP PMT 1994; AFMC 2009]
(a) Eel (b) Rohu
(c) Hilsa (d) Bombay duck

40. In fishes the kidney is [AFMC 1993]
(a) Pronephros (b) Mesonephros
(c) Metanephros (d) Holonephros

41. In one of the following fishes, the dorsal fin is modified into suckers [EAMCET 1999]
(a) *Torpedo* (b) *Echeneis*
(c) *Hippocampus* (d) *Neoceratodus*

42. Presence of claspers is an important character in [EAMCET 1999]
(a) *Sphyrna* (b) *Echeneis*
(c) *Hippocampus* (d) *Exocoetus*

43. Freshwater bony fishes maintain water balance by [BHU 2002]
(a) Excreting hypotonic urine
(b) Excreting salt across their gills
(c) Drinking small amount of water
(d) Excreting waste in the form of uric acid

44. Salmon belongs to the group of [BHU 1998; AMU (Med.) 2002]
(a) Bony fishes (b) Cartilaginous fishes
(c) Cod fishes (d) Trout fishes

45. One of the following is known as 'oil sardine' [EAMCET 1999]
(a) *Atropus surtensis* (b) *Harpodon recherius*
(c) *Sardinella longiceps* (d) *Rastrelliger kanegunta*

46. Which of the following is a migratory fish [AFMC 2001]
(a) Shark (b) Salmon
(c) Carp (d) Ribbon fish

47. Similarity between fish and tadpole is [BVP 2001]
(a) Legs (b) Fins
(c) Lateral line (d) Scales

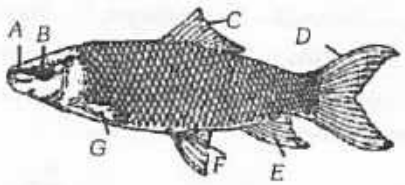
48. Which of the following is known as living fossil [MP PMT 2001, 03]
(a) *Lepidosiren* (b) *Lepidosteus*
(c) *Latimeria* (d) *Neoceratodus*

49. The aquatic organism with prehensile tail is [EAMCET 2002]
(a) *Macaca* (b) *Chameleon*
(c) *Exocoetus* (d) *Hippocampus*

50. Cartilaginous fishes belong to the class [NCERT; HP PMT 2005]
(a) Chondrichthyes (b) Osteichthyes
(c) Agnatha (d) None of these

51. Which of the following is a catadromous fish [WB JEE 2010]
(a) *Hilsa sp* (b) *Mystus sp*
(c) *Anguilla sp* (d) *Channa sp*

52. The diagram of *labeo rohita* is given below. Identify the parts labelled A, B, C, D, E, F, G [KCET 2010]



	A	B	C	D	E	F	G
(a)	Stimulus	Receptor	Sensory nerve	Motor nerve	Effector	Pectoral fin	Pelvic fin
(b)	Nostril	Eye	Anal fin	Caudal fin	Dorsal fin	Pectoral fin	Pelvic fin
(c)	Nostril	Eye	Dorsal fin	Caudal fin	Anal fin	Pelvic fin	Pecto ral fin
(d)	Nostril	Eye	Dorsal fin	Caudal fin	Pectoral fin	Anal fin	Pelvic fin

53. Which one of the following groups of animals is correctly matched with its one characteristic feature without even a single exception **[NCERT; CBSE PMT (Pre.) 2011]**

(a) *Mammalia* : give birth to young ones

(b) *Reptilia* : possess 3-chambered heart with one incompletely divided ventricle

(c) *Chordata* : possess a mouth provided with an upper and a lowar jaw

(d) *Chondrichthyes* : possess cartilaginous endoskeleton

54. What will you look for to identify the sex of the following **[NCERT; CBSE PMT (Pre.) 2011]**

(a) Male shark – Claspers borne on pelvic fins

(b) Female Ascaris – Sharply curved posterior end

(c) Male frog – A copulatory pad on the first digit of the hind limb

(d) Female cockroach – Anal cerci

55. Scientific name of rohu is **[Odisha JEE 2011]**

(a) *Anabas testudineus* (b) *Catla catla*

(c) *Labeo rohita* (d) *Naja naja*

56. Air bladder is present in **[DUMET 2010]**

(a) Chondricthyes (b) Star fishes

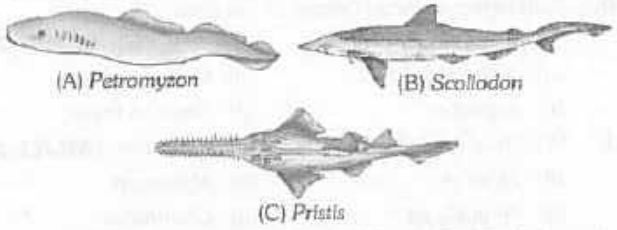
(c) Actinopterygii (d) Flying fishes

57. Jaw of shark contains **[AMU (Med.) 2012]**

(a) Thecodont teeth (b) Acrodont teeth

(c) Pleurodont teeth (d) None of these

58. See the following figures and click the correct option with their respective classes **[NCERT]**



(A) *Petromyzon* (B) *Scoliodon* (C) *Pristis*

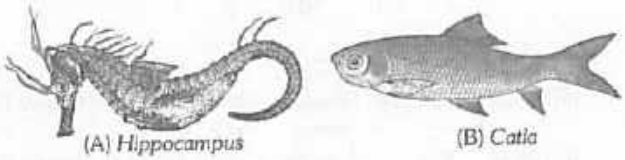
(a) A – *Osteichthyes*, B – *Chondrichthyes*, C – *Cyclostomata*

(b) A – *Osteichthyes*, B – *Chondrichthyes*, C – *Osteichthyes*

(c) A – *Osteichthyes*, B – *Chondrichthyes*, C – *Chondrichthyes*

(d) A – *Cyclostomata*, B – *Chondrichthyes*, C – *Chondrichthyes*

59. See the following figures and select the right option with their respective classes **[NCERT]**



(A) *Hippocampus* (B) *Catla*

(a) A – Cartilage fish, B – Hag fish

(b) A – Cartilage fish, B – Cartilage fish

(c) A – Bony fish, B – Cartilage fish

(d) A – Bony fish, B – Bony fish

60. The marine fish among the following varieties is **[MHCET 2015]**

(a) Stromateus (b) Labeo

(c) Cirrhina (d) Catla

61. Among the following edible fishes which one is a marine fish having rich source of omega-3 fatty acids **[NEET (Phase-II) 2016]**

(a) Mackerel (b) Mystus

(c) Mangur (d) Mrigala

62. Choose the correct statement **[NEET (Phase-II) 2016]**

(a) All pisces have gills covered by an operculum

(b) All mammals are viviparous

(c) All cyclostomes do not possess jaws and paired fins

(d) All reptiles have a three-chambered heart

Class-Amphibia

1. The pair of Amphibians found in Indian peninsula is **[EAMCET 2009]**

(a) *Amphiuma* and *Anguis*

(b) *Tylototriton and Ichthyophis*

(c) *Hyla* and *Ambystoma*

(d) *Psittacus* and *Apteryx*

2. Ovoviviparity is seen in this caecilsian **[EAMCET 2009]**

(a) *Wuchereria* (b) *Typhlonectus*

(c) *Ichthyophis* (d) *Uraeotyphlus*

3. Select the correct order of classification of Rana tigrina upto genus **[Kerala PMT 2008]**

(a) Chordata, craniata, amphibia, gnathostomata, rana

(b) Chordata, craniata, gnathostomata, amphibia, rana

(c) Chordata, amphibia, gnathostomata, craniata, tigrina

(d) Chordata, craniata, amphibia, gnathostomata, tigrina

(e) Gnathostomata, craniata, Chordata, rana, tigrina

4. Which one of the following is not a true amphibian animal

(a) Frog (b) Tortoise

(c) Salamander (d) Toad

5. The common name of necturus is

(a) Cave salamander (b) Congo eel

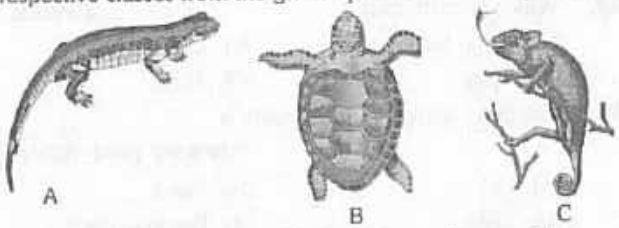
(c) Hell bender (d) Mud puppy

6. Salamander belongs to the class **[J & K CET 2002]**

(a) Reptilia (b) Amphibia

(c) Aves (d) Mammalia

7. Identify the names of the following animals with their respective classes from the given options **[NCERT]**



A B C

(a) A – *Salamandra*, Urochordata; B – *Chelone*, Cephalochordata; C – *Chameleon*, Hemichordata

(b) A – *Salamandra*, Amphibia; B – *Chelone*, Amphibia; C – *Chameleon*, Amphibia

(c) A – *Salamandra*, Reptilia; B – *Chelone*, Reptilia; C – *Chameleon*, Reptilia

(d) A – *Salamandra*, Amphibia; B – *Chelone*, Reptilia; C – *Chameleon*, Reptilia

8. *Ichthyophis* belongs to [DPMT 2006]
(a) Mammalia (b) Reptilia
(c) Amphibia (d) Aves

9. Capacity of amphibians to change colour is called
(a) Metachrosis (b) Metachronous
(c) Synchronous (d) None of these

10. The name of flying frog is [EAMCET 1998]
(a) *Rhacophorus* (b) *Bufo*
(c) *Phyllobates* (d) *Necturus*

11. Frog which lives on the trees [NCERT; RPMT 1999]
(a) *Alytes* (b) *Bufo*
(c) *Hyla* (d) *Rana*

12. The functional kidney of frog tadpole is [CBSE PMT 1995]
(a) Pronephros (b) Mesonephros
(c) Metanephros (d) Archinephros

13. Axolotl larva of *Ambyostoma* normally fails to metamorphose due to [KCET 1994; AFMC 2006]
(a) Lack of *Ca* and *Mg* ions in water
(b) Absence of phosphorus in water
(c) Lack of iodine in water or diet
(d) High concentration of iodine in body

14. Which of the following is a limbless amphibian [NCERT; MP PMT 1993, 2002; Kerala CET 2002; Kerala PMT 2010]
(a) Salamander (b) Ichthyophis
(c) Amphioxus (d) Balanoglossus

15. Limbless amphibians belong to the order [MHCET 2000; BHU 2001; CPMT 2001]
(a) Anura (b) Urodela
(c) Gymnophiona (d) Squamata

16. Which animal is surinam toad [RPMT 2000]
(a) Pipa (b) *Bufo*
(c) Bombinator (d) *Alytes*

17. Caecilians belong to the order [JIPMER 1999]
(a) Sirenia (b) Squamata
(c) Neognathae (d) Gymnophiona

18. Fire-belied toad is
(a) *Amphiuma* (b) *Necturus*
(c) *Salamandra* (d) *Bombinator*

19. Neoteny is found in [RPMT 1995]
(a) Tadpole (b) Salamander
(c) Hyla (d) Axolotl

20. The skull of frog is [Kerala CET 2005]
(a) Tricondylic (b) Monocondylic
(c) Dicondylic (d) Noncondylic
(e) Polycondylic

21. *Rana Tigrinum* is the zoological name of [Odisha JEE 2004]
(a) Frog (b) Garden lizard
(c) Tiger (d) Krait

22. Common Indian bull frog is [NCERT; CBSE PMT 1992; KCET 1998; JIPMER 1999]
(a) *Rana tigrina* (b) *Rana esculenta*
(c) *Rana silvatica* (d) *Rana cyanophlyctis*

23. Retention of larval characters even after sexual maturity is called [BHU 1993; Kerala CET 2005]
(a) Ontogenesis (b) Parthenogenesis
(c) Neoteny (d) Phyllogenesis

24. Axolotl larva belongs to the order [EAMCET 1994]
(a) Urodela (b) Anura
(c) Apoda (d) Stegocephalia

25. Frog is [NCERT; CPMT 1994]
(a) Aminotelic (b) Ammonotelic
(c) Ureotelic (d) Uricotelic

Class-Reptilia

1. Classification of reptilia is based on
(a) Scales (b) Type of brain
(c) Vaccuties (d) None of these

2. Typhlop is a [BHU 2001]
(a) True snake (b) False snake
(c) True worm (d) Shark

3. Only poisonous lizard of the world is [AMU (Med.) 2006; AFMC 2009]
(a) *Draco* (b) *Heloderma*
(c) *Sphenodon* (d) *Varanus*

4. Venom of which of the following snakes is proteolytic [AFMC 2012]
(a) Viper (b) Krait
(c) Cobra (d) Ajgar

5. Which of the following is primarily an ectotherm [Odisha JEE 2009]
(a) Pigeon (b) Camel
(c) Lizard (d) Rabbit

6. Egg of reptiles and birds are [CPMT 2009]
(a) Mesolecithal (b) Telolecithal
(c) Polylecithal (d) Alecithal

7. Members of class Reptilia are
(a) Homoiothermic and amniotic
(b) Homoiothermic and anamniotic
(c) Poikilothermic and amniotic
(d) Poikilothermic and anamniotic

8. Zoological name of common Indian Krait is [Odisha JEE 2005]
(a) *Bungarus coeruleus* (b) *Ophiopagus hannah*
(c) *Viper russeli* (d) *Naja naja*

9. Carapace is present in [CPMT 1999; BHU 2005]
(a) Toad (b) Bird
(c) Frog (d) Tortoise

10. Which is a poisonous snake [EAMCET 1998]
(a) *Enhydrina* (b) *Typhlops*
(c) *Python* (d) *Eryx*

11. The important character of Cobra is [Odisha JEE 1996; BVP 2000]
(a) Presence of hood (b) Small scales on head
(c) Rounded tail (d) None of these

12. Animals have the innate ability to escape from predation. Examples for the same are given below. Select the incorrect example. **[CBSE PMT 2005]**
(a) Colour change in chameleon
(b) Enlargement of body size by swallowing air in puffer fish
(c) Poison fangs in snakes
(d) Melanism in moths

13. Poison glands of snake are modified **[EAMCET 1995; MHCET 2004]**
(a) Sebaceous glands (b) Ceruminous glands
(c) Salivary glands (d) Endocrine glands

14. Snakes receive sound vibrations by **[RPMT 1999]**
(a) Tympanum (b) Body
(c) Internal ear (d) Earth

15. To which of the following category dinosaurs belong **[HP PMT 2005]**
(a) Reptiles (b) Amphibians
(c) Mammals (d) Birds

16. Whose skin colour does not change **[MP PMT 1995]**
(a) *Chameleon* (b) Horse
(c) Garden lizard (d) Two of the above

17. Which of the following feature is not common between *Newt* & *Hemidactylus* **[CPMT 2005, 09]**
(a) Body is divisible into head, neck, trunk and tail
(b) Head with pair of eyes and tympanic membrane
(c) Trunk has 2 pairs of limb for locomotion
(d) Heart is 3-chambered

18. Which type of respiratory organs are present in spiders and scorpions **[AFMC 2006]**
(a) Book lungs (b) Gills
(c) Gill books (d) Lungs

19. Which one of the following is a matching pair of an animal and its a one of the characteristics **[AIEEE Pharmacy 2004]**
(a) *Chamaelon* - binocular vision
(b) *Heloderma* - poison gland
(c) *Varanus* - prehensile tail
(d) House lizard- 4 chambered heart

20. Some reptiles show autotomy which means
(a) Voluntary breaking tail to confuse enemy
(b) Signal for charging
(c) Signal for courtship
(d) State of starvation prior to death

21. Which among these is not a homoiotherm **[Kerala PMT 2012]**
(a) Aptenodytes (b) Testudo
(c) Delphinus (d) Neophron
(e) Ornithorhynchus

22. The truly land animals are **[J & K CET 2010]**
(a) Newts (b) Lung-fishes
(c) Salamanders (d) *Calotes*

23. The injection of serum of horse which has been repeatedly injected by cobra venom into a person bitten by cobra results in
(a) No immunity (b) Natural immunity
(c) Active immunity (d) Passive immunity

24. Teeth conducting poison in a snake are called
(a) Incisors (b) Canines
(c) Heterodont (d) Fangs

25. The reptile which glides in the air is
(a) *Draco* (b) *Phrynosoma*
(c) *Anguis* (d) *Calotes*

26. Poisonous fangs of a snake are modified
(a) Mandible (b) Maxillary teeth
(c) Canines (d) Nasals

27. Which of the followig is a marine snake
(a) *Enhydrina* (b) *Typhlops*
(c) *Bungarus* (d) *Naja*

28. Snake moulting consists of
(a) Epidermis (b) Dermis
(c) Cornified cells (d) Stratum germinativum

29. Pear-shaped head, sharply separated from rest of the body and coverd with small scales is a feature of
(a) *Pythons* (b) Vipers
(c) Kraits (d) Cobras

30. Large size scales fully extended from side to side on the belly are characteristics of
(a) Krait and sea snake (b) Cobra and *python*
(c) Rat snake and Cobra (d) *Python* and Krait

31. Gavial or gharial is found in **[HPMT 1993]**
(a) Freshwater (b) Sea water
(c) Brackish water (d) Terrestrial habitats

32. Name a nonpoisonous snake
(a) Cobra (b) Krait
(c) Viper (d) Rat snake

33. A stumpy laterally compressed tail is characteristic of
(a) Tree snake (b) Sea snake
(c) Rat snake (d) Rattle snake

34. Order Squamata consists of **[CBSE PMT 1991]**
(a) Bats (b) Crocodiles
(c) Turtles and pangolin (d) Lizards and snakes

35. Which is correct for Indian snakes **[MP PMT 1992]**
(a) Only sea snakes are non-poisonous
(b) Only sea snakes are poisonous
(c) All water snakes are poisonous
(d) All sea snakes are poisonous

36. Besides mammals, diaphragm also occurs in **[JKCMEE 1992]**
(a) Birds (b) Crocodiles
(c) Fishes (d) Toads

37. The vestiges of girdles are found in **[AMU (Med.) 2010]**
(a) Cobra (b) Krait
(c) Rattle snake (d) Python

38. In suborder ophidia, the vertebrae are **[EAMCET 1998; BHU 1999]**
(a) Amphicoelus (b) Acoelus
(c) Heterocoelus (d) Procoelus

39. Gila Monster Heloderma occurs in **[MP PMT 2004]**
(a) Africa (b) America
(c) Central Asia (d) China

40. When the tail is cylindrical and ventral scales do not extend the entire width of the belly, the snake is **[BHU 1994]**
(a) Non-poisonous
(b) Either poisonous or non-poisonous
(c) Definitely poisonous
(d) Deadly poisonous

41. Cleidoic eggs are found in **[BHU 1994]**
(a) Fishes (b) Amphibia
(c) Reptiles (d) None of these

42. Even ventricles of reptiles are partitioned but there is mixing of blood **[AIIMS 1996]**
(a) Due to common ejection and entrance of blood in lungs
(b) Auricles are non-partitioned
(c) Heart is partially four-chambered
(d) None of these

43. *Calotes versicolor* is a **[Odisha JEE 1997]**
(a) House lizard (b) Garden lizard
(c) Flying lizard (d) Rock lizard

44. Animal which can move the upper jaw **[Kerala PMT 1997]**
(a) Elephant (b) Crocodile
(c) Clarius (d) Frog

45. Foramen of Panizzae is found in the heart of **[BVP 2003]**
(a) Rabbit (b) Crocodile
(c) Pigeon (d) Frog

46. *Typhlops* is **[BHU 2001]**
(a) Sea snake (b) Grass snake
(c) Glass snake (d) Blind snake

47. The snake having head shield and elongated hexagonal vertebrals is **[EAMCET 2000]**
(a) *Naja* (b) *Eryx*
(c) *Bungarus* (d) *Ptyas*

48. Which of the following is a poisonous snake **[CBSE PMT 2000]**
(a) Eryx (b) Natrix
(c) Tree snake (d) Russel's viper

49. Which of the following snake has hind legs **[CPMT 2000]**
(a) Python (b) Bungarus
(c) Typhlops (d) King cobra

50. The reptile which lacks penis belongs to **[EAMCET 2000]**
(a) Ophidia (b) Crocodilia
(c) Gymnophiona (d) Rhynchocephalia

51. Snake has **[MHCET 2000; Pb. PMT 2004]**
(a) Movable eyelids (b) No eyelids
(c) Immovable eyelids (d) Eyelids placed in pouches

52. Most favourable land adaptation for reptile is **[CBSE PMT 2001]**
(a) Moist skin (b) Scales on body
(c) Pulmonary respiration (d) None of these

53. Post anal tail is present in **[CBSE PMT 2001]**
(a) Cobra (b) Earth worm
(c) Scorpion (d) Lower invertebrate

54. Diapside skull is found in the following **[MP PMT 2001]**
(a) *Natrix*, Draco and Turtle
(b) Crocodile, Turtle and *Seymouria*
(c) *Sphenodon*, Crocodile and Viper
(d) *Calotes*, Cobra and Varanosaurus

55. Antivenin injections used for snake bite are prepared at **[BCECE 2001]**
(a) IVRI, Bareilly
(b) NDRI, Karnal
(c) Haffkin's Research Institute, Mumbai
(d) IARI, New Delhi

56. Which of the following systems in man is affected by the bite of cobra **[AFMC 2001]**
(a) Digestive (b) Nervous
(c) Excretory (d) Circulatory

57. Turtles are **[KCET 2002; J & K CET 2012]**
(a) Pisces (b) Reptiles
(c) Molluscans (d) Arthropods

58. The type of dentition in Crocodile is **[MP PMT 2002]**
(a) Acrodont (b) Bunodont
(c) Pleurodont (d) Thecodont

59. Scientific name of king cobra is **[Odisha JEE 2002]**
(a) *Naja naja* (b) *Bungarus coerulus*
(c) *Naja hunnah* (d) *Vipera russelli*

