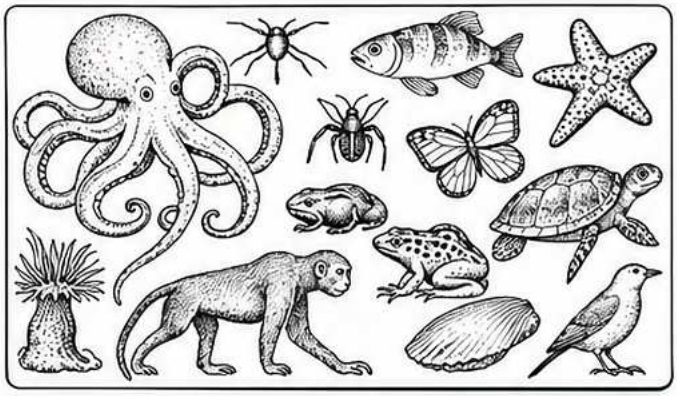
Chapter 6 Animal Classification

Chapter Overview

Animals are classified in a stepwise manner from lower to higher levels based on body organisation, cellular structure, tissue and organ development, and overall organisation. The scheme below summarises the grades of organisation and the symmetry and body cavity patterns with examples.



Grades of Organisation in Animals

Grades of Organisation

- **Protoplasmic grade of organisation** — E.g., *Amoeba*, *Paramecium*
- **Cellular grade of organisation** — E.g., Porifera
- **Cell-tissue grade of organisation** — E.g., *Cnidaria*
- **Tissue-organ grade of organisation** — E.g., *Platyhelminthes*
- **Organ-system grade of organisation** — E.g., Crab, frog, human, etc.

Body Symmetry

- **Asymmetrical body** — E.g., *Amoeba*, some sponges
- **Radial symmetry** — E.g., Adult starfish
- **Bilateral symmetry** — E.g., Insects, frogs, birds, humans, etc.

Body Cavity (Coelom)

- **Acoelomate** — E.g., Porifera, Cnidaria, Platyhelminthes
- **Pseudocoelomate** — E.g., Aschelminthes
- **Eucoelomate** — E.g., Annelida, Arthropoda, Mollusca, Echinodermata, Hemichordata, Chordata

Multiple-Choice Questions (MCQs)

Q1 The protoplasmic grade of organisation is shown by:
(A) Porifera (B) *Amoeba* (C) Cnidaria (D) Platyhelminthes

Q2 Cellular grade of organisation occurs in:
(A) Porifera (B) Cnidaria (C) Annelida (D) Arthropoda

Q3 Tissue-organ grade of organisation is seen in:
(A) Platyhelminthes (B) Aschelminthes
(C) Annelida (D) Chordata

Q4 Animals with asymmetrical body are:
(A) *Amoeba* (B) Sponges (C) Starfish (D) Frog

Q5 Bilateral symmetry is shown by:
(A) Insects (B) Frogs (C) Birds (D) All of these

Q6 Eucoelomate animals include:
(A) Annelida (B) Arthropoda (C) Mollusca
(D) All of these

Name the Following

Q1 Grade of organisation in *Amoeba*.

Q2 Group showing cellular grade of organisation.

Q3 Example of an animal with radial symmetry.

Q4 Phylum belonging to the acoelomate group.

Answer Key

MCQs

Q1. (B) **Q4.** (B)
Q2. (A) **Q5.** (D)
Q3. (A) **Q6.** (D)

Name the Following

Q1. Protoplasmic grade of organisation.
Q2. Porifera.
Q3. Starfish.
Q4. Platyhelminthes.

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Animal Classification

Nonchordates

- **Porifera** e.g. *Spongia, Sycon, Euspongia, Euplectella*, etc.
- **Coelenterata/Cnidaria** e.g. *Hydra, Obelia, Physalia, Doliolum*, etc.
- **Platyhelminthes** e.g. *Planaria*, liver fluke, tapeworm, etc.
- **Aschelminthes** e.g. *Ascaris*, filarial worm, *Loa loa*, etc.
- **Annelida** e.g. Earthworm, leech, *Nereis*, etc.
- **Arthropoda** e.g. Crab, spider, scorpion, millipede, centipede, cockroach, butterfly, honeybee, etc.
- **Mollusca** e.g. Bivalve, snail, octopus, etc.
- **Echinodermata** e.g. Starfish, sea urchin, brittle star, sea cucumber, etc.
- **Hemichordata** e.g. *Balanoglossus, Saccoglossus*, etc.

Chordates

Urochordata
e.g. *Herdmania, Doliolum, Oikopleura*, etc.

Cephalochordata
e.g. *Amphioxus*

Vertebrata/Craniata

- **Cyclostomata** e.g. *Petromyzon, Myxine*, etc.
- **Pisces** e.g. Rohu, pomfret, seahorse, shark, electric ray, stingray, etc.
- **Amphibia** e.g. Toad, frog, salamander, etc.
- **Reptilia** e.g. Tortoise, lizard, snake, etc.
- **Aves** e.g. Peacock, parrot, pigeon, duck, penguin, etc.
- **Mammalia** e.g. Elephant, human, kangaroo, dolphin, bat, etc.

History of animal classification

No.	Method of classification	Criteria for classification	Scientists
i.	Artificial classification	Animals are grouped using simple characters such as body size, habits and habitats.	Aristotle was the first to propose animal classification. This system was followed by Theophrastus, Pliny, John Ray, Linnaeus, etc.
ii.	Natural system of classification	Based on various natural criteria like body organization, types of eells, chromosomes, biochemical properties, etc.	
iii.	Five kingdom classification	Organisms classified based on body organization, body symmetry, body cavity, germinal layers, segmentation and other related features.	Proposed by Robert Whittaker

Questions and Answers

I. Choose the correct alternative

1. The conventional system of classification divides the Animalia into _____ groups.
   (A) one (B) two (C) three (D) five
2. Only two germ layers are found in _____.
   (A) Platyhelminthes (B) Aschelminthes
   (C) Coelenterata (D) Annelida
3. Which special cells are present in the body of sponges (Porifera)?
   (A) Choanocytes (B) Cnidoblasts
   (C) Collar cells (D) Ectodermal cells
4. Setae or spines or suckers for locomotion are present in the members of phylum _____.
   (A) Annelida (B) Arthropoda
   (C) Aschelminthes (D) Porifera

Answers

Q. No.	Answer	Option
1.	two	(B)
2.	Coelenterata	(C)
3.	Choanocytes	(A)
4.	Annelida	(A)

Correlation / Analogy – Question Bank (Q. 1 – 15)

1. **Which of the following animal's body shows bilateral symmetry?**
(A) Starfish (B) Jellyfish
(C) Earthworm (D) Sponge *[Mar '23]*

Answer: (C) Earthworm
Explanation: Earthworm has bilateral symmetry; starfish and jellyfish are radially symmetrical and sponge is asymmetrical.

2. **Animal with bilateral symmetry is _____.**
(A) Starfish (B) Human
(C) *Paramecium* (D) Hydra

Answer: (B) Human
Explanation: Humans show bilateral symmetry.

3. **Which of the following is a distinguishing feature of annelids?**
(A) Joined appendages
(B) Metameric segmentation
(C) Cnidoblasts
(D) Calcareous shell

Answer: (B) Metameric segmentation
Explanation: Annulids are characterised by metameric (segmental) body arrangement.

4. **Example of phylum Arthropoda is _____.**
(A) Scorpion (B) Starfish
(C) Earthworm (D) Hydra *[Mar '24]*

Answer: (A) Scorpion
Explanation: Scorpion belongs to phylum Arthropoda.

5. **Millipedes belong to phylum _____.**
(A) Echinodermata (B) Arthropoda
(C) Urochordata (D) Aschelminthes

Answer: (B) Arthropoda
Explanation: Millipedes are arthropods (jointed appendages, exoskeleton).

6. **An animal that can change its colour is _____.**
(A) *Planaria* (B) Octopus
(C) Leech (D) Hydra

Answer: (B) Octopus
Explanation: Octopus can change its colour (camouflage).

7. **Which of the following animals can regenerate its broken body part?**
(A) Cockroach (B) Frog
(C) Sparrow (D) Starfish *[July '25]*

Answer: (D) Starfish
Explanation: Starfish can regenerate lost body parts.

8. **Fish are _____ blooded animals.**
(A) Hot (B) Cold
(C) Warm (D) Mix

Answer: (B) Cold
Explanation: Fishes are cold-blooded (poikilothermic) animals.

9. **Which of the following is a cold-blooded animal?**
(A) Bat (B) Snake
(C) Rabbit (D) Elephant

Answer: (B) Snake
Explanation: Snakes are cold-blooded reptiles.

10. **Pigeon's heart has _____ compartments.**
(A) 1 (B) 2 (C) 3 (D) 4

Answer: (C) 3
Explanation: Pigeon (a bird) has a three-chambered heart.

11. **Bat is included in which class?**
(A) Amphibia (B) Reptilia
(C) Aves (D) Mammalia

Answer: (D) Mammalia
Explanation: Bat is a mammal.

12. **Human being belongs to the _____ class.**
(A) Mammalia (B) Amphibia
(C) Reptilia (D) Cyclostomata

Answer: (A) Mammalia
Explanation: Humans are mammals (class Mammalia).

13. **_____ is a cold-blooded animal.**
(A) Bat (B) Snake
(C) Pigeon (D) Elephant

Answer: (B) Snake
Explanation: Snake is a cold-blooded reptile.

14. **Which of the following animal belongs to class Amphibia?**
(A) Snake (B) Shark
(C) Beetle (D) Frog

Answer: (D) Frog
Explanation: Frog is an amphibian (lives both in water and on land).

15. **Pigeon's heart has _____ compartments.**
(A) 1 (B) 2 (C) 3 (D) 4

Answer: (C) 3
Explanation: Pigeon has a three-chambered heart.

Classification & Matching (Q. 1 – 15)

Q. No.	Answer
1.	(C)
2.	(B)
3.	(B)
4.	(A)
5.	(B)
6.	(B)
7.	(D)
8.	(B)
9.	(B)
10.	(C)
11.	(D)
12.	(A)
13.	(B)
14.	(D)
15.	(C)

Name the following

1. Classification proposed by Aristotle.
2. Criteria for five-kingdom classification system of animals.
3. Grade of body organization of flatworms.
4. Animals that belong to phylum Coelenterata.
5. Animals commonly known as the 'water animals'.
6. Portuguese man-of-war.
7. Animals of phylum Annelida.
8. Largest phylum in kingdom Animalia.
9. Animals belonging to phylum Arthropoda.
10. Secondly largest phylum in kingdom Animalia.
11. The most clever animal among all non-chordates.
12. The animal belonging to class Mammalia.
13. Dorsally in Chordates, supporting structure present.
14. The first true terrestrial animals with creeping mode of life.
15. These animals are radially symmetrical in adult stage.
16. Subphylum of Chordates showing symmetry in larval stage.
17. Animals present only in tail region of larval stage.

Chapter 6: Animal Classification

Question Bank – Factual Checklist

A. True / False – Correct the False Statements *(1 Mark each)*

State whether the following statements are True or False. For each False statement, write the correct statement.

No.	Statement	Answer (with correction & reason)
1.	Echinodermata includes starfish, sea urchin, sea cucumber, brittle star and sea lily.	**True.** These are members of phylum Echinodermata.
2.	Parapharyngeal gill slits are present in Hemichordates.	**True.** Members of Hemichordata (e.g., *Balanoglossus*) have pharyngeal gill slits.
3.	Notochord is present in kangaroo, bat, dolphin.	**False.** **Correct statement:** Notochord occurs in chordates during the embryonic stage; it is replaced by a vertebral column in adult kangaroo, bat and dolphin.
4.	Pseudocoelomate animals are found in almost all the types of phylum mentioned here.	**False.** **Correct statement:** Pseudocoelom is present only in some phyla, e.g., Aschelminthes (Nematoda); it is not found in almost all phyla.
5.	Antropods are found in almost all the types of habitats.	**True.** Arthropods are widely distributed in terrestrial, freshwater and marine habitats.
6.	Body of molluscs is divided into head, foot and visceral mass.	**True.** A typical molluscan body is organized into a head, muscular foot and visceral mass (mantle covers the visceral mass).
7.	Skeleton is present in arthropods.	**True.** Arthropods possess an external (exoskeleton) of chitin.
8.	Honey bees are hermaphrodites.	**False.** **Correct statement:** Honey bees are not hermaphrodites; they have separate sexes (queen, drones and workers).
9.	Visceral mass of molluscs is covered by mantle.	**True.** In molluscs, the visceral mass is covered by a mantle.
10.	Symmetrical animals, all molluscs are bilaterally symmetrical.	**True.** Members of phylum Mollusca show bilateral symmetry.

