04

Animal Kingdom

Quick Revision

- Animals are multicellular, heterotrophic, eukaryotes who exhibit different patterns of organisation of several types of cells.

Classification of Animals

Broadly kingdom–Animalia is classified as follows

I. Non-chordates

The non-chordates include the following phyla

1. Phylum–Porifera

- It includes sponges, which are usually marine and mostly asymmetrical animals with canal system as most important feature.
- Central cavity present in sponges is known as **spongocoel**, it is lined by collar cells or **choanocytes** and it opens to outside by **osculum**.
- Water enters the spongocoel through minute pores called **ostia** and moves out through osculum.
- The body is supported by **spicules** or **spongin** and protein fibres, which form skeletal system.
- They are **hermaphrodites**, i.e. both male and female gametes are produced within same individual. Fertilisation is internal and development is indirect.
- Sponges reproduce asexually by fragmentation and sexually by gamete formation. Larval forms are morphologically distinct form adults, e.g. *Sycon*, *Spongilla* and *Euspongia*.

2. Phylum–Cnidaria (Coelenterata)

- It consists of aquatic, mostly marine, sessile, radially symmetrical animals having tissue level organisation.
- Tentacles are either present over the mouth or around their body edges. Cells called **cnidoblasts** or **cnidocytes** are present on the tentacles and the body. These cells are used for anchorage, defense and capture of prey.
- A central gastrovascular cavity (coelenteron) with a single opening, mouth on **hypostome** is present.
- Some cnidarians, e.g. **corals**, have skeleton composed of $CaCO_3$.
- They show polymorphism with two basic body plans, i.e. **polyps** are fixed, sessile, cylindrical, e.g. *Hydra*, *Adamsia,* etc., and **medusae** are umbrella-shaped and free-swimming, e.g. *Aurelia*.
- The cnidarians exist in both forms and exhibit alternation of generation (metagenesis), i.e. polyps produce medusae asexually and medusae produce polyps sexually (e.g. *Obelia*).

3. Phylum–Ctenophora (Comb jellies or Sea walnuts)

- These are exclusively marine, diploblastic, radially symmetrical, acoelomate organisms with tissue level of organisation.
- Body is soft, transparent and gelatinous with well-marked **bioluminescence** (the property of a living organism to emit light).
- Eight external rows or ciliated **comb plates** help in locomotion.
- Digestion is both extracellular and intracellular.

- These are sexually reproducing, monoecious organisms with external fertilisation and indirect development, e.g. *Ctenophora* and *Pleurobrachia*.

4. Phylum–Platyhelminthes (Flatworms)

- These are dorsoventrally flattened, bilaterally symmetrical, triploblastic and acoelomate animals. They are mostly endoparasites and show organ level of organisation. Hooks and suckers are present in parasitic forms.
- They have specialised cells for excretion and osmoregulation called **flame cells**.
- They possess a high regeneration capacity. Fertilisation is internal and development is through many larval stages, e.g. *Planaria*, *Taenia* (tapeworm) and *Fasciola* (liver fluke).

5. Phylum–Aschelminthes (Roundworms)

- They are bilaterally symmetrical, triploblastic and pseudocoelomate animals with the body being circular in cross-section.
- They are free-living, aquatic, terrestrial or parasitic forms.
- They are **dioecious** (separate sexes) and show internal fertilisation with indirect/direct development. Females are often longer than males.
- Alimentary canal is complete with a well-developed **muscular pharynx**.
- Excretion is through excretory pore. Fertilisation is internal and development may be direct or indirect, e.g. *Ascaris* (roundworm), *Wuchereria* (filaria worm) and *Ancylostoma* (hookworm).

6. Phylum–Annelida (Segmented worms)

- They are triploblastic show organ level of body organisation and are bilaterally symmetrical.
- They show metameric segmentation, i.e. body surface is distinctly marked out into **segments** or **metameres**.
- Locomotion is aided by longitudinal and circular muscles. In *Nereis*, swimming is achieved by lateral appendages called **parapodia**.
- Respiration is through skin or gills, circulatory system is closed and digestive system is complete.
- Excretion and osmoregulation is through **nephridia**. Both dioecious, e.g. *Nereis* and monoecious forms, e.g. *Pheretima* (earthworm) and *Hirudinaria* (leech) occur.
- Neural system consists of paired ganglia connected by lateral nerves to a double ventral nerve cord.
- They reproduce sexually.

7. Phylum–Arthropoda

- **Largest phylum** of kingdom– Animalia, includes insects.
- They are triploblastic, segmented, bilaterally symmetrical and coelomate animals. Body is covered by chitinous exoskeleton.
- Body consists of **head**, **thorax** and **abdomen**.
- They possess **jointed appendages**.
- Circulatory system is open type, forming a **haemocoel**.
- Sensory organs like antennae, eyes, statocysts or balancing organs are present.
- Respiratory system shows diverse range, e.g. gills, trachea, book lungs, general body surface and book gills, e.g. *Apis*, *Culex*, *Limulus* (a living fossil), etc.
- Excretion takes place through **Malpighian tubules**.
- Fertilisation is internal with direct or indirect development. Mostly dioecious.

8. Phylum–Mollusca

- It is the **second largest** phylum.
- These are terrestrial or aquatic, mostly marine and some are freshwater.
- These are bilaterally symmetrical, triploblastic and coelomate animals.
- Body is unsegmented and covered by a calcareous shell. It consists of a distinct **head**, **muscular foot** and **visceral hump**. The space between hump and mantle is called **mantle cavity** in which feather like gills are present.
- They have respiratory and excretory functions. The anterior head region has sensory tentacles.
- Feeding is performed through **radula**. Circulation is open type, excretion through metanephridia pair.
- Sexes are separate and are mostly oviparous, e.g. *Octopus*, *Pila*, *Sepia*.
- They are usually dioecious and oviparous with indirect development.

9. Phylum–Echinodermata

- It have an endoskeleton of calcareous ossicles and exoskeleton of chitinuous spicules.
- They are radially (pentamerous) symmetrical at adult stage and bilaterally symmetrical at larval stage.
- They are triploblastic and coelomate animals.
- **Water vascular system** is present, which helps in locomotion, capture and transport of food and respiration.
- Complete digestive system is present and an excretory system is absent.
- Sexes are separate and reproduction is sexual with indirect development and free-swimming larvae, e.g. *Asterias* (starfish), *Echinus* (sea urchin), *Cucumaria* (sea cucumber).