60. Which of the following is incorrectly matched **[Odisha JEE 2010]**
(a) Spiny tailed lizard- *Hardwickii*
(b) Garden lizard- *Hemidactylus flaviviridis*
(c) Gila monster - *Heloderma*
(d) Monitor lizard - *Varanus*

61. The characteristics of class Reptilia are **[NCERT; NEET (Karnataka) 2013]**
(a) Body covered with moist skin which is devoid of scales, the ear is represented by a tympanum, alimentary canal, urinary and reproductive tracts open into a common cloaca
(b) Fresh water animals with bony endoskeleton, air-bladder to regulate buoyancy
(c) Marine animals with cartilaginous endoskeleton, body covered with placoid scales
(d) Body covered with dry and cornified skin, scales over the body are epidermal, they do not have external ears

Class-Aves

1. Characteristic features such as four-chambered heart, feather and pneumatic bone is applicable to the class of vertebrate **[NCERT; Odisha JEE 2002]**
(a) Cyclostomata (b) Aves
(c) Reptilia (d) Mammals

2. Quill feathers at the base of quill wings are called **[BHU 1999]**
(a) Remiges (b) Barbules
(c) Coverts (d) Down feathers

3. The pelvic girdle of birds is attached to a complex structure formed by the fusion of last thoracic, all lumbar and first five caudal vertebra. This structure is called **[MP PMT 1993; AFMC 2005]**
(a) Synsacrum (b) Symphysis
(c) Synkaryon (d) Sympelvis

4. Penguin is found in **[CBSE PMT 1990; BHU 1997]**
(a) Africa (b) Australia
(c) America (d) Antarctica

5. Flightless bird, cassowary is found in [CBSE PMT 1996]
(a) Australia (b) Newzealand
(c) Indonesia (d) Mauritious

6. Which animals have a beak with jaws but no teeth [CPMT 1995]
(a) Aves (b) Snakes
(c) Mammals (d) All the above

7. Characteristic feature of aves is [CPMT 1995]
(a) Presence of beak and feathers
(b) Ability to lay eggs
(c) Air spaces in lungs
(d) All the above

8. Which of the following group of animals maintain high and constant body temperature such as mammals [AFMC 2005]
(a) Reptiles (b) Amphibians
(c) Birds (d) Fishes

9. Only right aortic arches are present in [Manipal 2005]
(a) Reptilia (b) Mammals
(c) Birds (d) None of these

10. Only one ovary is present in the
(a) Aquatic reptiles (b) Terrestrial reptiles
(c) Birds (d) Egg laying mammals

11. Flightless birds belong to [CBSE PMT 2002]
(a) Ratitae (b) Neornithes
(c) Archaeornithes (d) None of these

12. Cleidoic egg is an adaptation for [RPMT 2001]
(a) Aerial life (b) Marine life
(c) Aquatic life (d) Terrestrial life

13. Pneumatic bones of birds
(a) Increase the respiratory rate
(b) Increase the heart beat rate
(c) Increase the CO_2 output
(d) Increase the buoyancy

14. Which one is characteristic for birds [NCERT; Wardha 2005]
(a) They are flying animals
(b) They are warm blooded
(c) They are Bipedal and have feathers
(d) They are quadruped and have scales

15. The beak in birds is toothed in [MP PMT 1993]
(a) Ostrich (b) Kiwi
(c) Archaeopteryx (d) Pelican

16. Pneumatic bones are found in [CBSE PMT 1996; AFMC 2000, 02]
(a) Domestic lizard (b) Tadpole of frog
(c) Flying lizard (d) Pigeon

17. The vertebrae of birds are characteristically [AIIMS 1999]
(a) Heterocoelous (b) Acoelous
(c) Opisthocoelous (d) Amphicoelous

18. See the following animals and identify them [NCERT]

(a) *Calotes, Psittacula* (b) *Testudo, Pavo*
(c) *Pavo, Psittacula* (d) *Psittacula, Pavo*

19. The special sound producing organ in birds is [BVP 2001]
(a) Syrinx (b) Glottis
(c) Larynx (d) Oesophaagus

20. Who called birds are glorified reptiles [BVP 2001]
(a) Huxley (b) Romer
(c) Mendel (d) Robert Hooke

21. Which is not aerial adaptation of Birds [RPMT 2001]
(a) Single ovary (b) Pneumatic bone
(c) Gizzard (d) Keeled sternum

22. Renal portal system is absent in [BHU 1998, 2008]
(a) Amphibians (b) Reptiles
(c) Amphibians and reptiles (d) Birds

23. Which one of the following is a flightless bird [AIIMS 2001; MHCET 2003; J & K CET 2010]
(a) *Passer* (b) *Corvus*
(c) *Aptenodytes* (d) *Pavo cristatus*

24. The presence of feathers and power of flight are characteristic feature of [NCERT; BVP 2000]
(a) Aves (b) Reptilia
(c) Mammals (d) Amphibians

25. Birds are [AIIMS 2000]
(a) Cold blooded (b) Homoeothermal
(c) Poikilothermal (d) Homeopoiesis

26. Kingfisher is a bird in which the feet are
(a) Scratching type (b) Raptorial type
(c) Perching type (d) Wading type

27. Both male and female pigeons secrete milk through
(a) Mammary glands (b) Crop glands
(c) Salivary glands (d) Gizzard glands

28. Birds differ from bats in the absence of
(a) 4-chambered heart (b) Homoeothermy
(c) Diaphragm (d) Tracheae

29. The wishbone of the birds is derived from
(a) Skull (b) Pectoral girdle
(c) Pelvic girdle (d) Hindlimb

30. Birds have bipedal locomotion as it [NCERT]
(a) Reduces body weight
(b) Increases rate of locomotion
(c) Provides more support to the body
(d) Spares forelimbs for flight

31. The largest egg belongs to [CPMT 1994; MHCET 2000]
(a) Elephant (b) Whale
(c) Dinosaur (d) Ostrich

32. Bone marrow does not occur in [BHU 1994]
(a) Fishes (b) Amphibians
(c) Birds (d) Reptiles

33. Preen gland occurs in [RPMT 1995]
(a) Pisces (b) Aves
(c) Reptilia (d) Mammalia

34. Without exception, all birds are [CPMT 1995]
(a) Omnivorous
(b) Have feathers and fly
(c) Forms nests and care them
(d) Have calcareous shelled egg

35. Which of the following is merrythought bone [EAMCET 1995]
(a) Coracoid (b) Clavicle
(c) Scapula (d) Suprascapula

36. The living wingless or flightless birds belong to the superorder [EAMCET 1995]
(a) Palaeognathae (b) Odontognathae
(c) Archaeornithes (d) None of these

37. Kiwi is found in [CPMT 1996]
(a) India (b) South America
(c) New Zealand (d) East Indies

38. Uropygial gland is associated with [MP PMT 2013]
(a) Lizard (b) Shark
(c) Frog (d) Pigeon

39. Flight muscles of bird are attached to [Kerala PMT 2001]
(a) Clavicle (b) Coracoid
(c) Keel of sternum (d) Scapula

Class-Mammalia

1. Instead of tooth, baleen (hanging horny plates in mouth) are found in [Odisha JEE 2008]
(a) Blue whale (b) Shark
(c) Dolphin (d) *Archaeopterix*

2. An egg laying mammal is [NCERT; J & K CET 2008]
(a) Didelphys (b) Macaca
(c) Ornithorhynchus (d) Macropus

3. Which one of the following animals is correctly matched with its one characteristic and the taxon [AIIMS 2008; NEET (Karnataka) 2013]

	Animals	Characteristic	Taxon
(a)	Millipede	Ventral nerve cord	Arachnida
(b)	Duckbilled platypus	Oviparous	Mammalian
(c)	Silver fish	Pectoral and pelvic fins	Chordate
(d)	Sea anemone	Triploblastic	Cnidaria

4. Egg-laying mammals are grouped as [Pune CET 1998]
(a) Eutheria (b) Prototheria
(c) Rodentia (d) Metatheria

5. Which pair of characters are found without exception in all mammals [RPMT 2001]
(a) Hair and viviparity
(b) Viviparity and mammary glands
(c) Viviparity and internal fertilization
(d) Mammary glands and internal fertilization

6. Which of the following animals is an example of class mammalia [MP PMT 1998]
(a) *Manis* (b) *Planorbis*
(c) *Hydrophis* (d) *Psittacula*

7. External ears are characteristics of [NCERT; MP PMT 1994, 97]
(a) Birds (b) Mammals
(c) Birds and mammals (d) Mammals and reptiles

8. Eutherian mammals are [MP PMT 1996; BVP 2002]
(a) Oviparous
(b) Viviparous
(c) Ovoviviparous
(d) Both oviparous and ovoviviparous

9. Which one of the following is not a mammalian character [Kerala PMT 2010]
(a) Presence of milk producing glands
(b) They have two pairs of limbs
(c) Skin is unique in possessing hair
(d) Presence of external ears called pinnae
(e) Homodont type of dentition

10. Which one of the following mammals is not an odd-toed ungulate [DUMET 2009]
(a) Rhinoceros (b) Camel
(c) Zebra (d) Horse

11. Animals belonging to the order 'rodentia' have
(a) Long incisors (b) long canines
(c) short incisors (d) long molars

12. *Tachyglossus is a connecting link between* [DUMET 2009]
(a) Reptiles and birds (b) Amphibians and reptiles
(c) Birds and mammals (d) Reptiles and mammals

13. Why do mammals lack mucus glands in their skin [AIIMS 1993]
(a) The skin is not slippery
(b) The skin is tough
(c) The epidermis has many layers of cells
(d) The skin is not respiratory

14. In which one of the following sets of animals do all the four give birth to young ones [NCERT; CBSE PMT 2006; KCET 2009]
(a) Shrew, Bat, Cat, Kiwi
(b) Kangaroo, Hedgehog, Dolphin, Loris
(c) Lion, Bat, Whale, Ostrich
(d) Platypus, Penguin, Bat, Hippopotamus

15. Which of the following is a connecting link between mammals and reptiles [AFMC 2009]
(a) *Peripatus* (b) *Balanoglossus*
(c) *Ornithorhyncus* (d) *Archaeopteryx*

16. 12 pairs of cranial nerves are present in [AIIMS 1993]
(a) Reptilia (b) Birds only
(c) Mammals only (d) All the above

17. Rabbit belongs to the order [CBSE PMT 1991]
(a) Rodentia (b) Lagomorpha
(c) Artiodactyla (d) Perissodactyla

18. Mammals have originated from which of the following [WB JEE 2012]
(a) Pisces (b) Amphibia
(c) Reptilia (d) Aves

19. Which one of the following is a metatherian
(a) Didelphis (b) Ornithorhynchus
(c) Tarsier (d) Hysterics

20. The mammal which possesses both the reptiles and mammalian characters **[DPMT 1993]**
(a) Marsupials (b) Monotremes
(c) Equus (d) Oryctolagus

21. Kangaroo is a member of which order **[RPMT 1995; MP PMT 2000]**
(a) Monotremata (b) Marsupilia
(c) Prototheria (d) Insectivora

22. Bat can travel with **[AFMC 1997]**
(a) Eyes open
(b) Eyes plugged and ears open
(c) Ears plugged and eyes open
(d) Ears closed and eyes plugged

23. Egg laying mammals are found in
(a) India (b) South Africa
(c) Africa (d) Australia

24. A fat called blubber could be obtained from **[Kerala PMT 2001]**
(a) Bat (b) Dolphin
(c) Shark (d) Blue whale

25. Identify the aquatic mammal(s) from the following
(A) *Balaenoptera* (B) *Equus*
(C) *Delphinus* (D) *Pterophus*
(E) *Felis*
[Kerala PMT 2010]
(a) (A) and (C) only (b) (B) and (D) only
(c) (E) only (d) (D) and (E) only
(e) (B) and (E) only

26. Which of the following four animals does not come under the same order as the other three **[BHU 2012]**
(a) Rat (b) Squirrel
(c) Porcupine (d) Rabbit

27. Ruminants belongs to order **[Manipal 2005]**
(a) Proboscida (b) Artiodactyla
(c) Marsupials (d) Edentata

28. Pouch is seen in **[J & K CET 2010]**
(a) Platypus (b) Bat
(c) Lemur (d) Marsupial

29. The biological name of 'domestic cat' is **[MP PMT 1993]**
(a) *Panthera domestica* (b) *Felis domestica*
(c) *Felis leo* (d) *Panthera indica*

30. Which one of the following characters is not typical of the class Mammalia **[CBSE PMT 2005]**
(a) Thecodont dentition (b) Alveolar lungs
(c) Ten pairs of cranial nerves (d) Seven cervical vertebrae

31. Which of the following structures is present characteristically only in mammalian brain **[MP PMT 2004]**
(a) Corpus fibrosum (b) Corpus striatum
(c) Corpus luteum (d) Corpus callosum

32. Flippers of seal are modified **[AFMC 2004]**
(a) Fins (b) Hind limb
(c) Forelimb (d) Gills

33. The feet with two toes forming cloven hoof is seen in **[Kerala PMT 2004]**
(a) Horse (b) Zebra
(c) Rhinoceros (d) Elephant
(e) Sheep

34. The zoological name of common hare found in northern India is **[MP PMT 2001; CPMT 2004]**
(a) *Oryctolagus cuniculus* (b) *Lepus ruficaudatus*
(c) *Dasypus sexcinctus* (d) *Alactaga indica*

35. The following mammal lays eggs **[KCET 1998; J & K CET 2005]**
(a) Porcupine (b) Platypus
(c) Kangaroo (d) Koala

36. Double Vagina are found in **[RPMT 1999]**
(a) Monotremata (b) Eutheria
(c) Marsupials (d) All of the above

37. Which of the following is not viviparous **[HP PMT 2005; AIPMT (Cancelled) 2015]**
(a) Mole (b) Platypus
(c) Kangaroo (d) Shrew

38. One of the following is a very unique feature of the mammalian body **[BHU 2000; RPMT 2002; CBSE PMT 2004; KCET 2006; MP PMT 2012]**
(a) Four chambered heart (b) Rib cage
(c) Homeothermy (d) Presence of diaphragm

39. Select the correct set of animals of class-mammalia **[Odisha PMT 2002]**
(a) Lion, hippopotamus, penguin, bat
(b) Lion, bat, whale, ostrich
(c) Hippopotamus, penguin, whale, kangaroo
(d) Whale, bat, kangaroo, hippopotamus

40. Which character is not same in aves and mammals **[RPMT 2002]**
(a) Single systemic arch (b) Metanephric kidney
(c) Seven cervical vertebrae (d) Homoiotherms

41. All mammals **[NCERT; AMU (Med.) 2002; Odisha JEE 2009]**
(a) Give birth to live young
(b) Have a thick coat of hair
(c) Nourish their young with milk
(d) Have a uterus

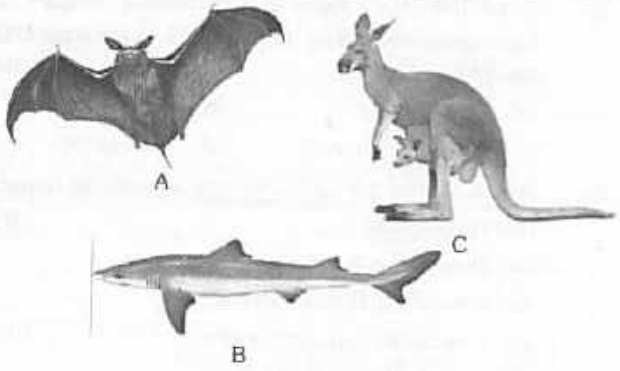
42. Most animals domesticated by man belong to the order **[BHU 2002]**
(a) Carnivora (b) Rodentia
(c) Ungulata (d) Lagomorpha

43. Which of the following is prototherian **[BHU 1999]**
(a) Platypus (b) Macropus
(c) Opposum (d) Bradypus

44. Jaw suspension characteristic of mammals is **[MP PMT 2002]**
(a) Amphistylic (b) Craniostylic
(c) Autodiastylic (d) Hyostylic

45. When embryo develops in the body of female but it does not obtain nutrients from the mother **[RPMT 1999]**
(a) Ovo-viviparous (b) Viviparous
(c) Oviparous (d) None of these

46.



Identify the names of animals A, B and C **[NCERT]**

(a) *Balaenopter, Macropus, Pteropus*
(b) *Balaenoptera, Pteropus, Macropus*
(c) *Macropus, Balaenoptera, Pteropus*
(d) *Pteropus, Balaenoptera, Macropus*

47. Which of the following is rightly matched **[CPMT 1995]**

(a) Mammalia-Human beings (b) Mollusca - Centipede
(c) Pisces - Silver fish (d) Echinoderm - Echidna

48. Consider the following four statements (A-D) about certain desert animals such as kangaroo rat

(A) They have dark colour and high rate of reproduction and excrete solid urine
(B) They do not drink water, breathe at a slow rate to conserve water and have their body covered with thick hairs
(C) They feed on dry seeds and do not require drinking water
(D) They excrete very concentrated urine and do not use water to regulate body temperature.

Which two of the above statements for such animals are true

Options **[CBSE PMT 2008]**

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

49. Considered the following four conditions (A - D) and select the correct pair of them as adaptation to environment in desert lizards.

The conditions

(A) Burrowing in soil to escape high temperature
(B) Losing heat rapidly from the body during high temperature
(C) Bask in sun when temperature is low
(D) Insulating body due to thick fatty dermis

Options **[CBSE PMT (Pre.) 2011]**

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

50. Which one of the following is categorised as a parasite in true sense **[CBSE PMT (Pre.) 2011]**

(a) The cuckoo (Koel) lays its egg in crow's nest
(b) The female Anopheles bites and sucks blood from humans
(c) Human foetus developing inside the uterus draws nourishment from the mother
(d) Head louse living on the human scalp as well as lying eggs on human hair

51. Which one of the following animals is correctly matched with its particular named taxonomic category **[NCERT; CBSE PMT (Pre.) 2011]**

(a) Housefly - *Musca*, an order
(b) Tiger - *Tigris*, the species
(c) Cuttlefish - *Mollusca*, a class
(d) Humans - *Primata*, the family

52. Pick the mammal with true placenta **[KCET 2011]**

(a) Kangaroo (b) *Echidna*
(c) Platypus (d) Mongoose

53. Which of the following is not a mammalian character **[MHCET 2002]**

(a) Hairy skin (b) Muscular diaphragm
(c) 3-chamberd heart (d) RBCs enucleated

54. Diaphragm is found in **[MH CET 2001]**

(a) Crocodile (b) Kangaroo
(c) Ostrich (d) Snake

55. Arboreal mammals have **[MH CET 2001]**

(a) Flying character (b) Burrowing character
(c) Climbing character (d) None of the above

56. Hairs occur in all mammals except those of

(a) Chiroptera (b) Rodentia
(c) Cetacea (d) Primates

57. The sweat gland are scanty in

(a) Elephant (b) Man
(c) Rabbit (d) Polar bear

58. "Sea lion" belongs to

(a) Class Reptilia (b) Subclass Prototheria
(c) Superclass Pisces (d) Order Carnivora

59. The Zoological name of 'Lion-tailed macaque' is

(a) *Macaca rhesus* (b) *Macaca silenus*
(c) *Macaca mulatta* (d) None of these

60. Locomotion in Kangaroo is

(a) Saltatorial (b) Volant
(c) Cursorial (d) Creeping

61. Pinna is absent in **[EAMCET 1994]**

(a) Sirenia (b) Primates
(c) Rodentia (d) All of these

62. Which one has a poison gland **[RPMT 1995]**

(a) Wall lizard (b) *Scoliodon*
(c) Rat snake (d) Male platypus

63. In mammals, few vertebrae join to form **[EAMCET 1995]**

(a) Humerus (b) Femur
(c) Synsacrum (d) Atlas

64. Whale is air breather but can live under water for a long time because it possesses **[CPMT 1997]**

(a) Large lungs (b) Small lungs
(c) Blubber (d) Retea mirabile

65. Only poisonous mammal or monotreme mammal is **[CBSE PMT 1992, 93; RPMT 1995; CPMT 1997; BCECE 1997; MP PMT 2002; WB JEE 2009]**

(a) *Ornithorhynchus* (b) *Echidna*
(c) Guinea pig (d) Snake

66. Which will not affect echolocation in bats **[AFMC 1997]**

(a) Covering eyes only
(b) Covering the whole head
(c) Covering the ears
(d) Covering the eyes and ears

67. Most primitive living mammals which provide an evidence of organic evolution from geographical distribution are found in **[AIIMS 1998]**
(a) Africa (b) Australia
(c) China (d) India

68. The zoological name of lion is **[MP PMT 2000]**
(a) *Felis leo* (b) *Panthera tigris*
(c) *Panthera pardus* (d) *Panthera leo persica*

69. Which of the following mammals lacks corpus callosum **[MP PMT 2000]**
(a) *Macaca* (b) *Macropus*
(c) *Balaenoptera* (d) *Ornithorhynchus*

70. Vestigial pelvic girdle and bones of hind limbs are characteristic of **[HPMT 2000]**
(a) Whales (b) Otters
(c) Rodents (d) Sharks

71. Which of the following exist in maximum number of terms of genera and species **[AFMC 2000]**
(a) Aquatic mammals (b) Carnivore mammals
(c) Herbivore mammals (d) Terrestrial mammals

72. Which of the following is largest mammals **[MHCET 2000]**
(a) Whale (b) Elephant
(c) Camel (d) Dinosaur

73. Without teats, mammary glands are found in **[EAMCET 1998; BHU 2000; MHCET 2000; CBSE PMT 2001]**
(a) Prototheria (b) Metatheria
(c) Eutheria (d) Theria

74. Bats belong to which order **[MP PMT 1994; CBSE PMT 2000; BVP 2001]**
(a) Carnivora (b) Chiroptera
(c) Dermoptera (d) Cetacea

75. A group of animals having marsupium **[MP PMT 2001; CBSE PMT 2001; MHCET 2001; BVP 2001]**
(a) Monotremata (b) Eutheria
(c) Metatheria (d) Prototheria