Answers: (True / False)

1. True
2. True
3. False
4. False
5. True
6. True
7. True
8. False
9. True
10. True

A. True / False – Correct the False Statements *(1 Mark each)*

No.	Statement	Answer (with correction & reason)
11.	Animals belonging to class Cyclostomata have gills for respiration.	**True.** Cyclostomes (e.g., lampreys) respire through gills.
12.	Amphibians undergo metamorphosis throughout their life cycle.	**False.** **Correct statement:** Amphibians undergo metamorphosis only once in their life cycle (e.g., frog: tadpole to adult).
13.	Heart is present on the dorsal side of the body of vertebrates.	**False.** **Correct statement:** In vertebrates, the heart is located on the ventral side of the body.
14.	Pharyngeal gill slits are a good ability of regeneration.	**False.** **Correct statement:** A good ability of regeneration is seen in certain animals (e.g., planaria, starfish), whereas pharyngeal gill slits are respiratory openings (e.g., in Hemichordata and Chordata).
15.	Animals belonging to class Cephalochordata have a notochord throughout their life.	**True.** In cephalochordates (e.g., *Branchiostoma*), the notochord persists throughout life.
16.	All vertebrates belong to class Osteichthyes.	**False.** **Correct statement:** Vertebrates are divided into several classes (e.g., Cyclostomata, Chondrichthyes, Osteichthyes, Amphibia, Reptilia, Aves and Mammalia), and not all belong to Osteichthyes.
17.	Sea anemone is an eucelomate.	**False.** **Correct statement:** Sea anemone (e.g., *Metridium*) is a diploblastic, acoelomate animal of phylum Cnidaria.
18.	Bivalve, snail, octopus and cuttlefish are members of phylum Echinodermata.	**False.** **Correct statement:** Bivalve, snail, octopus and cuttlefish are molluscs (phylum Mollusca), not Echinodermata.

B. Odd One Out *(1 Mark each)*

In each group, select the odd organism and give a reason.

No.	Group	Odd one out (with reason)
1.	*Oikopleura*, *Peramyzon*, *Myxine*, Salamander	*Oikopleura* – It is a tunicate (urochordate), whereas the others are vertebrates.
2.	*Portunus*, *Balanus*, *Pteropoda*, Dolphin	Dolphin – It is a vertebrate (mammal), whereas the others are invertebrates (arthropods/molluscs).
3.	Pisces, Arthropoda, Mollusca, Echinodermata	Pisces – It is a class of vertebrates, whereas the others are phyla of invertebrates.
4.	Starfish, Small, Frog, *Amoeba*	*Amoeba* – It is a unicellular protist, whereas the others are multicellular animals.

Answers: (Odd one out)

1. ***Oikopleura*** – Tunicate (urochordate); others are vertebrates.
2. ***Dolphin*** – Vertebrate (mammal); others are invertebrates.
3. ***Pisces*** – Class of vertebrates; others are phyla of invertebrates.
4. ***Amoeba*** – Unicellular; others are multicellular.

7. **Crab**
Crab belongs to phylum Arthropoda, whereas the rest belong to phylum Mollusca.

8. **Sea anemone**
Sea anemone belongs to the phylum Coelenterata, whereas the rest belong to phylum Echinodermata.

9. ***Oikopleura***
Oikopleura belongs to subphylum Urochordata, whereas the rest belong to subphylum Vertebrata.

10. **Dolphin**
It is a mammal, whereas shark, pomfret and rohu are fishes.

11. **Lizard**
Lizard is a poikilotherm, whereas the rest are homeotherms.

12. **Pisces**
The animals that belong to class Pisces are Chordates, whereas members of Arthropoda, Mollusca and Echinodermata are non-chordates.
[Note: Currently Pisces is considered as super class.]

13. **Frog**
Frog is the odd one out because it is the only vertebrate among the options, while the Starfish, Snail, and *Amoeba* are all invertebrates.

Write the correlation *[1 Mark each]*

1. Nonchordates : Ventral and solid nerve cord :: Chordates : _____
2. Tapeworm : Tissue – Organ grade organisation :: Crab : _____
3. Cylindrical body of coelenterate : Polyp :: Umbrella-like body of coelenterate : _____
4. Porifera : Collar cells :: Coelenterata : _____
5. Planaria : Hermaphrodite :: Filarial worm : _____
6. _____ : Metameric segmentation :: Arthropoda : Jointed appendages
7. Earthworm : Annelida :: Centipede : _____
8. Annelida : Earthworm :: Platyhelminthes : _____
9. *Herdmania* : Urochordata :: *Amphioxus* : *[Mar '20]*
10. Chordates with jaw : Gnathostomata :: Chordates without jaw : _____
11. A spindle shaped body : Minimize water resistance :: _____ : Steering organ during swimming
12. Pisces : Exoskeleton in form of scales :: Amphibia : _____
13. Amphibia : Moist skin :: _____ : Dry and scaly skin
14. Pisces : Poikilotherms :: Aves : _____
15. Mammalia : Eucoelomate :: Porifera : _____

Answers:

1. **Dorsal and hollow**
The nerve cord in non-chordates is ventral and solid, whereas the nerve cord in chordates is dorsal and hollow.

2. **Organ – System grade organization**
Tapeworms have tissue grade organisation, whereas crabs have Organ – System grade organization.

Note: *Tapeworms exhibit the organ-system level of organisation with specialized nervous, muscular, and reproductive systems. However, they lack complete digestive, respiratory, and circulatory systems.*

3. **Medusa**
When the body of coelenterates is cylindrical it is known as polyp and when it is umbrella like it is known as medusa.

4. **Cnidoblasts**
Special types of cells called collar cells are present in animals belonging to phylum Porifera, whereas special type of cells called cnidoblasts are present in animals belonging to phylum coelenterate.

5. **Unisexual**
Planaria is a hermaphrodite, whereas filarial worm is unisexual.

6. **Annelida**
Jointed appendages are a characteristic feature of phylum Arthropoda, whereas metameric segmentation is the characteristic feature of phylum Annelida.

7. **Arthropoda**
Earthworm belongs to phylum Annelida, whereas centipede belongs to phylum Arthropoda.

8. ***Planaria/Liver fluke/Tapeworm***
Earthworm belongs to phylum Annelida, whereas *Planaria*, liver fluke, tape worm belongs to phylum Platyhelminthes.

9. **Cephalochordata**
Herdmania belongs to subphylum Urochordata and *Amphioxus* belongs to subphylum Cephalochordata.

10. **Agnatha**
Chordates with jaw belong to sub group Gnathostomata, whereas Chordates without jaw belong to subgroup Agnatha.

11. **Tail fin**
In fishes, body is spindle shaped to minimize water resistance, whereas tail fin is used as steering organ during swimming.

12. **Exoskeleton is absent**
In Pisces, exoskeleton is in the form of scales, whereas in Amphibia exoskeleton is absent.

13. **Reptilia**
Animals of class Amphibian have moist skin, whereas animals of class Reptilia have dry and scaly skin.

14. **Homeotherms**
Members of class Pisces are poikilotherms (cold-blooded animals) and members of class Aves are homeotherms (warm-blooded animals).

15. **Acoelomate**
Mammalia includes eucoelomate animals, whereas Porifera includes acoelomate animals.

Chapter Opener

Animal Classification – Key Bases

Animals are classified using features such as the level of body organisation, type of symmetry and the nature of body cavity (coelom).

Concept Map

Basis of Classification (in Animals)

- **Grades of Organization** (Level of body organization)
- **Body Symmetry** (Arrangement of body parts)
- **Body Cavity (Coelom)** (Nature of the body cavity)

Quick Notes

1 Grades of Organization

- Refers to the structural complexity of the body.
- **Levels:** cell-tissue grade and tissue grade organisation.
- **Examples:** Cell-tissue grade → Cnidaria; Tissue grade → Arthropoda, Platyhelminthes.

2 Body Symmetry

- Refers to the arrangement of body parts around a plane or axis.
- **Types:** radial symmetry and bilateral symmetry.
- **Examples:** Radial → Porifera; Bilateral → Mollusca, Cnidaria, Protozoa.

3 Body Cavity (Coelom)

- Refers to the body cavity between the body wall and the alimentary canal.
- **Types:** acoelomate (absent), pseudocoelomate (partially formed) and coelomate (true coelom).
- **Examples:** Acoelomate → Eucoelomate; Pseudocoelomate → *Ascaris*; Coelomate → *Spongilla*.

Question Bank – Match the Following

Match the items of Column I with Column II and/or III.

1.

Column I (Grades of Organization)		Column II (Phylum)	
i.	Tissue grade organisation	a.	Cnidaria
ii.	Cell-tissue grade organisation	b.	Arthropoda
		c.	Platyhelminthes

Ans: (i – c), (ii – a)

2.

Column I (Body symmetry)		Column II (Phylum)	
i.	Radial	a.	Porifera
ii.	Bilateral	b.	Mollusca
		c.	Cnidaria
		d.	Protozoa

Ans: (i – c), (ii – b)

3.

Column I		Column II	
i.	Echinodermata	a.	Suckers
ii.	Cnidaria	b.	Tube feet
		c.	Tentacles

Ans: (i – b), (ii – c)

4.

Column I		Column II	
i.	Octopus	a.	Annelida
ii.	Leech	b.	Coelenterata
iii.	Centipede	c.	Mollusca
		d.	Arthropoda

Ans: (i – c), (ii – a), (iii – d)

5.

Column I		Column II	
i.	Mollusca	a.	Sacoglossus
ii.	Hemichordata	b.	Brittle star
		c.	Bivalve
		d.	*Herdmania*

Ans: (i – c), (ii – a)

6.

Column I		Column II	
i.	Urochordata	a.	*Petromyzon*
ii.	Cephalochordata	b.	*Herdmania*
		c.	*Amphioxus*

Ans: (i – b), (ii – c)

7.

Column I (Body cavity)		Column II (Animals)		Column III (Phylum)	
i.	Eucoelomate	a.	*Spongilla*	p.	Aschelminthes
ii.	Pseudo-coelomate	b.	*Ascaris*	q.	Annelida
		c.	*Myxine*	r.	Arthropoda
		d.	*Physalia*	s.	Cyclostomata

Ans: (i – c – s), (ii – b – p)

8.

Column I		Column II	
i.	Pigeon	a.	Mammalia
ii.	*Petromyzon*	b.	Aves
		c.	Amphibia
		d.	Reptilia
		e.	Cyclostomata

Ans: (i – b), (ii – e)

9.

Column I		Column II	
i.	Snail	a.	Head, foot and visceral mass
ii.	*Balanoglossus*	b.	Head, neck, trunk and tail
		c.	Head, neck and trunk
		d.	Proboscis, collar and trunk

Ans: (i – a), (ii – d)

10.

Column I		Column II	
i.	Exoskeleton in the form of hairs or fur	a.	Amphibia
ii.	Exoskeleton in the form of feathers	b.	Reptilia
		c.	Mammalia
		d.	Aves

Ans: (i – c), (ii – d)

11.

Column I (Animal)		Column II (Class)		Column III (Characters)	
i.	Kangaroo	a.	Reptilia	p.	Lay eggs in water
ii.	Tortoise	b.	Aves	q.	Warm blooded animals
		c.	Mammalia	r.	Feathery exoskeleton
		d.	Pisces	s.	Dry and scaly skin

Ans: (i – c – q), (ii – a – s)

Complete the Paragraph [3 Marks]

1. Fill in the blanks by selecting the correct word from the bracketed options and complete the paragraph.

(collar, roundworms, marine, proboscis, acorn worms, Urochordates, terrestrial, Herdmania, *Balanoglossus*, *Doliolum*, *Saccoglossus*)

Body of Hemichordates is divided into proboscis, _____ and trunk. Notochord is present in the _____ region only. These animals are also known as _____. They are found in _____ habitats. _____ and _____ are the members of this phylum.

