Notes

3.6 KINGDOM ANIMALIA

Includes the animals which animalia show a wide variety yet have some common features.

3.6.1 Few general features of kingdom animalia

- These are multicellular eukaryotes
- They have ingestive, heterotrophic nutrition.
- They have the power of locomotion.
- They show increased senstivity through nervous system.

Basis of classification of animals

Organization, symmetry, body cavity, number of embryonic cell layers and presence or absence of notochord are the features used for distinguishing broad categories of animals.

Organization : Bodies of animals are multicellular. although then cells may or may not be organised into tissues and organ systems. Animals such as sponges are aggregates of cells. These are at **cellular level** of organisation. Cnidarians have groups of cells performing specialised functions. They are at **tissue level** of organisation. All other animals have organs and systems for performing body functions. They are at **organ-system** grade.

Symmetry : means *dividing the body into two equal and identical parts*. Sponges are **asymmetrical**. Cnidaria and Echinoderm larvae are radially symmetrical. All other animals are **bilaterally symmetrical or dorsiventral**.

Body Cavity or Coelom : is a cavity between body wall and food canal. It is not present in Acoelomates (a = no, coelom = body cavity) and is present in Eucoelomates (eu = true). Pseudocoelom (pseudo = false) is not a true body cavity. It is found in roundworms.

Embryonic layers : Three layers of cells, ectoderm, mesoderm and endoderm in the embryo (germinal layers) give rise to various parts of the body of the animals. Sponges and Cnidaria do not have mesoderm in their embryos. They have two germinal layers ectoderm and endoderm (diploblastic). Others have three germinal layers (triploblastic).

Notochord : is a solid found in embryonic stage or adults of some animals which are grouped as **phylum Chordata**. All animal groups lacking notochord are termed, **non-chordates**.

Kingdom Animalia
(Multicellular Eukaryotic Heterotrophs)

	Sub-Kingdom	
	Parazoa	**Eumetazoa**
	(a) No symmetry	(a) Symmetrical
	(b) No tissues (cellular grade of organisation)	(b) Tissue and organ. grade of organisation
	Phylum Porifera	
Organisation and germinal layers	(a) Tissue grade of organisation	(a) Organ system grade of organisation.
	(b) Two embryonic germ layers. (diploblastic)	(b) Three embryonic germ layers (triploblastic)
	Phylum Cnidaria	All other Phyla

Symmetry	Asymmetrical	With Radial Symmetry	Bilateral Symmetry
	↓	↓	↓
	Phylum Porifera	**Phylum Cnidaria**	**All other phyla**
Body Cavity	Aoelomates (No coelom)	Pseudocoelomates (False coelom)	Eucoelomates (True coelom)
	↓	↓	↓
	Phyla Porifera, Cnidaria Platyhelminthes	**Phylum Aschelminthes**	**All other Phyla**
Notochord	Presence or absence of	no notochord	Notochord at some stage of life
	Notochord	**Non-chordata**	**Chordata**

3.6.2 Major phyla included in Kingdom Animalia

Phylum Porifera (Includes sponges)

Main characters:

- Body with many pores, canals or chambers through which water flows is called the **canal system**.
- large aperture called **osculum** at the upper end.
- Body encloses a large cavity **spongocoel**.
- No organs, movable parts or appendages. Different kinds of cells perform different functions.
- Usually with an internal skeleton of calcareous or siliceous **spicules**, or of **spongin** fibres, or both.
- Reproduction asexual by budding; also sexual.
- Almost all marine.

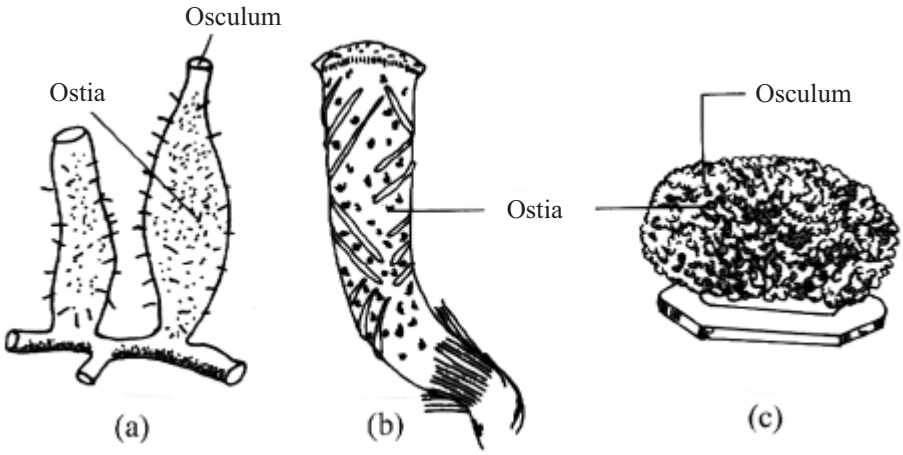

Fig. 3.7 : Phylum Porifera (a) *Sycon;* (b) *Euplectlella;* (c) *Euspongia*

2. Phylum Cnidaria (Includes hydroids, jelly fishes, sea anemone and corals)

Main Characters:

- Body with no head and no segmentation.
- Body wall two layered: external epidermis and inner gastrodermis, jelly-like, non-cellular mesogloea in between.
- Cnidoblasts (stinging cells) present, help to catch prey (carnivorous)
- Skeleton calcareous, horny or none.
- Asexual reproduction by budding in the sessile (polyp) stage, and sexual reproduction in free swimming (medusa) stage.
- Radial symmetry
- All marine, except Hydra (found in fresh water)
- Either fixed like hydra, sea-anemones and corals, or free floating like the jelly fish.