76. Echidna is found in **[BHU 2001]**
(a) India (b) Africa
(c) Malaysia (d) Australia

77. Which one of the following is egg-laying mammal **[RPMT 2001; MP PMT 2001]**
(a) Pangolin (b) *Tachyglossus*
(c) Porcupine (d) Bat

78. Order primata contains **[CPMT 2001]**
(a) Shrew and hedge hog (b) Bats and vampire
(c) Monkeys and man (d) Horses and zebra

79. The order insectivora comes under **[KCET 2001]**
(a) Class-mammalia (b) Class-insecta
(c) Phylum-echinodermata (d) Phylum-arthropoda

80. Which of the following represents order of 'Horse' **[NEET 2017]**
(a) *Equidae* (b) *Perissodactyla*
(c) *Caballus* (d) *Ferus*

NCERT Exemplar Questions

1. In some animal groups, the body is found divided into compartments with at least some organs/organ repeated. This characteristic feature is named **[NCERT]**
(a) Segmentation (b) Metamerism
(c) Metagenesis (d) Metamorphosis

2. Given below are types of cells present in some animals. Each one is specialized to perform a single specific function except **[NCERT]**
(a) Choanocytes (b) Interstitial cells
(c) Gastrodermal cells (d) Nematocytes

3. Which one of the following sets of animals share a four chambered heart **[NCERT]**
(a) Amphibian, Reptiles, Birds
(b) Crocodiles, Birds, Mammals
(c) Crocodiles, Lizards, Turtles
(d) Lizards, Mammals, Birds

4. Which of the following pairs of animals has non glandular skin **[NCERT]**
(a) Snake and Frog (b) Chameleon and Turtle
(c) Frog and Pigeon (d) Crocodile and Tiger

5. Birds and mammals share one of the following characteristics as a common feature **[NCERT]**
(a) Pigmented skin
(b) Alimentary canal with some modification
(c) Viviparity
(d) Warm blooded nature

6. Which one of the following sets of animals belong to a single taxonomic group (order) **[NCERT; AFMC 2012]**
(a) Cuttlefish, Jellyfish, Silverfish, Dogfish, Starfish
(b) Bat, Pigeon, Butterfly
(c) Monkey, Chimpanzee, Man, Gorilla
(d) Silkworm, Tapeworm, Earthworm

7. Which one of the following statements is incorrect **[NCERT]**
(a) Mesoglea is present in between ectoderm and endoderm in *Obelia*
(b) Radial symmetry is found in *Asterias*
(c) *Fasciola* is a pseudocoelomate animal
(d) *Taenia* is a triploblastic animal

8. Which one of the following statements is incorrect **[NCERT]**
(a) In cockroaches and prawns excretion of waste material occurs through malpighian tubules.
(b) In ctenophors, locomotion is mediated by comb plates
(c) In *Fasciola* flame cells take part in excretion
(d) Earthworms are hermaphrodites and yet cross fertilization take place among them

9. Which one of the following is oviparous **[NCERT]**
(a) Platypus (b) Flying fox (Bat)
(c) Elephant (d) Whale

10. Which one of the following is not a poisonous snake **[NCERT]**
(a) Cobra (b) Viper
(c) Python (d) Krait

11. Match the following list of animals with their level of organization

Division of Labour	Animal
A. Organ level	i *Pheritima*
B. Cellular agregate level	ii *Fasciola*
C. Tissue level	iii *Spongilla*
D. Organ system level	iv *Obelia*

Choose the correct match showing division of labour with animal example **[NCERT]**

(a) i-B, ii-C, iii-D, iv-A
(b) i-B, ii-D, iii-C, iv-A
(c) i-D, ii-A, iii-B, iv-C
(d) i-A, ii-D, iii-C, iv-B

12. Body cavity is the cavity present between body wall and gut wall. In some animals the body cavity is not lined by mesoderm. Such animals are called **[NCERT]**

(a) Acoelomate (b) Pseudocoelomate
(c) Coelomate (d) Haemocoelomate

13. Match the column A with column B and choose the correct option

Column A	Column B
A. Porifera	i. Canal system
B. Aschelminthes	ii. Water-vascular system
C. Annelida	iii. Muscular Pharynx Comb Plates
D. Arthropoda	iv. Jointed appendages
E. Echinodermata	v. Metameres

[NCERT]

(a) A-ii, B-iii, C-v, D-iv, E-i
(b) A-ii, B-v, C-iii, D-iv, E-i
(c) A-i, B-iii, C-v, D-iv, E-ii
(d) A-i, B-v, C-iii, D-iv, E-ii

Critical Thinking

Objective Questions

1. Note the following :

A. It is a fresh water, metamerically segmented protostome
B. The clitellum is absent
C. It is unisexual
D. Its larval form is Trochophore
E. The nervous system is found in the epidermis

Which of the above is true of "paddle worm" **[EAMCET 2009]**

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

2. Which of the following endoparasites of humans does show viviparity **[AIPMT (Cancelled) 2015]**

(a) *Enterobius vermicularis* (b) *Trichinella spiralis*
(c) *Ascaris lumbricoides* (d) *Ancylostoma duodenale*

3. Match the following

List-I		List-II	
(A)	Green glands	(I)	Scolopendra
(B)	Amphids and phasmids	(II)	Respiratory organ
(C)	Ctenidia	(III)	Shell protein
(D)	Poison claw	(IV)	Excretory organs
(E)	Concholin	(V)	Sense organs

The correct match is **[EAMCET 2009]**

	A	B	C	D	E
(a)	IV	V	II	I	III
(b)	I	III	IV	V	II
(c)	II	IV	V	III	I
(d)	III	IV	V	I	I

4. Match list I with list II and choose the correction option

List I (Organism)		List II (Excretory structure)	
(A)	Cockroach	(1)	Nephridia
(B)	*Clarias*	(2)	Malpighian tubules
(C)	Earthworm	(3)	Kidneys
(D)	*Balanoglossus*	(4)	Flame cells
(E)	Flatworm	(5)	Proboscis bland

[Kerala PMT 2009]

(a) (A) — (1), (B) — (3), (C) — (2), (D) — (4), (E) — (5)
(b) (A) — (3), (B) — (1), (C) — (2), (D) — (5), (E) — (4)
(c) (A) — (2), (B) — (1), (C) — (3), (D) — (5), (E) — (4)
(d) (A) — (2), (B) — (1), (C) — (5), (D) — (3), (E) — (4)
(e) (A) — (2), (B) — (3), (C) — (1), (D) — (5), (E) — (4)

5. Coelom is cavity found between **[JIPMER 2000]**

(a) Ectoderm and Endoderm
(b) Mesoderm and Endoderm
(c) Body wall and ectoderm
(d) Mesoderm and body wall

6. In *Hydra*, both pseudopodia and flagella occur in

(a) Nutritive cells (b) Epithelio-muscular cells
(c) Sensory cells (d) Gland cells

7. Common between trichocysts of *Paramecium* and nematocysts of *Hydra* is **[CPMT 1994]**

(a) Attachment and defence (b) Defence only
(c) Sensitivity (d) Food capturing

8. In *Hydra*, egestion of undigested food and excretion of nitrogenous wastes occur through **[CBSE PMT 2001]**

(a) Mouth and tentacles (b) Mouth and body wall
(c) Mouth and mouth (d) Body wall and body wall

9. The scientific name of Asian tiger mosquito **[WB JEE 2009]**

(a) *Aedes aegypti* (b) *Aedes albopictus*
(c) *Aedes taeniorhychus* (d) *Aedes albolineatus*

10. *Taenia saginata* differs from *Taenia solium* in **[CBSE PMT 1990]**

(a) Absence of scolex hooks
(b) Absence of scolex hooks and uterine branching
(c) Absence of scolex hooks and presence of both male and female reproductive organs
(d) Presence of scolex hooks

11. Correctly matched set of phylum, class and example is **[MP PMT 2009]**

(a) Protozoa – Mastigophora – Entamoeba
(b) Mollusca – Bivalvia – *Pinactada*
(c) Arthropoda – Diplopoda – *Scolopendra*
(d) Chordata – Cyclostomata – *Phrynosoma*

12. Sites of first, second and third moulting of *Ascaris* larva are **[AIIMS 2002]**

(a) Soil, lung, intestine (b) Soil, alveoli, lung
(c) Soil, intestine, lung (d) Liver, stomach, intestine

13. Match List I with List II and select the correct option

List I		List II	
A.	Protozoa	1.	Pennatula
B.	Aschelminthes	2.	Beroe
C.	Porifera	3.	Monocystis
D.	Ctenophora	4.	Wuchereria
E.	Cnidaria	5.	Cliona

[Kerala PMT 2008]

(a) A – 3, B – 5, C – 4, D – 1, E – 2
(b) A – 4, B – 3, C – 5, D – 2, E – 1
(c) A – 3, B – 4, C – 5, D – 2, E – 1
(d) A – 2, B – 4, C – 5, D – 3, E – 1
(e) A – 3, B – 4, C – 5, D – 1, E – 2

14. Dorsal vessel of Earthworm is **[APMEE 1996; Pb. PMT 1999]**

(a) Distribution
(b) Collecting
(c) Collecting in first thirteen segments and distributing in the rest
(d) Distributing in first thirteen segments and collecting in the rest

15. Blood glands of *Pheretima* take part in **[APMEE 2001]**

(a) Formation of red blood corpuscles
(b) Formation of phagocytes
(c) Maintenance of blood volume
(d) Maintenance of blood circulation

16. Read the following statements and select the correct option

A. Circulatory system in arthropods is of closed type
B. Parapodia in annelids help in swimming
C. Phylum Mollusca is the second largest animal phylum
D. Aschelminthes are dioecious

[NCERT; Kerala PMT 2012]

(a) A and C alone are wrong
(b) A alone is wrong
(c) C alone is wrong
(d) C and D alone are wrong
(e) D alone is wrong

17. Weberian ossicles are found in **[AIIMS 1999]**

(a) Frogs (b) Snakes
(c) Fishes (d) Birds

18. Match the items in column I with column II and choose the correct option

Column I		Column II	
(A)	Ascus	(1)	*Spirulina*
(B)	Basidium	(2)	*Penicillium*
(C)	Protista	(3)	*Agaricus*
(D)	Cyanobacteria	(4)	*Euglena*
(E)	Animalia	(5)	*Sponges*

[Kerala PMT 2009]

(a) (A) — (2), (B) — (3), (C) — (4), (D) — (5), (E) — (1)
(b) (A) — (1), (B) — (2), (C) — (3), (D) — (5), (E) — (4)
(c) (A) — (2), (B) — (5), (C) — (3), (D) — (1), (E) — (4)
(d) (A) — (1), (B) — (2), (C) — (3), (D) — (4), (E) — (5)
(e) (A) — (2), (B) — (3), (C) — (4), (D) — (1), (E) — (5)

19. Which of the following group of characters is present in all chordates in some or other stage in their life

Or

Chordates differ from nonchordates in having **[Odisha JEE 2012]**

(a) Mammary glands, hair and gill slits
(b) Notochord, gill slits and dorsal tubular nervous system
(c) Notochord, scales and dorsal tubular nervous system
(d) Gill slits, vertebral column and notochord

20. What is true about Nereis, Scorpion, Cockroach and Silver fish **[CBSE PMT 2007]**

(a) They all have jointed paired appendages
(b) They all posses dorsal heart
(c) None of them is aquatic
(d) They all belong to the same phylum

21. Which of the following pairs are correctly matched

Animals			Morphological features
(A)	Crocodile	–	4-Chambered heart
(B)	Sea Urchin	–	Parapodia
(C)	Obelia	–	Metagenesis
(D)	Lemur	–	Thecodont

[CBSE PMT 2007]

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

22. Which one of the following is matching set of a phylum and its three examples **[CBSE PMT 2006]**

(a) Mollusca-*Loligo, Teredo, Octopus*
(b) Porifera-Spongilla, Euplectella, Pennatula
(c) Cnidaria-Bonellia, Physalia, Aurelia
(d) Platyhelminthes-*Planaria, Schistosoma, Enterobius*

23. Which is living fossil **[NCERT; MP PMT 2000]**

(a) Coelacanth (b) Limulus
(c) Sphenodon (d) All of these

24. The group 'amniota' includes **[EAMCET 1998; KCET 1999; Wardha 2005]**
(a) Birds and reptiles
(b) Birds and mammals
(c) Reptiles and mammals
(d) Reptiles, birds and mammals

25. The animal group, where the adults are degenerated but larvae are well developed, is **[CPMT 1999]**
(a) Agnatha (b) Tunicates
(c) Amphibians (d) Cephalo chordates

26. Which one of the following statements is incorrect **[CBSE PMT 2006]**
(a) In insects, circulating body fluids serve to distribute oxygen to tissues
(b) The principle of countercurrent flow facilitates efficient respiration in gills of fishes
(c) The residual air in lungs slightly decreases the efficiency of respiration in mammals
(d) The presence of non-respiratory air sacs, increases the efficiency of respiration in birds

27. Which of the following statement is true **[Kerala PMT 2006]**
(a) All living members of class cyclostomata are parasites on some fishes
(b) There are about 2,000 species in the class osteichthyes
(c) Ciona belongs to the subphylum cephalochordata
(d) Arthropods are diplobastic animals
(e) Ascaris lumbricoides is a flat worm

28. Heterocercal tail is found in **[RPMT 2002]**
(a) Cartilaginous fishes (b) Bony fishes
(c) Whale (d) Amphibians

29. Stenohaline fishes are represented by **[MP PMT 2002]**
(a) Fresh water fishes only
(b) Marine fishes only
(c) Those which can tolerate a narrow range of salinity in water only
(d) Those which can tolerate a wide range of salinity in water

30. Fishes having swim bladder, which do not have direct communication with the exterior and where resorbent and secretory part is not sharply separated from one another are called as **[MP PMT 2002]**
(a) Physostomes (b) Physoclists
(c) Euphysoclists (d) Paraphysoclists

31. Which one of the following combination is generally recommended for composite fish farming in India **[MP PMT 2001]**
(a) Catla, Cyprinus, Clarias
(b) Catla, Labeo, Cirrhinus
(c) Cirrhinus, Cyprinus, Channa
(d) Clarias, Chanos, Cyprinus

32. Which type of coelom is found in frog **[RPMT 2001]**
(a) Enterocoel (b) Schizocoel
(c) Pseudocoel (d) Haemocoel

33. Which of the following statements are true / false
A. In Torpedo the electric organs are capable of generating strong electric shock to paralyze the prey
B. Bony fishes use pectoral, pelvic, dorsal, anal and caudal fins in swimming
C. Amphibian skin is moist and has thick scales
D. Birds are poikilothermous animals
E. The most unique mammalian characteristic is the presence of milk producing mammary glands by which the young ones are nourished **[Kerala PMT 2006; CBSE PMT 2014]**
(a) A, B and C are true; D, E are false
(b) A, B and E are true; C and D are false
(c) A, D and E are true; B and C are false
(d) A, B and D are false; C and E are true
(e) Only D is true; A, B, C and E are false

34. Which of the following snake is not poisonous **[AIIMS 2000; CPMT 2001]**
(a) *Naja naja* (b) Python
(c) Bungarus (d) Hydrophis

35. Limbless lizard is **[MP PMT 2000]**
(a) Draco (b) Ophisaurus
(c) Amblyrhynchus (d) Moloch

36. Reptiles share which of the following character with birds and mammals **[Pb. PMT 2000; CBSE PMT 2002]**
(a) Amnion (b) Diaphragm
(c) Homeothermy (d) All of these

37. In which of the following subclasses of reptiles, the skull has a solid roof **[MP PMT 2002]**
(a) Anapsida (b) Diapsida
(c) Synapsida (d) Parapsida

38. Which of the following bird is viviparous **[RPMT 1999]**
(a) Penguin (b) Humming bird
(c) Albatross (d) None of these

39. Which of the following sets is of flightless birds **[NCERT; MHCET 2002; Kerala PMT 2010]**
(a) Penguin, Pecock, Fowl, Rhea, Kiwi, Moa, Ostrich
(b) Emu, Penguin, Rhea, Kiwi, Moa, Cassowary, Ostrich
(c) Albatros, Humming bird, Falcon, Hawk, Emu
(d) Ostrich, Emu, Kiwi, Falcon, Albatros

40. Which is the common character between all the mammals **[BHU 1999]**
(a) They are oviparous
(b) They are herbivorous
(c) They are carnivorous
(d) They have seven cervical vertebrae

41. Find the odd example **[KCET 2007]**
(a) Sea lily (b) Sea fan
(c) Sea cucumber (d) Sea urchin

42. Annual migration does not occur in the case of **[CBSE PMT 2006]**
(a) Salamander (b) Arctic tern
(c) Salmon (d) Siberian crane

43. Match the following

Column I		Column II	
A.	*Euplectella*	1.	Sea pen
B.	*Physalia*	2.	Pinworm
C.	*Pennatula*	3.	Venus flower basket
D.	*Enterobius*	4.	Midwife toad
E.	*Alytes*	5.	Portuguese man of war

[MP PMT 1994; BHU 2001; Kerala PMT 2007, 09]

(a) A–5, B–4, C–3, D–2, E–1
(b) A–5, B–3, C–4, D–2, E–1
(c) A–4, B–5, C–1, D–2, E–3
(d) A–3, B–5, C–1, D–2, E–4
(e) A–2, B–1, C–3, D–4, E–5

44. During its life cycle, *Fasciola hepatica* (Liver Fluke) infects its intermediate host and primary host at the following larval stages respectively **[CBSE PMT 2003]**

(a) Redia and miracidium
(b) Cercaria and redia
(c) Metacercaria and cercaria
(d) Miracidium and metacercaria

45. Sea cows are aquatic mammals included under **[MP PMT 2001]**

(a) Lagomorpha (b) Pinnipedia
(c) Cetacea (d) Sirenia

46. Given below are four matchings of an animal and its kind of respiratory organ

1. Silver Fish – trachea, 2. Scorpion - book lung, 3. Sea squirt - pharyngeal gills, 4. Dolphin – skin **[CBSE PMT 2003]**

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

47. *Sycon* belongs to a group of animals, which are best described as **[CBSE PMT 2003]**

(a) Multicellular having tissue organization, but not body cavity
(b) Unicellular or acellular
(c) Multicellular without any tissue organization
(d) Multicellular with a gastrovascular system

48. The correct route through which Ascaris passes to complete its life cycle after infecting a fresh host is **[BHU 1999; MP PMT 2013]**

(a) Intestine → Liver → Heart → Lung → Pharynx → Gullet → Stomach → Intestine
(b) Outside → Intestine → Liver → Heart → Lung → Pharynx → Gullet → Intestine
(c) Intestine → Liver → Heart → Lung → Pharynx → Gullet → Stomach → Intestine → Outside → Intestine
(d) Outside → Intestine → Liver → Heart → Lung → Pharynx → Gullet → Stomach → Intestine → Outside

49. Cockroach and earthworm have common type of **[Pb. PMT 2004]**

(a) Heart (b) Nerve cord
(c) Nephridia (d) Spermathecae

50. Fertilization in earthworm is **[RPMT 1999]**

(a) Cross fertilization (b) Mutual fertilization
(c) Self fertilization (d) None of these

51. Choose the correct combination of the following **[CPMT 2000]**

(a) Annelida and porifera-phyla
(b) Aves and chordata-classes
(c) Mollusca and hydrozoa-classes
(d) Oligochaeta and arthropoda-phyla

52. Maximum nutritional diversity is found in the group **[CBSE PMT (Pre.) 2012]**

(a) Fungi (b) Animalia
(c) Monera (d) Plantae

53. Phylum annelida resembles mollusca in embryonic features because both have **[MP PMT 1999]**

(a) Spiral cleavage and mesoderm formation
(b) Identical conspicuous segmentation in body, muscles and nervous system
(c) Meroblastic cleavage and ectoderm formation
(d) Special type of mouth parts

54. The group that does not fit into this category **[MP PMT 1993]**

(a) Amphibia (b) Reptiles
(c) Aves (d) Mammals

55. In bioluminesence storage, energy changes into **[AFMC 2002]**

(a) Light energy (b) Radiant energy
(c) Chemical energy (d) Mechanical energy

56. The main difference between Gymnophiona (Apoda) and Urodela is that Urodela

(a) Have two auricles and one ventricle
(b) Have smooth moist skin
(c) Have a cloaca
(d) Respire by lungs in the adult stage

57. Body cavity surrounding alimentary canal but it is not lined by cellular layer in which of the following **[BHU 2003]**

(a) Nematodes (b) Platyhelminthes
(c) Annelids (d) Echinoderms

58. Match the items in column I with column II and choose the correct option

Column I		Column II	
A.	Binary fission	1.	Algae
B.	Zoospore	2.	*Amoeba*
C.	Conidium	3.	*Hydra*
D.	Budding	4.	*Penicillium*
E.	Gemmules	5.	Sponge

[Kerala PMT 2010]

(a) A-1; B-4; C-5; D-3; E-2 (b) A-2; B-1; C-4; D-3; E-5
(c) A-2; B-4; C-3; D-5; E-1 (d) A-1; B-4; C-3; D-2; E-5
(e) A-4; B-1; C-3; D-5; E-2

59. In which one of the following the genus name, its two characters and its class/phylum are correctly matched
[NCERT; CBSE PMT (Pre.) 2011]

	Genus name	Two characters		Class/ Phylum
(a)	Aurelia	(a)	Cnidoblasts	Coelenterata
		(b)	Organ level of organization	
(b)	Ascaris	(a)	Body segmented	Annelida
		(b)	Males and females distinct	
(c)	Salamandra	(a)	A tympanum represents ear	Amphibia
		(b)	Fertilization is external	
(d)	*Pteropus*	(a)	Skin possesses hair	Mammalia
		(b)	Oviparous	

60. Sinking of zooplankton during the day and rising to the surface at night is an example of **[AIIMS 2010]**
(a) Circinal rhythm (b) Circadian rhythm
(c) Tidal rhythm (d) None of these