Ans: Body of Hemichordates is divided into proboscis, **collar** and trunk. Notochord is present in the **proboscis** region only. These animals are also known as **acorn worms**. They are found in **marine** habitats. ***Balanoglossus*** and ***Saccoglossus*** are the members of this phylum.

Answer the Following

1. What is animal classification? *[1 Mark]*

Ans: Animal classification is the systematic grouping of animals into sub-groups based on similarities and differences among them. This process is called animal classification.

2. *Write in brief about progressive changes in animal classification.

OR

Explain briefly how the methods of classification changed over time. *[3 Marks]*

Ans:

i. Different scientists have tried to classify animals, from time to time.
ii. The Greek philosopher Aristotle first classified animals using the "artificial method" based on size, habits and habitat.
iii. Later, other scientists such as Theophrastus, Pliny, John Ray and Linnaeus followed the artificial method of classification.
iv. As scientific knowledge advanced, the criteria for animal classification evolved to a natural system based on body organisation, cells, chromosomes and biochemistry.
v. This approach was later complemented by a classification system based on evolution, employed by scientists like Dobzhansky and Mayr.
vi. Recently, Carl Woese has also proposed a system of animal classification.

Note: Carl Woese proposed the three-domain system for all living organisms, including animals, in 1990. This is not actually a system of only animal classification.

3. What are the advantages of animal classification? *[3 Marks]*

Ans: The advantages of animal classification are as follows:

i. Makes the study of animals easier.
ii. Helps in understanding a few animals thoroughly and then a whole group.
iii. Provides knowledge about animal evolution.
iv. Enables accurate identification of animals.
v. Enhances understanding of animal relationships with other living organisms.
vi. Offers insights into each animal's habitat and its role in nature.
vii. Helps grasp various adaptations displayed by animals.

4. State the phyla included under Non-Chordates. *[2 Marks]*

Ans: The phyla included under Non-Chordates are Protozoa, Porifera, Coelenterata/Cnidaria, Platyhelminthes, Aschelminthes, Annelida, Arthropoda, Mollusca, Echinodermata and Hemichordata.

Mnemonics

Concept: Phyla included under Non-Chordates.

Pretty Polly Can Play Athletics And Archery with Molly Every Holiday.

Pr – Protozoa, **Po** – Porifera,
C – Coelenterata/Cnidaria, **Pl** – Platyhelminthes,
A – Aschelminthes, **An** – Annelida, **Ar** – Arthropoda,
Mo – Mollusca, **E** – Echinodermata,
H – Hemichordata

5. Who proposed the five-kingdom system of classification? *[1 Mark]*

Ans: Robert Whittaker proposed the five-kingdom system of classification.

6. Explain in detail the types of grades of organization. *[5 Marks]*

Ans: The various types of grades of organization are as follows:

i. **Protoplasmic grade organization:** Body composed of a single cell performing all functions. E.g. *Amoeba*, *Paramecium*.
ii. **Cellular grade organization:** Multicellular without distinct tissues formed. E.g. Phylum Porifera.
iii. **Cell-tissue grade organization:** Cells form tissues that perform specific functions. E.g. Phylum Cnidaria.
iv. **Tissue-organ grade organization:** Tissues organized to form some organs; complete organs not formed. E.g. Flatworms.
v. **Organ-system grade organization:** Different organs come together to form organ-systems that perform specific functions. E.g. Crab, Frog, humans, etc.

1. Explain briefly how animals can be classified based on body symmetry. *[3 Marks]*

Ans. Based on the symmetry of the body, animals can be classified into three groups:

i. **Asymmetrical body:** In this type of symmetry, the body does not have any imaginary axis dividing it into two equal halves.
E.g.: *Amoeba*, some *sponges*.

ii. **Radial symmetry:** In this type of symmetry, if an imaginary cut is made through the central axis in any plane, it gives two equal halves.
E.g.: starfish.

iii. **Bilateral symmetry:** In this type of symmetry, only one such imaginary axis of the body divides it into two equal halves.
E.g.: insects, fishes, frog, birds, human, etc.

***8. What is the exact difference between grades of organization and symmetry? Explain with examples.** *[3 Marks]*

Ans.

i. The exact difference between grades of organization and symmetry is that body organization is the arrangement of smaller units into larger ones, whereas symmetry is the number of symmetrical parts into which the animal can be divided.

ii. It can be explained with the following examples:

a. **Cnidarians.**

1. **Body organization:** Cells come together to form tissues to perform body functions. This is cell-tissue grade organization.
2. **Body symmetry:** Radially symmetrical (body can be cut at an imaginary central axis through any plane of body to give two equal halves).

b. **Platyhelminthes.**

1. **Body organization:** Tissues are organized to form some organs. This is organ grade organization.
2. **Body symmetry:** Bilaterally symmetrical (there is only one imaginary axis through which two equal halves can be obtained).

9. How are different tissues formed in multicellular animals? *[1 Mark]*

Ans. In multicellular animals, during the initial period of embryonic development, germ layers are formed and from these germ layers, different body tissues are formed.

10. Mention the difference between eucoelomates and acoelomates. *[1 Mark]*

Ans. Animals in which true body cavity is present are eucoelomates and animals in which a true body cavity is absent are acoelomates.

11. What is body segmentation? *[1 Mark]*

Ans. Body segmentation is the division of the animal body into small and similar units known as segments.

12. State the characteristics of animals belonging to phylum Porifera. *[3 Marks]*

Ans.

i. Animals of phylum Porifera are multicellular and have an asymmetrical body.

ii. They have the simplest body plan amongst all multicellular organisms and are known as sponges.

iii. Most of these animals are marine and a few are freshwater dwellers.

iv. Their body shows numerous pores called ostia and oscula. Water enters the body through ostia and comes out through osculum.

v. They have special types of cells called collar cells.

vi. The members of this phylum are sedentary (do not show locomotion), as they remain attached to the substratum.

vii. Their body is supported by spicules or spongin fibres. These spicules are made up of calcium carbonate or silica.

viii. Poriferans reproduce asexually and/or sexually.

ix. They have the ability to regenerate.
For *E.g., Syon, Euspongia, Hyalonema, Euplectella*, etc.

13. Write a short note on bath sponge. *[2 Marks]*

Ans.

i. Bath sponge (*Euspongia*) is a black-coloured and somewhat round-shaped animal.

ii. Body of bath sponge consists of protein fibers called spongin. Due to the presence of these protein fibers, it has a good water-holding capacity and was therefore used for bathing in olden days.

iii. It was also used for manufacturing pillows and cushions.

iv. Bath sponges were also used as wetting material to stick postal stamps and to count currency notes.

⚠ CAUTION

Bath sponge (*Euspongia*) is different from synthetic bath sponges available in the market today. Synthetic sponges are made from man-made materials and are not derived from marine organisms.

14. Enlist the distinguishing features of Cnidarians. *[2 Marks]*

Ans.

i. Body of Cnidarians is cylindrical or umbrella-like. If cylindrical, they are called polyps and if umbrella-like they are called medusae (singular – medusa).

ii. Most of these animals are marine and only a few of them are freshwater dwellers.

iii. They are radially symmetrical and diploblastic.

iv. Tentacles present around the mouth of Cnidarians bear cnidoblasts. Tentacles are useful to capture the prey, whereas cnidoblasts inject the toxin in the body of the prey. Cnidoblasts are also useful for protection. Examples of Cnidarians are *Hydra, Adamsia, Physalia, Aurelia*, corals, etc.

Question Bank | True / False and Odd-one-out

15 **What are coral reefs?** *[1 Mark]*

Ans: Coral reefs are colonies of specific Cnidarians present in the ocean.

16 **State the uses of coral reefs.** *[2 Marks]*

Ans:
- A precious stone called 'Coral' is obtained from the coral reefs.
- Coral powder is also used in Ayurveda, and it is derived from coral reefs.

17 **Why are Platyhelminthes called flatworms?** *[1 Mark]*

Ans: The body of Platyhelminthes is slender and flattened like a leaf or a strip, so they are known as flatworms.

18 **Why are Aschelminthes also known as roundworms?** *[1 Mark]*

Ans: The body of Aschelminthes is long, thread-like or cylindrical; hence they are also called roundworms.

19 **Write a short note on the phylum Aschelminthes.** *[2 Marks]*

Ans:
- Aschelminthes include roundworms that are long, thread-like or cylindrical and non-segmented.
- Their body is covered with a tough cuticle.
- These animals are triploblastic and pseudocoelomate.
- They are either free-living or endoparasitic; free-living forms are terrestrial or aquatic.
- Animals of this phylum are unisexual, e.g., *Ascaris*, filarial worm, *Loa loa*, etc.

20 **Write the characteristic features of members belonging to phylum Annelida.** *[3 Marks]*

Ans:
- Members of phylum Annelida are triploblastic, bilaterally symmetrical and eucoelomate.
- These animals have a long, cylindrical and metamerically segmented body.
- Most animals of this phylum are free-living; a few are ectoparasites. Free-living forms may be marine or freshwater dwellers or terrestrial.
- Annelids have setae or parapodia or suckers for locomotion.
- Their body is covered with cuticle.
- They are either hermaphrodites or unisexual, e.g., earthworms, leech, *Nereis*, etc.

21 **Explain in detail the characteristics of phylum Mollusca.**

Ans:
i. Molluscs have a soft and slimy body.
ii. They are aquatic or terrestrial. Most aquatic molluscs are marine, but a few inhabit freshwater too.
iii. Members of phylum Mollusca are triploblastic, eucoelomate, non-segmented and bilaterally symmetrical.
iv. The body is divided into head, foot and visceral mass.
v. The visceral mass is covered with a mantle that secretes a hard, calcareous shell. The shell is present either externally or internally or may be absent in some.
vi. These animals are unisexual, e.g., Bivalve, snail, octopus, etc.

22 **Write three characteristics of phylum Mollusca.** *(Mar '25)* *[3 Marks]*

Ans: Any *three* of the following:
- Body soft and slimy.
- Body divided into head, foot and visceral mass.
- Visceral mass covered by a mantle that secretes a calcareous shell.
- Members are triploblastic, eucoelomate and bilaterally symmetrical.
- Animals are unisexual, e.g., Bivalve, snail, octopus, etc.

23 **To which phylum does cockroach belong? Justify your answer with scientific reasons.** *[2 Marks]*

Ans:
- Cockroach belongs to phylum Arthropoda.
- **Reasons:**
  a. It has jointed appendages.
  b. The body is triploblastic, eucoelomate, bilaterally symmetrical, segmented and divisible into head, thorax and abdomen.
  c. Its exoskeleton is chitinous.

24 **Write four distinguishing characters of phylum Echinodermata.** *[2 Marks]*

Ans:
- Body of animals of Echinodermata is composed of calcareous spines; hence they are called echinoderms.
- They are exclusively found in the ocean.
- Animals are triploblastic, eucoelomate and radially symmetrical. Larval forms, however, are bilaterally symmetrical.
- A tube feet is used for locomotion and capturing prey. The exoskeleton is made up of calcareous spines and/or plates called ossicles.
- These animals have a good ability of regeneration.
- They are mostly unisexual, e.g., starfish, sea urchin, brittle star, sea cucumber, etc.

[Any four points]

25 **What are the subphyla included under phylum Chordata?** *[1 Mark]*

Ans: The subphyla included under phylum Chordata are Urochordata, Cephalochordata and Vertebrata.

Odd-one-out

Q. No.	Group	Odd-one-out (Answer)
26.	*Ascaris*, filarial worm, *Loa loa*, octopus	**Octopus**
27.	Bivalve, snail, octopus, *Nereis*	**Nereis**
28.	Arthropoda, Echinodermata, Annelida, Aschelminthes	**Arthropoda**
29.	Triploblastic, eucoelomate, segmented, divisible into head, thorax and abdomen	**Segmented**
30.	Starfish, sea urchin, brittle star, sea cucumber	**Sea cucumber**

26. Write a short note on Cephalochordates. *[2 Marks]*

Ans:

i. Cephalochordates are small, fish-like, marine animals.
ii. Notochord extends throughout the entire length of the body.
iii. Their pharynx is very large and has gill slits.
iv. They are unisexual. E.g. *Amphioxus*.

