

UNIT 02

Biodiversity

Descriptive Questions

Biodiversity

Q.1. Discuss the concept of biodiversity and its significance in maintaining the health of ecosystems.

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Definition

Biodiversity means the variety of organisms in a particular area.

Explanation / Dependence and Distribution of Biodiversity

Biologists have named and classified almost 2 million kinds of organisms. Biodiversity is not evenly spread out. The biodiversity in a place depends on factors like climate, altitude, and soil type. Tropical regions have more biodiversity than polar regions.

Importance of Biodiversity

Biodiversity provides many essential services for humans and the planet. Here are some key benefits of biodiversity:

- i. **Ecosystem Stability:** Biodiversity helps maintain the balance of ecosystems by contributing to the biogeochemical cycles such as water cycle, carbon cycle, and nitrogen cycle.
- ii. **Climate Regulation:** Plants and algae absorb carbon dioxide, helping to regulate the climate.
- iii. **Natural Resources:** Biodiversity provides a vast array of resources, from food and medicine to building materials and fuel.
- iv. **Economic Benefits:** Biodiversity supports numerous industries, including agriculture, tourism, and pharmaceuticals.

International Biodiversity Day

The United Nations has designated May 22nd as International Biodiversity Day. It is celebrated to promote the protection of biodiversity.

Classification

Q.2. What is classification? Describe the aims and basis of classification.

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Known Number of Animals and Plants Species

Biologists have identified and described about 2 million kinds of organisms. Out of these, 0.5 million are the kinds of plants and 1.5 million are the kinds of animals. It is only a small percentage of the total kinds which live on Earth. Every year, biologists discover thousands of new kinds of organisms. They are challenged to organize their knowledge of such diversity.

Need of Classification

To study such a large collection of organisms, biologists classify them.

Definition

Classification is a method by which biologists divide organisms into groups and sub-groups on the basis of similarities found in them.

Aims and Principles of Classification

The main aims of classification are:

- a. To determine similarities and differences among organisms so that they can be studied easily.
- b. To find the evolutionary relationships among organisms.

Basis of Classification

- i. **Physical Characteristics:** Biologists classify organisms into groups and subgroups on the basis of similar physical characteristics.

ii. **Genetics:** In recent times, they also take help from genetics. They find the genetic similarities and differences among organisms. Then they use this information to know similarities and differences in their structures and functions.

Advantages of Classification

- Classification allows biologists to group similar organisms together, making it easier to identify and understand their characteristics, relationships, and evolutionary history.
- It helps us understand the vast diversity of living organisms on Earth.
- Classification provides a framework for studying and comparing different species.
- It explains the inter-relationship amongst various organisms.
- It helps in the identification of new species and in understanding their evolutionary relationships.
- Classification provides a common language for biologists around the world, enabling effective communication in the study of organisms.
- Overall, classification is crucial for our understanding of the natural world and for the conservation and management of biological diversity.

Q.3. Describe taxa or taxonomic ranks of taxonomy orderly. / Explain taxonomic hierarchy.

Ans.

Definition

The groups into which organisms are classified are known as taxonomic ranks or taxa (singular "taxon").

Linnaean System of Taxonomic Ranks

The Swedish botanist Carl Linnaeus devised the Linnaean system of taxonomic ranks in 1735. In this system, Linnaeus suggested seven taxonomic ranks i.e., kingdom, phylum (division), class, order, family, genus and species. In 1977, the rank of domain was added to this system.

The taxonomic ranks are defined as below:

Taxonomic Ranks

1. **Domain:** The highest taxonomic rank is domain. All organisms are divided into three domains: Bacteria, Archaea, and Eukarya.
2. **Kingdom:** Domain is further divided into kingdoms. For example, the domain Eukarya is divided into four kingdoms i.e., Animalia, Plantae, Fungi, Protista.
3. **Phylum (Division: for plants and fungi):** Each kingdom is subdivided into related phyla or divisions.
4. **Class:** Each phylum/division is divided into related classes.
5. **Order:** Each class is further divided into related orders.
6. **Family:** Each order is broken down into related families.
7. **Genus:** Each family is divided into related genera (singular genus).
8. **Species:** It is the most specific level of classification. A species consists of similar organisms that can interbreed and produce fertile offspring.