10. Phylum–Hemichordata
(Half chordates)

- These are bilaterally symmetrical, triploblastic and coelomate worm-like marine animals.
- Body is cylindrical and is divided into **proboscis**, **collar** and **trunk**. Notochord is absent. But a similar structure called stomochord is present in the collar region.
- Excretion occurs through proboscis gland, circulation is open type and respiration occurs through gill slit pairs.
- Sexes are separate, fertilisation is external and development is indirect.
- Connecting link between echinoderms and chordates, e.g. *Balanoglossus,* etc.

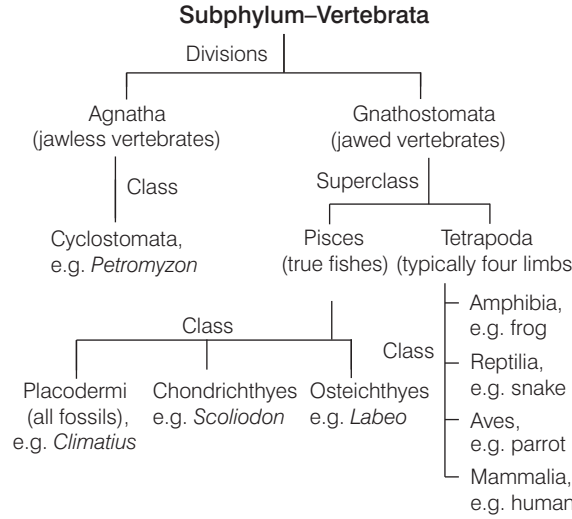
II. Phylum–Chordata

These have **notochord**, **dorsal hollow nerve chord, paired pharyngeal gill slits** and post-anal tail at some stages of life. They are divided into following subphyla

1. **Urochordata** (tunicates) Notochord is present only in larval tail, e.g. *Herdmania*.
2. **Cephalochordata** (lancelets) Notochord persists throughout life and extends from head to tail, e.g. *Branchiostoma*.

Note *Urochordata and Cephalochordata are often referred to as* ***Protochordata***.

3. **Vertebrata** (vertebrates) Notochord replaced by vertebral column in adults.



- **Some Major Classes of Vertebrates**
  Characteristic features of some major classes of subphylum– Vertebrata are as follows

1. Class – Cyclostomata

- These are ectoparasites on some fishes and their body have 6-15 pairs of **gill slits**.
- Sucking and circular mouth without jaws. These possess suctorial tongue that bears horny teeth.
- Cranium and vertebral column are cartilaginous.
- They die after spawing and their larvae return to ocean after metamorphosis, e.g. lamprey, hagfish.

2. Class–Chondrichthyes

- These are cartilaginous fishes.
- **Notochord** is well-developed and **persists** throughout life.
- Mouth is on the ventral side and teeth are modified **placoid scales**.
- Heart two-chambered, ureotelic animals, sexes are separate, males usually have claspers for copulation, e.g. sharks (*Carcharodon* and *Sphyrna*), sting rays (*Trygon*), etc.
- Some have **electric organs** (e.g. *Torpedo*) and others have **poison sting** (e.g. *Trygon*). They are poikilothermous (cold blooded, i.e. they lack the capacity to regulate their body temperature)

animals. Possess uncovered gills and five pairs of gill slits and tough skin containing minute placoid scales.
- Some are predaceous (e.g. sharks).
- Sexes are separate and fertilisation is internal. Many are viviparous, e.g. *Carcharodon, Sphyrna,* etc.

3. Class–Osteichthyes
- These are marine as well as freshwater bony fishes.
- Four pairs of filamentous gills, covered by **operculum** (gill cover) are present. Exoskeleton with **cycloid** or **ctenoid** scales.
- They contain **air bladder** that regulates buoyancy.
- Heart is two-chambered and mostly of these are ammonotelic.
- Sexes are separate and development is direct. Mostly they are oviparous.
- Fertilisation is external, e.g. *Labeo*, *Catla*, *Clarias*, etc.

4. Class–Amphibia
- These are the first terrestrial organisms and can live in both aquatic and terrestrial habitats. These are poikilothermic, ectothermic or cold-blooded.
- Body is divided into **head** and **trunk**. Tail may be present in some.
- Heart is three-chambered. These have mesonephric kidneys and mostly are ureotelic.
- Alimentary canal, urinary and reproductive tracts open into **cloaca**.
- Respiration occurs by gills, lungs, lining of buccopharyngeal cavity and moist skin, either, separately or in combination.
- **Tympanum** represents the ear.
- The eyes have eyelids. Fertilisation is external. These are oviparous and the development is indirect, e.g. *Salamandra, Rana* (Frog).

5. Class–Reptilia
- They show creeping or crawling movements and are mostly terrestrial.
- They are poikilothermic, exothermal or cold-blooded animals.
- Body covered by dry, epidermal and cornified **scutes** or **scales** and their skin lacks glands.
- Kidney is metanephric. Crocodiles are ammonotelic, turtles and alligators are ureotelic and lizards and snakes are uricotelic.
- Bony endoskeleton, well-developed digestive system, respiration through lungs (in turtles through cloaca), heart is three-chambered (except in crocodiles that have four- chambered heart).
- Sexes are separate and fertilisation is internal. They are oviparous and show direct development, e.g. *Chameleon, Gavialis.*

6. Class–Aves
- These animals are characterised by the presence of **feathers** that act as insulator and help in flight. Body is streamlined.
- They possess **beak** and forelimbs are modified into **wings**.
- They are endothermal and warm-blooded (**homoiothermous**) animals.
- Bony endoskeleton, feathery exoskeleton metanephric kidneys and have pneumatic bones (with air cavities).
- Digestive tract contains crop and gizzard. Heart is four-chambered and respiration occurs through lungs. These are uricotelic and have a special voice producing organ called syrinx.
- Sexes are separate. Fertilisation is internal. They are oviparous and show direct development, e.g. crow, pigeon.

7. Class–Mammalia
- These are characterised by the presence of milk producing **mammary glands** and give birth to young ones, i.e. show viviparity.
- They have two pairs of limbs and are adapted to fly (bat) or live in water (whale) or are terrestrial (horse, camel and human).
- They are homoiothermal and the skin is covered with **hairs** and have external ears or **pinnae**.
- Body is divisible into head, neck, trunk and tail. The heart is four-chambered and respiration occurs through lungs.
- Sexes are separate, fertilisation is internal and developmnent is direct, e.g. platypus, kangaroo, camel, etc.