61. Which one of the following is not correctly matched
[WB JEE 2011]
(a) Sycon – canal system (b) Star fish – radial symmetry
(c) Ascaris – flame cell (d) Prawn – haemocoel

62. Match the following and select the correct answer

Column I		Column II	
A.	Choanocytes	1.	Platyhelminthes
B.	Cnidoblasts	2.	Ctenophora
C.	Flame cells	3.	Porifera
D.	Nephridia	4.	Coelenterata
E.	Comb plates	5.	Annelida

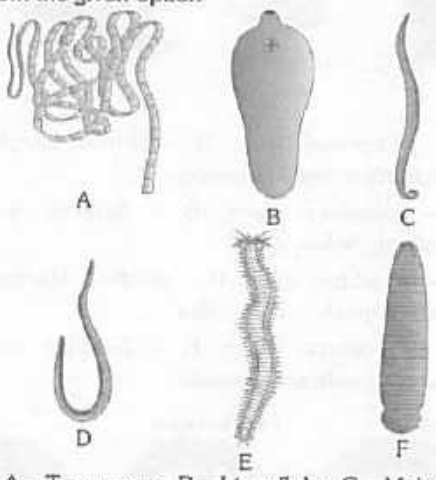
[Kerala PMT 2010]
(a) A-2, B-1, C-4, D-5, E-3 (b) A-2, B-4, C-1, D-5, E-3
(c) A-5, B-1, C-3, D-2, E-4 (d) A-3, B-4, C-1, D-5, E-2
(e) A-3, B-1, C-4, D-5, E-2

63. Which one of the following statements about all the four of Spongilla, Leech, Dolphin and Penguin is correct
[CBSE PMT (Pre.) 2010]
(a) All are bilaterally symmetrical
(b) Penguin is homoiothermic while the remaining three are poikilothermic
(c) Leech is a fresh water form while all others are marine
(d) *Spongilla* has special collared cells called choanocytes, not found in the remaining three

64. Animals possess nerve networks or nervous systems to respond to their environment. But the single celled *Amoeba* does not possesses any nerve cell, so, how it come to know whether a particle it encounters is a grain or sand and not its dinner **[AIIMS 2009]**
(a) By chemotaxis (b) By skin
(c) By hormones (d) All of these

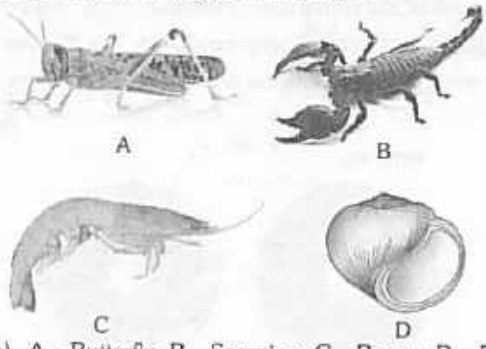
65. Retractile claws are found in **[MP PMT 2013]**
(a) Cat and Lion (b) Leopard
(c) Hyaena (d) All of the above

66. Identify the names of the following figure A, B, C, D, E and F from the given option **[NCERT]**



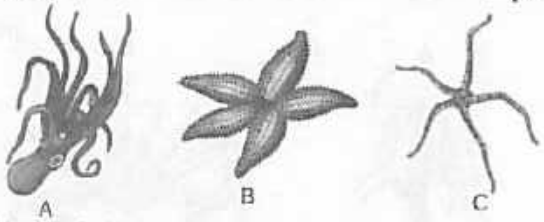
(a) A – Tape worm; B – Liver fluke; C – Male Roundworm; D – Female Roundworm; E – *Nereis*; F –*Hirudinaria*
(b) A – Tape worm; B – Liver fluke; C – Female Roundworm; D – Male Roundworm; E – *Nereis*; F –*Hirudinaria*
(c) A – Tape worm; B – Liver fluke; C – Male Roundworm; D – Female Roundworm; E – *Hirudinaria*; F – *Nereis*
(d) A – Tape worm; B – Liver fluke; C – Female Roundworm; D – Male Roundworm; E – *Hirudinaria*; F – *Nereis*

67. Identify the following figures correctly **[NCERT]**



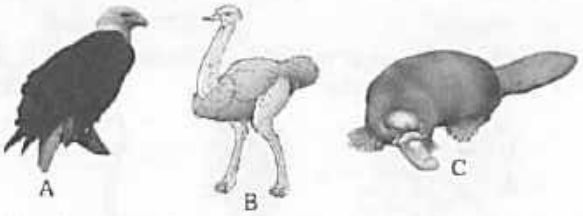
(a) A – Butterfly, B – Scorpion, C – Prawn, D – *Pila*
(b) A – Locust, B – Scorpion, C – Prawn, D – Snail
(c) A – Locust, B – Prawn, C – Scorpion, D – *Pila*
(d) A – Locust, B – Scorpion, C – Prawn, D – *Pila*

68. Identify the names of the following figure from the given option **[NCERT]**



(a) A – *Ophiura*, B – *Asterias*, C – *Octopus*
(b) A – *Octopus*, B – *Asterias*, C – *Ophiura*
(c) A – *Octopus*, B – *Asterias*, C – *Ascidia*
(d) A – *Octopus*, B – *Ascidia*, C – *Ophiura*

69. Identify the name of given animals with their respective classes **[NCERT]**



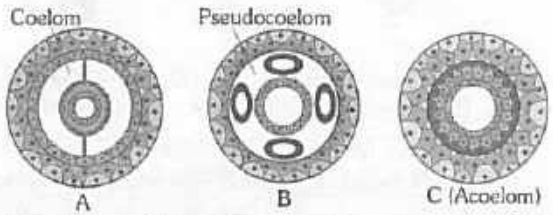
(a) A – *Neophron*, Aves, B – *Struthio*, Reptilia; C – *Ornithorhynchus*, Mammalia

(b) A – *Neophron*, Aves; B – *Struthio*, Aves; C – *Ornithorhynchus*, Aves

(c) A – *Neophron*, Aves; B – *Struthio*, Mammalia; C – *Ornithorhynchus*, Mammalia

(d) A – *Neophron*, Aves; B – *Struthio*, Aves; C – *Ornithorhynchus*, Mammalia

70.



In which phylum A, B and C are found **[NCERT]**

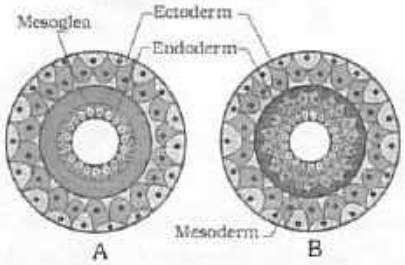
(a) Sponges, Aschelminthes, Platyhelminthes respectively

(b) Aschelminthes, Platyhelminthes, Annelids respectively

(c) Platyhelminthes, Annelids, Aschelminthes respectively

(d) Annelids, Aschelminthes, Platyhelminthes respectively

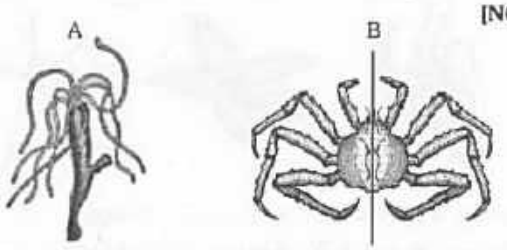
71. The given figure shows the germs layer. The animals having structures shown in the figure are respectively known as **[NCERT]**



(a) Triploblastic, Triploblastic (b) Diploblastic, Diploblastic

(c) Triploblastic, Diploblastic (d) Diploblastic, Triploblastic

72. Identify the symmetry of animals A and B respectively **[NCERT]**



(a) Radial, Radial (b) Bilateral, Bilateral

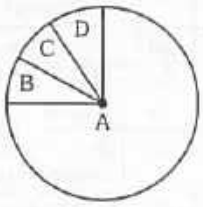
(c) Radial, Bilateral (d) Bilateral, Asymmetrical

73. Select the Taxon mentioned that represents both marine and fresh water species **[CBSE PMT 2014]**

(a) *Cephalochordata* (b) *Cnidaria*

(c) *Echinoderms* (d) *Ctenophora*

74. Given below is the representation of the extent of global diversity of *invertebrates*. What groups the four portions (A-D) represent repectively **[CBSE PMT 2014]**



Options

	A	B	C	D
(a)	Molluscs	Other animal groups	Crustaceans	Insects
(b)	Insects	Molluscs	Crustaceans	Other animal Groups
(c)	Insects	Crustaceans	Other animal groups	Molluscs
(d)	Crustaceans	Insects	Molluscs	Other animal group

75. Which of the following characteristics is mainly responsible for diversification of insects of land **[AIPMT (Cancelled) 2015]**

(a) Bilateral symmetry (b) Exoskeleton

(c) Eyes (d) Segmentation

76. Which of the following characteristic features always holds true for the corresponding group of animals **[NEET (Phase-I) 2016]**

(a)	Cartilagious endoskeleton	Chondrichthyes
(b)	Viviparous	Mammalia
(c)	Possess a mouth with an upper and a lower jaw	Chordata
(d)	3 – chambered heart with one incompletely divided ventricle	Reptilia

77. Which one of the following characteristics is **not** shared by birds and mammals **[NEET (Phase-I) 2016]**

(a) Ossified endoskeleton (b) Breathing using lungs

(c) Viviparity (d) Warm blooded nature

78. Chitin is chemically a polymer of **[Uttaranchal PMT 2001]**

Or

The chitinous exoskeleton of arthropods is formed by the polymerisation of **[AIPMT 2015]**

(a) N-acetyl gluconic acid (b) N-acetyl glucosamine

(c) N-acetyl muramic acid (d) None of these

79. Which of the following statements(s) is/are correct about *Macropus* spp **[WB JEE 2016]**
(a) They are metatherian mammals
(b) They are only found in Austria
(c) They have true placenta
(d) External ears are present

80. An important characteristic that hemichordates share with Chordates is **[NEET 2017]**
(a) Absence of notochord (b) Ventral tubular nerve cord
(c) Pharynx with gill slits (d) Pharynx without gill slits

81. Which among these is the correct combination of aquatic mammals **[NEET 2017]**
(a) Seals, Dolphins, Sharks (b) Dolphins, Seals, *Trygon*
(c) Whales, Dolphins, Seals (d) *Trygon*, Whales, Seals

A R Assertion & Reason

Read the assertion and reason carefully to mark the correct option out of the options given below :

(a) If both the assertion and the reason are true and the reason is a correct explanation of the assertion
(b) If both the assertion and reason are true but the reason is not a correct explanation of the assertion
(c) If the assertion is true but the reason is false
(d) If both the assertion and reason are false
(e) If the assertion is false but reason is true

1. Assertion : Sponges have tissue level of organization.
Reason : Sponges are multicellular.

2. Assertion : In mollusca, circulatory system is of closed type.
Reason : The blood of mollusca contains haemoglobin **[AIIMS 1995]**

3. Assertion : *Leucosolenia* shows ascon type of canal system.
Reason : In *Leucosolenia* water passes through ostia → spongocoel → osculum.

4. Assertion : Sponges do not show any animal nature.
Reason : Sponges are sessile with no apparent way of capturing food or eliminating water.

5. Assertion : The duck-billed *Platypus* and the spiny ant-eater, both are egg-laying animals yet they are grouped under mammals.
Reason : Both of them have seven cervical vertebrae and 12 pairs of cranial nerves. **[AIIMS 2005]**

6. Assertion : Tapeworm, roundworm and pinworm are endoparasites of human intestine.
Reason : Improperly cooked food is the source of all intestinal infections. **[AIIMS 2004, 08]**

7. Assertion : Coelenterates are known as Radiata.
Reason : Coelenterates are bilaterally symmetrical.

8. Assertion : *Hydra* is green coloured.
Reason : Green colour is due to the presence of chlorophyll in their body wall.

9. Assertion : Nerve cells in coelenterata have complete co-ordination in their body.
Reason : True nerve cells occur for the first time in coelenterate.

10. Assertion : King cobra is adaptive to oriental realm.
Reason : Wallace line prevents interaction of king cobra and kangaroo. **[AIIMS 2009]**

11. Assertion : Bats and whales are classified as mammals.
Reason : Bats and whales have four-chambered heart. **[AIIMS 2003, 08]**

12. Assertion : All birds, except the ones like koel (cuckoo) build nests for retiring and taking rest during night time (day time for nocturnal).
Reason : Koel lays its eggs in the nests of tailor bird. **[AIIMS 2003]**

13. Assertion : *Obelia* is dimorphic in nature.
Reason : *Obelia* shows polyp and gonangia form.

14. Assertion : Coelenterates show alternation of generation.
Reason : In coelenterates, asexual generation is followed by sexual generation.

15. Assertion : Lateral line system is found in fishes and aquatic larval amphibians.
Reason : Lateral line system has receptor of sensory cells derived from ectoderm. **[AIIMS 2002]**

16. Assertion : *F.hepatica* undergoes both aerobic and anaerobic respiration.
Reason : *Fasciola* respire only in absence of oxygen.

17. Assertion : *Plasmodium vivax* is responsible for malaria.
Reason : Malaria is caused by polluted water. **[AIIMS 2001]**

18. Assertion : Birds have one ovary.
Reason : This reduces the body weight for flight. **[AIIMS 1999]**

19. Assertion : A shark can stay at a desired level in water without swimming.
Reason : It has a buoyancy-regulating organ called as the swim bladder. **[AIIMS 1999]**

20. Assertion : Sponges belong to Porifera.
Reason : Sponges have canal system. **[AIIMS 1998]**

21. Assertion : There is no chance of malaria to a man on the bite of male *Anopheles* mosquito.
Reason : It carries a non-virulant strain of *Plasmodium*. **[AIIMS 1998]**

22. Assertion : Cold blooded animals do not have fat layer.
Reason : Cold blooded animals use their fat for metabolic process during hibernation. **[AIIMS 1997]**

23. Assertion : Acraniata is a group of organisms which do not have distinct cranium.
Reason : It includes small marine forms without head. **[AIIMS 1997]**

24. Assertion : The skeleton of sponges is made up of spicules.
Reason : Composition of spicules help in classification of sponges. **[AIIMS 1995]**

25. Assertion : Cephalization is advantageous to an animal.
Reason : It improves the appearance of the animal.
[AIIMS 1994]

26. Assertion : Blood is colourless in the insects.
Reason : Insect blood has no role in O_2 transport.
[AIIMS 1994]

27. Assertion : Lophodont dentition is also found in the mammals.
Reason : Lophodont type of dentition is specially for herbivore mammals.

28. Assertion : 'Calabar swelling' is caused by 'eye worm'.
Reason : *Loa loa* is called the 'eye worm'.

29. Assertion : Metamerism is the characteristic of annelida.
Reason : Metamerism is one type of body segmentation.

30. Assertion : Blood is red in annelida.
Reason : RBCs are absent in them.

31. Assertion : Baleen is an example of aquatic adapation.
Reason : Baleen is a balloon like structure present beneath the skin of mammals.

32. Assertion : Spermathecae are the main part of reproductive system of annelida.
Reason : Spermathecae help in sperm transfer.

33. Assertion : Coprophagy is the characteristic of mammal.
Reason : Coprophagy is found in all mammals.

34. Assertion : Both true ribs and floating ribs are present in mammals.
Reason : By nature, sternal ribs are true ribs as, they possess all the characters of ribs.

35. Assertion : Cutaneous glands help in regulation of body temperature.
Reason : Cutaneous glands are produced from stratum germinativum.

36. Assertion : Annelids are ureotelic.
Reason : Only excretory product of annelids is uric acid.

37. Assertion : Open circulatory system is found in most arthropods.
Reason : Arthropods contain haemolymph which directly bathes internal tissues and organ.
[AIIMS 2010]

38. Assertion : The birds can maintain a constant body temperature.
Reason : Birds possess feathers covering their body.

39. Assertion : Moulting or ecdysis occurs only in invertebrates.
Reason : In birds, moulting usually takes an average time of six weeks.

40. Assertion : Birds have no mammary gland.
Reason : Pigeons secrete 'pigeon's millk'.

41. Assertion : The fangs of snake is the maxillary teeth.
Reason : The poison apparatus in snake consists of poison gland, ducts and fangs.

42. Assertion : In reptiles, hemipenes is present.
Reason : Hemipenes is the combination of both ovary and penis.

43. Assertion : Parental care is seen in amphibians.
Reason : Amphibians have taken several method to protect their eggs and offspring.

44. Assertion : In frogs, the entire skin serves as tangoreceptors.
Reason : Tactile organs and patches are present throughout the skin of frog.

45. Assertion : "Lymph heart" is present in frog.
Reason : Lymph in frog is circulated by lymph heart.

46. Assertion : In frog, most of the absorption takes place in intestine.
Reason : The intestine in frog is the coiled structure.

47. Assertion : Amphibians are poikilothermal.
Reason : Amphibians often undergoes summer sleep.

48. Assertion : In fishes, heart is venous.
Reason : Only veins are present in the heart of fishes.

49. Assertion : Ampullae of lorenzini are found beneath the skin of head region in fishes.
Reason : Ampullae of lorenzini acts as receptors.

50. Assertion : Lateral line canal is one of the main characteristics of fishes.
Reason : Lateral line canal is a system of sense organ concerned with life in water.

51. Assertion : Characters of cyclostomes show an advance over *Amphioxus*.
Reason : Cyclostomes have some degenerated characters.

52. Assertion : *Amphioxus* has a simple organization compared to vertebrates.
Reason : Many important craniate structures are lacking in *Amphioxus*.

53. Assertion : Glochidium larva rapidly disperse to a great distance.
Reason : Glochidium is parasitic on fish.

54. Assertion : Respiration in *Amphioxus* is done by both water and blood.
Reason : *Amphioxus* is aquatic and possesses blood.

55. Assertion : Detorsion is the characteristic of mollusca.
Reason : Detorison is an arrested stage of torsion.

56. Assertion : Tube feet are characteristic organs of echinodermata.
Reason : Tube feet have an important role in respiration.

57. Assertion : Endostyle is present at the pharyngeal groove of the midventral wall of the pharynx of *Amphioxus*.
Reason : Endostyle has an important role in respiration.

58. Assertion : *Herdmania* has digestion mechanism like higher group of animals.
Reason : Liver of *Herdmania* possess several enzymes required for digestion.

59. Assertion : In *Balanoglossus* notochord is replaced by pygochord.
Reason : Pygochord supports adbominal region.

60. Assertion : Water vascular system is the characteristic of echinoderms.
Reason : Main function of water vascular system is locomotion.

61. Assertion : *Balanoglossus* is often considered as "acorn worms".
Reason : The word 'acorn worm' has no meaning.

Answers

Important terms and classification of animals

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

Phylum-Porifera

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

Phylum-Coelenterata

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

Phylum-Platyhelminthes

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

Phylum-Nemathelminthes

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

46	b	47	a	48	d	49	b	50	c
51	c	52	b	53	d	54	d	55	b
56	b								

Phylum-Annelida

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

Phylum-Arthropoda

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

Phylum-Mollusca

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

Phylum-Echinodermata

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

16	c	17	b	18	a	19	d	20	d
21	c	22	c	23	d	24	d	25	b
26	b	27	a	28	c	29	c	30	a
31	a	32	c	33	d	34	d	35	d
36	b								

Phylum-Chordata

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

Super Class-Pisces

1	a	2	b	3	a	4	d	5	d
6	d	7	a	8	a	9	d	10	c
11	a	12	c	13	d	14	d	15	a
16	a	17	a	18	b	19	b	20	c
21	b	22	b	23	a	24	c	25	b
26	b	27	b	28	c	29	a	30	b
31	b	32	d	33	b	34	b	35	d
36	a	37	a	38	d	39	a	40	b
41	b	42	a	43	a	44	d	45	c
46	b	47	c	48	c	49	d	50	a
51	c	52	c	53	d	54	a	55	c
56	c	57	b	58	d	59	d	60	a
61	a	62	c						

Class-Amphibia

1	b	2	b	3	b	4	b	5	d
6	b	7	d	8	c	9	a	10	a
11	c	12	a	13	c	14	b	15	c
16	a	17	d	18	d	19	d	20	c
21	a	22	a	23	c	24	a	25	c

Class-Reptilia

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

Class-Aves

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

Class-Mammalia

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

NCERT Exemplar Questions

1	b	2	b	3	b	4	c	5	d
6	c	7	a	8	a	9	a	10	c
11	c	12	b	13	c				

Critical Thinking Questions

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

Assertion and Reason

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

AS Answers and Solutions

Important terms and classification of animals

11. (a) Echinodermates and chordates are deuterostomous animals, in which blastopore of gastrula forms anus, so anus is formed earlier than mouth.

13. (b) The cell aggregate plan is seen in simplest animals, such as sponge. This plan exhibits essentially cluster of cells with rudimentary of labour amongst them.

18. (c) Blind sac body plan is found in coelenterates and flat worms. In this type of body plan animals has a single opening that act as both mouth and anus.

22. (a) From evolutionary point of view platyhelminthes are first triploblastic animals but do not contain coelom.

23. (b) Whole animal kingdom is classified into two sub-kingdom protozoa and metazoa. Unicellular animals are placed in protozoa while multicellular are included in metazoa.

29. (c) All sponges are aquatic, mostly marine rarely fresh water (e. g. spongilla)

36. (d) True coelom is present in Annelid while platyhelminthes have pseudo (false) coelom called pseudocoelomate animals.

39. (a) In nemathelminthes or round worm, coelom is present but it is derived from blastocoel. It is not lined by peritoneum. This type of coelom is known as pseudocoelom.

41. (a) Veliger, trochophore or glochidium larva are characterstic of mollusca.

44. (c) Metamerism is a condition in which the body is composed of a linear series of similar body segments called metameres or somites. It is found in Annelida, Arthropoda and chordata.

Phylum-Porifera

7. (b) Many pores are present on the body known as ostia through which water enters into the body. Ostia correspond to mouth of other animals.

8. (a) Choanocytes or collar cells are present only in sponges.

9. (b) Sponges have a canal system and they need a continuous current of water flowing through their bodies for respiration, excretion, nutrition and reproduction.

