CLASS 11 BIOLOGY NCERT SOLUTIONS

NCERT Solutions for Class 11 Biology Chapter 4: Animal Kingdom – Free PDF Download

Chapter 4, Animal Kingdom, is one of the longest and most important chapters in Class 11 Biology because it classifies the entire animal world – from simple sponges to complex mammals – using fundamental features such as body symmetry, coelom, segmentation, and notochord. The NCERT exercise for this chapter has ...

Contents

Chapter 4, **Animal Kingdom**, is one of the longest and most important chapters in Class 11 Biology because it classifies the entire animal world – from simple sponges to complex mammals – using fundamental features such as body symmetry, coelom, segmentation, and notochord. The NCERT exercise for this chapter has **15 questions** that test both conceptual understanding (classification logic, coelom types, parasitic adaptations) and quick-recall skills (matching, MCQs, examples). These Class 11 Biology Chapter 4 solutions are also useful as quick revision notes before exams.

Exercises

Q1. What are the difficulties that you would face in classification of animals, if common fundamental features are not taken into account?

Animal classification depends on shared, fundamental features such as **levels of organisation**, **body symmetry**, the **germinal layers**, the **nature of the coelom**, and **segmentation**. If these criteria are ignored, several problems would arise:

(i) Animals with completely different levels of organisation – for example, a cellular-level organism like a sponge and a tissue-level organism like *Hydra* – would end up grouped together.
(ii) Diploblastic animals (two germinal layers, e.g., *Hydra*) and triploblastic animals (three germinal layers, e.g., *Ascaris*) would not be distinguished.
(iii) Animals with radial symmetry (e.g., starfish) and bilateral symmetry (e.g., earthworm) would be clubbed together, even though their body plans are fundamentally different.
(iv) Coelomate, pseudocoelomate and acoelomate animals would not be separated, even though the presence or absence of a true body cavity affects organ arrangement and complexity.
(v) Segmented animals (e.g., annelids) and unsegmented animals would not be told apart.

Without these fundamental features as a basis, classification would become arbitrary, unscientific, and would fail to reflect true evolutionary relationships among animals.

Q2. If you are given a specimen, what are the steps that you would follow to classify it?

A specimen can be classified step by step using the following fundamental features, considered in a logical sequence:

(i) **Level of organisation** – Check whether the body shows cellular, tissue, organ, or organ-system level of organisation.
(ii) **Symmetry** – Determine whether the body is asymmetrical, radially symmetrical, or bilaterally symmetrical.
(iii) **Diploblastic or triploblastic nature** – Identify the number of germinal (embryonic) layers present.
(iv) **Coelom** – Check whether the specimen is acoelomate, pseudocoelomate, or coelomate (eucoelomate).
(v) **Segmentation** – Observe whether the body is divided into repeating segments (metameres).
(vi) **Notochord** – Check for the presence or absence of a notochord at any stage of the life cycle, which separates chordates from non-chordates.

By systematically working through these criteria, the specimen can be correctly placed into its phylum and, subsequently, into finer taxonomic categories.

Q3. How useful is the study of the nature of body cavity and coelom in the classification of animals?

The **coelom** is a body cavity lined by mesoderm on both sides (inner and outer). Its presence or absence is a key criterion used to classify triploblastic animals into three groups:

(i) **Acoelomates** – No body cavity between the body wall and the gut; the mesoderm is present as a solid mass of cells, e.g., Platyhelminthes (flatworms).
(ii) **Pseudocoelomates** – A body cavity is present, but it is not lined by mesoderm; the mesoderm is present as scattered pouches between the ectoderm and endoderm. This cavity is called a pseudocoel, e.g., Aschelminthes (roundworms such as *Ascaris*).
(iii) **Coelomates (eucoelomates)** – A true body cavity is present, completely lined by mesoderm on both sides, e.g., Annelida, Mollusca, Arthropoda, Echinodermata, and Chordata.