Figure 2.1: Taxonomic Ranks

Table 2.1: Classification of fruit fly, human and pea

Taxonomic Rank	Fruit fly	Human	Pea
Kingdom	Animalia	Animalia	Plantae
Phylum or Division	Arthropoda	Chordata	Magnoliophyta
Class	Insecta	Mammalia	Magnoliopsida

Taxonomic Rank	Fruit fly	Human	Pea
Order	Diptera	Primates	Fabales
Family	Drosophila	Hominidae	Fabaceae
Genus	Drosophila	Homo	Pisum
Species	D. melanogaster	H. sapiens	P. sativum

Q.4. Define Species. Give two exceptions for the species concept.

Ans.

Species: The Basic Unit of Classification

"A species is a group of organisms which can interbreed freely among them and produce fertile offspring but are reproductively isolated from all other such groups in nature". Each species has its own distinct structural, ecological and behavioural characteristics.

Two Exceptions for the Species Concept

(i) Artificial Cross Breeding

In the definition of species we must emphasize "in nature" because two organisms related to two different but closely related species can cross breed under artificial conditions. In such unnatural crosses, they produce infertile offspring. A cross between a male donkey and a female horse produces an infertile offspring, the mule.

(ii) Organisms with Asexual Reproduction

The criteria of interbreeding cannot be used for species recognition in organisms who reproduce asexually and don't interbreed with one another e.g. many unicellular organisms.

Figure 2.2: Infertile Mule

Q.5. Give an account of history of classification. Taleemzone.com

Ans.

History of Classification

The history of the classification system can be traced back to ancient times.

Aristotle and Ibn Rushd

- The Greek philosopher Aristotle (384-322 BC) was the first who classified organisms into two groups i.e., plants and animals.
- In 1172 Ibn Rushd (Averroes) translated Aristotle's book "de Anima (On the Soul)" into Arabic.

Abu Usman Umer Al-Jahiz

The Arab scholar Abu Usman Umer Al-Jahiz (781-869 AD) described the characteristics of 350 species of animals. He wrote a lot about the life of ants.

Andrea Caesalpinia

The Italian botanist Andrea Caesalpinia (1519-1603 AD) divided plants into fifteen groups and called them genera.

Tournefort

The French botanist Tournefort (1656-1708 AD) introduced the taxa of class and species.

Carl Linnaeus

The Swedish biologist Carl Linnaeus (1707-1778 AD) created a taxonomic hierarchy of organisms with six taxa i.e., Kingdom, Class, Order, Family, Genus, and Species.

Classification Systems

a. Two-Kingdom Classification System

- **Introduction:** It was the earliest classification system in which all organisms were classified into two kingdoms i.e., Plantae and Animalia.
- **Kingdom Plantae:** The organisms that make their own food (autotrophs) were classified in the kingdom Plantae.
- **Kingdom Animalia:** On the other hand, the organisms that cannot make their own food (heterotrophs) were classified in kingdom Animalia.
- According to two kingdom system, prokaryotes (bacteria, archaea) and fungi were members of kingdom Plantae.

Drawbacks / Shortcomings

- i. Some taxonomists found this system unworkable because many unicellular organisms like Euglena have both plant-like (presence of chlorophyll) and animal-like (heterotrophic mode of nutrition in darkness and lack of cell wall) characteristics. So, a separate kingdom was proposed for such organisms.
- ii. This system also did not clear the difference between prokaryotes (bacteria and archaea) and eukaryotes.

b. Three-Kingdom Classification System

- **Introduction:** In 1866, the German zoologist Ernst Haeckel proposed a third kingdom i.e., Protista for Euglena-like organisms. He also included prokaryotes (bacteria and archaea) in the kingdom Protista. In this system, fungi were still included in the kingdom Plantae.

Drawbacks / Shortcomings

- i. Some taxonomists disagreed about the position of fungi in kingdom Plantae.
- ii. Fungi resemble plants in many ways but are heterotrophs which get their food by absorption.
- iii. They do not have cellulose in their cell walls but possess chitin.

c. Five Kingdom Classification System

E-Chatton

In 1937, French biologist E-Chatton suggested the terms, "Procariotique" to describe bacteria and "Eucariotique" to describe protista, fungi, animal and plant cells.