Objective Questions

Multiple Choice Questions

1. In most simple type of canal system of Porifera, water flows through which one of the following way?

(a) Ostia → Spongocoel → Osculum → Exterior
(b) Spongocoel → Ostia → Osculum → Exterior
(c) Osculum → Spongocoel → Ostia → Exterior
(d) Osculum → Ostia → Spongocoel → Exterior

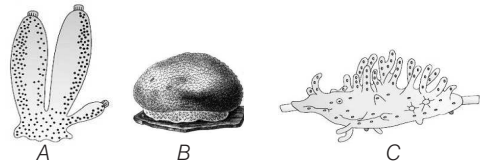
2. In case of poriferans, the spongocoel is lined with flagellated cells called

(a) ostia
(b) oscula
(c) choanocytes
(d) mesenchymal cells

3. The skeleton of animals belonging to phylum–Porifera are made up of

(a) spicules (b) spiracles
(c) calcareous shells (d) keratin fibres

4. Examine the figures *A, B* and *C*. In which one of the four options, all the animals (poriferans) are correct?



(a) A–*Sycon*, B–*Euspongia*, C–*Spongilla*
(b) A–*Euspongia*, B–*Spongilla*, C–*Sycon*
(c) A–*Spongilla*, B–*Sycon*, C–*Euspongia*
(d) A–*Euspongia*, B–*Sycon*, C–*Spongilla*

5. Which of the following is not true regarding phylum– Coelenterata?

(a) They are diploblastic animals
(b) They have cellular level of organisation
(c) They have nematocyte cells present on the tentacles
(d) The gastrovascular opening is called the hypostome

6. Metagenesis is observed in

(a) *Hydra* (b) *Sycon*
(c) *Obelia* (d) *Adamsia*

7. Body forms present in cnidarians are

(a) cylindrical and umbrella-shaped
(b) corals and coral reefs
(c) polyp and medusa
(d) cnidoblasts and nematocysts

8. Choose the correct option for the following diagram.

(a) It represents choanocyte in Porifera
(b) It represents cnidoblasts in Platyhelminthes
(c) It represents cnidoblast in Coelenterata
(d) It represents choanocyte in Coelenterata

9. Match the animals in Column I with common names in Column II and choose the correct option from the codes given below.

	Column I		Column II
A.	*Obelia*	1.	Portuguese man of war
B.	*Meandrina*	2.	Sea fan
C.	*Gorgonia*	3.	Sea fur
D.	*Physalia*	4.	Brain coral

Codes

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

10. Comb jellies is the name given to phylum
(a) Echinodermata (b) Ctenophora
(c) Annelida (d) Mollusca

11. Identifying feature of phylum–Ctenophora is
(a) the presence of comb plates and appearance like jellies
(b) the presence of comb plates only
(c) the presence of tentacles only
(d) alternation of generations only

12. Bioluminescence is a characteristic feature of phylum
(a) *Ctenoplana* (b) Coelenterata
(c) Ctenophora (d) Mollusca

13. Reproduction in *Ctenoplana* takes place by
(a) budding
(b) sexual reproduction
(c) binary fission
(d) multiple fission

14. The level of organisation in Platyhelminthes is
(a) cellular level (b) tissue level
(c) organ level (d) organ system level

15. Match the following columns.

	Column I (Specialised cells or parts)		**Column II** (Animal phyla)
A.	Choanocytes	1.	Platyhelminthes
B.	Cnidoblasts	2.	Ctenophora
C.	Flame cells	3.	Porifera
D.	Comb plates	4.	Coelenterata

Codes

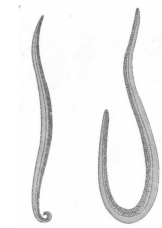
	A	B	C	D
(a)	2	1	4	3
(b)	2	4	1	3
(c)	2	1	3	4
(d)	3	4	1	2

16. Platyhelminthes have hooks and suckers and act as an endoparasite on other animals.
(a) True
(b) False
(c) Cannot say
(d) Partially true or false

17. Aschelminthes are usually
(a) dioecious (b) hermaphrodites
(c) metagenic (d) coelomates

18. Identify the correct statement describing *Wuchereria*?
I. Triploblastic with the presence of an excretory pore.
II. Presence of a muscular pharynx.
III. Cellular level of organisation.
IV. Males longer than females.
(a) II and III (b) I and IV
(c) I and II (d) III and IV

19. Identify the given diagram of the animal and select the correct option which includes the correct features of that animal?



(a) *A* is ♀ *Ascaris* and *B* is ♂ *Ascaris*. Male *Ascaris* is smaller than female *Ascaris*
(b) A is ♂ *Ascaris* and *B* is ♀ *Ascaris*. Posterior terminal of male is curved while in ♀ *Ascaris*, it is straight
(c) *A* is ♂ *Ascaris* and *B* is ♀ *Ascaris*. Male *Ascaris* is more longer than female *Ascaris*
(d) *A* is ♀ *Ascaris* and *B* is ♂ *Ascaris*. ♀ *Ascaris* has curved posterior end while in ♂ *Ascaris*, it is straight

20. The phylum–Annelida derived its name due to
(a) more organs are placed towards anterior part of the body
(b) the presence of antenna
(c) the presence of nephridia
(d) the presence of metameres

21. Identify the incorrect statement(s) for the phylum-Annelida.
I. They show metameric segmentation.
II. They have both monoecious and dioecious animal representatives.
III. Excretory system consists of flame cells.
IV. They do not have asexual reproduction.
(a) I and II (b) II and IV (c) only III (d) I, III and IV

22. Members of phylum–Annelida have
(a) Nephridia – Excretion
(b) Parapodia – Swimming
(c) Double ventral nerve cord – Neural system
(d) All of the above

23. The animals belonging to phylum–Annelida use the following in locomotion.
(a) Nephridia and nephridial pores
(b) Longitudinal and circular muscles
(c) Organs of bursa
(d) Spicules and ostia

24. Consider the following statements.

I. Triploblastic, bilateral symmetry.
II. Metamerically segmented and coelomate animals.
III. Dioecious
IV. Closed circulatory system.
V. Lateral appendages.
VI. Annelida
Which of the following information belongs to the given figure?
(a) I, II, IV and VI (b) I, III, IV and V
(c) I, III, IV and V (d) III, IV, V and VI

25. Arthropoda is the second largest phylum of kingdom–Animalia.
(a) True
(b) False
(c) Cannot say
(d) Partially true or false