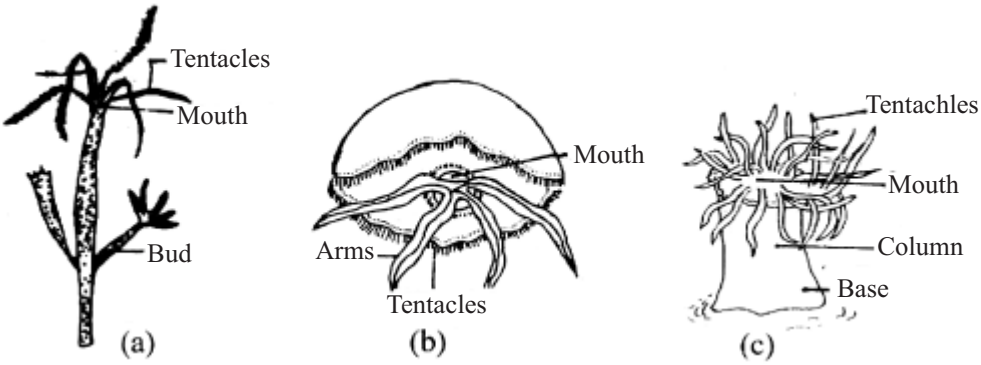

Fig. 3.8 Three common Cnidarians (a) Hydra (b) Jelly fish (c) Sea Anemone

3. Phylum Platyhelminthes (Flat worms)

Main Characters:

- Elongated, soft bodied, dorsoventrally flattened worms, without true segmentation.
- No body cavity

– Suckers or hooks or both for attachment to the body of the host
– Sexes usually united, mostly sexual reproduction, with asexual reproduction in some.
– Alimentary canal has only one opening–the mouth. In some forms (e.g. tapeworms) there is no alimentary canal at all.
– A few are free-living but mostly parasites.

Examples: *Planaria* (free living),
Fasciola (liver-fluke) is a parasite of sheep liver, *Taenia* (tapeworm) is a parasite of the human intestine.

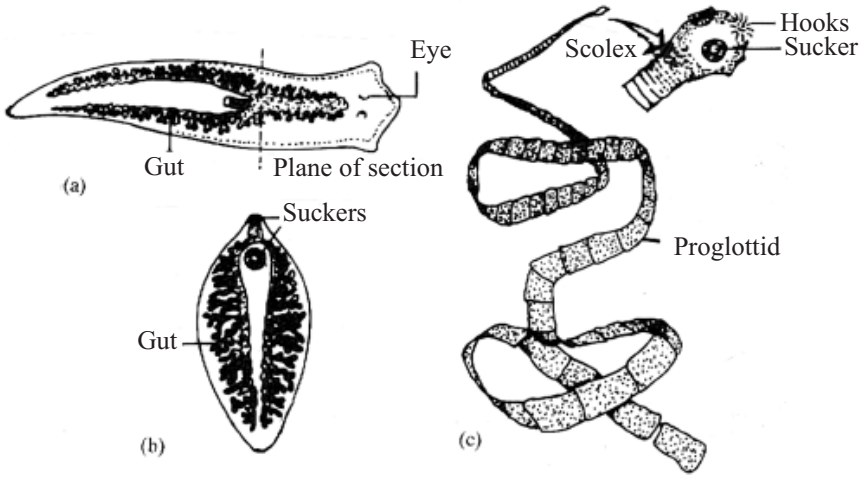

Fig. 3.9 Phylum Platyhelminthes (a) *Planaria* (b) *Fasciola* (c) *Taenia*

3. Phylum Aschehelminthes (Class Nematoda)

(Roundworms, thread worms)

Main characters:

– Elongated cylindrical round body
– Body cavity is a pseudocoelom (false body cavity)
– Alimentary canal opens at the two ends, mouth and anus.
– Sexes separate, males smaller than females (Fig 3.10).
– Mostly parasitic in animals but some live freely in the soil.
– *Ascaris* is a common roundworm, parasitic in the intestine of humans.
– Pinworm and *Wucheria* (Filariaworm) are some other examples.

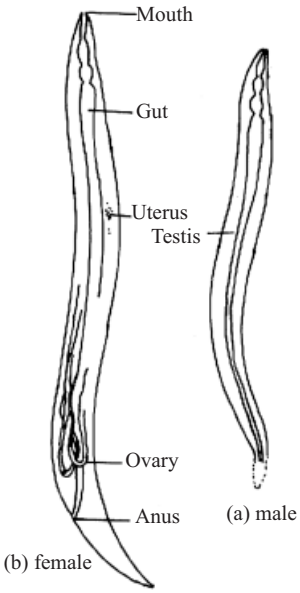

Fig. 3.10 *Ascaris* (a) Female (b) Male

4. Phylum Annelida (Includes earthworms)

Main characters:

– Elongated, segmented, coelomate (true body cavity) worm-like animals.
– Body provided with setae or parapodia for locomotion.

