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Class	9th	Chapter	02
Subject	BIOLOGY	Board	Federal

CHAPTER 2: BIODIVERSITY

Section I: Multiple Choice Questions

1. Into which kingdom you place a multicellular land organism that performs photosynthesis:

A) monera B) protista **C) plantae** D) animalia

- **Answer: C) plantae**

2. Which kingdom is mismatched with the characteristics?

A) fungi - usually saprotrophic **B) animalia - rarely ingestive** C) protista - various modes of nutrition D) plantae - photosynthetic

- **Answer: B) animalia - rarely ingestive** *(Animals are characteristically ingestive heterotrophs)*

3. The kingdom to which the algae belongs is:

A) animalia **B) protista** C) plantae D) fungi

- **Answer: B) protista**

4. Scientific name has advantages of:

A) same name applied to different organisms. B) same organisms have different name in different areas C) has no scientific basis. **D) has scientific basis and is universally accepted.**

- **Answer: D) has scientific basis and is universally accepted.**

5. Binomial nomenclature was introduced by:

A) Aristotle **B) Carolus Linnaeus** C) Ernest Haeckel D) R.H Whittaker

- **Answer: B) Carolus Linnaeus**

6. The organisms that feed on dead, decaying matter are called:

A) saprotrophs B) autotrophs C) heterotrophs D) parasites

- **Answer: A) saprotrophs**

7. Viruses are assigned to the kingdom:

A) Plantae B) Protista C) Fungi **D) Not included in any kingdom**

- **Answer: D) Not included in any kingdom**

8. The common characteristic of viruses, prions and viroids is:

A) Respiration B) Movement **C) Infectious nature** D) Excretion

- **Answer: C) Infectious nature**

9. Colonial organization is the unique feature of kingdom:

A) Animalia **B) Protista** C) Fungi D) Plantae

- **Answer: B) Protista**

10. Which option is correct regarding the mode of nutrition of following organism?

A) heterotrophic | heterotrophic | ingestive | autotrophic

B) ingestive | absorptive | autotrophic | heterotrophic

C) ingestive | heterotrophic | absorptive | photosynthetic

D) absorptive | autotrophic | ingestive | autotrophic

- **Answer: C** *(Animal: ingestive, Prokaryote: heterotrophic, Fungi: absorptive, Plant: photosynthetic)*

11. Viruses are not included in any domain or classification as:

A) they are poorly understood. B) they are too large. C) they are of various colours. **D) they are not considered as organism.**

- **Answer: D) they are not considered as organism.**

12. A related groups of genera consists of:

A) a phylum B) a class C) an order **D) a family**

- **Answer: D) a family**

13. In which of the following the first letter is capitalized in binomial nomenclature?

A) genus B) class C) species D) family

- **Answer: A) genus**

14. If humans and cats belong to the same class, they must belong to the same:

A) phylum B) order C) family D) genus

- **Answer: A) phylum**

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Section II: Short Answer Questions

1. Why are the following scientists famous for?

- **(a) Aristotle:** Classified organisms into two broad groups (blood and bloodless groups / plants and animals).
- **(b) Carolus Linnaeus:** Developed the system of **Binomial Nomenclature** and hierarchical classification.
- **(c) Carl Woese:** Introduced the **Three-Domain System** of classification based on ribosomal RNA sequences.

2. Define:

- **(a) Biodiversity:** The variety and variability of life forms (plants, animals, microorganisms) on Earth and the ecological complexes in which they occur.
- **(b) Classification:** The sorting or categorizing of organisms into groups and subgroups based on similarities and evolutionary relationships.
- **(c) Taxonomy:** The branch of biology that deals with the naming, description, and classification of organisms.
- **(d) Systematics:** The study of the diversification of living forms and the evolutionary relationships among extinct and extant organisms.
- **(e) Domain:** The highest taxonomic rank in the biological classification system, higher than a kingdom.
- **(f) Taxa (Taxon):** Units or categories of biological classification (e.g., species, genus, family).
- **(g) Species:** A group of natural populations of organisms that can interbreed freely in nature and produce fertile offspring, reproductively isolated from other such groups.