26. Which one of the following features is not present in the phylum–Arthropoda?
(a) Metameric segmentation
(b) Parapodia
(c) Jointed appendages
(d) Chitinous exoskeleton

27. The option that is not the respiratory organ of phylum–Arthropoda is
(a) tracheal system
(b) gills
(c) water vascular system
(d) book lungs

28. Malpighian tubules are
(a) excretory organs of insects
(b) excretory organs of frog
(c) respiratory organs of insects
(d) endocrine glands of insects

29. Mark which statement is incorrect regarding to the phylum–Arthropoda?
I. Open type of circulatory system.
II. Bilaterally symmetrical, coelomate animals.
III. Diploblastic with head, thorax and abdomen.
IV. Presence of Malpighian tubules and antennae.
(a) II and III (b) I, II and III
(c) Only III (d) II and IV

30. The body of organisms belonging to phylum–Mollusca is divided into
(a) head, thorax and abdomen
(b) head, muscular foot and abdomen
(c) head, thorax, visceral hump and muscular foot
(d) head, muscular foot and visceral hump

31. What is true about Mollusca?
(a) The presence of metameric segmentation
(b) The presence of mantle cavity and coelomic cavity
(c) The presence of tissue level of organisation
(d) The presence of chitinous exoskeleton

32. Choose the incorrect option for phylum–Mollusca.
(a) Body is covered by a calcareous shell and unsegmented
(b) Feather-like gills present for excretion and respiration
(c) The anterior head region has sensory tentacles
(d) Mostly terrestrial, triploblastic and acoelomates

33. The organ that enables feeding in phylum–Mollusca is
(a) ctenidia
(b) undulating membrane
(c) ganglia
(d) radula

34. The nature of exoskeleton in echinoderms is
(a) calcareous (b) chitinous
(c) siliceous (d) tunicin

35. Which of the following is not a correct identification or characteristic feature of the organism depicted below in the diagram?

(a) The organism illustrated in the figure is *Ophiura* (brittle star)
(b) They are exclusively in marine waters
(c) The adults are radially symmetrical, but larvae are bilaterally symmetrical
(d) They are triploblastic, coelomate and segmented animals

36. Match the following columns.

	Column I (Phylum)		**Column II** (Characteristic features)
A.	Aschelminthes	1.	Water vascular system
B.	Annelida	2.	Muscular pharynx
C.	Arthropoda	3.	Jointed appendages
D.	Echinodermata	4.	Metameres

Codes

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

37. Scientific name of starfish is
(a) *Echinus* (b) *Limulus*
(c) Echidna (d) *Asterias*

38. The notochord-like structure of hemichordates is called
(a) proboscis (b) pyloric
(c) protochord (d) stomochord

39. Select the feature(s) which is/are present in hemichordates.
(a) Stomochord
(b) Worm-like body
(c) Gills
(d) All of the above

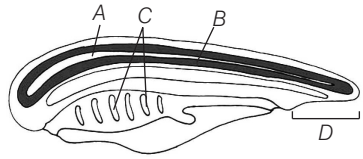
40. The body of *Balanoglossus* is divided into
(a) head and trunk
(b) head, neck and abdomen
(c) proboscis, collar and trunk
(d) prosoma, mesasoma and metasoma

41. The correct classification of given animal is

(a) Chordata – Vertebrata – Craniata
(b) Chordata – Craniata
(c) Chordata – Acraniata
(d) Non-chordata – Hemichordata

42. All chordates have the following characteristics.
(a) Bilaterally symmetrical, presence of coelom, triploblastic, open circulatory system
(b) Bilaterally symmetrical, presence of coelom, diploblastic or triploblastic
(c) Open circulatory system, diploblastic or triploblastic, coelom and bilaterally symmetrical
(d) Bilaterally symmetrical, coelom present, triploblastic with closed circulatory system

43. Animals belonging to phylum–Chordata are fundamentally characterised by the presence of structure noted as *A, B, C* and *D*. Identify *A, B, C* and *D*.



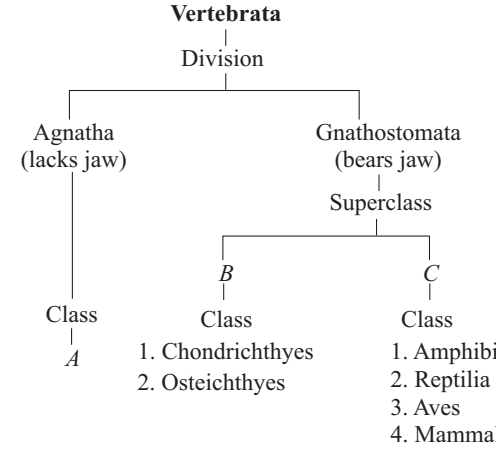
(a) *A*–Notochord, *B*–Nerve cord, *C*–Gill slits, *D*–Post-anal part
(b) *A*–Nerve cord, *B*–Notochord, *C*–Gill slits, *D*–Post-anal part
(c) *A*–Nerve cord, *B*–Notochord, *C*–Post-anal part, *D*–Gill slits
(d) *A*–Nerve cord, *B*–Gill slits, *C*–Notochord, *D*–Post-anal part

44. Phylum–Chordata is divided into subphyla namely
(a) Vertebrata, Protochordata and Urochordata
(b) Urochordata, Gnathochordata, Vertebrata and Cephalochordata
(c) Urochordata, Tunicata and Vertebrata
(d) Tunicata, Cephalochordata and Vertebrata

45. The members of which of the following are often referred as protochordates?
(a) Urochordata (b) Cephalochordata
(c) Both (a) and (b) (d) None of these

46. A set of features observed in chordates
(a) dorsal heart, pharynx perforated by gill slits and dorsal ventral system
(b) ventral heart, presence of post-anal tail and presence of gill slits
(c) ventral heart, absence of notochord, but presence of post-anal part of the tail
(d) dorsal heart, presence of post-anal tail and central nervous system in dorsal

47. The following is the flow chart depicting the divisions of the subphylum–Vertebrata. Fill in the parts *A, B* and *C* and choose the correct option.



