

Class – IX (Science)

Chapter – Patterns in Life : Diversity and Classification

Back Exercise Solution

1. Meena and Hari observed an animal in their garden. Hari called it an insect while Meena said it was an earthworm. Choose the correct option which confirms that it is an insect.

- (i) Bilateral symmetrical body
- (ii) Body with jointed legs
- (iii) Cylindrical body
- (iv) Body with little segmentation

Ans - Correct option: (ii) Body with jointed legs.

An insect belongs to phylum Arthropoda. The most important identifying feature of arthropods is the presence of jointed appendages or legs. Earthworms have segmented cylindrical bodies but do not possess jointed legs. Therefore, the organism is confirmed to be an insect because of its jointed legs.

2. Sponges represent one of the simplest animal body plans. Their bodies lack true tissues and organs. Which feature of sponge cells supports its classification under the animal kingdom?

- (i) Absence of mitochondria
- (ii) Ability to photosynthesise
- (iii) Presence of a cell membrane
- (iv) Presence of a cell wall

Ans - Correct option: (iii) Presence of a cell membrane.

Sponges are classified under the animal kingdom because they are multicellular, heterotrophic organisms whose cells lack a cell wall. Their cells possess a plasma membrane like other animal cells. They do not photosynthesise and have no cell wall.

3. Observe two different animals in your immediate environment. What features help you distinguish between them? How do these features help place them into different groups?



Ans- Example: Ant and Earthworm.

An ant has jointed legs, a hard exoskeleton and segmented body, which places it under Arthropoda. An earthworm has a cylindrical segmented body without jointed legs and moves using muscles, so it belongs to Annelida. Thus, body covering, locomotory organs and segmentation help classify organisms.

4. How would a scientist justify choosing cellular organisation as a more fundamental characteristic for the basis of classification rather than the presence of xylem and phloem?

Ans - Cellular organisation is a more basic and universal criterion because all living organisms are made of cells. It helps scientists separate prokaryotes from eukaryotes and unicellular organisms from multicellular ones. Xylem and phloem occur only in some plants and therefore cannot be used as a universal classification feature.

5. You find an unlabelled slide of a single-celled organism that has a well-defined nucleus and multiple cilia. Which group would it most likely belong to? Give reasons.

Ans- The organism most likely belongs to Kingdom Protista because it is unicellular, eukaryotic and possesses cilia for movement. Organisms such as Paramecium show these features.

6. How does the diversity of organisms contribute to the balance and stability of an ecosystem?

Ans - Biodiversity maintains ecosystem balance because different organisms perform different ecological roles. Plants produce food and oxygen, animals help in pollination and seed dispersal, while fungi and bacteria decompose waste and recycle nutrients. High biodiversity increases ecosystem stability and reduces the risk of collapse.

7. If all unicellular organisms were grouped into a single kingdom, what problems would arise?

Ans – If all unicellular organisms were grouped together, major differences would be ignored. Bacteria are prokaryotic, Amoeba is eukaryotic and yeast is fungal in



nature. Such grouping would fail to reflect evolutionary relationships and structural differences.

8. Viruses were studied in earlier classes. Why are they not placed in any of the five kingdoms? Give reasons.

Ans - Viruses are acellular and lack cytoplasm, organelles and independent metabolism. They reproduce only inside living host cells and remain inactive outside them. Therefore, they do not fit into the five kingdom classification.

9. If you were asked to revise the five kingdom classification, would you create a separate category for viruses or keep them outside the system? Justify your answer and explain what this indicates about the evolving nature of scientific classification.

Ans - Viruses should remain outside the five kingdom system because the system is based mainly on cellular organisation. Viruses lack cells, although they possess genetic material. This shows that scientific classification changes and improves with new discoveries.

10. Viruses contain genetic material like living organisms but lack cellular organisation. Which features prevent them from fitting into the five kingdom system? What does this tell us about the limitations of classification systems?