3. What is domain? Name the three domains of life.

- A **domain** is the highest taxonomic rank, superior to kingdoms, separating life based on fundamental cellular and genetic differences.
- **Three domains of life:**
    1. Archaea
    2. Bacteria
    3. Eukarya

4. What are the basis of classification of life into domains?

Classification into domains is primarily based on **ribosomal RNA (rRNA) gene sequences**, cellular architecture (presence or absence of a nuclear membrane), and membrane lipid chemistry.

5. Can you differentiate between?

- **(a) Bacteria and Protists:** Bacteria are prokaryotes lacking a membrane-bounded nucleus and organelles, whereas protists are eukaryotes with true nuclei and membrane-bound organelles.

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- **(b) Fungi and Plants:** Fungi are heterotrophic, absorptive organisms with cell walls made of chitin; plants are autotrophic, photosynthetic eukaryotes with cell walls made of cellulose.
- **(c) Plants and Animals:** Plants are multicellular autotrophs with cellulose cell walls; animals are multicellular ingestive heterotrophs lacking cell walls.

6. Answer the following with supportive reasons:

- **(a) Which is the simplest domain? Bacteria** or **Archaea**, because they are unicellular prokaryotes lacking membrane-bound organelles and complex internal compartmentalization.
- **(b) Which is the complex domain? Eukarya**, because its organisms possess complex eukaryotic cells with nuclei and membranous organelles.
- **(c) Are most bacteria harmful? No**, the vast majority of bacteria are harmless or highly beneficial (e.g., decomposers, gut flora, nitrogen fixers); only a small fraction are pathogenic.
- **(d) Which domain/s can flourish or survive in most adverse conditions? Archaea** (extremophiles), which survive in extreme temperatures, high salinities, and acidic environments.

7. Compare the two-kingdom, three-kingdom and five-kingdom system of classification.

- **Two-Kingdom:** Proposed by Aristotle/Linnaeus; divides life into Plantae and Animalia. It failed to accommodate microorganisms like bacteria and fungi.
- **Three-Kingdom:** Proposed by Ernst Haeckel (1866); added kingdom **Protista** to accommodate unicellular organisms.
- **Five-Kingdom:** Proposed by R.H. Whittaker (1969) and modified by Margulis & Schwartz; classifies life into Monera, Protista, Fungi, Plantae, and Animalia based on cellular organization and modes of nutrition.

8. Compare the three-domain system of classification.

The three-domain system divides cellular life into **Archaea**, **Bacteria**, and **Eukarya**. Archaea and Bacteria consist of prokaryotic cells, but Archaea differ significantly in cell wall composition, membrane lipids, and ribosomal RNA genetics, placing them closer evolutionarily to Eukarya.

9. Why is mule not regarded as a species?

A mule is the sterile offspring of a male donkey and a female horse. Because mules **cannot produce fertile offspring** with one another under natural conditions, they fail to meet the biological definition of a species (interbreeding and producing fertile descendants).

10. Complete the following chart:

- **Top-left box:** Prokaryotes (or Monera)
- **Top-right box:** Eukaryotes (or Eukarya kingdoms)
- *(Following the branching diagram paths for organism characteristics:* Unicellular →Prokaryotes; Multicellular →Eukaryotes; Photosynthetic plants vs non-photosynthetic fungi/animals).

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Section III: Extensive Answer Questions

1. What is biodiversity? Write the importance of biodiversity in the natural ecosystem.

- **Biodiversity** refers to the total variety of genes, species, and ecosystems in a region.
- **Importance:**
  - Maintains ecosystem stability and resilience.
  - Provides food, medicines, and industrial raw materials.
  - Regulates climate, purifies air and water, and cycles nutrients (ecosystem services).
  - Supports pollination and soil fertility.