27. Mention any one difference between Urochordates and Cephalochordates. *[1 Mark]*

Ans:

Urochordates	Cephalochordates
In Urochordates, notochord is present only in the tail region of larvae.	In Cephalochordates, notochord is present throughout the body length and throughout the life of the organisms.

OR

Urochordates	Cephalochordates
Urochordates are hermaphrodites.	Cephalochordates are unisexual.

28. State the characteristics of subphylum Vertebrata. *[2 Marks]*

Ans:

i. Notochord of animals belonging to the subphylum Vertebrata is replaced by a vertebral column.
ii. Their head is well developed.
iii. Their brain is protected in the cranium.
iv. Endoskeleton is cartilaginous or bony.

29. Classify and explain the characteristics of *Petromyzon*. *[3 Marks]*

Ans:

i. Classification of *Petromyzon*:

Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata / Craniata
Class	Cyclostomata

ii. Characteristics of *Petromyzon*:

a. *Petromyzon* has a jawless mouth (suctorial), with a sucker-like structure.
b. Its skin is soft and without scales.
c. *Petromyzon* is an ectoparasite.
d. It has a cartilaginous endoskeleton.
e. Paired appendages (fins) are absent in this animal.

30. State the characteristics of the members of class Pisces.

Ans:

i. Members of class Pisces are poikilothermic (cold-blooded).
ii. They are marine or fresh-water animals.
iii. They have a spindle-shaped body to minimise water resistance.
iv. They have paired or unpaired fins for swimming. The tail fin is used as a steering organ during swimming.
v. Exoskeleton is in the form of scales.
vi. Endoskeleton is either bony or cartilaginous.
vi. Respiration takes place through gills. E.g. Rohu, Pomfret, seahorse, shark, electric ray, sting ray, etc.

Note: *Currently Pisces is considered as super class.*

31. Explain the adaptation in fish body which makes floating on water as well as going in deep water easy. *[HOTS]*

Ans: *Refer Answer to the following: Q. 30 (iii, iv, vi)*

32. * Give scientific classification of shark upto class.

Ans:

Kingdom : Animalia
Phylum : Chordata
Subphylum : Vertebrata / Craniata
Class : Pisces

Note: *Currently Pisces is considered as super class. Shark belongs to class Chondrichthyes.]*

33. Enlist the characters of Amphibians. *[2 Marks]*

Ans:

i. Larvae of amphibians are strictly aquatic and perform aquatic respiration only. Adults can perform aquatic as well as aerial respiration.
ii. Exoskeleton is absent and skin is usually kept moist for respiration.
iii. They have two pairs of appendages and their digits are without claws.
iv. Neck is absent. Eyes are prominent with eyelids. External ear is absent, but tympanum is present. E.g. frog, toad, salamander, etc.

34. Answer the following questions:

i. Give scientific classification of wall lizard. *[2 Marks]*

Ans: The classification of wall lizard is as follows:

Kingdom	: Animalia
Phylum	: Chordata
Subphylum	: Vertebrata / Craniata
Class	: Reptilia

ii. Write any three characteristics of class reptilia. *[Mar '22] [3 Marks]*

Ans: The characteristics of class reptilia:

a. They are poikilothermic (cold-blooded) animals.
b. They creep on the land because their body cannot be lifted.
c. Digits are provided with claws.
d. Their skin is dry and scaly.
e. Neck is present between the head and trunk.
f. External ear is absent.

[Any three characteristics]

35. Write any *three* characteristic features of class "Aves". *[July '24] [3 Marks]*

Ans:

i. The members of class Aves are completely adapted for aerial life.
ii. They are homoeotherms i.e., they can maintain a constant body temperature.

A. GIVE REASONS

1 Why does a jellyfish (*Aurelia*) sting on touch?

Ans. The tentacles of jellyfish bear stinging cells called cnidoblasts (nematocysts) that discharge a coiled, barbed thread and inject venom. Therefore, touch causes irritation.

2 Why are annelids termed as eucoelomates?

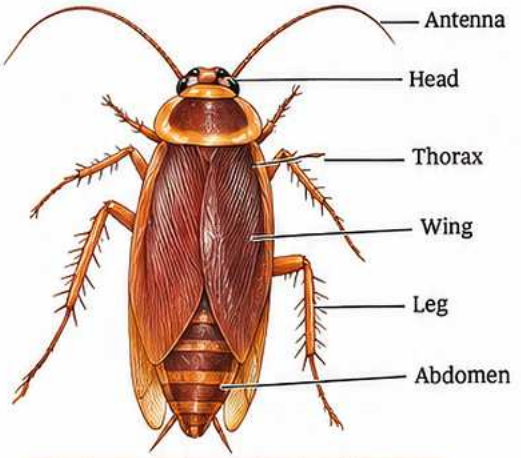
Ans. Annelids have a true, spacious coelom (eucoelom) that is completely lined by mesoderm (peritoneum). Hence, they are called eucoelomates.

Example: *Pheretima* (earthworm), *Hirudinaria* (leech).

3 Why is cockroach placed in Phylum Arthropoda?

Ans. Cockroach shows key arthropod characters: a segmented body (head, thorax, abdomen), jointed appendages, and an external chitinous exoskeleton. Hence, it is placed in Phylum Arthropoda.

Example: *Periplaneta* (cockroach).

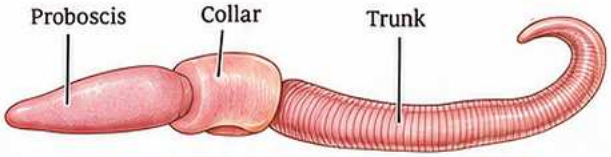


Cockroach – Dorsal view *(Periplaneta)*

4 Why is *Balanoglossus* regarded as a connecting link between non-chordates and chordates?

Ans. *Balanoglossus* (a hemichordate) shows characters of both groups: it resembles non-chordates through the broken gill slits (and absence of a true notochord), and shows chordate affinities by having pharyngeal gill slits and a dorsal, hollow nerve cord. Hence, it is a connecting link.

Example: *Balanoglossus*.



Balanoglossus – External body (showing regions)

5 Why are all vertebrates grouped under Chordata?

Ans. All vertebrates possess the fundamental chordate plan at least during embryonic development: a notochord (which later forms the vertebral column), a dorsal hollow nerve cord, pharyngeal gill slits, and a post-anal tail. Therefore, all vertebrates are included in Phylum Chordata.

Examples: *Pisces, Amphibia, Reptilia, Aves and Mammalia.*

6 Why is a tortoise not placed in Amphibia?

Ans. A tortoise is a reptile, not an amphibian, because it has dry, scaly skin; breathes only by lungs; and lays Ammniotic (shelled) eggs on land. Amphibians have moist, scaleless skin, dual (cutaneous and pulmonary) respiration, and usually lay eggs in water.

Example: *Tortoise (Testudo).*

7 Why do reptiles maintain a variable body temperature?

Ans. Reptiles are ectothermic (poikilothermic); they cannot maintain a constant internal temperature and their body temperature changes with the surrounding environment.

Examples: Lizard *(Calotes)*, snake *(Naja)*, crocodile *(Crocodylus)*.

B. DISTINGUISH BETWEEN

1 Chordates and Non-chordates

Feature	Chordates	Non-chordates
Notochord	Present at least in embryonic stage.	Absent.
Nerve cord	Dorsal, hollow and tubular.	Ventral, solid and non-tubular.
Pharyngeal gill slits	Present at least in development.	Absent.
Post-anal tail	Present at least in embryo.	Absent.
Examples	*Herdmania, Amphioxus, Frog, Lizard, Pigeon, Man.*	*Starfish, Earthworm, Cockroach, Octopus.*

2 Flatworms (Platyhelminthes) and Roundworms (Aschelminthes)

Feature	Flatworms (Platyhelminthes)	Roundworms (Aschelminthes)
Body form	Dorso-ventrally flattened (flat).	Cylindrical, round and unsegmented.
Body cavity	Acoelomate (no coelom).	Pseudocoelomate (with a pseudocoelom).
Digestive system	Incomplete (a single opening).	Complete (mouth and anus).
Examples	*Planaria, Taenia, Fasciola.*	*Ascaris, Wuchereria.*

C. SUMMARY: IMPORTANT CLASSIFICATIONS

Animals	Kingdom	Phylum	Class	Body organization	Body symmetry	Body cavity	Germ layers	Characters
Starfish	Animalia	Echinodermata	*Asteroidea*	Multicellular, cellular grade	Pentamerous radial	Coelomate	Triploblastic	Spiny skin, water vascular system.
Sea urchin	Animalia	Echinodermata	Echinoidea	Multicellular, cellular grade	Radial (5-rayed)	Coelomate	Triploblastic	Spines, calcareous test.
Brittle star	Animalia	Echinodermata	Ophiuroidea	Multicellular, cellular grade	Radial (5-rayed)	Coelomate	Triploblastic	Slender, flexible arms.
Sea horse	Animalia	Chordata	Pisces	Multicellular, organ-system grade	Bilateral	Coelomate	Triploblastic	Bony, upright body; gills.
Shark	Animalia	Chordata	Pisces	Multicellular, organ-system grade	Bilateral	Coelomate	Triploblastic	Cartilaginous skeleton; gills.

Note: *Currently, Pisces is considered a super class.*

Animal Classification

Classification Hierarchy

- Animals are arranged in a graded series of groups from general to specific.
- The taxonomic order is:
  Kingdom → Phylum → Class → Order → Family → Genus → Species.



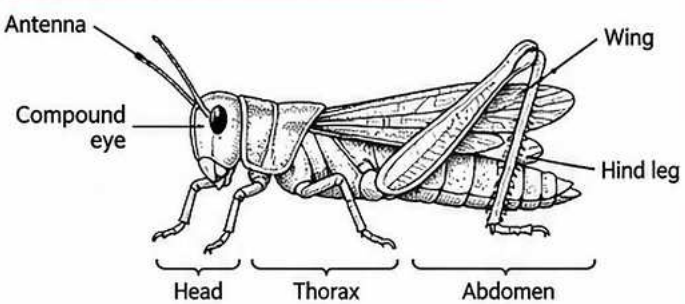
Methods and History of Animal Classification

Method / System	Basis used	Main idea
Artificial system	Few selected characters	• Uses one or a few visible features. • Examples: early grouping by habitat, colour, or mode of life.
Natural system	Many characters (overall similarity)	• Considers a large number of characters. • Shows natural relationships among animals.
Phylogenetic system	Evolutionary relationships (ancestry)	• Groups animals based on their common origin and evolutionary history.

Classification of Some Animals

Animal	Kingdom	Phylum	Class	Sub-kingdom (Body organisation)	Body symmetry	Body cavity	Germ layers	Main characteristics (key points)
Grasshopper	Animalia	*Arthropoda*	Insecta	Organ-system grade	Bilateral	Eucoelomate	Triploblastic	• Numerous pores on body (ostia & osculum) • Special collar cells (choanocytes) • Regeneration ability high • Do not show locomotion • Reproduce by budding
Rohu	Animalia	Chordata	Pisces	Organ-system grade	Bilateral	Eucoelomate	Triploblastic	• Lives in fresh water • Bony fish • Scales on body • Respiration through gills
Penguin	Animalia	Chordata	Aves	Organ-system grade	Bilateral	Eucoelomate	Triploblastic	• Exoskeleton in form of feathers • Warm-blooded • Oviparous • Neck between head and trunk
Frog	Animalia	Chordata	Amphibia	Organ-system grade	Bilateral	Eucoelomate	Triploblastic	• Can live on land and in water • Skin without exoskeleton • Fingers and toes without claws • External ear absent • Tympanum present
Lizard	Animalia	Chordata	Reptilia	Organ-system grade	Bilateral	Eucoelomate	Triploblastic	• Cold-blooded • Body divisions: head, neck and trunk • Regeneration ability for lost part is absent • External ear is absent
Elephant	Animalia	Chordata	Mammalia	Organ-system grade	Bilateral	Eucoelomate	Triploblastic	• Heart is four-chambered • Viviparous • Body divided into head, neck, trunk and tail
Jellyfish	Animalia	Cnidaria	–	Cell-tissue grade	Radial	Acoelomate	Diploblastic	• Body is medusa-shaped • Tentacles are used for catching prey • Tentacles have cnidoblasts (stinging cells) • Cells secrete toxin, which paralyzes the prey

Grasshopper – Labeled Diagram



Question Bank – Multiple Choice Questions

1 **Write the characters of each of the following animals with the help of classification chart:**
(a) Bath sponge (b) Grasshopper (c) Rohu
(d) Penguin (e) Frog (f) Lizard (g) Elephant (h) Jellyfish

Ans. Characteristics are given in the table 'Classification of Some Animals' above.