12. (d) Food vacuole is transferred to amoebocytes and digestion is completed there.

13. (d) In *Leucosolenia*, further development results in the formation of stereogastrula or parenchymula larva.

15. (b) *Euplectella* with its imprisoned shrimps makes a good wedding gift in Japan, symbolizing the idea "till death us do part".

16. (a) Water currents produced by choanocytes because they are flagellated.

18. (b) Spongilla is known as fresh water sponge.

20. (a) The larva of *cliona* or boring sponge or sulphur sponges bores through and damages the skeleton of corals and shells of molluscs. It is harmful to pearl industry.

22. (b) Classification of sponges is primarily based on skeleton or spicules.

23. (b) Amphiblastula and stereogastrula are the larval stages of *sycon*.

24. (d) When bathsponges are dried all its cells are destroyed except spongin fibre.

25. (c) Sponges have excellent regeneration power so each piece develop into complete individual.

26. (a) Archaeocytes may be converted into other types of cells and are also called undifferentiated totipotent cells.

27. (d) The spongin fibres are secreted by cells termed spongioblasts. They are formed of protein collen and occur as a network.

28. (b) In porifera, bodywall is with outer pinacoderm (ectoderm), inner choanoderm (endoderm) and gelatinous noncellular mesenchyme in between.

29. (a) Food coming through the incoming water is ingested by choanocytes.

32. (a) The course taken by water into the canal system is.

water from outside $\xrightarrow[\text{dermal ostia}]{\text{through}}$ incurrent canals $\xrightarrow[\text{prosopyles}]{\text{through}}$ radial canals $\xrightarrow[\text{apopyles}]{\text{through}}$ spongocoel $\xrightarrow[\text{osculum}]{\text{through}}$ outside.

34. (a) The gemmules are asexual reproductive bodies found in all fresh water and a few marine sponges. They are formed as internal buds and protect the species during unfavourable conditions.

35. (b) Spongin fibres occurs in various forms in the class Demospongiae. It may occur as a cement connecting together the siliceous spicules.

36. (b) Digestion of food takes place partially in choanocytes and partially in wandering amoebocytes.

42. (a) Ascon is the simplest type of canal system, in which the body is thin-walled, bilaterally symmetrical and hollow due to the central cavity known as the spongocoel or gastrovascular cavity.

45. (a) Collar cells occur in sponges and located at the anterior end of each choanocyte.

47. (c) If carmine particles are placed close to osculum of a living sponge, these will be carried away.

49. (a) Sponges are multicellular grade organism.

50. (d) The sponges closely resemble to colonial choanoflagellates belonging to the phylum protozoa. Both possess collared and amoeboid cells.

53. (d) Sponges have numerous mouthlets(ostia) and one exit (osculum).

54. (b) Incurrent canals are communicated to outside through ostia but end blindly at their inner ends. Pinacocytes line these canals throughout.

Phylum-Coelenterata

4. (a) Metagenesis is alternation of generations found in *cnidaria* phylum eg. *Obelia*

5. (b) In class scyphozoa of phylum coelenterata, the polyp form is reduced or absent.

8. (b) *Obelia* shows alternation of asexual and sexual phase (both phase are diploid). The asexual phase is represented by the colony while the sexual phase is medusa. The two alternate in life cycle. Such an alternation between asexual and sexual phases is called metagenesis.

9. (c) Sea cucumber is the common name of *Cucumaria*. It is belong to phylum Echinodermata.

13. (d) The ctenophora is a small phylum of marine animals, which are commonly known as comb jellies or sea walnuts. The phylum takes its name from two Greek words, ketos = comb and phoros = bearing, as the animals possess eight comb like for locomotion. In Ctenophora, asexual reproduction is totally absent.

15. (a) Polyp and medusa are the asexual and sexual phase present respectively in coelenterates.

Aurelia (jelly fish) belongs to class Scyphozoa, in which medusoid phase is dominant, polypoid phase absent.

16. (b) Jelly-fishes (Aurelia) are the animals which belong to the class scyphozoa of the phylum coelenterata.

17. (d) Special type of cells called nematocytes are present in only coelenterata. These cells are used for food catching, defensive and offensive purposes.

19. (a) Nematoblast (cnidoblast) are sensory in nature and acts as a organ for offense and defence.

20. (a) In *Hydra* the exchange of oxygen and CO_2 and the excretion of waste nitrogeneous matter (chiefly ammonia) occur directly by diffusion through cell membrane to outside.

22. (a) Body cavity of hydra is called coelenteron or gastrovascular cavity. It is surrounded by the body wall. The mouth leads into this cavity.

23. (d) Pneumatophore is a gas filled chamber found in *Physalia* which helps in floating.

27. (d) Larval stage is absent in *Hydra*.

29. (c) Coelenterates are diploblastic animals i.e., derived only from two embryonic germ layers. Ectoderm and endoderm. They show radial symmetry.

32. (d) Sea pen are pen–like colonial coelenterates.

34. (a) In hydrozoa, either only polyps are found or polyps and medusae are present. Examples – *Hydra*, *Obelia*, *Physalia* etc.

36. (c) *Physalia* is commonly known as 'portuguese man of war' due to sudden appearance and disappearance like active Navy ships of portugal which is pelagic, marine swimming animal.

37. (d) Statocyst help to maintain equilibrium in larval stage (medusae) of *Obelia*.

38. (c) Ephyra is a small, medusa like stage in the life cycle of scyphozoans or jelly fish (aurelia).

40. (a) Coelenterata (coelom + enteron) or phylum Cnidaria shows both sexual and asexual reproduction. The larval stage are Planula (*Obelia*) and Ephyra (*Aurelia*).

42. (d) Cnidoblasts (nematoblast) are specialised and modified interstitial cells which are found in coelenterate animals. The cnidoblasts are organs of defence and offence.

44. (c) Choanocytes cells is a characteristic feature of sponge which are also known as collar cells.

45. (b) *Hydra* possesses a very primitive nervous system consisting of a synaptic network of bipolar and multipolar nerve cells. Thus, hydra has a nervous system but no brain.

46. (a) *Hydra* has four types of nematocysts. They are penetrants (largest). Volents (smallest) steroline glutinant (small atriechous) and streptoline glutinants (large holotrichous)

50. (a) A unicellular green alga of the genus *zoochlorellae* and *zooxanthallae* habitually lives in nutritive-muscular cells of *Hydra*.

52. (c) *Corallium rubrum* is the precious red coral of commerce. It is highly valued as it is used for making jewellery.

53. (d) A sexually mature medusa of *obelia* bears four groups of gonads situated on the middle of four radial canal.

55. (b) Stinging cells or cnidocytes having nematocysts which is found in ectoderm.

59. (d) Nematocyst plays an important role in locomotion, food capture both offence and defence.

61. (b) A mechanical stimulation of cnidocil by contact with an object is essential, but not sufficient, for discharge.

62. (d) *Gorgonia* (sea-fan) is an animal. All animal lack cell wall.

64. (b) The *hydra* has a great power of regeneration, the power of replacing lost tissues. If a living *hydra* is cut into two or more very small fragments, every fragment develops into a new individual. Basal disc is developed towards lower side and mouth, hypostome and tentacles, developed at upper side in each part whatever is required according.

65. (a) The interstitial cells become active and form germ cells by repeated multiplication which bulge out as gonads.

73. (d) Cnidoblast or nematocysts are derived from interstitial cells of epidermis.

75. (a) The medusa is strictly carnivorous. The food includes minute worms, nematods, insects, crustaceans, etc.

80. (c) In this method of locomotion of *hydra*, usually the body first extends and then bends over, so that the tentacles attach to the substratum with the help of adhesive atrichous isorhizas.

82. (a) When the body can be divided into two similar halves by one or two vertical planes only, the radial symmetry is called biradial symmetry. It is present in the sea anemone.

86. (b) Ctenophores have certain characteristics in common with the coelenterates, but there is no evidence that they were derived from the latter.

87. (d) During the development in Hydra, a solid gastrula is formed. The solid gastrula is neither ciliated nor free swimming because it is still attached to the parent body. This type of gastrula is characteristically called stereogastrula which represents the planula stage of hydrula.

Phylum-Platyhelminthes

1. (a) Flame cell or solenocyte or protonephridia and nephridia are excretory organs of phylum platyhelminthes and annelida respectively.

2. (a) Planaria (*Dugesia*) belong to class Turbellaria of phylum platyhelminthes. Mostly free living flatworms are placed in class Turbellaria.

3. (d) Self fertilization is fusion of male and female gametes (sex cells) produced by the same individual. Self-fertilization occurs in bisexual organisms, including most flowering plants, numerous protozoans, and many invertebrates.
Flukes are hermaphrodites, meaning each worm has both ovaries and testes. Probably cross fertilization is the rule, but self fertilization is certainly a possibility. In any case, it means that every individual is capable of producing fertilized eggs, certainly an advantage in species in which a high reproductive output is required.

5. (b) In cestodes digestive system is completely absent due to endoparasitic mode of life but it may be present in Trematoda and Turbellaria.

6. (b) *Schistosoma* is blood fluke.

9. (b) Onchosphere, hexacanth and cysticercus (bladder-worm) are different larval stage of *Taenia-solium*.

13. (d) Solenocytes are flame cells like structures attached within the body of nephridium. Each cell has nucleus, cytoplasm and long flagellum that runs through tubules.

14. (c) In *Fasciola*, laurer's canal is a temporary vaginal canal, which arise from oviduct during breeding season and act as fertilization tube.

17. (d) Being parasitic in mode of life, locomotory organs are totally absent in *Taenia*.

18. (a) On the basis of body shape and habitat, platyhelminthes are classified into three classes. Turbellaria, Trematoda and cestoda.

20. (a) Among invertebrates upto platyhelminthes (flatworm), they have no coelom and are called acoelomate animals.

24. (d) Planaria/Dugesia is a free living leaf like flatworm found in fresh water. It has high power of regeneration so it is used in regeneration experiments.

25. (b) Ventral surface of *Dugesia's* body is covered with fine hair like locomotory structure called cilia.

29. (d) *Taenia Solium* is a facultative anaerobe. It decomposes glycogen into CO_2 and fatty acids to liberate energy. However it is also capable of aerobic respiration and utilizes even traces of oxygen when available in host fluids.

30. (a) Platyhelminthes (liver-fluke) are first acoelomate animals, which have organ system organization and bilateral symmetry.

32. (a) Mehlis's glands of Tapeworm are associated with reproductive system. Secretory substance of mehlis's glands act as lubricant.

34. (b) *Taenia* has no digestive system, it obtain digested nutrients (like glucose, amino acid, glycerol) from small intestine of host through body surface with the help of microvilli.

36. (b) Hexacanth embryo of *Taenia* is present in ripe proglottids or gravid proglottids, which is covered by shell structure, called onchosphere.

37. (a) *Schistosoma* lives in hepatic portal system and mesenteric blood vessels of human beings, so commonly called "blood fluke".

38. (c) Fertilized egg of *Taenia solium* develops into an embryo that gets covered by a shell. The shelled embryos are called onchospheres. Secondary host acquires infection by ingesting the onchosphere, released from *Taenia*.

39. (b) *Hymenolepis nana*, belong to class cestoda and generally known as dwarf tapeworm, which length about 2-4.5 c.m. Life cycle of *Hymenolepis* is monogenetic.

40. (a) Life history of liver fluke is digenetic, primary host is liver of sheep and secondary host is snail.

41. (a) *Schistosoma mansoni* is the common human blood fluke. It belongs to class Trematoda of platyhelminthes. Blood fluke is digenetic, primary host is man and secondary host is snail.

42. (a) Miracidium, sporocyst and cercaria are different form of larva in life history of *schistosoma*.

43. (d) Mature proglottids are in the middle having reproductive organs both male and female.

45. (d) Shelled hexacanth larva in pig muscle, absorbs a large amount of watery fluid from host tissue and grows to a spherical pea sized, sac like cyst called bladder worm or cysticercus.

46. (a) Mostly flatworms are included in class Turbellaria of phylum platyhelminthes e.g. planaria.

47. (a) Anus is absent in Fasciola hepatica. Undigested food material is probably ejected through the mouth or diffused into excretory system

49. (b) Hexacanth moves in the body and ultimately settles in the muscles of secondary host (pig). Here it forms an encysted bladderworm or cysticercus. Cysticercus remain viable for upto six months.

50. (b) Different larval stage of liver fluke are found in following sequence.
Miracidium → Sporocyst → Redia → Cercaria → Metacercaria

55. (c) *Taenia solium* (Tape worm) and *Echinococcus* (Dog Tapeworm) are endoparasite. They obtain their food from host through body surface. So lacks alimentary canal.

Phylum-Nemathelminthes

1. (d) *Enterobius vermicularis* is the human 'pin worm' or 'seat worm' and is perhaps the most common parasitic nematode of man throughout the world.

2. (a) Pineal setae is the main characteristic of male *Ascaris* and situated on the dorsal side of cloaca.

4. (d) *Ascaris* is monogenetic so it completes its life cycle in single host *i.e.*, man.

5. (a) *Taenia* is grouped into phylum platyhelminthes and is acoelomate.

6. (c) Filariform larva of *Ancylostoma* infects a new host (man) by chance contact with his skin.

7. (b) In *Ascaris* first moulting takes place in soil, second in intestine, third and fourth in lungs.

12. (a) In *Ascaris* amphids are chemoreceptor which are present on ventrolateral lips.

13. (c) Body cavity of Hookworm is pseudocoelom so it is called pseudocoelomate.

14. (b) Ascaris being an endoparasite respires anaerobically because the oxygen content in the hosts intestine is usually poor.

17. (d) The adult *Wuchereria bancrofti* live in lymph vessel and lymph glands. It is a viviparous nematode.

19. (b) *Ascaris* is monogenetic; its infection is through contaminated food and water.

23. (a) The epidermis of *Ascaris* is syncytial (coenocytic) with scattered nuclei and with out partition wall.

24. (d) Male *Ascaris* is differentiable from female *Ascaris* tail end of male *Ascaris* is characterized by the presence of numerous genital papillae on ventral surface. There are 50 pairs of preanal papillae in front of cloaca, and 5 pairs of postanal papillae behind it. Sometimes, two chitinous spiculate process of equal size are seen protruding out of the cloacal aperture. These are called peneal setae or spicules which serve to transfer sperms into female vagina during copulation.

25. (d) In *Ascaris*, female is with straight posterior end of the body.

27. (c) *Ascaris* is monogenetic parasite; so there is no intermediate host only one host is required for the development.

28. (c) *Ascaris* also secretes anti-enzyme and presence of, cuticle both protect it from hosts digestive enzymes.

30. (c) Ascariasis can be treated by antihelminthetic drugs such as Alcopar, Antipar, santonin, chenopodium oil and Tetrachloroethylene etc.

31. (c) *Dracunculus* is digenetic, intermediate host is cyclops or water fleas.

33. (b) Microfilariae are the larva of *Wuchereria* which are carried by *Culex* mosquito.

36. (c) Presence of the resistant thick cuticle is not degenerate but a specialized character with reference to parasitism.

38. (d) The sense organ of *Ascaris* are simple elevations supplied by nerve. They include various papillae, amphids and phasmids.

39. (a) The excretory pore (one) is situated midventrally, a little behind the mouth.

41. (d) Pseudocoelom developes from blastoderm i.e., between mesoderm and endoderm of embryo.

42. (d) Hookworm (*Ancylostoma duodenale*) live in the intestine of man and feed upon blood. No secondary host.

46. (b) Lifespan of *Ascaris* in the host is of 9-12 months.

47. (a) *Ascaris* has three denticulate lips, one median dorsal and two venterolateral.

50. (c) Microfilariae appear in peripheral blood circulation during night while day they disappear.

55. (b) Wuchereria is a ovoviviparous parasite which releases numerous juveniles called microfilariae.

56. (b) The embryonated egg passes into the intestine of man and second stage larva hatches out from the egg.

Phylum Annelida

3. (d) Two male genital pores lie ventrolaterally in segment 18.

4. (c) The annelids are triploblastic, *i.e.*, having three germ layers-ectoderm, mesoderm and endoderm.

5. (a) Species of *monocystis* are typically endoparasites of earthworms and occurs in their coelom and seminal vesicles.

6. (a) Pseudocoelom or false coelom is found in nematodes.

8. (b) Both annelids and arthropods possess ventral nerve cord.

14. (c) Typhlosole is a highly glandular, vascular longitudinal ridge increasing the area for absorption of digested food.

15. (c) Botryoidal tissue is found surrounding the alimentary canal of leech and is probably excretory in function.

17. (d) In 4, 5 and 6 segment red colour follicular bodies called blood glands serve for the manufacture of blood corpuscles and haemoglobin.

18. (b) Annelids like oligochaetes exhibit concentric "tube within a tube" body plan with multicellularity and bilateral symmetry.

19. (a) Earthworm is brown or clay coloured. This is because of the pigment porphyrin.

20. (c) Prof. Karm Narayan Bahl of Lucknow University published a memoir on Indian earth worm *Pheretima* in 1926. He was awarded Joy Govind law memorial gold medal in 1942 for notable research in Asiatic Zoology.

22. (b) One pair of ovary and 11 pairs of testis are found in Leech or *Hirudinea*.

24. (a) The *Aphrodite* is a marine polychaete which is commonly called the 'Sea mouse'. It belongs to the phylum Annelida.

29. (a) Clitellar region contains 2000 nephridiopores per segment, so called "forest of nephridia".

30. (c) Coelomic fluid of earthworm contains granulocytes, mucocytes, leucocytes and chloragogen cells.

32. (c) In earthworm, two pairs of genital papillae are situated ventrally on 17^{th} and 19^{th} segments. It helps in copulation.

33. (b) Flow of blood in dorsal blood vessel of earth worm is from posterior to anterior direction.

35. (c) The single female genital pore is situated in the median position on 14^{th} segments.

37. (b) Hearts of *Pheretima* are situated in the segment 7, 9 (Lateral hearts) and 12, 13 (Lateral oesophageal hearts).

38. (d) In earthworm, fertilization is external and occurs in cocoon.

39. (a) During breeding season, glandular cells of clitellum become very active and secrete a slimy substance that forms a girdle like covering around the clitellum. In air, this gradually dries and hardens to form a tough but elastic, ring-like egg capsule or cocoon.

40. (b) Earthworms are monoecious or hermaphrodites but fertilization is crossed type due to protandrous condition.

42. (c) Excretory products of earthworm are urea (about 50%), ammonia (about 40%) and traces of creatinin.

44. (b) In *pheretima posthuma*, the clitellum occurs around the segments 14, 15 and 16.

49. (c) Photoreceptors (with *L* – shaped lens or optic organelles) of earthworm occurs on dorsal surface of the skin.

52. (b) In each of the segment 7, 9, 12 and 13 is found a pair of large, thick, muscular and rhythmically contractile hearts (Total 4 pairs).

56. (d) In earthworm, blood is red in colour, respiratory pigment haemoglobin is dissolved in the blood plasma.

57. (b) In leech, a triradiate mouth is found at its bottom. The mouth is used for puncturing the skin of the host. It is also suctorial.

58. (a) A larval stage is absent in earthworm, so their is no metamorphosis.

63. (b) The common Indian earthworm is *pheretima posthuma*.

64. (d) Posterior sucker of *Hirudinaria* take part in locomotion and attachment.

67. (b) In earthworm, blood vascular system is different in first 13 segments as regards to number, arrangement and nature of blood vessels.

68. (d) Chloragogen cells are small star shaped, yellow cells concerned with storage of reserve food, deamination of proteins, formation of urea and also excretory.

74. (d) Nephridia are absent in the first three segments and the last segment. Some workers believe that all the nephridia are of micronephridia type. Other consider septal nephridia to be meganephridia.

76. (a) Trochophore larva is present during the development of archiannelida and polychaeta of the phylum annelida.

78. (a) Four pairs of spermatheca are present in earthworm which are situated a pairs in the each 6^{th}, 7^{th}, 8^{th} and 9^{th} segments. They opens outside on intersegmental grove 5/6, 6/7, 7/8, 8/9.

79. (d) In between the 26^{th} segment and the rectum intestine has a median dorsal fold projecting into the lumen. This is know as typhlosole.

80. (a) Roof of pharynx contains pharyngeal glands containing chromophil cells secreting mucus and proteases.

81. (a) Septal nephridia are the only nephridia with nephrostome or funnel.

83. (d) In earthworm, coelomic fluid works as a hydraulic skeleton, aids in locomotion.

86. (b) In earthworm, first segment or peristomium has a ventral mouth with a dorsal lobe or prostomium.

90. (c) Neurons in earthrorm are motor, sensory and adjuster (association neurons).

93. (a) In dorsal blood vessel valves are present in front of septum in each segment.

94. (b) Oxygen carrying blood pigment of earthworm is haemoglobin which is dissolved in blood plasma.

98. (d) The coelomic fluid of earthworm is milky white without haemoglobin.

102. (a) Each photoreceptor cell of earthworm has a nucleus and the cytoplasm contains an optic organelle or *L* – shaped lens or phaosome made up of a hyaline substance.

105. (b) Pharyngeal nephridia of *pheretima* are situated in the segments, 4, 5 and 6. They opens in the anterior part of alimentary canal, i.e., buccal cavity and pharynx. They are without nephrostome.

109. (d) Locomotion in earthworm is carried with the help of buccal cavity, setae and the body muscles.

Phylum Arthropoda

4. (b) Metamorphosis is a conversitonal process in which small cockroach (nymph) convert into adult due to secretion of juvenile hormone.

5. (c) Insecta is a another name of hexapoda, because they have 3 pair jointed legs on thoracic region.

6. (c) Glow-worm and fireflies belong to the insect order coleoptera. *Lampyris noctiluca* is the common European glow-worm.

9. (a) In cockroach, pigment sheath of ommatidia is non contractile so capable of only apposition or mosaic vision even during night.

10. (c) Presence of jointed legs is unique character of phylum Arthropoda.

14. (a) Arthropoda is largest phylum and includes about 80% of total animals. It includes about 9,00,000 species.