This classification is useful because the coelom provides space for internal organs to grow, move and function independently of the body wall, allows for a more efficient circulatory and excretory system, and directly reflects the level of complexity and evolutionary advancement of an animal group.

Q4. Distinguish between intracellular and extracellular digestion.

Intracellular Digestion	Extracellular Digestion
Digestion occurs inside individual cells, within food vacuoles.	Digestion occurs outside cells, in a gut cavity or alimentary canal.
Seen in simple organisms such as *Amoeba* and sponges (Porifera).	Seen in most multicellular animals with a proper digestive tract, e.g., Annelida, Arthropoda, Chordata.
Digestive enzymes act within the cell; the process is slower and less efficient for larger food particles.	Digestive glands secrete enzymes into a canal or cavity, allowing large amounts of food to be digested efficiently.
No regional specialisation of the digestive pathway.	The alimentary canal shows regional specialisation (e.g., separate regions for ingestion, digestion, absorption).

Q5. What is the difference between direct and indirect development?

Direct Development	Indirect Development
The young one that hatches or is born resembles the adult in basic body form; there is no larval stage.	The fertilised egg develops into a larva that looks very different from the adult; the larva undergoes metamorphosis to become an adult.
No metamorphosis is involved.	Metamorphosis (often drastic) converts the larva into the adult form.
Example: reptiles, birds, and most molluscs and annelids such as earthworm.	Example: frog (tadpole to adult), butterfly (caterpillar to adult), many marine invertebrates.

Q6. What are the peculiar features that you find in parasitic platyhelminthes?

Parasitic flatworms (Platyhelminthes), such as liver flukes and tapeworms, show several special adaptations for a parasitic lifestyle:

(i) A thick, protective **tegument** (body covering) that resists the host's digestive enzymes and immune attack.

(ii) Presence of **adhesive organs** such as hooks and suckers (in tapeworms) or suckers alone (in flukes) to attach firmly inside the host's body.
(iii) Loss or reduction of **locomotory organs**, since active movement is unnecessary inside a host.
(iv) In tapeworms, the **digestive system is completely absent** – the already-digested food of the host is absorbed directly through the body surface.
(v) A highly developed **reproductive system**, producing enormous numbers of eggs to ensure transmission to new hosts.
(vi) Ability to carry out **anaerobic respiration**, since oxygen availability inside a host (e.g., the intestine) is limited.
(vii) Considerable **osmotic adaptability**, allowing survival in the varied internal environments of different hosts.

Q7. What are the reasons that you can think of for the arthropods to constitute the largest group of the animal kingdom?

Phylum Arthropoda contains more species than all other animal phyla combined, largely due to the following adaptive advantages:

(i) A tough, **chitinous exoskeleton** that protects the body, reduces water loss (helping them colonise land), and provides points for muscle attachment.
(ii) **Jointed appendages** that are modified for a wide variety of functions – walking, swimming, feeding, sensing, and reproduction – enabling arthropods to exploit almost every habitat.
(iii) Small body size and high **reproductive rate**, with short life cycles and large numbers of offspring.
(iv) Ability to undergo **metamorphosis**, which reduces competition for food and space between larval and adult stages of the same species.
(v) A well-developed **nervous system and sense organs** (compound eyes, antennae) that allow quick responses to the environment.
(vi) Extraordinary **ecological and physiological tolerance** – arthropods are found from deep oceans to mountain peaks, and some (like cockroaches) can survive extreme conditions.
Together, these features have allowed arthropods to successfully colonise land, air, freshwater, and marine habitats.

Q8. Water vascular system is the characteristic of which group among the following? (a) Porifera (b) Ctenophora (c) Echinodermata (d) Chordata

Answer: (c) Echinodermata. The water vascular system is a network of water-filled canals unique to echinoderms (e.g., starfish, sea urchins). Water enters through a sieve-like structure called the **madreporite** and is circulated through canals to numerous **tube feet**, which are used for locomotion, food capture, and respiration.