Ans- Viruses contain DNA or RNA but lack cellular organisation and independent life processes. They challenge the definition of life itself. This reveals that classification systems have limitations and may not perfectly fit every biological entity.

11. Both pteridophytes and bryophytes lack flowers and seeds, yet they are placed in different groups. Explain this classification using their key features.

Ans- Bryophytes lack vascular tissues and possess rhizoids instead of true roots, stems and leaves. Pteridophytes possess vascular tissues such as xylem and phloem along with true roots, stems and leaves. Therefore, pteridophytes are more advanced and placed separately.



12. In the classification hierarchy, which group — class or genus — has fewer members but more features in common? Explain your answer.

Ans - Genus has fewer members but more features in common. Class is a broader category, whereas genus contains closely related species sharing many similarities.

13. A scientist discovers a new organism with the characteristic features of locomotion and autotrophic nutrition. Which character(s) would help the scientist identify the organism belonging to Protista according to the five kingdom classification?

Ans - The organism belongs to Protista if it is unicellular and eukaryotic. Mixed features such as locomotion and autotrophic nutrition are seen in organisms like Euglena.

14. A researcher identified a unicellular eukaryotic organism as fungi. What identification key would you suggest according to the five kingdom classification to keep a unicellular organism in the Kingdom Fungi?

Ans - A unicellular organism can be placed under fungi if it possesses a chitin cell wall, lacks chlorophyll and absorbs nutrients heterotrophically. Yeast is a common example.

15. During a long-term ecological study, students examined organisms collected from three different environments — a freshwater pond, damp soil near decaying logs and the digestive tract of animals. Instead of naming organisms directly, scientists recorded only structural, cellular and nutritional features as given in the table below.



Organisms	Key Observations
P	Microscopic; no true nucleus; rigid cell covering; survives high salinity and temperature
Q	Multicellular; filamentous body; cell wall present; no chlorophyll; grows on dead organic matter
R	Unicellular; true nucleus; contractile vacuole present; moves using flagella; shows photosynthesis in light but heterotrophic in the absence of light
S	Multicellular; well-differentiated tissues; backbone present; aquatic respiration during early life stage
T	Acellular; contains genetic material; remains inactive outside a host cell

The students realised that some organisms fit neatly into Whittaker's five kingdom classification, while others challenged the very basis of this classification.

Based on the case study, answer the following questions —

(i) Identify one organism that clearly belongs to the Kingdom Fungi.

State one observation that supports your answer.

(i) Organism Q belongs to Kingdom Fungi because it is multicellular, filamentous and grows on dead organic matter.

(ii) Which organism would be placed in the Kingdom Monera?

Mention one characteristic that justifies this placement.

(ii) Organism P belongs to Monera because it lacks a true nucleus and is prokaryotic.

(iii) Organisms R and Q are both eukaryotic, yet they are placed in different kingdoms. Analyse the criteria that separate them.

(iii) R belongs to Protista because it is unicellular and photosynthetic, while Q belongs to Fungi because it is multicellular and decomposer in nature.

(iv) Explain why organism S cannot be classified using the mode of nutrition alone.

(iv) Organism S cannot be classified using nutrition alone because many organisms are heterotrophic. Its backbone and aquatic respiration indicate vertebrate



characteristics.

(v) Organism T does not fit into any of the five kingdoms. Which fundamental characteristic used in classification does it lack and what does this reveal about the limitations of classification systems?

(v) Organism T lacks cellular organisation. This shows the limitations of the five kingdom classification.

(vi) If classification were based only on habitat, which organisms might be incorrectly grouped together? Explain the scientific consequences of such a classification.

(vi) Habitat-based classification would incorrectly group unrelated organisms together, ignoring cellular and evolutionary differences.

(vii) Imagine scientists discover a new organism that is multicellular, eukaryotic, lacks chlorophyll and absorbs nutrients from a host externally. Should it be placed under fungi or animalia? Justify your reasoning using classification criteria.

(vii) The newly discovered organism should be placed under Fungi because it lacks chlorophyll and absorbs nutrients externally from a host.