– Well developed digestive system with the alimentary canal open at both the ends.
– Excretory organs called **nephridia**.
– Sexes united (as in earthworm) or separate (as in *Nereis*).
– Regeneration quite frequent.
– Aquatic, some terrestrial animals, some living in tubes and some even parasitic.

Examples: *Nereis*, Earthworms like *Pheretima* (free-living in soil), *Hirudinaria* (leech, a parasitic on cattle, See figure 3.11.

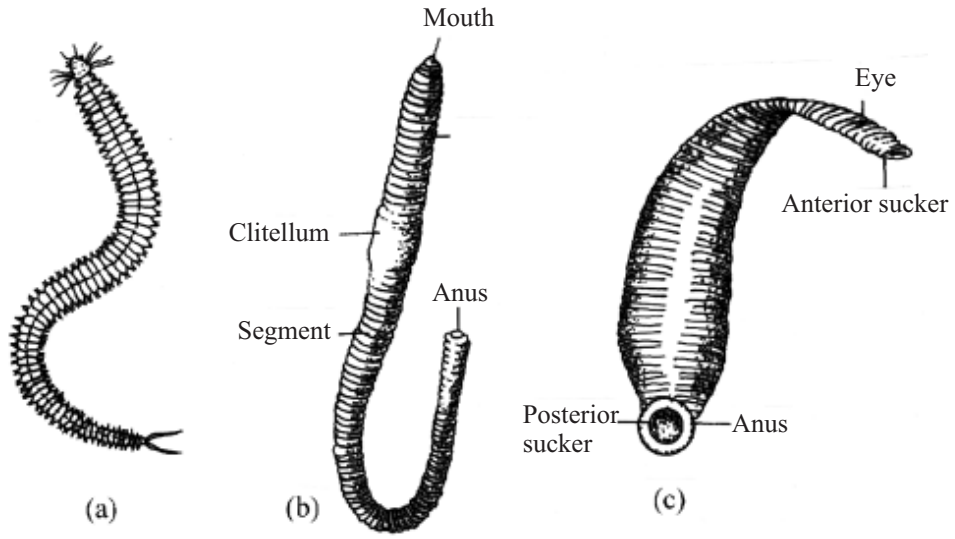

Fig. 3.11 Annelids (a) *Nereis* (b) *Pheretima* (c) *Hirudinaria*

6. Phylum Arthropoda (includes Crab, scorpion, insect, spiders etc.)

Main Characters:

– Segmented body, can be differentiated into head, thorax and abdomen
– Head and thorax often fused to form **cephalothorax**
– Jointed legs for locomotion, one pair each on some or all body segments
– Exoskeleton of chitinous cuticle, shed at intervals (moulting)
– Sexes usually separate.

Arthropods are further divided into classes.

(i) Crustacea (ii) Myriapoda (iii) Insecta (iv) Arachnida

Classification

Phylum Arthropoda

Class 1 Arachnida	Class 2 Crustacea	Class 3 Myriapoda	Class 4 Insecta
(a) Cephalothorax with 2-chelicerae, 3- pedipalpi, and 4 pairs of walking legs	(a) body covered with dorsal covering called carapace	(a) Body with numerous segments	(a) body divisible into head, thorax, and abdomen.

(b) abdomen usually without legs	(b) cephalothorax with 13 pairs of legs in appendages sexes usually separate	(b) each segment bearing 1-2 pairs of legs terrestrial and air-breathing arthropods	(b) thorax 3-segmented with 3 pairs of legs in each segment usually 2 pairs of wings on the last two thoracic segments.
(c) eyes simple	(c) eyes compound	(c) eyes compound	(c) eyes compound
(d) sexes separate	(d) sexes separate	(d) sexes separate	(d) sexes separate
(e) Example scorpion (Fig. 3.12a)	(e) Example Prawn (Fig. 3.12b)	(e) Example (Scolopendra) and Millipede (Fig. 3.12c)	(e) Example: Cockroach (Fig 3.12d)