	A	*B*	*C*
(a)	Ostracodermi	Pisces	Tetrapoda
(b)	Cyclostomata	Pisces	Tetrapoda
(c)	Ostracodermi	Cyclostomata	Pisces
(d)	Pisces	Tetrapoda	Cyclostomata

48. Which of the following options about the class–Cyclostomata is incorrect?
(a) Cranium and vertebral column are cartilaginous
(b) Elongated body bearing scales and paired fins
(c) Gill slits for respiration
(d) Sucking and circular mouth

49. Chondrichthyes is characterised by tooth shaped
(a) placoid scale with dorsal mouth
(b) ctenoid scale with dorsal mouth
(c) ctenoid scale with ventral mouth
(d) placoid scale with ventral mouth

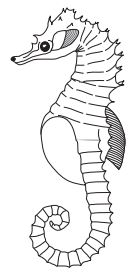
50. Which statement is incorrect about class–Chondrichthyes?
(a) Presence of placoid scales
(b) Absence of air bladder
(c) Presence of cartilaginous endoskeleton
(d) Notochord is persistent only at larval stage, after that it disappears

51. Bony fishes
(a) have external fertilisation
(b) are mostly oviparous
(c) show direct development
(d) All of the above

52. The number of gills present in Osteichthyes is
(a) 2 pairs (b) 6 pairs (c) 5 pairs (d) 4 pairs

53. Buoyancy in a bony fish is maintained with the help of
(a) stream-lined body (b) paired fins
(c) swim bladder (d) All of these

54. Choose the incorrect option for the given figure.



(a) Operculum present
(b) Bony fish
(c) Poisonous sting at tail
(d) Sexes separate

55. A characteristic observed in amphibians
(a) cold-blooded animals
(b) absence of scales
(c) three-chambered heart
(d) All of the above

56. Choose the incorrect option for the following animal.

(a) Cloaca present
(b) Dioecious, external fertilisation, oviparous, indirect development
(c) Body divisible into head and trunk
(d) Eyes are without eyelids

57. The class name–Reptilia refers to
(a) presence of scales or scutes on their body
(b) presence of dry and cornified skin
(c) their creeping or crawling mode of locomotion
(d) None of the above

58. Dry skin with scales or scutes without gland is a characteristic of
(a) Fishes
(b) Reptilia
(c) Amphibia
(d) Aves

59. Crocodile is a reptile with four-chambered heart.
(a) True
(b) False
(c) Cannot say
(d) Partially true or false

60. Features common to the animals belonging to class–Amphibia and class–Reptilia are
(a) presence of scales with internal fertilisation and usually four-chambered heart
(b) presence of tympanum, poikilotherms and usually possess three-chambered heart
(c) presence of cloaca, oviparous and external fertilisation
(d) skin is moist

61. Which one of the following is incorrect for Aves?
(a) Heart is four-chambered and animals are oviparous
(b) The presence of air cavities in bones and the presence of feathers on the body
(c) Digestive tract has additional chambers and animals are homeothermous
(d) The forelimbs are not modified into wings

62. Fill in the blanks with respect to *A*, *B*, *C*, *D*, *E* and *F* with the appropriate option (i) or (ii) for animals belonging to class–Aves.
I. Crop and gizzard are ..... *A* ..... .
II. Forelimbs are modified into wings ..... *B* .... .
III. Scales are ..... *C*..... .
IV. A three-chambered heart is .....*D*..... .
V. Air cavities in bones are ..... *E*.
VI. Lungs are .... *F*..... .
(i)-Absent (ii)-Present

	A	*B*	*C*	*D*	*E*	*F*
(a)	(i)	(ii)	(i)	(ii)	(i)	(ii)
(b)	(ii)	(i)	(ii)	(ii)	(ii)	(ii)
(c)	(i)	(i)	(i)	(ii)	(ii)	(i)
(d)	(ii)	(ii)	(ii)	(i)	(ii)	(ii)

63. The unique character of animals belonging to class–Mammalia is
(a) bipedal locomotion
(b) completely four-chambered heart
(c) the presence of mammary glands
(d) fertilisation is internal

64. Which one of the following is not a mammalian character without exception?
(a) The presence of milk producing gland
(b) They have two pairs of limbs
(c) Skin is unique in possessing hairs
(d) Heterodont type of dentition

65. Which one of the following characteristics is not shared by birds and mammals?
(a) Breathing using lungs
(b) Viviparity
(c) Warm-blooded nature
(d) Ossified endoskeleton

Assertion-Reasoning MCQs

Direction *(Q. Nos. 66-80) Each of these questions contains two statements Assertion (A) and Reason (R). Each of these questions also has four alternative choices, any one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.*
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true, but R is not the correct explanation of A
(c) A is true, but R is false
(d) A is false, but R is true

66. **Assertion** (A) Radial symmetry in animals is advantageous in detecting food and danger.
Reason (R) It allows the animal to be able to respond to stimulus from any direction.

67. **Assertion** (A) Animals that have an exoskeleton, always lack an endoskeleton.
Reason (R) Skeleton cells in the embryonic stage migrate to produce exoskeleton and endoskeleton.

68. **Assertion** (A) Digestion is chiefly extracellular in ctenophores.

Reason (R) In ctenophores, digestive tract is incomplete.

69. **Assertion** (A) *Taenia solium* and *Fasciola* belong to Platyhelminthes.

Reason (R) Platyhelminthes are coelomates.

70. **Assertion** (A) Digested and semi-digested food is absorbed by body surface in tapeworms.

Reason (R) Digestive organs are absent in tapeworms.

71. **Assertion** (A) Tapeworm and roundworm are endoparasites of human intestine.

Reason (R) Contaminated food is the main cause of intestinal infections by Aschelminthes.

72. **Assertion** (A) Aschelminthes are called as pseudocoelomates.

Reason (R) In Aschelminthes, mesoderm is present as scattered pouches in between ectoderm and endoderm.

73. **Assertion** (A) Arthropods are able to survive in adverse conditions.

Reason (R) They have well-developed sense organs, compound eyes and taste receptors.

74. **Assertion** (A) In many gastropods, the anus and the mantle cavity are placed anteriorly above the head.

Reason (R) During embryonic development in many gastropods, one side of the visceral mass grows faster than the other side. This uneven growth rotates the visceral organs upto 180° in many gastropods.

75. **Assertion** (A) In molluscs, feather-like gills are present in mantle cavity.

Reason (R) These gills have respiratory and excretory functions.

76. **Assertion** (A) The body of hemichordates is divisible into proboscis, collar and trunk.

Reason (R) Proboscis gland helps in digestion.

77. **Assertion** (A) Amphibians cannot survive in sea water.
Reason (R) They have lungs for breathing on land which would collapse under the water pressure of the sea.

78. **Assertion** (A) Aves must feed more often than reptiles.
Reason (R) Birds are homeotherms and this consumes more energy than reptiles that are poikilotherms.