15. (d) Malpighian body is related with kidney of higher chordates animals. It consist of glomerulus and bowman capsule.

17. (c) Mandibles are totally absent in the housefly *(Musca)*.

22. (b) Tegra, sterna and pleura are joined by a flexible arthrodial membrane.

24. (c) In arachnids, respiration occurs through book lungs which are connected with the outside through spiracles or stigmeta.

26. (d) The class insect has largest number of animals. It has about 7,75,000 species.

27. (d) Spider belongs to class arachnida.

30. (d) Most of the economically important species of phylum Arthropoda are found in class Insecta. It includes cockroach, bedbug, termites silkmoth, aphid, rat flea, wasp etc.

36. (d) Haemolymph is found in insect blood which is colourless.

38. (c) In some arthropodes like spiders, scorpions, mites, ticks etc., respiration occurs through book lungs or tracheae.

39. (c) The taste receptor (gustato receptors) are organs of taste, mainly confined to the tips of maxillary palps, labial palps labium and hypopharynx, in cockroach.

41. (b) *Xenopsylla* cheopis, resembles the human flea and is the chief transmitter of bubonic plague.

42. (c) White ants are found in the tropical and warm temperate countries of the world, white ants are colonial, polymorphic and social insects.

44. (d) Each compound eye of cockroach is composed of 2000 visual units called ommatidia.

45. (a) Malpighian tubules are the excretory organs of insects. It opens at the junction of midgut and hindgut (ileum) in cockroach. Malpighian tubules absorb excretory substances from haemolymph and fat bodies and pass into the proctodaum.

47. (b) The pupa of mosquito is known as tumbler. It has a life span of 2 – 7 days.

49. (d) Juvenile hormone is produced by corpora allata in insects. It favours the development of juvenile characteristics. During larval life, this hormone predominates and each moult yields another larger juvenile and keeps the larva in immature condition or maintains juvenility.

52. (b) In cockroach, an elongated, flat phalic gland or conglobate gland on the right side of ventral nerve cord and open out through a small pore close to male gonopore.

54. (c) A larval stage occurs in housefly that lives in dung and is called maggot.

55. (a) In Pheretima septa are absent in first four segments and in between 9^{th} and 10^{th} segment.

58. (d) After completion of metamorphosis housefly and mosquito will transform into an adult called 'Imago'.

59. (a) The mosquito (*Culex*, *Anopheles*, and *Aedes*) are pathogenic. The fleas (*Culex*) is also pathogen *i.e.*, ectoparasites of birds and mammals, feeding on blood and the *tse-tse* fly is pathogen for sleeping sickness.

61. (a) Moulting is controlled by a steroid hormone ecdysone produced by prothoracic glands.

62. (c) Cockroach is omnivorous, feeds on all sorts organic debris.

63. (a) Johnston's organ lies in the second segment of antennae. In male mosquito, it helps to locate females by flight tone.

65. (b) In mosquito and housefly, halteres developes from metathorax. They are balancing organs during flight and also recieve sound stimuli.

69. (a) In cockroach, a pair of many jointed structures are present on the tergite of 10^{th} segment in both sexes, called anal cerci.

70. (b) In mosquito, 5^{th} instar larva changes into a pupa (nonfeeding), it is comma – shaped.

71. (c) Different stages in the life history of housefly are – Egg – Larva (Maggot) – pupa – Imago (adult).

73. (d) Corpora allata is attached to the brain. It is secrets juvenile horme (Prolongs larval period).

74. (a) Cockroach is unisexual and exhibit sexual dimorphism. In male's ninth segment bears a pair of anal styles ventrally.

75. (d) Metamorphosis in cockroach is incomplete or paurometabolous type. Incomplete metamorphosis is also called gradual metamorphosis.

76. (d) If food material of housefly is solid, such as a sugar crystal, the fly first pours a little saliva or regurgitates droplets of liquid from its crop to liquify it and then sucks the liquid which fills the tubular pseudo-trachaeae by capillary action.

77. (c) Metamorphosis of insects is controlled by a steroid hormone ecdyson produced by pro-thoracic.

79. (b) The total number of ganglia in ventral nerve cord of cockroach is nine pairs, i.e. three pairs thoracic and six pairs adbominal.

80. (d) In male *anopheles*, mandibles are totally absent because it is feed on nector and have only sucking mouth parts.

84. (c) The major excretory product of insects is uric acid, so they are uricotelic.

88. (c) *Anopheles* shows sexual dimorphism. Sex differentiation can be done on the basis of antennae and maxillary palps.

89. (b) In cockroach, the trachea is lived with spiral thickning of cuticle called intima which prevents the tracheal tubes from collapsing (Trachea of rabbits is also non collapsible).

92. (a) Cockroach has two pairs of wings. The first pair (mesothoracic) are thick, hard and leathery, protective in function called tegmina or elytra second pair (metathoracic) are thin, soft and membranous.

95. (d) Bed bug, sand fly, silk worm are placed in tracheate group of Arthropoda because they have trachae for respiration. Embryonic development of echinoderms shows a number of similarities with those of chordates.

97. (b) In female cockroach, abdomen is broader than in male.

98. (d) All body tissue receive oxygen directly through tracheoles.

100. (a) In *periplaneta*, wings are well developed and in female of *Blatta*, the tegmina are very short, hind wing absent.

101. (a) The heart of cockroach is formed of 13 chambers each chamber (except the last one) has a pair of small lateral apertures called ostia which open into the pericardial sinus.

102. (d) Haploid parthenogenesis is called arrhenotoky. In it, development of egg into adult organism without fertilization. Example Honey bees, wasps and ants.

104. (c) The longest podomere or segment of cockroach is tibia.

106. (b) Housefly and butterfly possess larval stage. Their larval forms are maggot and caterpillar respectively.

107. (b) In butterfly, proboscis is long and is formed by galea of maxillae.

110. (c) Locusts is herbivorous in diet and gregarious in nature, migrating or swarming in great number.

112. (a) The labellae are traversed by a series of channels known pseudobracheae, because of their resemble once to tracheae in appearance.

113. (b) In cockroach, the tracheal system opens outside by ten pairs of spiracles. The first and third pairs spiracles remain open all the times.

114. (a) In insects, juvenile hormone or neotinin is produced by the corpora allata. It favours the development of juvenile characteristics. During larval life, this hormone predominates and each moult yield another larger juvenile.

116. (d) Antennae of cockroach bears tactile and olfactory receptors and are sensitive to touch and smell.

119. (c) Spider bears spinnerets or spinning organ just anterior to the terminal anus. These produce silken threads for construction of spider-web.

122. (b) Ootheca of cockroach contains sixteen fertilized egg in two rows.

123. (c) Ootheca of cockroach if formed of a protein secreted by collaterial gland.

125. (b) Palaemon is commonly called as prawn. It is an aquatic animal. It belongs to class crustacea of the phylum arthropoda.

127. (b) Sexual dimorphism is found in both *Ascaris* and cockroach.

128. (a) White ants are social and polymorphic insects, living in large, well organised colonies.

133. (a) Holometabolous or complete metamorphosis, includes four developmental stages – egg, larva, pupa and adult. Example – Lady Bird beetle *(coccinella)*.

134. (c) Malpighian tubules of cockroach are concerned with homeostasis, osmoregulation and excretion. These are between 60 to 150 in number and are arranged in 6 – 8 bundles.

135. (b) Nephridia are absent in arthropoda.

136. (b) *Peripatus* belong to onychophora. In *peripatus*, excretory organs are nephridia.

137. (b) In case of gradual metamorphosis, the newly hatched creature resembles an adult in general body form, but lacks wings and external genital appendages. It is also called paurometabolous development.

139. (b) Caterpillar of *bombyx mori* after 4 or 5 days, stops feeding and become inactive; Moulting or ecdysis then taken place. The larva repeats this process four times.

142. (a) Crustacean are the dominant arthropods of sea, with cephalothorax, biramous appendages, and respiration by gills. Common example are prawn, lobsters and crabs.

143. (d) *Limulus* or king crab belong to the sub class xiphosure and class merostomata of sub phylum chelicerata of phylum arthropoda. It is a living member of very ancient primitive chelicerates and hence called a "living fossil."

144. (c) Silver fish *(Lepisma)* is a primitive wingless insect without metamorphosis. It is belong to the phylum arthropoda.

145. (a) Caterpillar and maggot are the larva of respectively butterfly and housefly.

147. (b) Mouth parts of housefly are sponging type. These are adapted for sucking liquid or semiliquid.

148. (c) Tornaria larva is larva of Balanoglossus.

150. (b) The larva of mosquito is also known as 'wriggler'.

151. (d) The amount of yolk determine the type of cleavage in the egg. In superficial meroblastic cleavage, the cleavage remains restricted to the peripheral portion of the egg. This cleavage occur in arthropods especially insects.

153. (b) Exoskeleton of arthropod is light weight, tough and composed of structural polysaccharide chitin.

155. (b) In earthworm as well as cockroach, a ventral nerve cord extends back along the midventral axis from the sub pharyngeal ganglion.

157. (c) Abductor and adductor muscles associated with the mandibles move these in horizontal plane to cut and chew the food particles that are brought in between the mandibles by the first maxillae.

161. (a) In cockroach the food is grinded by mandibles and gizzard. In insects there is no oxygen transporting pigment and nitrogenous excretory product is uric acid.

162. (c) Cray fish *(Astacus)* is the phylum arthropoda.

163. (c) Leg of cockroach is five segmented, segments from base are-coxa, trochanter, femur, tibia and tarsus.

164. (c) In mosquito, metathoracic or hind wings are modified into halteres which are balancing and sound producing structures.

167. (b) Arthropoda have a compound eyes. Each compound eye is made of a large number of independent visual elements, called ommatidia. It helps in photoreception.

168. (a) The mouth parts of male mosquito are of sucking type while those of female mosquitoes are of piercing and sucking type.

169. (d) In cockroach, pigment sheath of ommatidia is non contractile so capable of only mosaic vision even during night.

170. (c) *Musca domestica* shows a complete metamorphosis (holometabolous type).

171. (d) Haemocoel is the body cavity of arthropods and molluscs, containing blood.

174 (a) Scorpion and ticks belong to the class arachnida of the phylum arthropoda.

181. (a) Pheromones are the secretion of small amount of chemical substance leading to specific physiological or behaviour responses in other members of the same species. Pheromones are also used to induce mating.

183. (b) In cockroach, newly hatched young one is called nymph. It resembles the adult in general structure but lacks the wings and mature reproductive organs.

195. (b) Class crustacea includes *cyclops* other options are from class insecta.

Phylum-Mollusca

4. (c) In *sepia*, the foot is modified into oral arms and siphon.

6. (a) Dentalium is commonly known as 'elephant's tusk-shell'.

7. (a) In bivalve molluscs (*Unio*) the gills are formed by fusion of successive branchial or gill filaments. These are surfaced with cilia. The beating of lateral cilia of gill filaments draw water into the infra branchial chamber of mantle cavity through the incurrent siphon. The water contain food material of *Unio*.

8. (d) Decapoda is not a class of phylum mollusca. It is order of phylum Arthropoda.

11. (c) Sea hare (*Aplysia punctata*) and snail (*Helix*) belong to same class gastropoda of phylum mollusca.

12. (c) Twisting of visceral mass in the snails through an angle of 180° due to which snails become asymmetrical.

13. (c) *Neopilina* is a most primitive mollusca having characters of annelida i.e., internal metameric segmentation, 5 pair of nephridia etc. There is no common name of this mollusc which is truly a living fossils and connecting link between annelids and molluscs.

17. (b) Cephalopoda word is composed of two words *cephalo* and *poda* which in Greek language means head and foot respectively *i.e.*foot present on head.

18. (d) The head of snail bears a pair of short, fleshy and stump-like optic stalk or ommatophores, one on either side behind 2nd pair of tentacles each ommatophore bears a small, black and some what circular eye, slightly below its tip on the other side.

19. (c) Mantle secrets a calcareous shell which is generally external but may be internal an supportive or absent.

20. (c) Snail moves with the creeping activity of the muscular sole of its foot.

22. (c) *Octopus* belong to the class cephalopoda of phylum mollusca.

25. (a) Mantle, foot and shell are characteristics of a mollusc. Out of the given options *Nautilus* is a mollusc, it is a tetrabranch cephalopod.

28. (a) *Loligo* is a commonly known as "cuttle-fish". It is belong to phylum mollusca.

29. (b) *Teredo* is commonly known as 'shipworm'. It is a highly specialized marine bivalve which is very destructive to wood in sea water. The body is long and slender with a small anterior shell. The shell is used for burrowing in the wood of ships or wharves.

30. (a) Radula is found in gastropods.

31. (c) In mollusca, blood has amoebocytes and often a copper containing blue respiratory pigment called haemocyanin.

32. (b) *Unio* display filter-feeding that involves straining food from large quantities of water.

35. (b) Snail may tide over long periods of drought by remaining torpid with the shell aperture tightly closed. It is then said to be in summer sleep or aestivation.

36. (d) *Octopus* belongs to the class cephalopoda of phylum Mollusca.

37. (c) In mollusca, excretion occurs through paired sac like kidneys (or metanephridia) but in echinodermata kidneys are absent and excretion occurs partly by diffusion through body surface and partly by amoeboid coelomocytes.

39. (a) Shell is internal *sepia, Loligo.*

41. (b) Ammonites belong to subclass ammonoidea of class cephalopoda. It is the largest subclass of extinct mesozoic cephalopods.

42. (d) Scaphopoda commonly called tusk shell, body within a tubular shell open at both ends.

Phylum-Echinodermata

1. (d) Aristotle's lantern is a five teeth masticatory apparatus which is present surrounding to the mouth. It is used by sea urchin for feeding. Presence of Aristotles lantern is characteristic of class Echinoidea.

4. (d) Pedicellariae of Asterias are minute, whitish jaw like structure, found on both the body surface, in association with spine. It's help in the capture of prey and removal of debris.

5. (c) The members of class crinoidea, are commonly called feather star or sea lilies because of their lily flower like appearance.

9. (c) Star fish belong to class Asteroidea of phylum echinodermata.

10. (b) In class ophiuroidea, Ambulacral grooves are absent or covered by ossicles.

12. (b) When irritated or when subjected to unfavorable conditions, many species of sea cucumbers cast out a part of their viscera by a strong muscular contraction that may either rupture the body wall or evert its contents through the anus or sometime mouth. The lost part regenerate again.

14. (c) Echinoderms are exclusively marine most members are bottom dwellers or banthonic some are pelagic while a few are sedentary.

16. (c) Adult echinodermata (Star fish) show pentamerouradial symmetry while larvae are show bilateral symmetry.

23. (d) Cephalization is a process of Brain formation. In echinodermata brain is absent, nervous system is consist only nerve ring and radial nerve cords.

24. (d) Sea squid *(loligo)* belong to class cephalopoda of phylum mollusca.

27. (a) Echinodermats are true enterocoelic animals, which is formed from enteron of gastrula like chordata.

28. (c) Tube feet act as locomotory organ in star fish.

30. (a) Antedon belong to class crinoidea of phylum echinodermata. It is a living fossil and commonly known as feather star.

31. (a) *Gorgonocephalus* (Basket-star) belong to ophiuroidea. The body of *Gorgonocephalus* is consist of large pentagonal disc and five elongated and much branched arms.

33. (d) Sea lilies are member of crinoidea having long stalk.

35. (d) Sea lily belong to class crinoidea of phylum echinodermata. Echinoderms possess both exoskeleton and endoskeleton. The endoskeleton consist of calcareous plates or ossicles while exoskeleton consist of spines and pedicellariae.

Phylum-Chordata

3. (d) The larva (tadpole) undergo retrogressive metamorphosis *i.e.*, change from better developed larva to less developed adult *e.g., Herdmania.* The notochord is only present in the tail of larva and diasppear in adult.

5. (b) On the basis of presence or absence of jaw subphylum vertebrate is classified into Agnathostomata and Gnathostomata. In gnathostomata all that animals are included in which jaw is present.

6. (c) In poikilothermal (cold blooded) animals, body temperature varies according to the temperature of the environment.

7. (b) Amphioxus (Branchiostoma) is placed in subphylum cephalopoda, in which notochord is present throughout life along entire length of the body.

9. (a) The blood vascular system in hemichordates is simple and open type. It includes a dorsal heart and two longitudinal vessels (one dorsal and one ventral).
In chordates, closed circulatory system is found except in hemichordata or stomochordata (*e.g., Herdmania*) where, open circulatory system occurs.

11. (c) This type of metamorphosis shows retrogression or degeneration from larva to adult.

12. (b) Both are included in class cyclostomata.

16. (d) Homeothermic or warm blooded animals are able to maintain constant body temperature. e.g. Aves and Mammals.

22. (c) A post anal tail occurs in most chordates atleast in embryonic stage. In majority of the chordates it helps in balancing. Tail provides protection to genital and anal regions.

24. (d) Crocodile, Penguin, Whale and Dogfish all are chordates. So, all have gill slits at some stage of development.

25. (b) In cyclostomata, body is eel shaped with scales jaw and lateral fins. Mouth rounded and suctorial. e.g. Petromyzon and myxine.

32. (a) In vertebrata, notochord is replaced partly or fully by a jointed vertebral column (back bone) *i.e.* vertebral column is derived from notochord.

34. (b) Presence of well developed skull or cranium is important dignostic feature of chordata.

37. (c) Ostracoderms are earliest known primitive fish like extinct vertebrate. These along with cyclostomes constitute the Agnatha.

40. (c) Homeothermous animals are also known as warmblooded or endothermal animals. With constant body temperature, body heat is produced by the metabolic reaction taking place within the body. *e.g.* Aves and mammals.

41. (a) In fishes and amphibian, amnion is absent and called Anamniota.

42. (c) In urochordata, notochord and nerve cord is found only tail region in tadpole like larva.

45. (c) Notochord is the prime diagnostic feature of phylum chordata. Chordates possess notochord either throughout whole life or during early embryonic period.

48. (c) Tunicates are ciliary or filter feeder animals, which obtain their food from diatoms, desmids, protozoans and others pelagic microscopic organism, suspended in sea water, by the ciliary movement of wheel organ.

Class-Pisces

1. (a) Lateral line system is found in fishes. It serves to detect waves in water current, thereby helps in swimming process by perceiving the distance of surrounding objects.

2. (b) Elasmobranchii (dog fish) is an alternative name for cartilaginous fish or chondrichthyes. The name refers to the fact that the gill–slits are exposed and not covered by an operculum.

4. (d) *Torpedo* (*Astrope*) is the electric ray. Their electric organs are highly modified masses of muscles cells.

6. (d) Protopterus is the member of Dipnoi, which shows double breathing through gills as well as lungs.

8. (a) Cyclostomes lack paired appendages.
Aves have dry skin, without glands, only preen gland at base of tail present. Whale lack body hairs and hind limbs.

13. (d) Sea horse (*Hippocampus*) has bony plates/scutes in addition to scales.

16. (a) Silver fish (*Lepisma*) is an arthropod.

17. (a) Dog fish or scoliodon is a true fish whereas silver fish, star fish and whale are arthropod, echinoderm, and mammal respectively. Catfish is a true fish. It has sensory barbels without scales.

19. (b) One auricle and one ventricle.

20. (c) Sea horse (Hippocampus) belongs to the class osteichthyes (due to bony skeleton) of super class pisces.

21. (b) Pisces, amphibia and reptiles are unable to maintain constant body temperature hence, called poikilothermic or cold blooded animal.

22. (b) Fishes have two chambered heart one auricle and one ventricle, which receive only venous blood and pump it to gills for purification.

23. (a) Sea horse or hippocampus is a fish.

30. (b) *Wallago attu* is commonly known as catfish. It possess very small eyes and well developed sensory barbels by which they make a good vision and find their way.

33. (b) *Hemicyclaspsis* is a genus of fossil, primitive, jawless fish like animals belonging to the class ostracodermi.

34. (b) Sucker fish attached to shark, feeds on the left over of shark's prey. The relationship is that of commensalism or ectocommensalism.

35. (d) Whale-mammals, cuttlefish-cephalopod and silver fish-Insect.

36. (a) Anadromous fishes move from sea to fresh water for breeding *e.g. salmon.*

39. (a) *Anguilla* is commonly known as freshwater eel. Eel is the name for a number of smooth snake like fishes with continuous dorsal anal and tail fins and without peluic fins. *Anguilla anguilla* the European eel is born in the Sargasso sea.

41. (b) *Echeneis* is commonly known as sucker fish. Its upper surface bears a large, flat oval adhesive disc or sucker. Sucker represents modified anterior dorsal fin.

42. (a) Claspers are intromittent organs found on the pelvic fins of male cartilaginous fishes like sharks. Sphyrna is commonly known as 'hammer-headed shark'.

47. (c) Lateral line system in a fish and some aquatic larvae (Tadpole) is made up of neuromast organs. It detects vibrations and pressure changes in water.

48. (c) *Latimeria* is called living fossil as it has remained unchanged for several million years.

50. (a) Cartilagenous fishes belong to the class chondrichthyes due to cartilagenous endoskeleton of superclass pisces.

51. (c) *Anguilla sp* (Eel) is a catadromous fish that lives in fresh water and breeds in sea.

53. (d) All chondrichthyes possess cartilaginous endoskeleton without exception.

54. (a) In class chondrichthyes males possess claspers on the plevic fins.

61. (a) Mackerel is a marine fish having rich source of omega-3 fatty acids

Class-Amphibia

4. (b) Tortoise is a reptile belonging to the order chelonia.

5. (d) Mud puppy is an aquatic salamander of genus *Necturus* with persistant gills. It is found in North America.

6. (b) Salamander is a semiterrestrial lizard-like tailed carnivorous and nocturnal amphibian.

8. (c) *Ichthyophis* is a limbless amphibian of 15-22 cm length that lives in burrows in moist soil.

9. (a) Ability to change colour as in amphibians by expansion and contraction of pigment cells is called metachrosis.