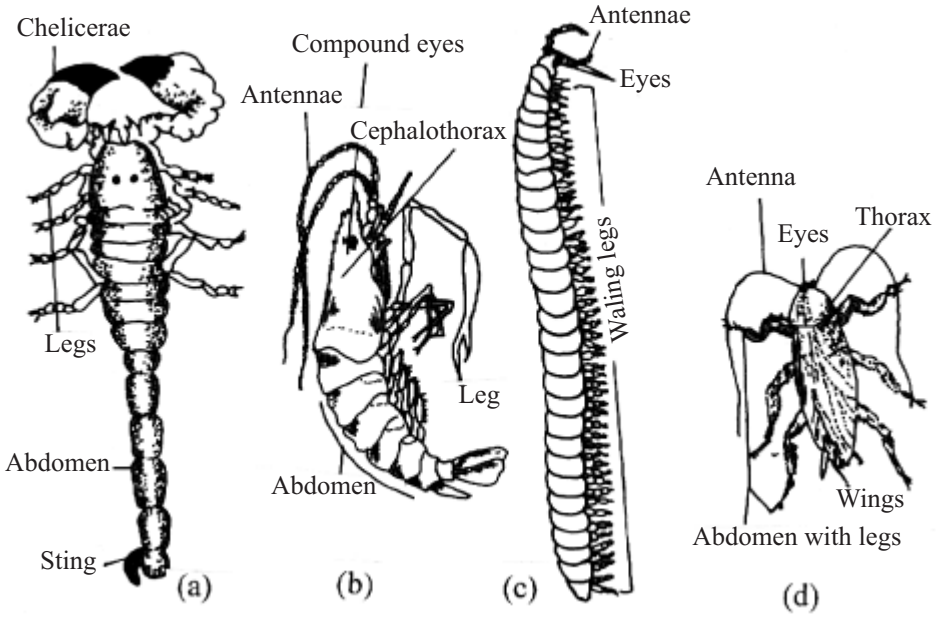

Fig. 3.12 Arthropods (a) Scorpion; (b) Prawn; (c) Millipede; (d) Cockroach

7. Phylum Mollusca (includes squids, snails and oysters)

Mollusca

These animals have a soft, unsegmented body, with a hard, calcareous shell to protect the soft body. They have a muscular foot to help in locomotion and also to act as a weapon in some cases. Examples: snails, slugs, oysters, mussels, clams, squids, and octopuses (Fig. 3.13).

Main Characters.

- Unsegmented soft-bodied animals terrestrial or aquatic,
- Exoskeleton in the form of a shell. When present shell is usually univalved or bivalved; internal shell present in some.
- Sexes separate or united.
- Have a muscular foot for locomotion.

Examples. Apply snail (*Pila*), Freshwater mussel (*Unio*), Cuttlefish (*Sepia*), Slugs, Octopus.

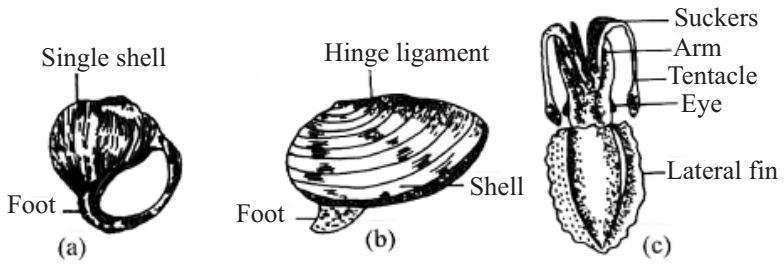

Fig. 3.13 Three molluscs (a) *Pila* (b) *Unio* (c) *Sepia*

8. Phylum Echinodermata (Includes starfishes, brittle stars, sea urchins, sea cucumbers)

Main Characters:

- Marine animals, with unsegmented body.
- Head absent, body surface marked with 5 radiating areas.
- Radial symmetry.
- Endoskeleton of dermal calcareous ossicles with spines.
- Movement by tube feet.
- Sexes usually separate.
- Regeneration of lost parts a peculiarity.
- Adults are radially symmetrical, but the larvae are bilaterally symmetrical.

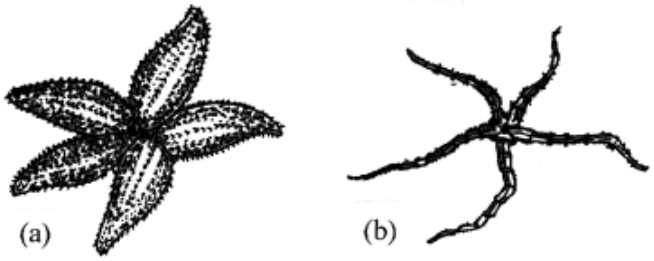

Fig. 3.14 Echinoderms (a) Asterias (b) Ophiara

INTEXT QUESTIONS 3.5

1. Member of which phylum possesses the cnidoblasts?

   .....

2. What do the earthworms possess which help them in locomotion?

   .....

3. Are all the Platyhelminthes parasites?

   .....

4. How many pairs of legs do the following have

   (i) Insects; .....

   (ii) Scorpions; .....

(iii) Spiders .....

5. Name the organs by which the starfish move?

.....

6. Give two examples of the Phylum Arthropoda :

.....

7. Name the phyla which have the following characteristics :
   (i) Tube feet. .....
   (ii) Cnidoblasts .....
   (iii) Chitinous exoskeleton .....
   (iv) Jointed legs .....
   (v) Nephridia .....
   (vi) Flattened body and a gut without anus. .....

3.9 PHYLUM CHORDATA

Main Characters:

– Notochord present at some stage of life, in most cases replaced by backbone.
– Dorsal tubular nerve cord.
– Gill slits present at some stage of life. (larva or adult)
– Body with a head and trunk and two pairs of appendages.

Classification

Phylum Chordata

1. Subphylum Urochordata	2. Subphylum-Cephalochordata	3. Subphylum Vertebrata
(a) Notochord present only in larval stage. (uro-tail)	(a) Notochord and nerve cord remain present throughout the life and extend through entire length of the body.	(a) Notochord replaced by vertebral column (back bone)
(b) Body bag-shaped, covered by a particular tunic or testa in adult stage.	(b) Body elongated and flattened from sides.	(b) Body with well developed head and paired fins or limbs. Cartilaginous or bony endoskeleton
(c) Limbs absent	(c) Limbs or paired fins absent.	(c) paired limbs present (tetrapoda)
(d) Dorsal tubular nerve cord present in the larval forms and reduced in adult.	(d) Dorsal tubular nerve cord present in adults.	(d) Dorsal tubular nerve cord present which is divided into brain and spinal cord.
(e) Example: *Herdmania* (Fig. 3.15a)	(e) Example: *Amphioxus* (Fig 3.15b)	(e) Examples.: All animals with backbone (Fig. 3.15c)