79. **Assertion** (A) Air sacs are connected to lungs in class–Aves.

Reason (R) They supplement respiration in birds.

80. **Assertion** (A) Duck-bill platypus is not a true mammal.

Reason (R) True mammals are all viviparous, while platypus lays eggs.

Case Based MCQs

81. **Direction** *Read the following and answer the questions that follow*

The water vascular system in echinoderms is a unique and defining characteristic that acts as a vital part of whole animal's body. It consists of hundreds to thousands of tubefeets that are found in the ambulacral grooves. Due to this, this system is also called ambulacral system. The water vascular

system controls the tubefeets hydraulically through a complex of fluid-filled canals and reservoirs. In response, tubefeets perform various functions. Echinoderms also possess special structures for respiration.

(i) The ambulacral system is ..... in origin.
(a) ectodermal (b) mesodermal
(c) coelomic (d) endodermal

(ii) In echinoderms, tubefeet help in
(a) locomotion and food capture
(b) paralysing the prey
(c) the formation of leucocytes
(d) All of the above

(iii) The respiratory structure in echinoderms is
(a) dermal branchiae
(b) bursae
(c) tubefeet
(d) All of the above

(iv) The haemal system in echinoderms
(a) contains myoglobin pigment
(b) is of open type
(c) contains two-chambered heart
(d) All of the above

(v) **Assertion** (A) Tubefeet expand or contract due to the hydrostatic pressure within it.

Reason (R) They help to filtere the water that enter the water vascular sytem.
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true, but R is not the correct explanation of A
(c) A is true, but R is false
(d) Both A and R are false

82. Direction *Read the following and answer the questions that follow*

Coelenterates are aquatic, mostly marine organisms exhibiting tissue level of organisation. Their body is characterised by tentacles, stinging cells and horny or calcareous exoskeleton. They possess well-defined gastrovascular cavity having single opening, polymorphism is one of the major characteristic of coelenterates.

In this, the organism exists in different forms out of which one is sessile, while the other is free-swimming. These forms exhibit division of labour and alternation of generation. Major representative animals of this group are *Adamsia, Physalia, Gorgonia,* etc.

(i) A freshwater coelenterate is
(a) *Hydra* (b) *Obelia*
(c) *Aurelia* (d) *Physalia*

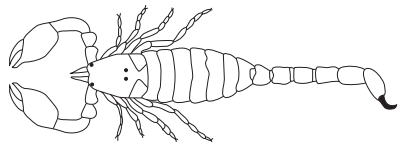
(ii) The exoskeleton of corals is composed of
(a) pectins
(b) keratin
(c) calcium carbonate
(d) calcium sulphate

(iii) Medusae form is seen in
(a) *Hydra* (b) *Aurelia*
(c) *Adamsia* (d) Both (b) and (c)

(iv) The comon name of *Adamsia* is
(a) sea fan (b) jellyfish
(c) sea fur (d) sea anemone

(v) One of the special character of Coelenterata, only is the occurrence of
(a) polymorphism (b) flame cells
(c) hermaphroditism (d) nematocysts

83. Observe the shown diagram and answer the following questions.



(i) Identify the correct characteristics about the arthropod shown in the diagram.

I. Possess 8 walking legs.
II. Chelicerae are appendages for grasping prey.
III. Mandibles are absent.
IV. Main body cavity is haemocoel.

Codes

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

(ii) Exoskeleton of arthropods is made up of

(a) keratin
(b) chitin
(b) hemicellulose
(d) pectin

(iii) Respiration through book gills occurs in

(a) king crab (b) prawn
(c) scorpion (d) cockroach

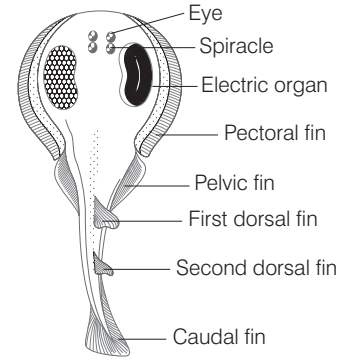
(iv) A representative animal of class–Myriapoda is

(a) *Culex*
(b) *Apis*
(c) *Scolopendra*
(d) *Palaemon*

(v) Excretory structure that directly open to exterior in arthropods is

(a) Malpighian tubule
(b) nephridia
(c) glomerulus
(d) green gland

84. Observe the following diagram and answer the following questions.



(i) With respect to the above diagram, choose the correct statements.

I. It swims constantly due to the absence of air bladder.
II. It is commonly called hammer head shark.
III. Body is covered by placoid scales.
IV. It possesses poison sting.

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

(ii) Among the following phyla, diploblastic animals are found in

(a) Coelenterata (b) Arthropoda
(c) Mollusca (d) Hemichordata

(iii) In which phylum, metameric segmentation is found?

(a) Chordata (b) Porifera
(c) Annelida (d) Mollusca

(iv) The type of symmetry found in arthropods is

(a) radial symmetry (b) bilateral symmetry
(c) asymmetry (d) biradial symmetry

(v) All the listed organisms are coelomate, except

(a) *Unio* (b) *Scolopendra*
(c) *Pheretima* (d) *Wuchereria*

ANSWERS

Multiple Choice Questions

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

Assertion-Reasoning MCQs

66. (a)	67. (d)	68. (d)	69. (c)	70. (a)	71. (b)	72. (a)	73. (b)	74. (a)	75. (b)
76. (c)	77. (c)	78. (a)	79. (a)	80. (a)					

Case Based MCQs

81. (i) *(c),* (ii) *(a),* (iii) *(d),* (iv) *(b)* (v) *(c)*
82. (i) *(a),* (ii) *(c),* (iii) *(b),* (iv) *(d),* (v) *(d)*
83. (i) *(a),* (ii) *(b),* (iii) *(a),* (iv) *(c),* (v) *(d)*
84. (i) *(a),* (ii) *(a),* (iii) *(c),* (iv) *(b),* (v) *(d)*

EXPLANATIONS

1. (a) Ostia → Spongocoel → Osculum → Exterior

In most simple type of canal system, i.e. ascon type, the water current passes directly through the ostia into the spongocoel and goes out through an apical opening, the osculum and then moves to exterior.

2. (c) Choanocytes are the flagellated cells lining the spongocoel (central cavity) in poriferans or sponges. The function of a choanocyte is to create water flow through the body of a sponge.

This allow nutrients to filtre through and feed the sponge.

3. (a) Animals belonging to the phylum-Porifera are supported by spicules or spongin fibres.