Q9. "All vertebrates are chordates but all chordates are not vertebrates." Justify the statement.

Phylum Chordata is defined by the presence of a **notochord**, a dorsal hollow nerve cord, paired pharyngeal gill slits, and a post-anal tail at some stage of life. Chordata is divided into three subphyla:

(i) **Urochordata (Tunicata)** – the notochord is present only in the larval tail and is lost in the adult.

(ii) **Cephalochordata** – the notochord extends from head to tail and persists throughout life.
(iii) **Vertebrata** – the notochord is present only during the embryonic stage and is replaced by a cartilaginous or bony **vertebral column** in the adult.

Since Urochordata and Cephalochordata (together called protochordates) possess a notochord but never develop a vertebral column, they are chordates but not vertebrates. Only the members of Vertebrata develop a backbone. Therefore, every vertebrate is necessarily a chordate (it has a notochord at some stage), but not every chordate is a vertebrate.

Q10. How important is the presence of air bladder in Pisces?

The **air bladder (swim bladder)** is a gas-filled sac found in most bony fishes (Osteichthyes), arising as an outgrowth of the gut. Its main functions are:

(i) It regulates **buoyancy**, allowing the fish to maintain its position at a particular depth in water without constantly swimming, thus saving energy.
(ii) It prevents the fish from sinking to the bottom or floating to the surface uncontrollably.
(iii) In some species, it assists in **respiration** by acting as an accessory gas-exchange surface.
(iv) It can also act as a **resonating chamber**, helping some fish produce or detect sound.
Cartilaginous fishes (Chondrichthyes, e.g., sharks) lack an air bladder, which is why they must swim continuously to avoid sinking.

Q11. What are the modifications that are observed in birds that help them fly?

Birds (Class Aves) show numerous adaptations for aerial life:

(i) The body is **streamlined (spindle-shaped)** to reduce air resistance during flight.
(ii) **Forelimbs are modified into wings**, providing the surface needed for flight.
(iii) The body is covered with **feathers**, which reduce friction, provide lift, and help maintain a constant body temperature.
(iv) Bones are **pneumatic** (hollow and filled with air spaces), which reduces body weight without compromising strength.
(v) Birds are **warm-blooded (endothermic)**, maintaining a high, stable body temperature needed for the intense muscular activity of flight.
(vi) The **flight muscles (pectoral muscles)** are exceptionally well-developed and anchored to a keeled sternum.
(vii) The heart is **four-chambered** with complete double circulation, ensuring an efficient, high-oxygen blood supply to flight muscles.
(viii) **Air sacs** connected to the lungs improve respiratory efficiency and also lighten the body.
(ix) Only one functional ovary is usually present in females, and a urinary bladder is absent, both of which reduce body weight.

Q12. Could the number of eggs or young ones produced by an oviparous and viviparous mother be equal? Why?

No, the numbers are generally not equal. **Oviparous** animals (e.g., most fish, reptiles, birds) lay eggs outside the body, where the developing embryo is exposed to predators, temperature fluctuations, and

other environmental hazards. Since the survival rate of externally-laid eggs is low, oviparous mothers compensate by producing a **very large number of eggs**. In contrast, **viviparous** animals (e.g., most mammals) retain and nourish the developing embryo inside the mother's body, where it is protected and receives direct nourishment. Because survival chances are much higher, viviparous mothers produce a **much smaller number of young ones** at a time. This difference in reproductive strategy reflects a trade-off between the quantity and the survival probability of offspring.

Q13. Segmentation in the body is first observed in which of the following?
(a) Platyhelminthes (b) Aschelminthes (c) Annelida (d) Arthropoda

Answer: (c) Annelida. Annelids (e.g., earthworm, leech) show true **metameric segmentation** – the body is externally and internally divided into a linear series of similar segments (metameres). This is the first phylum in the classification sequence to show this feature; it is retained and further specialised in Arthropoda, the next phylum.