10. (a) *Rhacophorus* has characteristic large webs developed between the much elongated digits. Webs and flattened body serve as a parachute in gliding from higher elevation to a lower ones, so they are designated 'flying frogs'.

11. (c) *Hyla* is also known as tree frog.

12. (a) The functional kidney of a frog tadpole is pronephros (head kidney) developed from nephrostomes in the anterior region.

13. (c) Environmental factors affect metamorphosis in several ways. Abundence of food, cold temperature or insufficient iodine (component of thyroxin hormone) may cause failure of metamorphosis and retention of larval features.

Calcium, magnesium, phosphorus are not found to play any role in metamorphosis in animals. Larva of *Ambystoma* is known as axolotl. It is found in USA (North America) and Maxico. It show neoteny or paedogenesis.

14. (b) Ichthyophis is a limbless amphibian showing parental care. It has no tongue.

16. (a) *Pipa americana* is commonly known as surinam toad.

17. (d) Caecilians or limbless amphibians belong to the order Gymnophiona or Apoda. They are sometimes called blindworms.

18. (d) *Bombinator* is a small sized amphibian found in Europe. It is commonly known as Fire-belied toad.

25. (c) Frog is ureotelic because nitrogenous excretory product is usually urea.

Class-Reptilia

1. (c) Classification of reptiles is based on temporal fossa (vaccuties) on skull.

2. (a) Typhlopidae includes burrowing snakes having a vestigeal pelvic girdle and having reduced eyes covered by scales; found in almost all parts of the world except New Zealand.

3. (b) *Heloderma* (Gila monster) is the only poisonous lizard in the world. It is also called 'Beaded lizard' because its scales resemble beads.

7. (c) Reptiles have body temperature which varies with that of its surroundings and embryos have amnion, chorion and allantois.

9. (d) Body of Tortoise is enclosed in two shell plates, dorsal carapace and ventral plastron.

11. (a) Cobra is characterized by hood supported by ribs bearing spectacle mark dorsally. The third supralabial shield of upper lip touches eye and nasal shield.

13. (c) Poison glands of snake are modified salivary glands (Superior labial or parotid glands).

14. (b) A snake has no middle ear. It perceives sound through skin from earth.

16. (b) Colour changing power is present in pisces, amphibians and reptiles but absent in aves and mammals.

18. (a) In scorpion and spiders the respiratory organs are book lungs. They are named so because their folds resemble the leaves in a book. In this the exchange of gases takes place between the air of interlamelar spaces and the venous blood through the thin membranous walls of the lamellae.

20. (a) The tail of most lizard is easily broken off when threatened or seized by a predator. This ability is known as autotomy. Autotomy is voluntary breaking tail to confuse enemy.

24. (d) In poisonous snakes, two maxillary teeth are enlarged, grooved or tubular. They are called poison fangs and are concerned with injecting poison.

25. (a) *Draco* is a lizard which glides with the help of patagium, it is called 'flying dragon'.

27. (a) Two common marine poisonous snakes are *Enhydrina* and *Hydrophis*.

28. (c) Snakes shed scaly epidermis of skin periodically usually in one piece. This process is termed moulting of ecdysis of cornified cells of skin.

29. (b) A viper can be easily identified by its triangular, pearshaped head bearing small cephalic scales.

31. (a) Gavial or gharial, *Gavialis gangeticus* is found in freshwater. It lives in Gangas and Brahmputra rivers and grows to 8 metres.

36. (b) The lung cavity of crocodile is separated from rest of the body cavity by a muscular diaphragm.

39. (b) There are two species of *Heloderma*, *H.Suspectum* and *H. horridum*. Both are found in America.

41. (c) Shelled eggs are found in reptiles and birds are known as cleidoic eggs.

43. (b) *Calotes versicolor* is commonly known as Garden lizard. It is quite common in hedges, garden and jungles.

45. (b) Foramen of panizzae is a aperture in the heart of lizards and crocodiles. It is located at the point where right and left aortae cross each other and are in contact.

49. (a) *Python* and Boa have vestigeal pelvic girdle and hind limbs.

50. (d) In some reptiles, cloacle aperture is transverse and male is without copulatory sacs (Penis) *e.g. sphenodon*. They are includes in order Rhynchocephalia.

51. (c) Eyelids of snake are immovable, nictiting membrane is absent.

52. (b) The loss of water from body is prevented by dry cornified scales on the body of reptiles. It is a favourable land adaptation.

55. (c) In India, antivenin injections are prepared at Haffkin's Institute, mumbai and central Research Institute, Kausuali (Shimla).

56. (b) Poison of cobra is most virulent. It is a neurotoxin attacking nerve centres and causing paralysis of muscles, especially those of respiratory muscles.

58. (d) Crocodile is a carnivorous and feeds on fish, aquatic birds and mammals. It has thecodont teeth.

Class-Aves

2. (c) Coverts are small feathers similar to quills meant for filling gaps on the wings and tail.

3. (a) A synsacrum is formed by fusion of posterior thoracic, lumbar, sacral and anterior caudal vertebrae.

4. (d) Penguin is a flightless bird occurs in flocks in the Antarctic region and some islands of south Africa.

5. (a) The flightless bird cassowary occurs in N.E. Australia and New Guinea.

10. (c) Presence of a single functional ovary of the left side in the female bird leads to reduction of weight which is so essential for flight.

11. (a) Ratitae are the flightless birds which are grouped under super order paleognathae.

15. (c) Archaeopteryx possessed prolonged jaws or beak. However, it contained teeth.

17. (a) Heterocoelous is a term used to denote a vertebra whose centrum has one face convex and the other concave.

19. (a) The syrinx or sound producing organ lies at or near the junction of trachea and bronchi.

20. (a) Huxley has called birds to be glorified reptiles.

25. (b) Birds are homoeothermal or capable of keeping their body temperature constant.

27. (b) Pigeon are noted for their unique ability to produce 'pigeon milk' by crop glands. It is formed by the degenration of the epithelial cells lining the crop. The milk is produced by both sexes.

29. (b) The clavicle and interclavicles are fused to form a v-shaped bone, called furcula or wishbone or merry thought bone which help in flying.

30. (d) Birds have bipedal locomotion because fore limbs are modified into wings.

31. (d) Egg of ostrich weights nearly 1.5 Kg. and requires about 50 minutes to boil it. It is the largest egg among the animals.

32. (c) Bones of birds are pneumatic or hollow and have no bone marrow.

33. (b) In birds, only one gland is present in the skin at the base of short tail or uropygium. It is known as oil or preen gland.

37. (c) Kiwi is the smallest living flightless bird. It is found in New Zealand.

Class-Mammalia

4. (b) Prototherians are primitive, egg laying mammals, oviparous mammals, reptile like mammals, confined to Australian region.

5. (d) Most important character of mammals is the presence of mammary gland and internal fertilization.

6. (a) *Manis* (Pangolin or scaly anteater) belong to the order pholidota of the class mammalia.

8. (b) Eutheria includes viviparous placental mammals.

11. (a) Animals belonging to the order rodentia have each jaw with one pair of long rootless chisel-like incisors growing throughout life.

13. (d) Mucous makes skin moist. Moist skin is helpful in respiration.

17. (b) Rabbit belongs to the order lagomorpha of the class mammalia.

19. (a) *Didelphis* (opossum) is a tree dwelling which is found in America. It is belong to the metatheria.

20. (b) Monotremes is a group showing peculiar characteristics as a mixture of reptilian and mammalian features.

21. (b) Kangaroo (*Macropus*) found in Australian region which is belong to the order marsupilia or metatheria.

31. (d) Most unique character of mammalian brain is presence of corpus callosum. It connect the two cerebral hemispheres internally.

34. (b) The zoological name of common north indian hare is *Lepus ruficaudatus*.

36. (c) Double vagina is main character of marsupilia.

40. (c) Except a few, only mammals possess seven cervical (neck) vertebrae.

42. (c) Ungulata comprises large sized hoofed mammals such as pig, horse, ass, camel, deer, sheep, goat, cow, buffalo *etc*. These animals are domesticated by man for centuries.

49. (c) The adaptations in desert lizard are
(i) Burrowing in soil to escape high temperature
(ii) Bask is sun when temperature is low

50. (d) Head louse living on the human scalp as well as laying eggs on human hair is a parasite in true sense. Female mosquito is not considered as a parasite, though it needs human blood for reproduction. Koel that lays in crow's nest is just a brood parasite.

51. (b) The zoological name of tiger is *Panthera tigris* in which *Panthera* is genus and *tigris* is species.

53. (c) 3-chamberd Heart is found in only members of class Amphibia and Reptilia.

54. (b) Diaphragm is commonly found in only mammals (kangaroo) except crocodile.

58. (d) Sea lion (*Zalophus*) is a larged-eared seal. It is belong to the order carnivora.

62. (d) In male platypus a grooved erectile poison spine is present on the tarsus which is served by a poison gland in the thigh. The poison is used to immobilize a female during coition.

64. (d) In whale, Retea mirabilia are present which store extra oxygen and help the animal to remain under water for some time.

69. (d) Brain of prototherian relatively small, simple and without corpus callosum.

73. (a) In prototherian, mammary glands are modified sudorific glands and they lack the nipples or teats.

75. (c) Marsupium or marsupial pouch is the main characteristic of metatherian (mammals).

76. (d) *Echidna* (*Tachyglossus*) is found in Australia, New Guinea and Tasmania.

77. (b) Members of order Monotremata of sub class prototheria are oviparous. i.e. egg laying mammals. *e.g. Echidna* (*Tachyglossus*), Ornitho-*rhynchus* (Duck billed platypus).

78. (c) Order Primata includes lemurs, loris, tarsiers, monkeys, apes and man.

79. (a) Order Insectivora comes under sub class Theria of class Mammalia.

Critical Thinking Questions

2. (b) *Trichinella spiralis* shows viviparity.

6. (a) Nutritive muscular cells bear both flagella and pseudopodia.

7. (b) Trichocysts of *Paramecium* and nematocysts of *Hydra* are the organ cells of offence and defence.

8. (b) In Hydra, undigested residues are egested from coelenteron through mouth and body wall.

10. (a) *Taenia saginata* is also 'unarmed tapeworm' because the scolex does not possess hooks.

14. (d) Dorsal blood vessel is collecting blood vessel in the segments 14 onwards and distributing blood vessel in segments 1 to 13.

15. (a) Blood glands of *Pheretima* serve for the manufacture of blood corpuscles and haemoglobin.

17. (c) Weberian ossicles refer to a paired chain of three or four small bones in certain fishes *e.g.* Carps and cat fishes. It connects the air bladder with auditory capsule.

19. (b) Presence of notochord, Dorsal tubular nerve cord, Pharyngeal gill clefts, post anal tail, RBCs and hepatic portal system is distinguising feature of chordates.

21. (a) Crocodile is an exceptional case of reptile having 4 chamber in heart while other reptile shows 3 or 3½ chambered heart.

23. (d) All these (coelacanth, limulus and sphenodon) are representative of its own kind hence called living fossil.

24. (d) The characteristic feature of amniota is the development of amnion and other foetal membranes during development. Amnion and other foetal membranes are developed in reptiles, birds and mammals.

25. (b) Tunicates (Herdmania) shows retrogressive metamorphosis which results in the degeneration in adult.

28. (a) In mostly cartilagenous fishes caudal fins (Tail fins) forms two unequal lobe, which act as steering organ in locomotion.

29. (c) Stenohaline fishes have only a narrow range of salinity tolerance and hence remain restricted to either fresh or salt water.

30. (b) Two type of air bladders are known. In the more generalized groups of teleosts, the air bladder retains connection with the gut via a pneumatic duct, just as in ganoids and dipnoi. Such an open air bladder is called physostomous. In the teleost Erythrinus the air bladder has a lateral attachment to gut. Such a closed or ductless air bladder is called physoclistous.

31. (b) Catla, Labeo and cirrhinus are fresh water fishes. These are important cultiable species in india.

32. (a) Enterocoelic coelom is found in echinoderm to chordates.

34. (b) Python captures its prey and directly engulfs it by creating suction pressure inside its mouth.

35. (b) Ophisaurus is a limbless lizard also known as glass snake.

36. (a) Pisces and amphibia are anamniotic while reptiles, aves and mammals are amniotic.

37. (a) Anapsida has a solid roof due to the absence of any temporal vacuties on skull.

39. (b) All flightless birds belong to the super order Ratitae *e.g.* Emu, Panguin, Rhea, Kiwi, Moa, Cassowary.

40. (d) The presence of seven cervical vertebrae is common feature of mammals.

45. (d) Sea cows (Rhytina) belong to order Sirenia of mammals. Presence of blubber and few hairs are characters of order sirenia.

46. (c) Silver fish belong to insecta in which respiratory organ is trachae, scorpion belong to Arachnid which respiratory organ is book lung sea squirt (Herdmania) belong to urochordata, which respiratory organ is pharyngeal gills.

47. (c) Sponges "multicellular grade" organism but exhibit cellular level of organization.

48. (c) Embryonated eggs → Mouth → Intestine → Liver → (2^{nd} stage larva)
Heart → Lungs → trachea → Pharynx → Intestine.
(4^{th} Stage larva)

49. (d) Cockroach and earthworm have common type of spermatheca. The spermathecae receive and store sperm cells during copulation.

50. (a) Earthworm is a bisexual or hermaphrodite but always shows cross-fertilization due to protandrous conditions.

54. (a) Reptiles, aves and mammals are amniotes while amphibia is an anamniote.

55. (a) Bioluminescence is a method of light producing by living organisms in which usally certain protein called luciferins in the presence of oxygen and an enzyme luciferase, are converted to oxyluciferins with the libration of light.

56. (b) In some gymnophiona, dermal scales are embedded in dermis. Skin shows transverse wrinkles.

57. (a) Pseudocoelom formed by blastocoel surrounds the alimentary canal in Nematodes (*Ascaris*).

59. (c) *Salamandra* is a tailed amphibian, has tymphanum which represents ear.

60. (b) Circadian rhythm or diurnal rhythm is any 24 hour periodicity in the behaviour or physiology of animals or plants. Examples are the sleep/activity cycle in many animals and the growth movements of plants. Circadian rhythms are generally controlled by biological clocks

64. (a) Although the *Amoeba* has no sense organs, it responds to chemical stimuli. It makes this determination by chemotaxis, a kind of chemical sense. This is the same response mechanism that our white blood use when they encounter and phagocytize a pathogen.

73. (b) Members of *ctenophora, cephalochordate* and echinodermata are exclusively marine.

74. (b) A – Insects
B – Molluscs
C – Crustaceans
D – Other animal groups.

75. (b) Exoskeleton is mainly responsible for diversification of insects on land.

Assertion and Reason

1. (e) Sponges are the lowest multicellular animal but they have simple structures. Organs and tissues are absent. The constitution cells perform their functions more or less independently exhibiting division of labour performing specialized functions. Hence, they possess cellular level of organization.

2. (d) In Mollusca, circulatory system is of open type with a heart made up of two auricles and a ventricle. The blood has haemocyanin.

3. (a) Leucosolenia shows simplest (ascon) type of canal system. In this, surrounding water enter the canal system through ostia. This water of sea enters into the spongocoel and pushed out readily through osculum. Course taken by the water current in the body of sponge may be shown as under.

$$\text{Ingressing} \xrightarrow[\text{Ostia}]{\text{Through}} \text{Spongocoel} \xrightarrow[\text{Osculum}]{\text{Through}} \text{To outside}$$

4. (e) Robert Grant (1857) was the first to recognise and prove the true animal nature of sponges. The animal nature of sponges was well established on the following grounds-

(i) Sponges feed on inwafted solid particles. Their mode of nutrition is truely holozoic.

(ii) Sponge cells are devoid of cellulose cell walls.

(iii) Life cycle of sponges include swimming ciliated larval stages resembling those of other marine animals. Sponges are sessile and digestion is very simple without any apparent way of capturing food or eliminating wastes.

5. (a) The duck billed platypus and the spiny anteater are primitive oviparous, reptiles like mammals and these are included in subclass prototheria of class mammalia. Both of them have 12 pairs of cranial nerves and 7 pairs of cervical nerves.

6. (b) Tape worm belonging to phylum platyhelminthes, pinworms and roundworm belonging to phylum nematoda, are all endoparasites. They all are intestinal parasites. In case of *Taenia solium* man gets infection by uncooked or improperly cooked measly pork. Cysticercus becomes active on reaching the intestine.Proscolex everts or evaginates in the intestinal wall. *Ascaris*, being an endoparasite inhabits the small intestine of man, more frequently of children than of adults. Man gets infection by consuming contaminated or uncooked food and water. *Enterobius vermicularis* or pinworm live in caecum, appendix and at the junction of large and small intestine. They are also transmitted in the same way like *Taenia* and *Ascaris*.

7. (c) Coelenterata is the phylum of acoelomate and radially symmetrical lower invertebrates. Due to their radial body symmetry they are also known as radiata. Bilateral symmetry starts from the phylum platyhelminthes.

8. (c) H. viridis is green in colour. Its bright green colour is not because of chlorophyll containing chloroplasts, but due to the presence of symbiotic zoochlorallae, *Chlorella vulgaris*, a unicellular green alga, that lives in its gastrodermal cells.

9. (a) Coelenterates possess a very primitive type of nervous system. This system is composed of many nerve cells. In coelenterates, the separate mechanisms for digestion, respiration and excretion, reproduction etc evolved for the first time. Thus there is a constant need to maintain coordination between these systems. Nerve cells are developed for this purpose, for the first time in coelenterates. Nerve in Hydra is the beginning in the evolution for nervous system.

10. (b) Realm is a large landscape (generally subcontinental) having its unique biodiversity. South Asia (including India) occurs in oriental realm; king cobra is endemic here and kangaroo is found in Australian realm. Wallace line is the imaginary line separating oriental and Australian realms.

11. (b) Bats and whales are the members of class Mammalia (L. *Mamma* = breast). The bats are the only mammals which have wings can realy fly while whales are the largest animals in existence. Both bats and whales have four chambered heart but birds and crocodiles also have four chambered heart.

12. (b) The birds are the most beautiful among the animals. They show court ship, nest building, parental care, migration and territorial behaviour. Koel (*Eudynamis*) does not make any nest but lays eggs in the crow nest. In this way koel is nest parasite.

13. (a) Hydroid colony of Obelia is dimorphic, exhibiting two types of individuals or zooids which differ both morphologically as well as physiologically. These two zooids are-

(i) Polyps – the nutritive zooid of the colony

(ii) Gonangium – the reproductive zooid.

14. (a) Alternation of generations may be defined as a phenomenon whereby, in the life history of an organism, a diploid asexual phase and a haploid sexual phase regularly alternates with each other. This type of true alternation of generations is also called metagenesis. In coelenterates, an asexual polypoid generation appears to alternate regularly with a sexual medusoid generation.

15. (a) Lateral line system of fishes and aquatic larval amphibians whose receptors are group of sensory cells derived from ectoderm.

16. (c) *F. hepatica* undergoes both aerobic and anaerobic respiration depending on the availability of oxygen. Oxygen content in bile being extremely low, respiration in *F. hepatica* is anaerobic or anoxybiotic. This is an exothermic reaction involving release of energy (heat). If free oxygen is available, aerobic respiration takes place.

17. (c) *Plasmodium vivax* is responsible for malaria. It spreads by bite of female *Anopheles*. Its spread does not have any relation with polluted water.

18. (a) Birds have many adaptations for flight. They have pneumatic bones and only one ovary which reduces the body weight.

19. (d) Shark is a cartilagenous fish and lack buoyancy regulating organ called Swim bladder. These fishes swim constantly or will sink to the bottom. They cannot stay at a desired level in water without swimming.

20. (b) Sponges belong to Porifera and they have characteristic canal system.

21. (c) Malaria can not be transmitted by the bite of male *Anopheles* mosquito it does not carry active stage of *Plasmodium*.

22. (b) In cold blooded animals, there is no fat layer below skin and their temperature varies with the environment. These animals use their body fat during hibernation to carry out.

23. (b) Acraniata includes marine forms without head or cranium. They lack jaws, vertebral column, paired appendages.

24. (b) Spicules help in making skeleton of sponges. These are made up of silica, calcium or spongin substances. The structure of spicules also help in classification of sponges.

25. (c) Cephalization is the differentiation of head at anterior end. This does not play any role in appearance of animal but it may involve in accumulation of nervous tissue and sense organs in head.

26. (b) Insects blood is colourless. The blood also does not play any role in transport of oxygen. Insects have tracheal respiration.

27. (b) In lophodont condition, found in elephants, there is an intricate folding of enamel and dentine. Cresentic enamel cusps are connected by several transverse ridges called lophos. A single large lophodont molar, 30 *cm* by 10 *cm*, is present at one time in each half of each jaw. These are adapted to grind all sorts of plants, including grasses.

28. (b) One of the important human filaria is the African eye-worm *Loa loa*, transmitted by mangofly chiefly found in Africa. They commonly invade subcutaneous tissue and during their migration may pass across the eye-ball, hence the name eyeworm.

Loa microfilariae is very injurious and fatal when they penetrate brain and spinal cord and perhaps carry neurotropic viruses. During their migration, they cause itense itching and swelling. They also cause swelling and pain in eyes, known as "calabar swellings".

29. (b) The body of annelids is divided into segments called metameres, externally ring like grooves (annuli) and internally by vertical partitions called septa. The external segmentation corresponds to internal segmentation. This phenomenon is called metamere or metameric segmentation. Phylum annelida represents the first group of metazoan animals developing a true coelom with metameric segmentation.

30. (b) In annelida, blood is red due to the presence of haemoglobin or erythrocruorin dissoved in plasma. *RBCs* are absent in them. Blood corpuscles are colourless. Instead of blood, leeches posses reddish haemocoelomic fluid that flows in haemocoelomic channels.

31. (c) In whale bone whales, teeth are absent. Instead, the upper jaw carries two transverse rows of numerous triangular fringed horny plates of baleen or whale bone. This serves as the effective sieve for straining plankton (mostly krill) which forms their chief food.