Give reasons (2 Marks each)

1. Our body irritates if it comes in contact with jellyfish.

Ans:
i. Jellyfish is a coelenterate/cnidarian with tentacles around its mouth bearing cnidoblasts (stinging cells).
ii. When a person touches jellyfish, the tentacles come in contact with the skin and inject toxins, which cause irritation as a defensive response.

2. Annelids are considered as eucoelomates.

Ans:
i. The body cavity between the body wall and internal organs is a true coelom (body cavity/coelom).
ii. During early embryonic development of multicellular animals, this body cavity is formed from the inner mesodermal layer.
iii. Hence the body cavity is a true body cavity, and animals with such a body cavity are called eucoelomates.
iv. Annelids possess a true body cavity and therefore are considered eucoelomates.

3. Cockroach belongs to phylum Arthropoda.

Ans: Refer to the answer of Q. 23.

4. * *Balanoglossus* is a connecting link between Non-chordates and Chordates.

OR

How is *Balanoglossus* connecting link between chordates and non-chordates?

Ans:
i. *Balanoglossus*, a member of the phylum *Hemichordata*, shows characters of both chordates and non-chordates.
ii. It lacks a vertebral column (non-chordate character), while showing chordate features such as a pharyngeal gill slits and a stomochord-like structure.
iii. Hence, *Balanoglossus* is regarded as a connecting link between non-chordates and chordates.

***5. All vertebrates are chordates but all chordates are not vertebrates.**

Ans:
i. All chordates possess a notochord at least at some developmental stage.
ii. In vertebrates, the notochord is present only during embryonic stages, and later it is replaced by the vertebral column (backbone).
iii. However, urochordates have a notochord only in their larval stage, while cephalochordates maintain it throughout life without developing a vertebral column.
iv. The presence of a notochord defines all vertebrates as chordates, yet the absence of a vertebral column in urochordates and cephalochordates shows that not all chordates are vertebrates.

***6. Though tortoise lives on land as well as in water, it cannot be included in class-Amphibia.** *[Mar '24, July '24]*

Ans:
i. The tortoise respires using lungs both on land and in water and is unable to extract oxygen from water like true amphibians, which respire through their moist skin in water.
ii. Its body is dry and scaly, and there is a distinct neck between the head and trunk, with digits bearing claws – characters of class Reptilia.
iii. True amphibians have moist, glandular, permeable skin for respiration in water.
iv. Therefore, despite its dual habitat (land and water), the tortoise is placed in class Reptilia, not in class Amphibia.

***7. Body temperature of reptiles is not constant.**

Ans:
i. Reptiles are poikilothermic (cold-blooded) animals, unlike mammals and birds which are warm-blooded.
ii. They cannot maintain a constant internal body temperature; it varies according to the external environmental temperature.
iii. Reptiles regulate their body temperature by moving to warmer or cooler areas as needed.

Thus, due to lack of internal regulation of temperature, the body temperature of reptiles is not constant.

Distinguish between

1. Chordates and Non-chordates *[Mar '23]* *(2 Marks)*

Ans:

Sr. No.	Chordates	Non-chordates
i.	Body is supported by notochord.	Body is not supported by notochord.
ii.	Pharyngeal gill slits are present, at least in developmental stages.	Pharyngeal gill slits are absent.
iii.	Nerve cord is hollow and present dorsally.	Nerve cord, if present, is solid, paired and present ventrally.
iv.	Heart is present on the ventral side of the body.	Heart, if present, is on the dorsal side of the body.

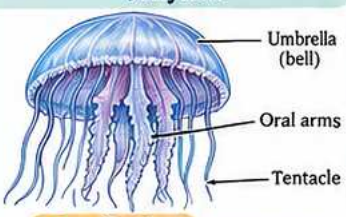
2. Flatworms and Roundworms *(2 Marks)*

Ans:

Sr. No.	Flatworms	Roundworms
i.	They belong to phylum Platyhelminthes.	They belong to phylum Aschelminthes.
ii.	They are acoelomates.	They are pseudocoelomates.
iii.	Their body is slender and flat, like a leaf or strip.	Their body is long, therad-like or cylindrical.
iv.	They are hermaphrodites. *e.g. Planaria*, liver fluke, tape worm, etc.	They are unisexual. e.g. *Ascaris*, filarial worm, *Loa loa* (eye worm), etc.

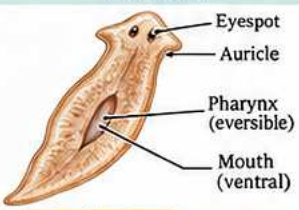
Diagram Bank : Important Organisms with Labels & Classification

Jellyfish



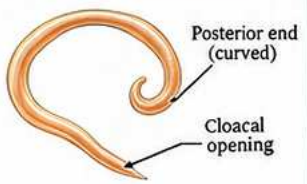
Classification
Phylum : Coelenterata (Cnidaria)
Class : Scyphozoa

Planaria



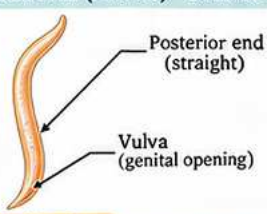
Classification
Phylum : Platyhelminthes
Class : Turbellaria

Roundworm (*Ascaris*) – Male



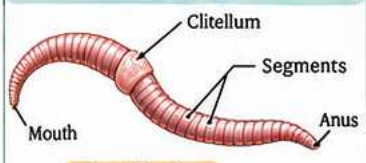
Classification
Phylum : Aschelminthes
Class : Nematoda

Roundworm (*Ascaris*) – Female



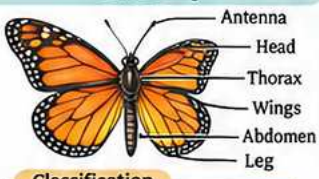
Classification
Phylum : Aschelminthes
Class : Nematoda

Earthworm



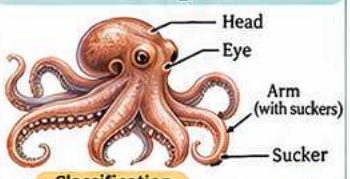
Classification
Phylum : Annelida
Class : Oligochaeta

Butterfly



Classification
Phylum : Arthropoda
Class : Insecta

Octopus



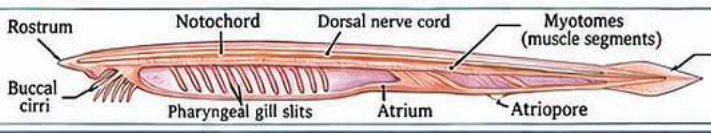
Classification
Phylum : Mollusca
Class : Cephalopoda

Starfish



Classification
Phylum : Echinodermata
Class : Asteroidea

Amphioxus (*Branchiostoma*)



Classification
Phylum : Chordata
Class : Cephalochordata

Chapter 6: Animal Classification

1. Playthelminthes and Aschelminthes [2 Marks]

Ans: Both groups can be distinguished as follows:

Sr.	Playthelminthes	Aschelminthes
i.	The body of these animals is soft and slimy.	The body of these animals is covered by calcareous spines.
ii.	These animals are aquatic or terrestrial.	These animals are found only in the ocean.
iii.	Their bodies show bilateral symmetry, except snail.	Their bodies show bilateral symmetry only in larval stage and radial symmetry in adult stage.
E.g.,	Bivalve, octopus, etc.	Starfish, sea-urchin, brittle star, sea cucumber, etc.

2. Mollusca and Echinodermata [2 Marks]

Ans:

Sr.	Mollusca	Echinodermata
i.	The body of these animals is soft and slimy.	The body of these animals is covered by calcareous spines.
ii.	These animals are aquatic or terrestrial.	These animals are found only in the ocean.
iii.	Their bodies show bilateral symmetry, except snail.	Their bodies show bilateral symmetry only in larval stage and radial symmetry in adult stage.
E.g.,	Bivalve, octopus, etc.	Starfish, sea-urchin, brittle star, sea cucumber, etc.

3. Frog and Tortoise [2 Marks]

Ans:

Sr.	Frog	Tortoise
i.	It belongs to class Amphibia.	It belongs to class Reptilia.
ii.	Digits are without claws.	Digits are with claws.
iii.	Skin is moist and without scales.	Skin is dry and with scales.
iv.	Neck is absent.	Neck is present between head and trunk.

4. Class Pisces and Class Reptiles [Mar '25] [2 Marks]

Ans:

Sr.	Class Pisces	Class Reptiles
i.	These are aquatic animals living in marine and fresh waters.	These are the first true terrestrial animals with creeping movements.
ii.	They have paired and unpaired fins for swimming; tailfin acts as steering organ.	They creep on land as body cannot be lifted up.
iii.	E.g.: Rohu, Pomfret	E.g.: Tortoise, Lizard

5. Amphibia and Reptilia [2 Marks]

Ans: They differ as follows:

Sr.	Amphibia	Reptilia
i.	It belongs to phylum Arthropoda.	It belongs to phylum Chordata.
ii.	It has jointed appendages.	It does not have jointed appendages.
iii.	It has four wings for flying.	It has patagium that functions as a wing.
iv.	Body is divisible into head, thorax and abdomen.	Body is divisible into head, neck, trunk and tail.
v.	Exoskeleton is chitinous.	Exoskeleton is in the form of hairs.

6. Butterfly and bat [2 Marks]

Ans:

Sr.	Butterfly	Bat
i.	It belongs to phylum Arthropoda.	It belongs to phylum Chordata.
ii.	It has jointed appendages.	It does not have jointed appendages.
iii.	It has four wings for flying.	It has patagium that functions as a wing.
iv.	Body is divisible into head, thorax and abdomen.	Body is divisible into head, neck, trunk and tail.
v.	Exoskeleton is chitinous.	Exoskeleton is in the form of hairs.

7. Aves and Mammalia [Mar '20] [2 Marks]

Ans:

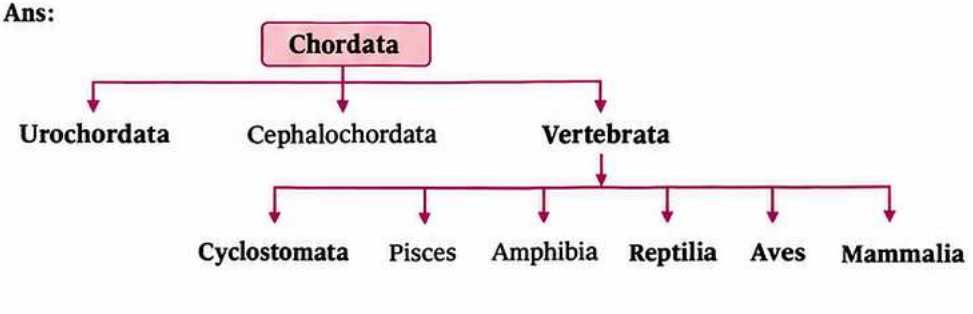
Sr.	Aves	Mammalia
i.	Mammary glands are absent.	Mammary glands are present.
ii.	They are completely adapted for aerial life.	They are mostly terrestrial animals with some exceptions like dolphin, bat, etc.
iii.	Body is divided into head, neck and trunk.	Body is divided into head, neck, trunk and tail.
iv.	Exoskeleton is present in the form of feathers.	Exoskeleton is present in the form of hair or fur.
v.	Digits are covered with scales and bear claws.	Digits are provided with nails, claws or hooves.
E.g.,	Peacock, penguin, parrot, pigeon, duck, etc.	Elephant, human, kangaroo, dolphin, bat, etc.