Q14. Match the following:

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

Brief reasoning: the **operculum** (gill-cover) is characteristic of bony fishes (Osteichthyes); **parapodia** (lateral appendages for swimming) occur in annelids like *Nereis*; epidermal **scales** are the diagnostic body covering of reptiles; **comb plates** (rows of fused cilia) are unique to ctenophores; the **radula** (rasping, tooth-bearing organ) is used by molluscs for feeding; **hair** is the defining feature of mammals; **choanocytes** (collar cells) line the body cavity of sponges (Porifera); and **gill slits** without an operculum are seen in jawless cyclostomes and cartilaginous fishes.

Q15. Prepare a list of some animals that are found parasitic on human beings.

Animal (Genus)	Common Name	Phylum
Ascaris	Roundworm	Aschelminthes
Ancylostoma	Hookworm	Aschelminthes
Wuchereria	Filarial worm	Aschelminthes
Enterobius	Pinworm	Aschelminthes
Taenia	Tapeworm	Platyhelminthes
Fasciola	Liver fluke	Platyhelminthes
Plasmodium	Malarial parasite (Protista, often included for context)	–

Class 11 Biology Chapter 4 – Notes and Extra Questions

Chapter 4 currently carries a single Exercise with **15 questions** covering the whole spectrum of the chapter – from broad classification logic (Q1–Q3) to phylum-specific concepts (coelom, digestion, development,

platyhelminthes, arthropods, echinoderms, chordates, pisces, aves, and reproduction in Q4–Q13) and quick-recall items (matching and listing in Q14–Q15). While the 2023 NCERT rationalisation trimmed detailed phylum-wise descriptive content and dropped the chapter-end “Summary” box from many chapters, the core 15-question Exercise for Animal Kingdom has remained unchanged from earlier editions, making this one of the more stable chapters in terms of exam-ready question patterns. While revising, focus especially on the coelom classification (acoelomate/pseudocoelomate/coelomate), the differences between direct and indirect development, the “vertebrates vs chordates” logic, and the phylum-level matching terms (operculum, radula, choanocytes, comb plates), since these recur frequently as both board-exam and competitive-exam (NEET) questions.

What is the main basis on which animals are classified in NCERT Class 11 Biology Chapter 4?

Animals are classified using a set of fundamental features observed together: levels of organisation (cellular, tissue, organ, organ-system), body symmetry (asymmetrical, radial, bilateral), diploblastic or triploblastic organisation, presence and type of coelom (acoelomate, pseudocoelomate, coelomate), segmentation, and, for chordates, the presence of a notochord.

What is the difference between a pseudocoelomate and a coelomate animal?

In a coelomate (eucoelomate) animal, the body cavity is completely lined by mesoderm on both sides, as seen in annelids, molluscs, arthropods, echinoderms and chordates. In a pseudocoelomate animal, the body cavity is not lined by mesoderm; instead, mesoderm occurs as scattered pouches between the ectoderm and endoderm, as seen in Aschelminthes (roundworms like *Ascaris*).

Why do parasitic worms lack a well-developed digestive system?

Parasites such as tapeworms (*Taenia*) live inside the host’s intestine, which is already full of the host’s partly and fully digested food. Since this nutrient-rich fluid can be absorbed directly through the parasite’s body surface (tegument), a separate digestive system is unnecessary and has been lost through evolutionary adaptation, allowing the parasite to devote more energy to reproduction.

Is Chapter 4 Animal Kingdom important for NEET and other competitive exams?

Yes. Animal Kingdom is one of the highest-yield chapters for NEET Biology because it covers phylum-level classification of the entire animal world. Topics such as classifying criteria (symmetry, coelom, segmentation), phylum-specific examples, and distinguishing features (e.g., water vascular system, notochord, operculum) are asked almost every year, making thorough revision of this chapter’s classification logic essential.