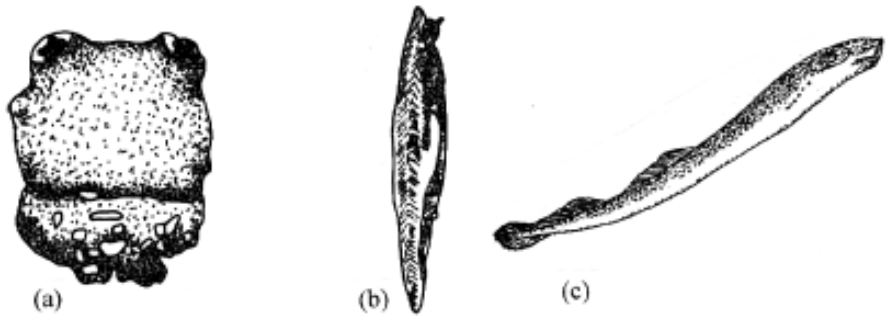

Fig. 3.15 Chordates (a) *Herdmania* (b) *Amphioxus* (c) *Petromyzon*

The subphylum vertebrata has 2 super classes Agnatha (jawless vertebrate) and Gnathostomata (jawed vertebrata)

Super-class Agnatha (A, no ; Gnathos : jaw) (jawless vertebrates)	Super-class Gnathostomata (jawed vertebrates)
Class : Cyclostomata	Class (1): Chondrichthyes
(Cyclo = circular, Stoma = mouth)	Class (2): Osteichthyes
– no jaws	Class (3): Amphibia
– 7 pairs of gill-slits	Class (4): Reptilia
– no paired fins	Class (5): Aves
– eg. Petromyzon (Lamprey) (Fig. 3.15)	Class (6): Mammalia

The two classes of fish include the cartilaginous and bony fish. Fishes are aquatic animals, gill breathing and move with the help of scales.

Class 1. Chondrichthyes

(Gk, Chondro = cartilage; ichtyes = fish)

– mouth ventral
– tail heterocercal
– Skeleton cartilaginous
– Five to seven pairs of gills
– Operculum (gill cover) absent

Example: *Scoliodon* (*dog-fish*) (Fig 3.16a)

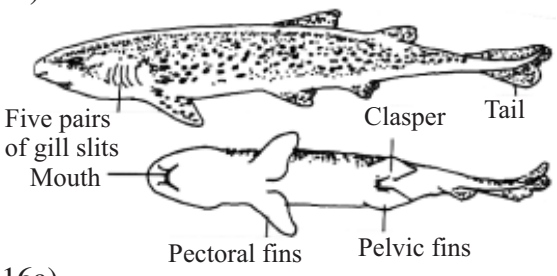

Fig. 3.16a Scoliodon

Class 2. Osteichthyes

(os = bone; ichthyes = fish)

– Mouth terminal
– Tail homocercal
– Skeleton bony
– Four pairs of gills
– Operculum present

Example : *Labeo* (Rohu) (Fig. 3.16b)

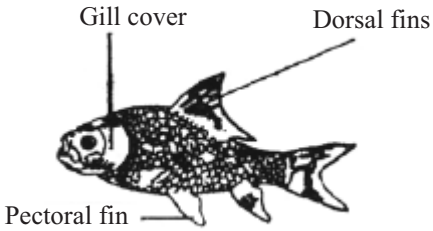

Fig. 3.16b Labeo

INTEXT QUESTIONS 3.6

1. Name the following
   (i) The category of animals possessing backbone.

   .....

   (ii) The group of backboned animals but having no jaws.

   .....

   (iii) Any one cartilaginousfish.

   .....

2. State one difference between cartilaginous and bony fishes.

   .....

3. Name one bony fish.

   .....

4. List the three main characters of the phylum Chordata.

   .....

Class 3 : Amphibia (amphi: double or both, "bios" : life referring to life on land as well as in water)

Main characters:

– The animal partly live in water and partly on land.

– Skin smooth or rough, rich in glands.

– Two pairs of limbs; pentadactyl (five-fingered), digits without claws.

– Body with distinct head and trunk, no neck.

– Two nostrils opening into the buccal cavity.

– Tympanum present on surface of body wall.

– Eggs are laid in water.

– In the early stage of life (larvae), they breathe by means of gills, but adults breathe by lungs.

– Heart three-chambered.

– Larval stage tailed and aquatic.

Some are tailed (salamander) and some are tailless (Frog, Toad)

Examples : *Salamandra*, *Proteus* (Fig. 3.17a), *Rana* (Frog, Bufo Toad (Fig. 3.17b) *Ichthyophis* (Fig. 3.17c)

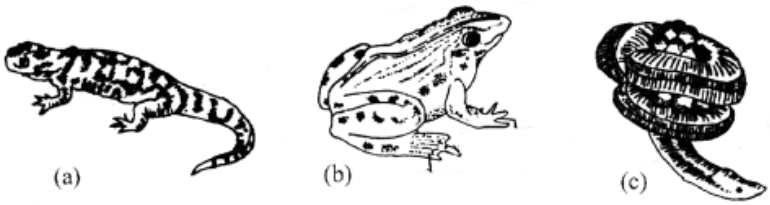

Fig. 3.17 *Amphibian* (a) *Salamandra* (b) Frog (c) *Ichthiophis*

INTEXT QUESTIONS 3.7

1. How many chambers are there in an amphibian heart?

   .....