2. Describe classification. How are the organisms classified?

- **Classification** is the systematic arrangement of organisms into hierarchical groups based on shared characteristics and evolutionary history.
- **Method:** Organisms are sorted based on morphological, anatomical, genetic, and biochemical similarities into taxonomic ranks (Domain →Kingdom →Phylum →Class →Order →Family →Genus →Species).

3. What are the main aims and objectives of classification?

- To determine evolutionary relationships (phylogeny) among organisms.
- To make the study of millions of diverse living organisms easy and manageable.
- To provide universal identification and scientific names to organisms.

4. Give an account of history of classification.

- **Aristotle:** Classified life into plants and animals.
- **Abu Usman Umer Al-Jahiz:** Described characteristics of 350 species of ants and animal behaviors.
- **Andrea Cesalpino & John Ray:** Introduced advanced plant grouping methods.
- **Carolus Linnaeus:** Formulated binomial nomenclature and hierarchical taxonomy.
- **Haeckel, Chatton, Copeland, Whittaker, and Woese:** Progressively updated classification from 2 kingdoms to 5 kingdoms and 3 domains based on modern cellular and molecular discoveries.

5. What are the characteristics of the domain Archaea?

- Comprises ancient prokaryotes adapted to extreme environments (extremophiles like halophiles, thermophiles, and methanogens).
- Lack peptidoglycan in their cell walls.
- Possess unique membrane lipids and distinct ribosomal RNA sequences.

6. What are the characteristics of the domain (a) Bacteria (b) Eukarya?

- **(a) Bacteria:** Unicellular prokaryotes with cell walls containing peptidoglycan; widespread in all environments.
- **(b) Eukarya:** Organisms with eukaryotic cells containing a true nucleus and membrane-bound organelles; includes single-celled protists and complex multicellular fungi, plants, and animals.

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7. What are the diagnostic characteristics of the four kingdoms of domain Eukarya?

1. **Protista:** Mostly unicellular or simple multicellular eukaryotes (e.g., algae, protozoa); diverse modes of nutrition.
2. **Fungi:** Multicellular/unicellular heterotrophic eukaryotes with chitin cell walls, acquiring nutrients by absorption.
3. **Plantae:** Multicellular autotrophic eukaryotes with cellulose cell walls performing photosynthesis.
4. **Animalia:** Multicellular ingestive heterotrophic eukaryotes lacking cell walls.

8. Describe the taxonomic ranks of classification.

The hierarchical ranks from broadest to most specific are:

1. **Domain**
2. **Kingdom**
3. **Phylum** (or Division for plants)
4. **Class**
5. **Order**
6. **Family**
7. **Genus**
8. **Species** (the fundamental unit of classification)

9. Write a brief note on species.

A **species** is the basic unit of classification. It consists of a group of organisms capable of interbreeding in nature to produce fertile offspring, sharing a common gene pool, distinct morphological traits, and evolutionary lineage.

10. What is Binomial nomenclature? Describe aims, principles and importance of Binomial nomenclature using local examples.

- **Binomial Nomenclature:** The system of giving a scientific name composed of two parts to every organism.
- **Aims & Principles:**
  - The first name represents the **genus** (capitalized) and the second represents the species name (lowercase).
  - Names are typically italicized in print or underlined when handwritten.
- **Local Examples:**
  - *Corvus splendens* (House crow / Desi Kaak)
  - *Allium cepa* (Onion / Pyaaz)
- **Importance:** Eliminates confusion caused by local/common names, providing a universal scientific language understood globally.

11. State the complications of classifying viruses.

- Viruses are **acellular** and lack cellular machinery, metabolism, and independent reproduction.

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- They do not fit into any of the 3 domains or 5 kingdoms because they are inactive outside a host cell, occupying a grey area between living and non-living entities.

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