[Any four points]

8. Complete the given chart/table [3 Marks]

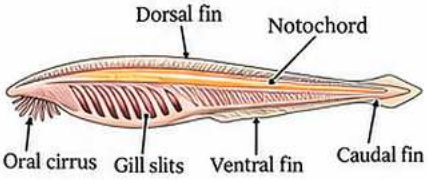
1. Complete the following chart. *(Answers are directly given in **bold**)*

Ans:

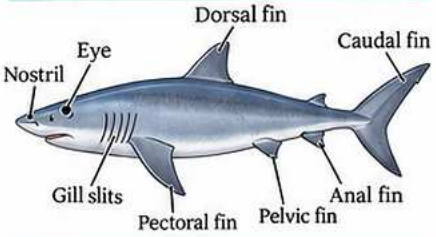


Label the Following Diagrams (Question-Bank)

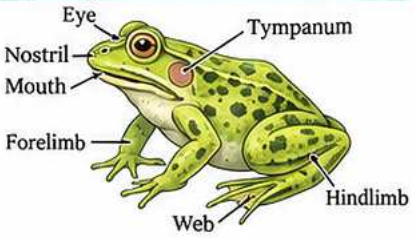
(i) Amphioxus [2 Marks]



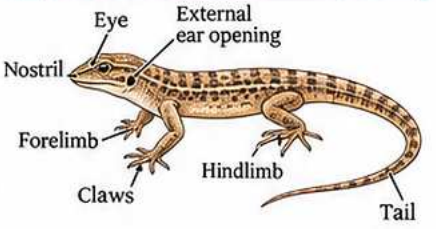
(ii) Shark [2 Marks]



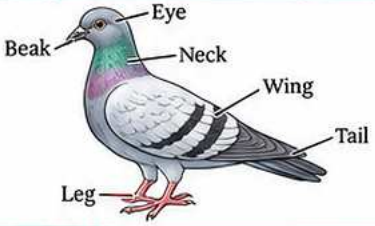
(iii) Frog [2 Marks]



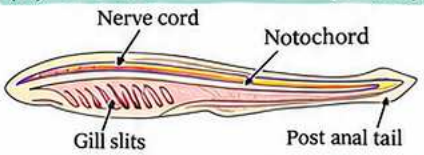
(iv) Wall Lizard [2 Marks]



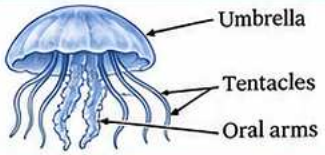
(v) Pigeon [2 Marks]



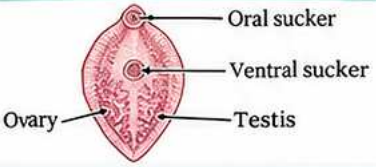
(vi) Chordate [2 Marks]



(vii) Jellyfish [2 Marks]



(viii) Liver-fluke [2 Marks]



2 **Complete the following chart.**

Body cavity	Germ layer	Phylum
Absent	----------	*Porifera*
Absent	Triploblastic	----------
Pseudocoelom	----------	*Aschelminthes*
Present	----------	Arthropoda

[2 Marks]

Ans: *[Note: Discus the body's germ layer arrangement with your teacher to select the correct phylum for Porifera.]*

Body cavity	Germ layer	Phylum
Absent	----------	*Porifera*
Absent	Triploblastic	**Platyhelminthes**
Pseudocoelom	**Triploblastic**	*Aschelminthes*
Present	**Triploblastic**	*Arthropoda*

- *Porifera (sponges) lack true germ layers. Their body shows three layers—pinacoderm (outer), choanoderm (inner) and mesohyl (gelatinous matrix); however, these do not correspond to the ectoderm, mesoderm and endoderm seen in **diploblastic** or **triploblastic** animals.*
- *In diploblastic and triploblastic animals, germ layers are established during gastrulation, a process absent in sponges.*
- *Thus, scientific classification distinguishes sponges from other animals with well-defined germ layers, making "Absent" the correct entry in this context.*

3 **Complete the following chart.** *[2 Marks]*

*(Answers are directly given in **bold**.)*

Group	Character	Example
Urochordata	Body is covered by tunic	*Doliolum*
Arthropoda	Eucoelomate, bilateral symmetry and segmented	Honeybee
Cnidaria	Polyp and medusa body form	**Sea anemone**
Craniata	**Notochord is replaced by vertebral column**	Toad

4 **Complete the following chart.**

Type	Character	Example
Cyclostomata	----------	----------
----------	Gill respiration	----------
Amphibia	----------	----------
----------	Poikilotherms	Whale

Ans:

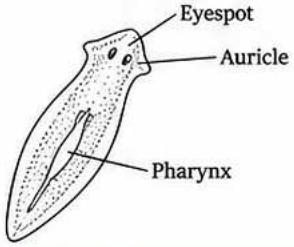
Type	Character	Example
Cyclostomata	**Jawless mouth provided with sucker**	*Petromyzon*
Pisces	Gill respiration	**Shark, Pomfret**
Amphibia	**Live on land and water**	**Frog**
Mammalia	**Mammary glands**	Whale
Reptilia	Poikilotherms	**Lizard, tortoise, snake**

Questions based on diagram

1. Sketch, label and classify. *[3 Marks each]*

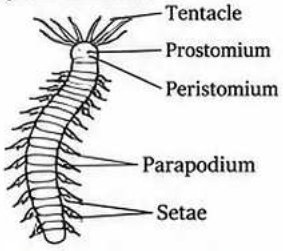
i. *Planaria*

Ans: Classification
Kingdom: Animalia
Phylum: **Platyhelminthes**



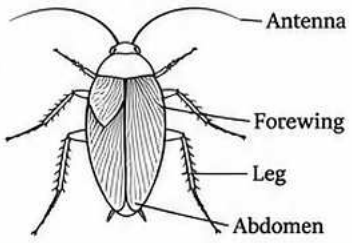
ii. *Nereis*

Ans: Classification
Kingdom: Animalia
Phylum: **Annelida**



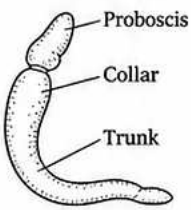
iii. *Cockroach*

Ans: Classification
Kingdom: **Animalia**
Phylum: **Arthropoda**



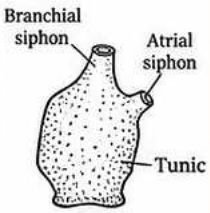
iv. *Balanoglossus*

Ans: Classification
Kingdom: **Animalia**
Phylum: **Hemichordata**



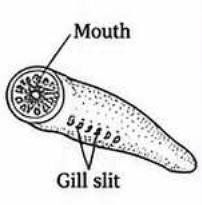
v. *Herdmania*

Ans: Classification
Kingdom: **Animalia**
Phylum: **Urochordata**



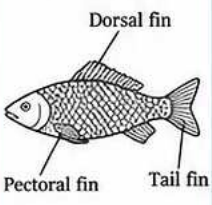
vi. *Petromyzon*

Ans: Classification
Kingdom: **Animalia**
Phylum: **Cyclostomata**



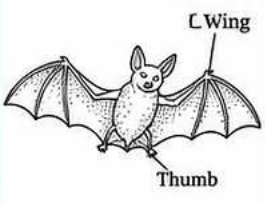
vii. *Bony fish*

Ans: Classification
Kingdom: **Animalia**
Phylum: **Pisces**



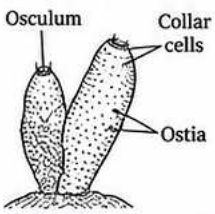
viii. *Bat*

Ans: Classification
Kingdom: **Animalia**
Phylum: **Mammalia**



ix. *Spongilla*

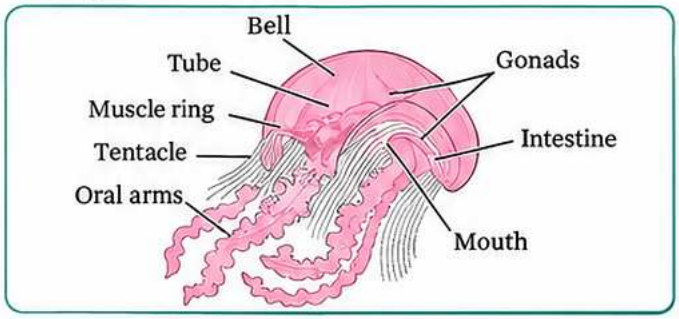
Ans: Classification
Kingdom: **Animalia**
Phylum: **Porifera**



T Classified Examples (with Diagrams)

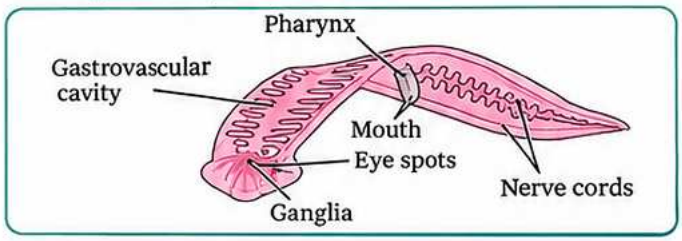
iii. Jellyfish

- **Ans:** Classification
- Kingdom: Animalia
- Phylum: Coelenterata



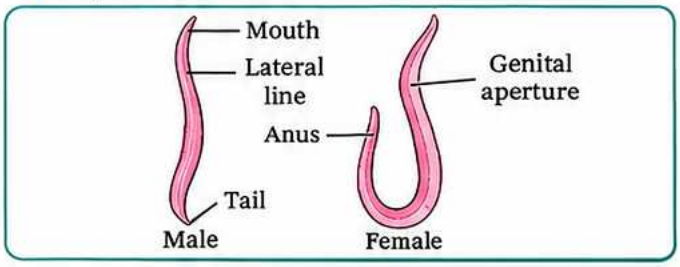
iv. *Planaria*

- **Ans:** Classification
- Kingdom: Animalia
- Phylum: Platyhelminthes



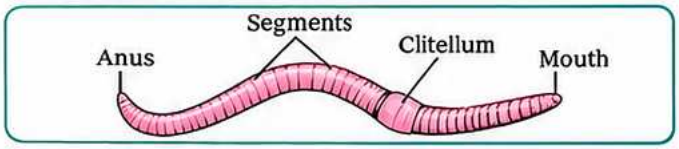
v. Roundworm

- **Ans:** Classification
- Kingdom: Animalia
- Phylum: Aschelminthes



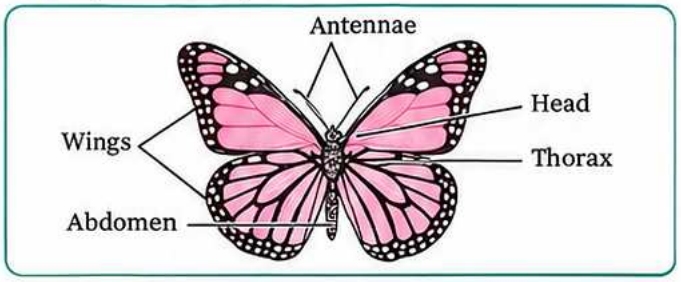
vi. Earthworm

- **Ans:** Classification
- Kingdom: Animalia
- Phylum: Annelida



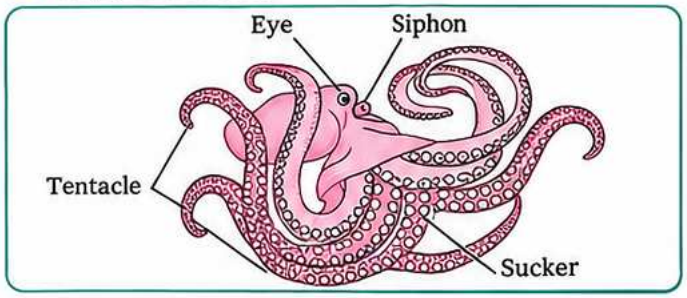
vii. Butterfly

- **Ans:** Classification
- Kingdom: Animalia
- Phylum: Arthropoda



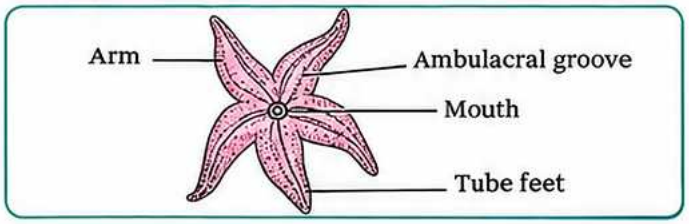
viii. Octopus

- **Ans:** Classification
- Kingdom: Animalia
- Phylum: Mollusca



ix. Starfish

- **Ans:** Classification
- Kingdom: Animalia
- Phylum: Echinodermata



x. Amphioxus

- **Ans:** Classification
- Kingdom: Animalia
- Phylum: Chordata
- Subphylum: Cephalochordata

Question-Bank

A. Short Answer Type Questions

Q1. What are coral reefs? Write a short note on their formation.
A. Coral reefs are large, hard structures in sea made of calcium carbonate, built by colonies of coelenterates (e.g., corals). They form due to deposition of calcium carbonate from the skeletons of corals over a long period.