2. Name one tailless amphibian.

   .....

3. What is the literal meaning of the term "amphibia".?

   .....

Class 4 : Class Reptilia (reptere: to crawl) : are four-legged or legless crawling animals whose body is covered by scales. they lay eggs on land

Characteristic features:

- Terrestrial (live on land), or some are aquatic (live in water).
- Body covered with horny scales.
- Skin is dry.
- Paired pentadactyl limbs (absent in snakes) with clawed digits.
- Tympanum small and depressed (absent in snakes).
- Respiration by lungs.
- Heart three-chambered but with a partially divided ventricle (4- chambered in crocodiles).
- Their eggs have leathery shell.

Examples : Tortoise, turtles, garden lizard (calotes) wall lizard (*Hemidactylus*), cobra (*Naja naja*) and crocodile (*Crocodilus*) and Gharial (*Gravialis*)

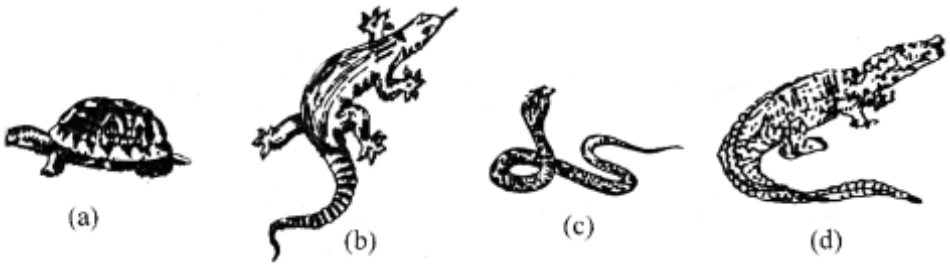

Fig. 3.18 Reptiles (a) Turtle (b) Wall lizard (c) Cobra (d) Crocodile

Class (5) Class : Aves (avis = Bird)

Characteristic features:

- Warm-blooded (homoiothermal, also called endothermal i.e. body temperature remains constant).
- Body covered with feathers, scales are present only on hind-limbs
- Body is divisible into three parts: head, neck and trunk.
- Jaws with horny beak, no teeth.
- Hind-limbs with four digits adapted for perching, walking or swimming
- Bones with air spaces to make the skeleton light (pneumatic bones).
- Forelimbs modified into wings for flight.
- Heart 4-chambered, lungs for respiration connected with air-sacs.
- Voice-box or **syrinx** (present at the junction of trachea and bronchi).
- Only left ovary and oviduct present in the females (economy in body weight.)
- All oviparous (lay eggs), egg with much yolk and calcareous shell.

Example : *Struthio* (Ostrich), *Abteryx* (Kiwi), *Pavo* (Peacock) *Columba*, (Pigeon), Corvus (Crow), etc. (Fig. 3.19).

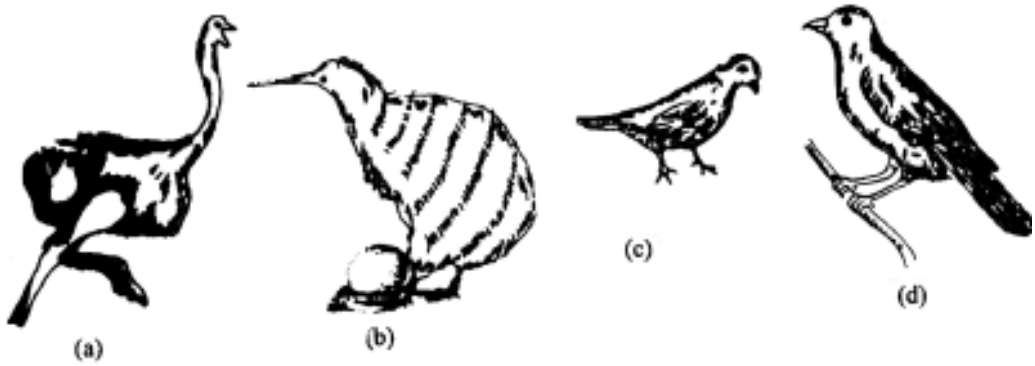

Fig. 3.19 Aves (a) Ostrich (b) Kiwi (c) Pigeon (d) Crow

INTEXT QUESTIONS 3.8

1. Name an aquatic reptile.

   .....

2. How many chambers are there in the heart of a:

   (i) lizard; .....

   (ii) crocodile .....

3. What is the voice box in birds called?

   .....

Class (VI) Mammalia (Mamma : breast)

Characteristic features:

- Body covered with hair.
- Presence of milk (Mammary) glands.
- Sweat and oil glands present in the skin.
- Body divisible into head, neck, trunk and tail; tail absent in some.
- Projecting external ears (pinna) present.
- Digits usually ending in claws, nails or hoofs.
- Dentition thecodont (teeth in sockets of jaw bones) and generally heterodont (four different types).
- Seven neck vertebrae
- Homoiothermal, warm blooded and heart four-chambered.
- Testes are extra-abdominal (not within abdominal cavity) contained in scrotal sacs
- Viviparous, give birth to the young, some primitive mammals are oviparous (lay eggs).
- Foetus is nourished by mother through placenta.