5. (b) Option (b) is not true for coelenterates as the phylum–Coelenterata or Cnidaria have tissue level of organisation. Cellular level of organisation is only present in phylum–Porifera. Rest options are correct.

6. (c) Metagenesis is alternation of generation. It is seen in the animals of phylum-Coelenterata that exist in two body forms, i.e. polyp and medusa in *Obelia.*

8. (c) The figure represents cnidoblast or cnidocyte, found in animals of the phylum–Coelenterata.

Cnidoblasts contain stinging capsule, which releases the toxin, thus used in the defense mechanism by the animals belonging to phylum–Coelenterata.

10. (b) Ctenophores are comb jellies. Ctenophora is a small phylum of marine invertebrates, the comb jellies, which show similarities to the coelenterates. They have eight external rows of fused ciliated comb plates for locomotion.

Nematocysts and anus are absent.

11. (a) The members of the phylum – Ctenophora appear like jellies and have eight external rows of ciliated comb plates.

12. (c) *Ctenoplana* is an animal belonging to phylum–Ctenophora. The property of emission of light by living organisms is called bioluminescence. It is seen in animals belonging to phylum–Ctenophora.

13. (b) *Ctenoplana* belongs to phylum–Ctenophora. Reproduction in all the animals belonging to phylum– Ctenophora takes place by sexual reproduction only.

16. (a) Animals of phylum– Platyhelminthes are triploblastic, bilaterally symmetrical, acoelomate animals. They live as endoparasites in intestine of other animals.

For this purpose, they bear hooks and suckers near their mouth region which helps them to cling on the intestinal wall of the host and obtain nutrition.

Thus, option (a) is correct.

17. (a) Aschelminthes are dioecious with separate sexes and females are usually longer than males.

18. (c) Statements I and II are true for *Wuchereria* and statements III and IV are false. False statements can be corrected as

In *Wuchereria* and all animals belonging to phylum–Aschelminthes, females are longer than males and they have an organ system level of organisation.

19. (b) Option (b) is correct feature of that animal. *A* is ♂ *Ascaris* and *B* is ♀ *Ascaris*. Female is longer than male. Posterior terminal of ♂ (male) is curved while in ♀ (female) *Ascaris*, it is straight.

20. (d) The phylum-Annelida derived its name because of the presence of metameres or segments.

21. (c) Statement III is incorrect and can be corrected as

The excretory system in phylum-Annelida consists of nephridia. Flame cells are part of the excretory system of animals belonging to phylum–Platyhelminthes.

Rest statements are correct for the phylum–Annelida.

23. (b) Longitudinal and circular muscles are useful in locomotion in animals of the phylum–Annelida. On the other hand,

Nephridia are the part of the excretory and osmoregulatory system. Organs of bursa are copulatory organs present in male hookworms. Spicules and ostia are present in animals belonging to phylum–Porifera.

24. (a) The animal given is *Hirudinaria* belonging to the phylum–Annelida. It is a triploblastic, bilaterally symmetrical, coelomate. It shows metameric segmentation. It is monoecious animal without lateral appendages. It possesses closed circulatory system. Lateral appendages are possessed by *Nereis*.

26. (b) Feature in option (b) is not present in phylum-Arthropoda because

Parapodia are present in aquatic annelids like *Nereis*, which help them in swimming. Other three features, i.e. metameric segmentation, jointed appendages and chitinous exoskeleton are present in phylum–Arthropoda.

27. (c) Water vascular system is characteristic feature of phylum–Echinodermata (not Arthropoda).

Tracheal system, gills, book gills and book lungs, all are organs of respiration in animals belonging to phylum–Arthropoda.

28. (a) Malpighian tubules are involved in the excretion of nitrogenous waste in insects, arachnids and centipedes. They lie in the haemocoel. In insects, Malpighian tubules open into the intestine, they selectively extract uric acid from the blood which together with water and salts is deposited into the hindgut and excreted in the faeces. Some reabsorption of water and salts can occur in the tubule itself, but most reabsorption occurs in the hindgut.

29. (c) Statement III is incorrect and can be corrected as

Body of arthropods is divided into head, thorax and abdomen. Arthropods are triploblastic, coelomate animals.

Other statements are correct regarding to the phylum-Arthropoda.

30. (d) The body of animals belonging to phylum–Arthropoda are divided into head, thorax and abdomen, while animals belonging to phylum– Mollusca are divided into head, muscular foot and visceral hump.

31. (b) Option (b) is correct. Other options are incorrect and can be corrected as

Phylum–Mollusca do not have metameric segmentation, they have a calcareous exoskeleton with organ system level of organisation, but shows the presence of mantle cavity and coelomic cavity during development.

32. (d) Option (d) is incorrect and can be corrected as

Molluscs are terrestrial or aquatic (marine or freshwater) having an organ system level of organisation. They are bilaterally symmetrical, triploblastic and coelomate, e.g. *Pila*.

Rest options are correct for phylum-Mollusca.

33. (d) The feeding organ in phylum–Mollusca is a radula. It is a file-like rasping organ. Undulating membranes and suctorial organs are present in ciliated protozoans.

34. (b) Body wall of echinoderms consists of single-layered ciliated epidermis and overlies dermis. Chitinous spines are often present on the surface which constitute the exoskeleton.

35. (d) Option (d) is not a correct identification or characteristic feature of the organism depicted in the diagram and can be corrected as Echinoderms are triploblastic, have true coelom (enterocoelom) but are not segmented, their body is covered with spines which are protective in function.

38. (d) The notochord-like structure of hemichordates is called stomochord.

39. (d) Hemichordates have a rudimentary structure in the collar region called stomochord, a structure similar to notochord. They are worm-like marine animals. Respiration takes place through gills.

Thus, option (d) is correct.

40. (c) The body of *Balanoglossus* is divided into proboscis, collar and trunk.

44. (d) Phylum–Chordata is divided into three subphyla, i.e. Urochordata, Cephalochordata and Vertebrata. Urochordata is also called as Tunicata. In Cephalochordata, notochord is present throughout life.

46. (b) Chordates have a notochord, central nervous system is dorsal with pharynx perforated by gill slits and heart is ventral, post-anal tail is present.

48. (b) Option (b) is incorrect about the class–Cyclostomata. It can be corrected as

Cyclostomata have elongated body devoid of scales and paired fins.

Rest options are correct about the class-Cyclostomata.