Q2. Name the phylum of Planaria and write its classification.
A. **Phylum:** Platyhelminthes; **Classification:** Kingdom – Animalia, Phylum – Platyhelminthes.

Q3. Name the phylum of roundworm and write its classification.
A. **Phylum:** Aschelminthes; **Classification:** Kingdom – Animalia, Phylum – Aschelminthes.

Q4. Name the phylum of earthworm and write its classification.
A. **Phylum:** Annelida; **Classification:** Kingdom – Animalia, Phylum – Annelida.

Q5. Name the phylum of octopus and write its classification.
A. **Phylum:** Mollusca; **Classification:** Kingdom – Animalia, Phylum – Mollusca.

Q6. Name the phylum of butterfly (cockroach) and write its classification.
A. **Phylum:** Arthropoda; **Classification:** Kingdom – Animalia, Phylum – Arthropoda.

Q7. Name the phylum of starfish and write its classification.
A. **Phylum:** Echinodermata; **Classification:** Kingdom – Animalia, Phylum – Echinodermata.

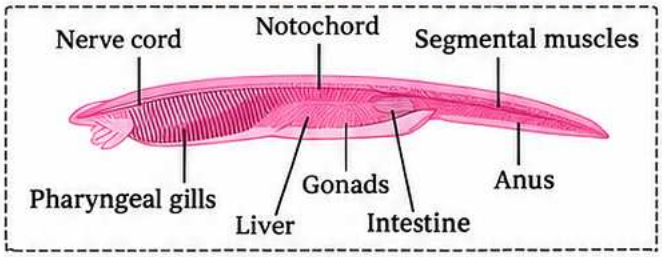
Q8. Write the classification of Amphioxus and name its subphylum.
A. **Classification:** Kingdom – Animalia, Phylum – Chordata, Subphylum – Cephalochordata.

B. Long Answer Type Question

Q9. Describe coral reefs in detail with their formation and examples.
A. Coral reefs are extensive, hard, calcium carbonate structures in sea, formed by the continuous deposition of calcium carbonate from the skeletons of colonial coelenterates (corals). Examples: corals (e.g., reef corals).

Phylum Chordata – Selected Examples, Classification and Labeling

A. Cephalochordata : Example – Amphioxus

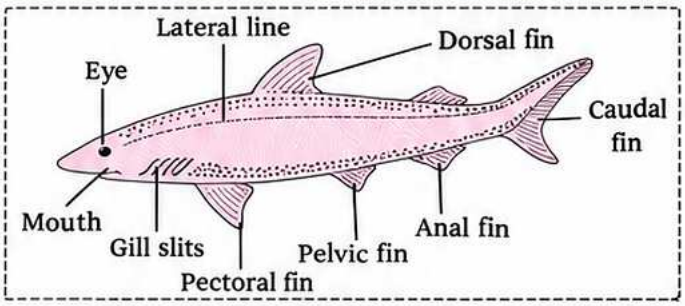


B. Pisces : Example – Shark

Ans: Classification of Shark

Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata
Class	Pisces

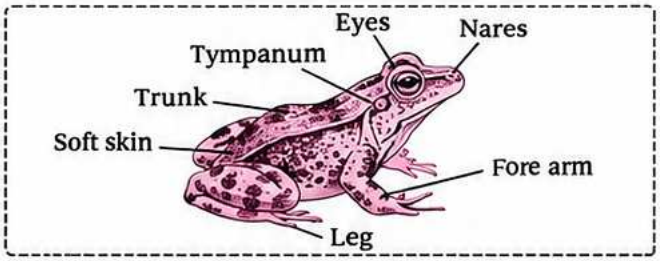
Note: *Under Pisces, shark is treated as a higher (super) class. Shark is placed in the class Chondrichthyes.*



C. Amphibia : Example – Frog

Ans: Classification of Frog

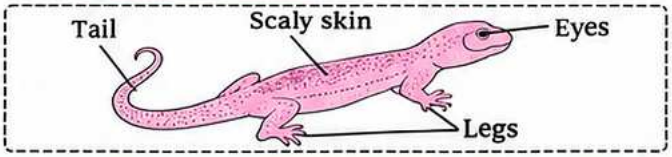
Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata
Class	Amphibia



D. Reptilia : Example – Wall Lizard

Ans: Classification of Wall Lizard

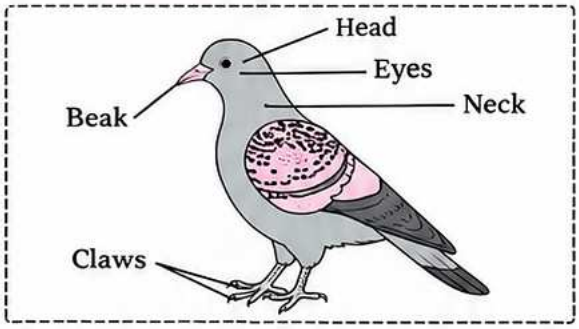
Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata
Class	Reptilia



E. Aves : Example – Pigeon

Ans: Classification of Pigeon

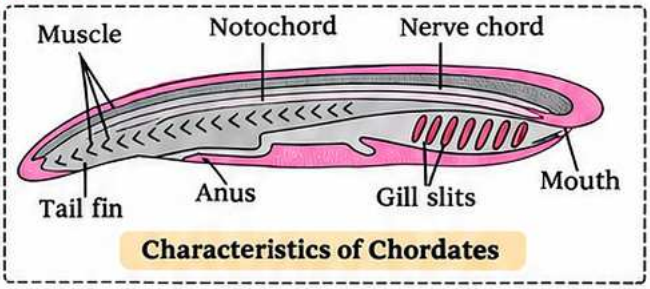
Kingdom	Animalia
Phylum	Chordata
Subphylum	Vertebrata
Class	Aves



2. Label the following. *[2 Marks each]*

i. *(Labelings are directly given in the diagram)*

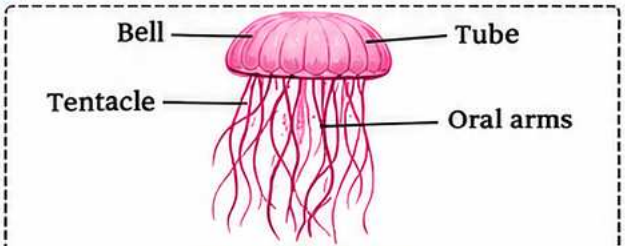
Ans:



Characteristics of Chordates

ii. *(Labelings are directly given in the diagram)*

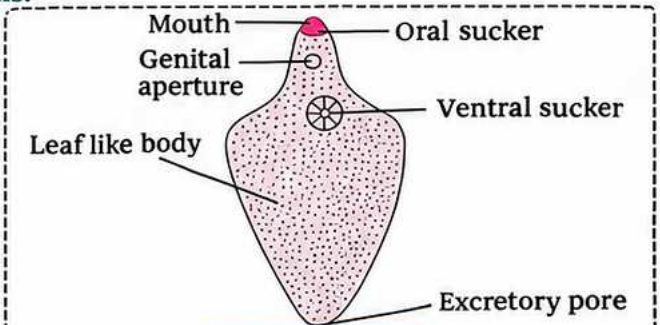
Ans:



Jellyfish

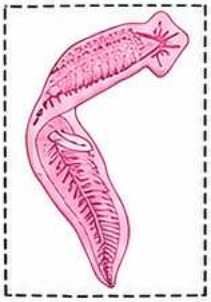
iii. *(Labelings are directly given in the diagram)*

Ans:



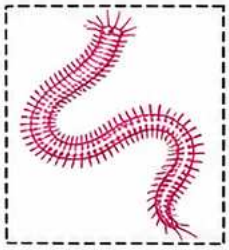
Liverfluke

Q. iv.

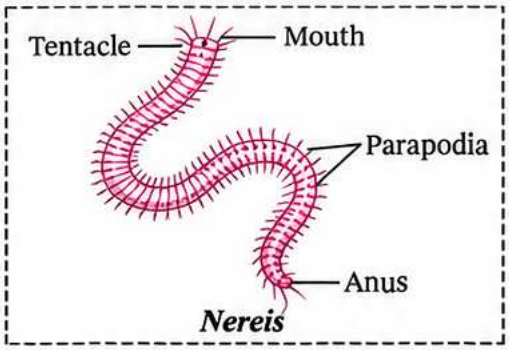


Ans. *Refer to Q. 1 (iv) based on the given diagram.*

***v.**

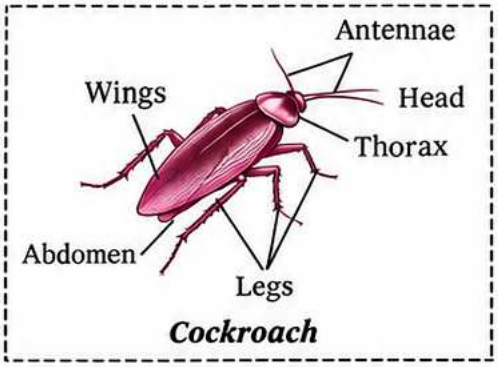


Ans.



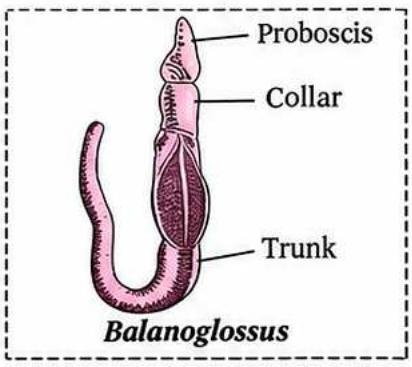
vi. ***(Labelings are directly given in the diagram)***

Ans.



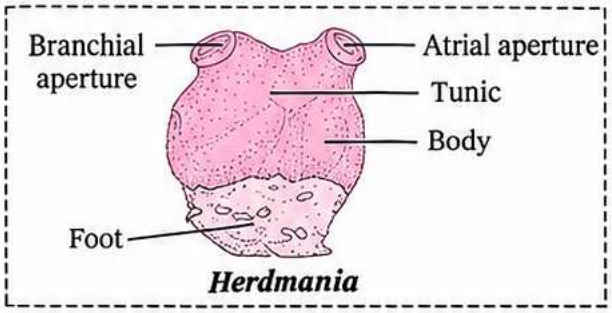
vii. ***(Labelings are directly given in the diagram)***

Ans.



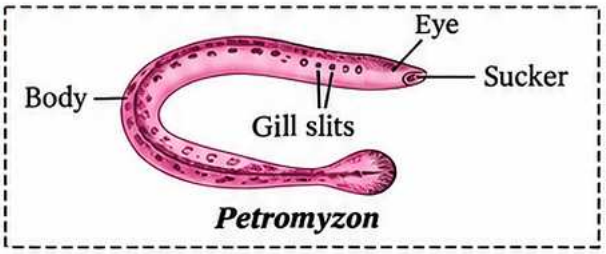
viii. ***(Labelings are directly given in the diagram)***

Ans.