Classification of Class Mammalia

1. Sub-class Prototheria	2. Sub-class Metatheria	3. Sub-class Eutheria
(a) No external ear.	(a) External ear present.	(a) External ear well developed
(b) Teeth found only in young	(b) teeth found in both young and adults	(b) Teeth present in young as well as adults.
(c) Placenta absent	(c) No placenta for nourishment to the embryo	(c) Placenta is present
(d) Mammary glands are devoid of nipples	(d) Mammary glands present	(d) Mammary glands present
(e) Females are oviparous. Example: Duck-bill platypus (Ornithorhynchus) (Fig. 3.20a)	(e) Immature young ones are born. Marsupium (pouch) is present in females Example: Kangaroo (Macropus) (Fig. 3.20b)	(e) Mature young ones are born (For further classification and examples, see below).

Fig. 3.20 (a) Duck-billed Platypus (b) Kangaroo

Birds and mammals have a constant body temperature. The are termed homoiothermal.

Sub-class Eutheria has been divided into a number of orders. Some important ones are as follows:

Order 1 : Rodentia

– Herbivorous and terrestrial.
– Incisors long, sharp and chisel-shaped.
– Forelimbs shorter than the hindlimbs.

Example: Rat, Squirrel (Fig. 3.21).

Fig. 3.21 Squirrel

Order 2 : Cheiroptera:

– These are flying mammals.
– Fore-limbs adapted for flight.
– Skin folded i.e. patagium works as wing.
– Hind-limbs thin and short.
– Nocturnal (active at night).
– Bats have poor eyesight. They avoid colliding against objects by **echolocation** in which the bat emits supersonic waves which are reflected back from the objects and the bat can perceive the reflected waves to determine the position of the object. The method is very similar to radar.

Example- Bat (Fig. 3.22)

Fig. 3.22 Bat

Order 3. Carnivora

– Flesh-eating mammals.
– Large pointed and sharp canines to tear the flesh.
– Fingers with sharp claws.

Example: Lion, Tiger, Cat, Dog (Fig. 3.23).

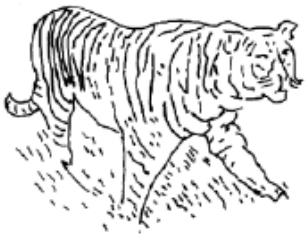

Fig. 3.23 Tiger

Order 4. Primates

– Highly developed brain.
– Eyes are set forward in the head to provide binocular (depth-perception) vision

– The neck is mobile.
– Limbs have five digits with flat nails.
– The thumb of the hand and the greater toe of the feet are opposable (for grasping)
– Two thoracic mammae (breasts) present.

Example: Monkey, Apes, Man (Fig. 3.24).

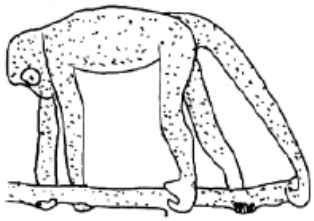

Fig. 3.24 Monkey

Order 5. Cetacea

– Aquatic.
– Fore-limbs are changed into paddles.
– No neck.
– Fish-like shape but respiration by lungs.

Example: whale (Fig. 3.25)

Fig. 3.25 Whale

Order 6. Proboscidea

– Large, herbivorous, terrestrial.
– Fusion of upper lip and nose to form a long mobile trunk.
– Only one pair of incisors in upper jaw which form huge tusks in males.

Example: Elephant (Fig. 3.26).

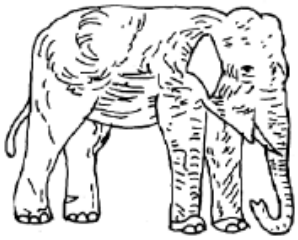

Fig. 3.26 Elephant

Order 7. Ungulata

– Hoofed mammals.
– Herbivorous.
– Usually domesticated by man.
– Mammae are abdominal with teats.

Example: Deer, Cows, Sheep (Fig. 3.27)

Fig. 3.27 Deer

INTEXT QUESTIONS 3.9

1. Match the items in Column I with those in Column II

Column I	Column II
(i) Humans	(a) Carnivora
(ii) Platypus	(b) Ungulata
(iii) Tiger	(c) Primates
(iv) Whale	(d) Prototheria
(v) Horse	(e) Metatheria
(vi) Kangaroo	(f) Cetacea

2. Name the Group of Mammals which includes
   (i) Egg-laying mammals .....
   (ii) Pouched mammals .....
   (iii) Flesh-eating mammals .....
   (iv) Aquatic mammals .....
   (v) Flying mammals .....
3. For which characteristic feature are certain animals placed in class mammalia?

   .....
4. Name a mammal which has marsupium.

   .....
5. Which group of chordates possesses hair?

   .....