32. (a) In annelida four pairs of flask shaped sacs, each with a diverticulum for storage of sperms and large ampulla for their nourishment is present. Spermathecae occur in 6-9 segments. They receive sperm during copulation. As cross fertilization occurs in earthworm, the sperms of one worm are transferred to spermathecae of the other.

33. (c) Coprophagy is found in certain mammals (e.g. Rabbits). This is the process by which many rodents form a special kind of faeces from the contents of the caecum and these are reingested, so that the food passes through the digestive system second time. Rabbit is coprophagus in habit, eating its own faeces in order to get maximum amount of nutrient from its food. Faeces produced during night alone are eaten up which are soft and moist due to incompletely digested cellulose. Thus passing through the gut once more, the faeces are subjected once again to digestion and absorption.

34. (b) All the sternal parts of the thoracic ribs except the last five, attached the sternum below by hyaline cartilage. Therefore, they are called as true ribs. Actually last two pairs of ribs (11^{th} and 12^{th} pair) provided with the sternal parts and they are not connected with the sternum and hence, known as floating ribs. Floating ribs protect the kidney.

35. (b) Sweat glands produced from stratum germinativum, plays an important role in the regulation of body temperature. When the body temperature rises too much, the sweat glands are stimulated to take up water from blood vessels and to pour out their secretion on the general surface of the skin. Evaporation of sweat from the body surface uses up latent heat of vaporization from the skin, thus the extra heat of the body is used up and the body cools down reducing the temperature.

36. (c) Aquatic annelids excrete ammonia, and terrestrial species (earthworm) excrete urea. However, earthworms are less ureotelic than other terrestrial animals. Excretory fluid contains 40% urea, 20% ammonia and 40% amino acids and other nitrogenous compounds, but no uric acid or urate.

37. (a) Most arthropods certain molluscs and tunicates contain open circulatory system. In them, a fluid composed of blood mixed with tissue fluid bathes with internal tissues and organs directly. It oozes through spaces or cavities that surround the organs, this mixture of fluid is usually referred to as haemolymph.

38. (a) Birds have a constant body temperature which commonly remains in between 104° to 112°*F*, even in subzero weather. Thus they are called homoiothermal. The feathers serve the most important function of retention of heat. Because the plumage forms an efficient, non-conduction covering with its innumerable dead air spaces, useful as insulation. In cold weather, the heat loss is reduced to minimum by fluffing out the feathers, which increases the depth of insulating material by adding to the air spaces within the feathery layers. In warm weather, the feathers are often held close to the body to allow some escape of body heat.

39. (e) Moulting or ecdysis occurs not only in invertebrates, but in birds also. In birds, shedding and replacement of feathers is moulting or ecdysis which takes place gradually, moulting usually takes an average time of six weeks. At the base of each feather follicle, a dermal papilla persists from which new feathers will form. Thus there is a continuous replacement of feather throughout life. The replacement of feathers is seasonal in some birds such as peacock, while in other birds such as pigeon it is gradual throughout the year.

40. (b) Though pigeons have no mammary glands, (as they belong to class aves not to mammals), milk is secreted by them. The pigeons are oviparous, the eggs are laid in the nest and are incubated by the warmth of the parent's body and hatching occurs after a fortnight. The immature, helpless and featherless young ones are nourished by parents by a fatty curdy secretion, the pigeons milk which is secreted in their crop. The parental care and homing instinct are well developed in pigeons.

41. (b) The poison apparatus of snake consists of a pair of poison glands, their ducts and a pair of fangs. The poison glands are situated one on either side of the upper jaw. The poison glands are possibly the superior labial glands or parotid glands. The fangs are sharply pointed and are enlarged maxillary teeth.

42. (c) The hemipenes are the copulatory organs found in *Uromastix* and some other reptiles. These are two eversible hollow sacs lying under the skin behind the cloacal aperture at the base of the tail. Proximally, the hemipenes communicate with the urodaeum of the cloaca. During copulation, only one hemipenes, is inserted into the cloaca of the female. Erection of the hemipenes is due to the muscular action and filling with blood, then they are everted and become cylindrical and project beyond the cloaca.

43. (a) Parental care is clearly seen in amphibians. They protect their eggs by keeping them –
(i) In enclosures in the water, (ii) In holes near water, (iii) In nests, on trees or on rocks, overhanging water, (iv) In transparent gelatinous bag in the water, (v) On trees or in moss, away from water. They also show direct nursing by the parent. The examples are -
(i) Tadpoles transported from one place to another by males, (ii) Eggs protected by male who covers with his body, (iii) Eggs carried round the legs by the female, on the back of the female etc.

44. (a) The entire skin of frog serves as organs of touch as it is abundantly supplied with sensory nerve endings situated in the spaces between the cells. Thus the skin is called tangoreceptor. At places, groups of epidermal cells-tactile organs and patches are present. These are very much sensitive to touch and also to temperature. The tactile organs make the skin of frog sensitive to touch, heat, cold and the effects of the chemicals.

45. (a) From the diffused lymphatic system lymph is pumped back into veins by two pairs of lymph hearts. One of which is situated just behind the transverse processes of the third vertebra opening into the sub scapular veins, the second pair of lymph hearts is found on either side at the end of the urostyle. They open into the femoral vein.

46. (b) In frog, most of the absorption takes place in intestine. The intestine of frog is so formed, that it gives the greater surface area. The intestine is the longest part of the alimentary canal where the absorption of the digested food materials take place.
To increase the absorptive surface of the intestine, the internal lining of the intestine forms transverse folds in the duodenum and longitudinal folds in the region of the ileum and rectum.

47. (a) Amphibia is cold blooded or ectothermal animal as its body temperature does not remain constant but fluctuates with that of environment. Thus it is called poikilothermal animal. In winter the temperature of the body activities ceases down. In this condition it can not live more on the land, so it takes winter sleep or hibernation in underground. Similarly during the summer it once again goes underground to sleep as its all body activities are slowed down due to high temperature. This is known as summer sleep.

48. (c) In fishes, the heart is mainly two chambered one auricle and one ventricle. Heart of *Scoliodon* receives only deoxygenated or venous blood, hence named as venous heart. The auricle opens to the ventricle through atrioventricular aperture. Mainly the impure blood passes from the heart to the gills only once. Therefore, they have single circulation only.

49. (b) The ampullae of Lorenzini are found in clusters on the dorsal and ventral surfaces of the head embeded below the skin but opening externally on the surface of the skin. The ampullae of Lorenzini were formerly regarded as neuromast organs but Sand (1938) has proved that these are thermoreceptor organs. The change in the temperature of water is carried to the brain through the ampullary receptors.

50. (a) A faint line runs on either side of the body extending from the head to the posterior end of the tail, this is called lateral line (also called neuromast system). It marks the position of an underlying canal which runs along side of the body and contains special receptor organs. The lateral line canal extends anteriorly into the head, where it branches into several canals; at intervals these canals opens to the exterior through the pores. These canals contain neuromast organs like rheoreceptors or current receptors. The latter can perceive vibration of very low frequency and detect disturbances in water.

51. (b) Following are the characters of cyclostomes showing an advance over *Amphioxus*. A distinct head, however may be secondary, a so-called cranium, a more advanced brain, pro and mesonephric kidneys, secondary notochord, vertebrae introduced (lampreys) etc. Cyclostomes also have some particular specialization like tongue apparatus, sucking mouth with horny teeth, sac-like gill pouches, separate branchial sac with branchial basket etc.

The degenerated characters of cyclostomes are –

(i) tongue apparatus (ii) rudimentary paired eyes in hagfishes (iii) lack of exoskeleton (iv) reduced liver and lack of gall bladder and bile duct in adult lamprey.

52. (a) *Amphioxus* is devoid of heart, head, kidneys and paired limbs. Paired sense organs are absent here receptors are of primitive types. A complete notochord is persistant with no vertebral column. This shows that it has a simple organization compared to vertebrates because many important craniate structures are lacking in it. But it is definitely a simple chordate having a large number of primitive characters such as a notochord, dorsal hollow nerve cord, and gill clefts.

53. (a) The life cycle of fresh water mussel, including a parasitic glochidium larva on a fish host has many advantages. Besides affording protection and a means of nourishment, it ensures a far wide and more rapid dispersal of the species. A fish may carry these tiny parasites to great distances before they drop off. Considering the sluggish habits and poor locomotory ability of the mussels, this is probably the only way to ensure their proper distribution.

54. (a) In *Amphioxus*, some exchange of O_2 and CO_2 occurs between the water current and blood through the gill-clefts, but this appears doubtful since the blood contains no respiratory pigment. The pharyngeal wall of *Branchiostoma* is richly vascular and the water current entering the pharyngeal cavity brings O_2. The blood flows so close to the surface that some exchange between CO_2 of blood and O_2 of water can easily occur. It appears more probable that an exchange of gases occurs over the whole surface of the body and particularly in the walls of atrium.

55. (b) Torsion or twisting is a process during larval development of gastropods, which rotates the viscero-pallium anticlockwise brought 180° from its initial position, so that mantle cavity, with its pallial complex, is through in front of the body in adult. Changes occuring in torsion are to certain extent reversible. This reversion is known as detorsion and it is a very characteristic of the whole group of the euthyneura. Formerly, this condition was looked upon as an arrested stage in the torsion, but there is the same reduction of the paired parts of the pallial complex as in the specialized streptoneura. Total detorsion, as shown by the typical opisthobranchia is accompained by the reduction of disappearance of the shell.

56. (c) Each ambulacral groove of echinoderms contains two double rows of short, tubular retractile projections, called as podia or tube feet, that end in suckers. Tube feet are characteristic organs of echinoderms serving variously for locomotion, capturing of food, respiration etc.

57. (c) In the mid ventral wall of pharynx is a shallow groove called endostyle. The endostyle is lined with gland cells which secrets mucus. The larval endostyle is lost during metamorphosis of lamprey, it contributes to the formation of a thyroid gland in the adult. Like thyroid it concentrates radioactive iodine in itself. Similar endostyle is found in urochordate and the ammocoete larva of lampreys.

58. (a) Digestive mechanism of *Herdmania* is similar to that of higher group of animals due to possessing several enzymes used in digestion. In *Herdmania*, the liver secretes a yellowish-brown digestive fluid into the stomach, it has many enzymes, an amylase which splits carbohydrates into maltose, a protease which breaks down proteins and a weak lipase which probably acts on fats. And also secretion of pyloric gland probably has an accessory digestive function similar to that of pancreas.

59. (d) Pygochord is longitudinal rod like structure extending from the ventral side of the intestine to the body wall, in the post hepatic region of the trunk. Its cells are vacuolated. It supports the post hepatic region of the body but probably also performs some other functions not yet understood.

60. (b) Water vascular system or ambulacral system is a unique system of echinoderms which helps mainly in locomotion. It is infact a modified part of coelom consisting of a system of canals containing sea water and amoeboid corpuscles. It helps in locomotion by providing a hydraulic pressure mechanism of tube feet may serve for respiratory exchange of gases. Tube feet also help in anchoring the body to substratum and in capturing and handling the food.

61. (c) Balanoglossus belong to class enteropneusta. In certain cases, the proboscis pore does not communicate with the proboscis coelom, but terminate blindly, and may send off a narrow tubular diverticulum which opens into the neurocoel. The proboscis sits in the collar somewhat like an acorn in its cup, a character that has given the name "acorn worm" to the group.

Animal Kingdom

SET Self Evaluation Test

1. Select incorrect pair **[MP PMT 2009]**
(a) Porifera–choanocytes (b) Coelenterata-nematocysts
(c) Annelida – segmentation (d) Monera – eukaryote

2. Which of the following is a chordate feature, not shared by the non-chordates **[AIIMS 2001; CBSE PMT 2002; CPMT 2005]**
(a) Metamerism (b) Axiate organization
(c) Bilateral symmetry (d) Pharyngeal gill slits

3. Which one of the following invertebrates is a deuterostome and enterocoelous coelomate **[MP PMT 2000]**
(a) Pila (b) Ascaris
(c) Aphrodite (d) Asterias

4. Helically coiled shaped "X" organ is found in **[Odisha JEE 2008]**
(a) Crustacea (b) Porifera
(c) Insecta (d) Amphibia

5. *Scoliodon* is called dogfish due to one of its following characteristics **[MP PMT 2000]**
(a) Mouth (b) Gait
(c) Carnivorous (d) Power of smell

6. The stages between larval moults in an insects are called **[Odisha JEE 2008; J & K CET 2012]**
(a) Instar (b) Morula
(c) Pupa (d) Larva

7. Scales in chondrichthyes are **[AIIMS 2000; MP PMT 2011]**
(a) Placoid (b) Ganoid
(c) Cycloid (d) Sesamoid

8. Which one of the animal of amphibia has no tongue
(a) Amphiuma (b) Ichthyophis
(c) Necturus (d) Salamander

9. Comb plates are found in **[J & K CET 2008]**
(a) Adamsia (b) Aurelia
(c) Nereis (d) Pleurobrachia

10. Sharks and dogfishes differ from skates and rays by **[NEET (Karnataka) 2013]**
(a) Gill slits are ventrally placed
(b) Head and trunk are widened considerably
(c) Distinct demarcation between body and tail
(d) Their pectorals fins distinctly marked off from cylindrical bodies

11. Which of the following is not found in birds **[CBSE PMT 1999]**
(a) Hind limb (b) Fore limb
(c) Pelvic girdle (d) Pectoral girdle

12. Biradial symmetry is found in **[Odisha JEE 2010]**
(a) Beroe (b) Hydra
(c) Sponges (d) Labeo

13. Paired appendages are not found in **[AFMC 2008]**
(a) Hemichordates (b) Urochordates
(c) Cephalochordates (d) All of these

14. Which of the following group is Deuterostome **[Kerala PMT 2000; RPMT 2001]**
(a) Annelida, Arthropoda, Mollusca
(b) Echinodermata, Hemichordata, Chordata
(c) Annelida, Mollusca. Chordata
(d) Arthropoda, Mollusca, Echinodermata

15. Discoblastula found in **[MP PMT 2011]**
(a) Echinoderms and amphioxus
(b) Reptiles, birds and fishes
(c) Annelids, molluscs and nemertens
(d) Insects

16. Which is not a bird **[MP PMT 2011]**
(a) *Columba* (b) *Testudo*
(c) *Pavo* (d) *Struthio*

17. The paralysing toxin in nematocyst is **[RPMT 1999; AIIMS 2000; CPMT 2001; MH CET 2002; Pb. PMT 2004]**
(a) Glutathione (b) Heparin
(c) Histamine (d) Hypnotoxin

18. Dropping of gravid proglottids by cestodes is called **[MP PMT 2000]**
(a) Apolysis (b) Autotomy
(c) Paedogenesis (d) Autophagy

19. *Calotes versicolor* belongs to class **[Odisha JEE 2009]**
(a) Osteichthyes (b) Amphibia
(c) Reptiles (d) Aves

20. Chloragogen cells of earthworm are similar to the organ of vertebrate's **[CPMT 1999, 2004; MH CET 2002]**
(a) Liver (b) Lung
(c) Kidney (d) Spleen

21. Interstitial fluid resembles **[Odisha JEE 2009]**
(a) Sea water (b) Fresh water
(c) Ground water (d) None of these

22. The modification of second pair of wings into halteres or balancers is the characteristic of **[MP PMT 2001]**
(a) Lepidoptera (b) Orthoptera
(c) Diptera (d) Hemiptera

23. Mesoglia is seen in between **[NCERT; WB JEE 2008]**
(a) Ectoderm and endoderm
(b) Ectoderm and mesoderm
(c) Mesoderm and endoderm
(d) Just below mesoderm

24. Flagellated collar cells (choanocytes) is the characteristics of **[MP PMT 2011]**
(a) Cnidaria (b) Arthropoda
(c) Porifera (d) None of the above

25. In which one of the following groups an animals are hermaphrodite **[MP PMT 2001]**
(a) Hydra, Ascaris, Pheretima
(b) Hydra, Homo sapiens, Leech
(c) Tapeworm, Toad,Starfish
(d) Hydra, Leech, Tapeworm

26. Which of the following is a correct sequence of decreasing order of number of species **[BHU 2008]**
(a) Aves, pisces, reptiles, amphibians, mammals
(b) Pisces, aves, reptiles, mammals, amphibians
(c) Pisces, mammals, reptiles, amphibians, aves
(d) Amphibians, aves, pisces, mammals, reptiles

27. In *Hydra*, digestion is **[BHU 1999; CPMT 1999]**
(a) Extracellular
(b) Intracellular
(c) First extracellular and then intracellular
(d) First intracellular and then extracellular

28. Infective stage of *Ascaris* is **[CBSE PMT 1997; KCET 1998; RPMT 1999, 2002; BHU 2002; WB JEE 2008]**
(a) Adult worm (b) Second juvenile
(c) Fourth juvenile (d) Egg

29. How are annelida advanced over nematoda **[Pb. PMT 1999]**
(a) Closed circulation (b) True coelom
(c) Metameric segmentation (d) All of these

30. Two pairs of antennae are found in class **[EAMCET 1998]**
(a) Myriapoda (b) Crustacea
(c) Insecta (d) Arachnida

31. Which is the correct order of evolution **[CPMT 1998]**
(a) *Leucosolenia – Hydra – Amoeba – Ascaris*
(b) *Ascaris – Amoeba – Leucosolenia – Hydra*
(c) *Amoeba – Leucosolenia – Hydra – Ascaris*
(d) None of these

32. Which one of the following is correctly paired **[Kerala PMT 2007]**
(a) *Trygon* - Monitor
(b) *Ichthyophis* - Crow
(c) *Varanus* - Stingray
(d) *Corvus* - Limbless amphibian
(e) *Pristis* - Sawfish

33. Which is vivipary **[BVP 2003; Bihar CECE 2006]**
(a) Whale, rabbit (b) Frog, kangaroo
(c) Snake, lizard (d) Cockroach, aves

34. Antennary glands of crustaceans are meant for **[DPMT 2006]**
(a) Excretion (b) Respiration
(c) Digestion (d) Circulation

35. Pancreas is absent in which group of vertebrates **[DPMT 2006]**
(a) Reptiles (b) Cyclostomates
(c) Birds (d) Mammals

36. Praying mantis is a good example of **[CBSE PMT 2006]**
(a) Social insects (b) Camouflage
(c) Mullerian mimicry (d) Warning colouration

37. Biradial symmetry and lack of cnidoblasts are the characteristics of **[CBSE PMT 2006]**
(a) *Aurelia* and *Paramecium* (b) *Hydra* and starfish
(c) Starfish and sea anemone (d) Ctenophora and *Beroe*

38. What is common between parrot, platypus and kangaroo **[CBSE PMT 2007]**
(a) Homoeothermy (b) Toothless jaws
(c) Functional post-anal tail (d) Ovoparity

39. Which one of the following is a matching pair of a body feature and the animal possessing it **[CBSE PMT 2007]**
(a) Post-anal tail – Octopus
(b) Ventral Central nervous system – Leech
(c) Pharyngeal gill slits absent in embryo – Chameleon
(d) Ventral heart – Scorpion

40. Axis vertebra is identified by **[MP PMT 2009]**
(a) Sigmoid notch (b) Deltoid ridge
(c) Odontoid process (d) Centrum

41. The most primitive vertebrates are **[MP PMT 2009]**

(a) Ostracoderms (b) Cephalochordates

(c) Placoderms (d) Cyclostomes

42. In anura group of frog, caudal vertebra fused to form **[Odisha JEE 2008]**

(a) Coccyx (b) Urostyle

(c) Pygostyle (d) Prehensile tail

43. The extinct reptiles without temporal fossae belong to **[EAMCET 2009]**

(a) Chelonia (b) Synaptosauria

(c) Ichthyopterygia (d) Cotylosauria

Answers and Solutions

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

2. (d) Chordates show the presence of nerve cord, Notochord and pharyngeal gill slits.

3. (d) Echinodermata and all chordates are deuterostome and enterocoelous.

5. (d) In scoliodon, olfactory organs are characteristically large in elasmobranchs correlated with a highly developed sense of smell for perception of chemical substances dissolved in water.

7. (a) Placoid scale has a disc like basal plate. It resembles a tooth. These scales are found in cartilagenous fishes (chondricthyes).

8. (b) Icthyophis is a limbless amphibian showing parental care. It has no tongue.

10. (d) Sharks and dogfishes have cylindrical body while skates and rays have flattened body with winglike pectoral fins which are not distinct from body.

11. (b) In birds, forelimbs are modified as wings for flying. Therefore, the forelimb is not found in birds.

14. (b) Deuterostomes includes Echinodermata, Hemichordata and chordata. The mouth is derived away from the blastopore.

17. (d) Hypnotoxin is secreted by nematocyst cell of tentacles of hydra to paralyse the active prey for easy engulfing.

18. (a) Loss of gravid proglottids from posterior end of body is called apolysis.

20. (a) Because they are supposed to be associated with the function of excretion just like liver.

22. (c) In diptera, hindwings are greatly reduced to drumstick shaped structures, called halters. These carry sense organs and serve as balancing organ during flight.

25. (d) An individual with both male and female reproductive organs called hermaphrodite.

28. (b) The second stage of juvenile is infective stage of *Ascaris* which is also called embryonated egg.

29. (d) Annelids are first animals in which closed circular system, metamerism segmentation and true coelom is evolved. On the basis of these comments annelids are advanced over nematoda.

30. (b) Presence of two pair antennae is character of class crustacea. Antennae are sensory and help in searching food and shelter.

34. (a) The excretory system of crustacea (*Palaemon*) consists of a pair of antenary or green glands, a pair of lateral ducts and an unpaired renal or nephroperitoneal sac coxa of each antenna encloses an antennary gland.

35. (b) Pancreas is absent in cyclostomates, a class of Agnatha.

The pancreas is derived from the endoderm of embryo. It lies inferior to the stomach in a bend of the duodenum. It is both an exocrine and endocrine gland.

38. (a) All these three animals are Homeiothermic; although platypus is incomplete homeiothermic.

39. (b) In invertebrates nerve cord is found in ventral position that is a part of CNS.