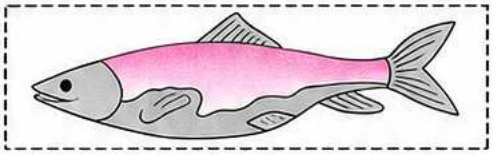


ix. ***(Labelings are directly given in the diagram)***

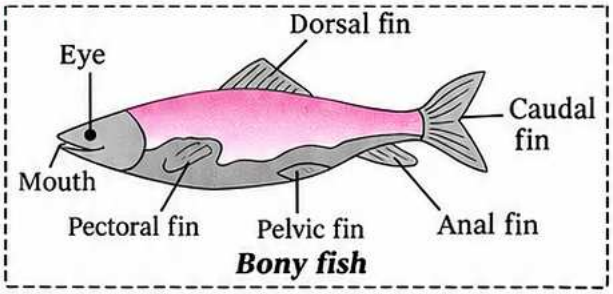
Ans.



***x.**

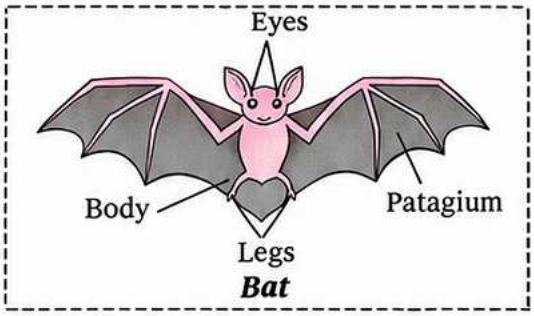


Ans.



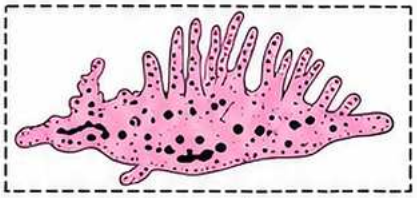
xi. ***(Labelings are directly given in the diagram)***

Ans.



3. Identify the animal and the phylum to which it belongs. ***[1 Mark each]***

i.



Ans. The animal shown above is *Spongilla* and it belongs to phylum Porifera.

4. Classification – Identify Phylum & Write Characters

Identify the phylum of the animal shown and write any two characteristics. ***[3 Marks]***

ii.



Ans: The animal shown is Tapeworm. It belongs to phylum ***Platyhelminthes.***

iii.



Ans: The animal shown is Leech. It belongs to phylum ***Annelida.***

iv.



Ans: The animal shown is Sea cucumber. It belongs to phylum ***Echinodermata.***

v.



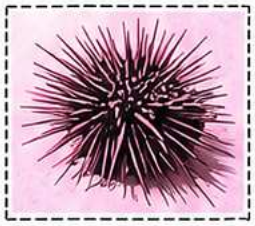
Ans: The animal shown is *Saccoglossus.* It belongs to phylum ***Hemichordata.***

vi.



Ans: The animal shown is *Myxine.* It belongs to phylum ***Chordata.***

Characters of Echinodermata



Ans: The animal shown is a sea urchin. It belongs to phylum *Echinodermata.*

Note: *Characteristics of phylum Echinodermata: refer Answer to Q.24.*

5. Observe the figures and answer the questions given below. *[3 Marks]*





i. **The organisms in the given figures belong to which phylum?**

Ans: The organisms in the figures belong to phylum *Coelenterata.*

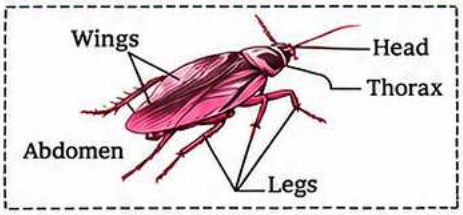
ii. **Name the special type of cells present around the mouth of these animals.**

Ans: Cnidoblasts.

iii. **What is the symmetry and body organization of these animals?**

Ans: These animals are radially symmetrical and have cell – tissue grade organization.

6. Observe the following diagram. Write the answers of the following questions.



i. **To which phylum does the animal included in the diagram belong?**

ii. **What is the exoskeleton made up?**

iii. **What is the symmetry?** *[Mar '20]* ***[3 Marks]***

Ans:

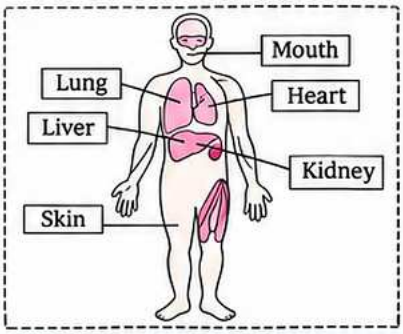
i. The animal in the diagram belongs to phylum Arthropoda.

ii. The exoskeleton of cockroach is made up of chitin.

iii. Symmetry is the number of symmetrical parts the animal can be divided into. Cockroach shows bilateral symmetry.

7. Label the body organization of human in the following figure. *[Mar '20]* ***[3 Marks]***

(Answers are directly given in the diagram)



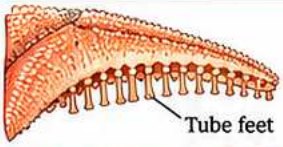
Types of Symmetry in Animals

Type of symmetry	Meaning	Example
Radial symmetry	Body can be divided into similar halves by any one of several planes passing through the central axis.	*Hydra, Starfish (Echinodermata)*
Bilateral symmetry	Body can be divided into two equal halves by only one plane along the longitudinal axis.	Cockroach, Human *(Chordata)*

Adaptation for Different Modes of Life

Feature/Adaptation	Fish (Aquatic)	Pigeon (Aerial)
Body shape	Streamlined body to reduce water resistance.	Streamlined body to reduce air resistance.
Locomotory organs	Fins for swimming.	Wings for flight.
Respiration	Gills to extract oxygen from water.	Lungs for breathing air.

Tube Feet in Starfish



- **Function:** Tube feet are used in locomotion, attachment (adhesion) and capture of food.
- **Example:** Starfish (phylum *Echinodermata).*

Identification – Hydra



- The given organism is *Hydra.*
- It belongs to phylum Coelenterata.
- It has tentacles around the mouth with cnidoblasts.

Paragraph-based Questions – Worm

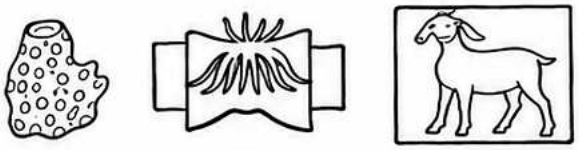
A certain worm-like animal has a soft, elongated and cylindrical body with segments, and shows protostome development.

i. Identify the worm.
ii. Name the phylum to which it belongs.
iii. State two characteristic features of that phylum.

Ans:
i. The worm is Earthworm.
ii. It belongs to phylum Annelida.
iii. (Any two)
- Body is soft, elongated and segmented.
- These animals show protostome development.

Q8. Observe the given figures and answer the following:

(i) Identify the types of body symmetry and give one example of each, from the given figures.



(i) (ii) (iii)

[July '23] [3 Marks]

OR

Identify and explain the above different types of symmetry. *[Dec '20] [3 Marks]*

Ans: (i) *Refer Answer to the following Q.7 (i)*
(ii) *Refer Answer to the following Q.7 (ii)*
(iii) *Refer Answer to the following Q.7 (iii)*

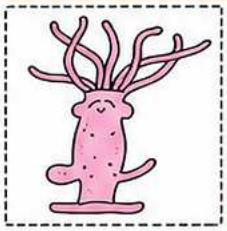
Q9. Name the locomotory organ of animal shown in the figure.



[Dec '20] [1 Mark]

Ans: 'Tube feet' is the locomotory organ of animal shown in the figure (Starfish).

Q10. Observe the diagram and identify the phylum.



[July '24] [1 Mark]

Ans: Phylum: Coelenterata/Cnidaria.
The given diagram is of *Hydra*.

Q11. Observe the following picture. Write the answers of the following questions:

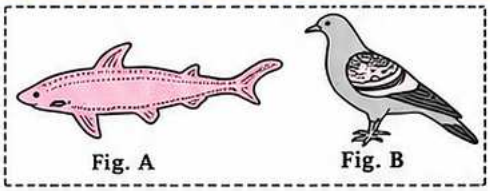


Fig. A Fig. B

(i) Identify the class of animals shown in above picture.

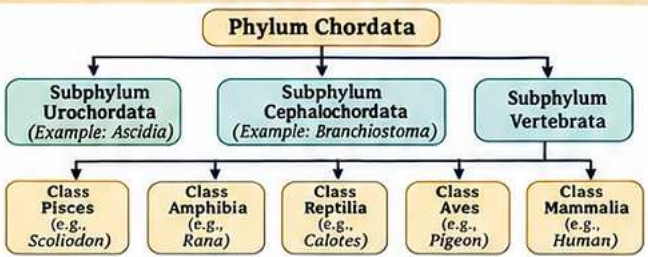
(ii) Which similarities are shown in above animals from the adaptation point of view?

Ans:

(i) Fig. A: Class Pisces, Fig. B: Class Aves.

(ii) Common adaptations: spindle-shaped body that minimizes resistance during movement. *Scoliodon* (Fig. A) can swim faster in water and Pigeon (Fig. B) can fly faster in air due to their spindle-shaped bodies.

Hierarchical Classification of Phylum Chordata



Q12. Why these animals are included in different classes inspite of their similarities? *[July '25] [5 Marks]*

Ans:

i. These animals are placed in different classes because classification is based on fundamental characters and not just on external similarities.

ii. *Scoliodon* belongs to class Pisces (fishes) – it is cold-blooded, respires by gills, has fins and scales, and lives in water. Pigeon belongs to class Aves (birds) – it is warm-blooded, breathes by lungs, has feathers and wings, and can maintain constant body temperature.

iii. The similarities are due to adaptations required for locomotion, but basic features differ, so they are in separate classes.

Questions Based on Paragraph

Q1. During a field visit, one of the students observed a cylindrical worm in the soil, and noted its characteristics like segmented body, bilateral symmetry and presence of clitellum. After its dissection, students observed that the worm was eucoelomate. Another student observed a worm which was thread-like without segments and after its dissection they found that the worm was pseudocoelomate. Based on the given paragraph answer the following questions.

i. Which animal was observed by the first student?
ii. Mention the phylum of the animal observed by the other student.
iii. To which phylum does the animal observed by the first student belong?
iv. Mention any two characteristics of animal observed by the first student.
v. Mention any two characteristics of the thread-like worm, observed by the second student. *[5 Marks]*

Ans:

i. The animal observed by the first student is earthworm.
ii. The animal observed by the second student belongs to phylum Aschelminthes.
iii. The animal observed by the first student belongs to phylum Annelida.
iv. Two characteristics of the first animal:
– Segmented body. – Presence of clitellum.
v. Two characteristics of the thread-like worm:
– Cylindrical and unsegmented body. – Pseudocoelomate.

Important Comparison Tables

Mollusca vs Echinodermata

Sr. No.	Character	Mollusca	Echinodermata
1.	Body covering	Soft, unsegmented body	Spiny skin with calcareous plates
2.	Symmetry	Bilateral	Pentamerous radial (adult)
3.	Coelom	Eucoelomate	Eucoelomate
4.	Example	*Pila, Unio*	Starfish, *Asterias*

Frog vs Tortoise

Sr. No.	Character	Frog	Tortoise
1.	Class	Amphibia	Reptilia
2.	Body covering	Moist, glandular skin	Dry, scaly skin
3.	Respiration	Lungs, skin and buccal cavity	Lungs only
4.	Example	*Rana*	*Testudo*

Pisces vs Reptiles

Sr. No.	Character	Frog	Tortoise
1.	Habitat	Aquatic	Mostly terrestrial
2.	Respiration	By gills	By lungs
3.	Body covering	Scales (usually)	Scales or scutes
4.	Example	*Scoliodon, Labeo*	*Calotes, Naja*

Butterfly vs Bat

Sr. No.	Character	Frog	Tortoise
1.	Class	Insecta	Mammalia
2.	Wings	Chitinous wings (scaly)	Skin (membranous) wings
3.	Body covering	Exoskeleton of chitin	Skin with hair
4.	Example	*Papilio* (Butterfly)	*Pteropus* (Bat)

Aves vs Mammalia

Sr. No.	Character	Frog	Tortoise
1.	Body covering	Feathers	Hair
2.	Thermoregulation	Warm-blooded	Warm-blooded
3.	Reproduction	Oviparous (lay eggs)	Viviparous (give birth to young ones)
4.	Example	Pigeon, Crow	Human, Cow