WHAT YOU HAVE LEARNT

- Animals are multicellular eukaryotes with heterotrophic nutrition, locomotion and sensitivity through nervous system.
- They may be at cellular grade of organisation (Phylum Porifera), tissue grade (Phylum Cnidaria) or organ grade of organisation (other animal phyla).
- Their body may be asymmetrical (Porifera), radially symmetrical (Cnidaria), or bilaterally symmetrical (other animal phyla).
- Kingdom Animalia is divided into two groups: Non-chordates and Chordates.
- Non-chordates are included in three sub phyla Urochordata, Cephalo-chordata and Vertebrata. Vertebrata has super classes-Agnatha (Jawless) and Gnathostomata (possessing jaws).
- Gnathostomata includes six classes – Chondrichthyes (cartilaginous fishes), Osteichthyes (bony fishes), Amphibia (frog), Reptilia (lizard) Aves (birds) and Mammalia (rat)
- Porifera are characterised by ostia, osculum, spongocoel and canal system.
- Cnidaria have cnidoblasts (stinging cells), coelenteron and the polyp and medusoid forms.
- Platyhelminthes (flat worms) include some free-living but mostly parasites like tapeworm and liver fluke.
- Class Nematoda of phylum Aschelminthes includes roundworms.
- Annelida (Earthworms) show metameric segmentation and have nephridia.
- Arthropods have jointed appendages and chitinous cuticle as their exoskeleton.
- Mollusca includes soft-bodied animals covered by a calcareous shell.

- Echinodermata includes spiny-skinned, marine animals which have tube feet for locomotion.
- Chordates have (i) a notochord (ii) a dorsal hollow nerve cord and (iii) gill slits at some stage of the life.
- Amphibians live on land as well as in water. Their limbs have no claws.
- Reptiles have horny scales covering the body. They are mostly terrestrial.
- Class Aves includes birds–the flying vertebrates with forelimbs modified into wings.
- Mammals possess hair and mammary glands which secrete milk to feed the young ones.
- Kingdom Plantae is classified into two divisions i.e. Bryophyta and Trachaeophyta.
- Bryophytes are amphibians of plant kingdom and are non-vascular.
- Main plant body of Bryophytes is a gametophyte; sporophyte remains attached to gametophyte.
- The main plant body of Pteridophytes is a sporophyte.
- All groups of Plantae show alternation of generations
- Gymnosperms and Angiosperms are seed-producing plants.
- In Gymnosperms seeds are naked, whereas in Angiosperms seeds are enclosed in ovary.
- Main difference between dicotyledonous and monocotyledonous plants is number of cotyledons in the embryo.
- Brassicaceae and Fabaceae are dicot families, whereas Poaceae and Liliacea, are monocot families.

TERMINAL EXERCISES

1. List the main groups of Kingdom Plantae.
2. Give the two main types of Bryophytes.
3. Differentiate between gametophyte and sporophyte.
4. Define alternation of generations.
5. Why are Pteridophytes grouped under Trachaeophyta?
6. Differentiate between Angiosperms and Gymnosperms.
7. Give three main differences between dicot and monocot plants.
8. Name three families of Angiosperms giving one character of each family.
9. Define an animal.
10. With examples name (i) the three kinds of symmetry and (ii) the three grades of organisation met within the Kingdom Animalia.

11. Explain the term triploblastic.
12. Name the major non-chordate phyla. Give one characteristic feature and one example of each.
13. Give one major difference between
    (i) Cyclostomes and other fishes
    (ii) Chondrichthyes and Osteichthyes, Cite examples.
14. Why are frogs included in the class Amphibia?
15. Give two characteristic features of reptiles. Cite examples of five reptiles
16. Give three features of birds which adapt them to aerial life and give two examples of flightless birds.
17. Give three features of mammals and one difference between Prototheria, Metatheria and Eutheria.
18. Name any five orders of Mammalia, Give one characteristic feature and one example of each.

ANSWERS TO INTEXT QUESTIONS

3.1 1. They complete their life cycle in water and land.

2. Alternation of gametophytic phase with sporophytic phase.

3. Antheridia and Archegonia

4. Cool and humid place.

3.2 1. Sporophytic 2. Sporophyte 3. They have vascular tissues

4. Antheridia and Archegonia 5. Prothallus

3.3 1. Naked seeds 2. *Cycas* and *Pinus* 3. Timber, resins

3.4 1. Fabaceae, Poaceae. 2. 10, infinite

3. (i) *Oryza sativa* (ii) *Cajanus cajan* (iii) *Aloe barbadumins*

4. In the Ovary after fertilization

3.5 1. Cnidaria 2. Cetae 3. No

4. (i) 3 (ii) 4 (iii) 3

5. Tube feet 6. Prawn, Millipede or any other

7. (i) Echinodermata (ii) Cnidaria

(iii) Arthropoda (iv) Arthropoda

(v) Annelida (vi) Platyhelminthes

3.6 1. (i) Vertebrata (ii) Agnatha (iii) Scoliodon

2. Endoskeleton bony in bony fishes and cartilaginous in cartilaginous fishes

or

5 to 7 pairs of gills in cartilaginous fishes and 4 pairs in bony fishes.

3. *Labeo, Catla.*

4. 1. notochrod at some stage of life

2. dorsal tubular nerve cord

3. gill slits at some stage of life.

3.7 1. Three 2. Ichthyophis

3. Can live both, in water and on land.

3.8 1. Turtle, seasnake 2. Three and four

3. Syrinx

3.9 1. (i) and c (ii) and d (iii) and a (iv) and f

(v) and b (vi) and e

2. (i) Prototheria (ii) Metatheria (iii) Carnivora

(iv) Cetacea (v) Cheiroptera

3. Mammary or milk glands 4. Kangaroo

5. Mammalia