49. (d) Chondrichthyes is one of the class of superclass–Pisces, subphylum–Vertebrata and phylum–Chordata. The mouth of the members of class–Chondrichthyes is located ventrally and the teeth are modified placoid scales, which are in backward direction.

50. (d) Statement in option (d) is incorrect about Chondrichthyes and can be corrected as

Notochord is persistent throughout the life in Chondrichthyes.

Other options are correct.

Animals belonging to class–Chondrichthyes are so called because of the presence of cartilaginous endoskeleton. They lack air bladder thus, swim constantly and have placoid scales. They are poikilotherms.

53. (c) Swim bladder is a large, thin-walled sac in bony fishes that may function as a buoyant float, a sound producer and receptor and a receptor organ.

It is located in the dorsal portion of the body cavity and is filled with gases.

When gas is added to the swim bladder, by diffusion through the blood vessels in the bladder wall, the fish become less dense overall, when gas is removed the fish becomes more dense.

54. (c) The given figure is that of *Hippocampus* (sea horse) which is a bony fish. It does not have a poisonous sting at tail and this feature is present in *Trygon*.

55. (d) Amphibians are characterised by three-chambered heart. They are cold-blooded animals and their skin is moist and generally lack scales or scutes.

Thus, option (d) is correct.

58. (b) The skin of reptiles is dry, cornified and devoid of glands.

60. (b) Class–Amphibia and class–Reptilia share the following features.

Presence of tympanum is seen in both classes, which represent the ear. Animals of both classes are cold-blooded or poikilotherms and usually have a three-chambered heart with the exception of a crocodile.

61. (d) Option (d) is incorrect for Aves and can be corrected as

The forelimbs of Aves are modified into wings and have powerful flight muscles.

Rest options are correct for Aves.

62. (d) Aves have additional chambers in the digestive system, the crop and the gizzard. Forelimbs are present and modified as wings. Scales are present on the hindlimbs that are modified to assist in movement or in clasping.

The heart of Aves is completely four-chambered. Air cavities are present in long bones and help the animal in flight. Lungs are present to perform respiration.
Thus, option (d) is correct.

63. (c) Mammalia is the only class in which members contains mammary glands and hence is an unique characteristic among the members of this class.

64. (c) The character mentioned in option (c) is not a mammalian character without exception.

Mammals such as dolphins, whales, elephants, mole, rats, etc., have little to no body hair.

Rest of the options contain characters that are present in all the mammals without exception.

65. (b) Viviparity characteristic is not shared by birds and mammals because

Mammals are viviparous, while birds are oviparous. Viviparous means giving birth to offspring that develops within the mother's body. Oviparous means producing eggs that hatch outside the body of mother.

66. (a) Both A and R are true and R is the correct explanation of A.

Radial symmetry is advantageous as it allows the animal to respond to stimulus from any direction, allowing it to detect food and danger easily.

67. (d) A is false, but R is true. A can be corrected as

Many animals have both an endoskeleton and an exoskeleton such as *Chelon* (turtle) or *Testudo*-(tortoise). During embryonic stage, skeleton cells migrate to produce both exoskeleton and endoskeleton.

69. (c) A is true, but R is false because

Taenia and *Fasciola* both belong to Platyhelminthes. Platyhelminthes are acoelomate animals.

71. (b) Both A and R are true, but R is not the correct explanation of A.

Tapeworm (*Taenia solium*) belongs to Platyhelminthes and roundworm (*Ascaris*), belongs to Aschelminthes. Both of these are endoparasites and cause intestinal infection. The main cause of the intestinal infection is improperly cooked food. However, tapeworm infection occurs by eating improperly cooked food, *Ascaris* is transmitted by contaminated food and water.

74. (a) Both A and R are true and R is the correct explanation of A.

In gastropods (molluscs) the skin of visceral mass forms a thin delicate covering called mantle over the head. The hindgut of alimentary canal is composed of rectum and anus.

The anus is located at anterior end. Due to torsion during the developmental stages in most gastropods, the visceral mass and the shell of embryo become spirally coiled (due to unequal growth).

77. (c) A is true, but R is false because

Amphibians cannot live in the sea water because their body will lose water due to high salinity of sea water by exosmosis as their body lacks scales or an impermeable exoskeleton.

78. (a) Both the A and R are true and R is the correct explanation of A.

Aves feed more often than reptiles because Aves are endothermic (homeotherms) and need to produce heat through various metabolic activities in order to constantly maintain body temperature. Whereas amphibians are poikilotherms, thus do need more energy because their body temperature changes with respect to surrounding.

81. (i) (c) Ambulacral system is coelomic in origin.
(ii) (a) Tubefeet help in locomotion, respiration, food capture, etc.
(iii) (d) Dermal branchiae, bursae and tubefeet. all these structures perform respiration in echinoderms.
(iv) (b) Haemal system lacks respiratory pigment and heart. It is of open type and is enclosed within the coelomic perihaemal channels.
(v) (c) A is true, but R is false. R can be corrected as
The water that enter the water vascular system is filtered by the calcerous opening called madreporite.

82. (i) (a) *Hydra* is a freshwater coelenterate, while the rest are found in marine water.
(ii) (c) The exoskeleton of corals is formed of calcium carbonate.
(iii) (b) Medusa or free-swimming form is seen in *Aurelia.*
(iv) (d) The common name of *Adamsia* is sea anemone.
(v) (d) The nematocysts are special characteristics of coelenterates having chitinous double wall collagenous capsule with an operculum (lid). It is an organ of offence and defence in coelenterates. It also helps in food capture, locomotion and anchorage. It contains a poisonous fluid of proteins and phenol.

83. (i) (a) All characters are correct for the given diagram of scorpion (Arthropods).
(ii) (b) Exoskeleton is made up of chitin. It does not grow with animal body, therefore it is being moulted.
(iii) (a) In king crab, respiration occurs through book gills.
(iv) (c) *Scolopendra* belongs to the class–Myriapoda.
(v) (d) Green gland directly open to exterior.

84. (i) (a) I, III and IV are correct. II is incorrect because it is commonly called sting ray.
(ii) (a) Among the given phyla, coelenterates possess diploblastic animals having two body layers, *viz.* ectoderm, endoderm and mesoglea in between.
(iii) (c) Metamerism is found in phylum-Annelida. In it, body is divided into metamers by ring-like annuli.
(iv) (b) Arthropods are bilaterally symmetrical, i.e. body is divided into 2 identical halves in only one plane.
(v) (d) *Wuchereria* is pseudocoelomate, while other three are coelomate.