Robert Whittaker

In 1967, American ecologist Robert Whittaker introduced the five-kingdom classification system.

Basis of Five Kingdoms System

This system is based on:

- i. The levels of cellular organization i.e prokaryotic (bacteria, archaea), unicellular eukaryotic (Protista) and multicellular eukaryotic (fungi, plants and animals).
- ii. The modes of nutrition i.e. photosynthesis, absorption, and ingestion.

Five Kingdoms

On this basis, organisms were classified into five kingdoms: Monera, Protista, Fungi, Plantae and Animalia.

Margulis and Schwartz

In 1988, American biologists Margulis and Schwartz modified the five-kingdom classification of Whittaker. They considered genetics along with cellular organization and mode of nutrition in classification. They classified the organisms into the same five kingdoms as proposed by Whittaker.

d. Three-Domain Classification System

Carl Woese

In 1977, American microbiologist Carl Woese (1928-2012 AD) added a level of classification (the domains) above the kingdoms present in the previously used five-kingdom system.

Three Domains

He classified the organisms into three domains i.e. Archaea, Bacteria and Eukarya. It was actually a division of the prokaryotes in two domains (Archaea and Bacteria). While all eukaryotes were placed in a single domain i.e., Eukarya.

Basis of Classification

This classification is based on the differences between Archaea and Bacteria.

Different Classification Systems

2-Kingdom System	3-Kingdom System	5-Kingdom System	3-Domains
Plantae	Plantae	Monera	Archaea
Animalia	Protista	Protista	Bacteria
	Animalia	Plantae	Eukarya
		Fungi	
		Animalia	

Q.6. Describe the domains of living organisms. / Compare and contrast the domains of Archaea and Eubacteria focusing on their key characteristics.

Ans.

Classification into three domains is based on difference in the sequence of nucleotides in the rRNA (ribosomal Ribonucleic acid) of the cell, the cell membrane lipid structure and its sensitivity to antibiotics.

1. Domain Archaea

- These are the most primitive organisms on Earth.
 - They are prokaryotes but their cell wall does not contain peptidoglycan.
 - Their rRNA (ribosomal RNA) is more closely related to eukaryotes than to bacteria.
 - Their cell membrane contains unique lipids which enable them to live in extreme environments e.g., hot springs, salt lakes, deep-sea hydrothermal vents, and acidic or alkaline waters.
 - However, they also exist in more common environments like soil and oceans.
 - Some archaea obtain energy from inorganic compounds such as sulphur or ammonia. Other groups perform photosynthesis but do not produce oxygen.
 - The domain Archaea contains kingdom Archaeobacteria (ancient bacteria).
 - Major archaeobacteria include Methanogens (produce methane as byproduct), Halophiles (found in extremely salty environments), Thermophiles (found in hot springs), Acidophiles (found in extremely acidic environments).
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Figure 2.3: Diversity in domain Archaea

2. Domain Bacteria

- They are the true bacteria.
- They are also prokaryotic and have cell wall made of peptidoglycan.
- Bacteria are found everywhere including soil, water, air, and living organisms.
- They are unicellular. Many live solitary although some form chains, clusters, or colonies of cells.

- v. Most are heterotrophic but some perform photosynthesis because they have chlorophyll.
- vi. This domain contains kingdom Eubacteria.
- vii. Major groups in this kingdom are bacteria and cyanobacteria. Some bacteria cause diseases and many play essential roles in nutrient recycling.

3. Domain Eukarya

- i. Eukarya consists of kingdoms protista, fungi, plantae and animalia.
 - ii. It includes all eukaryotes which consist of complex, eukaryotic cells containing nucleus and other membrane-bound organelles.
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Figure 2.4: Three Domains

Bacterial cells are smaller than Eukarya cells and have no nucleus.

Eukarya cells are larger and contains more complex structures.

1. Kingdom Protista

- i. Kingdom Protista includes eukaryotes which are unicellular or colonial or filamentous or simple multicellular. Simple multicellular means that they do not have multicellular sex organs.
 - ii. There are three types of protists:
 - (a) **Plant-like protists** have cell walls made of cellulose. They have chlorophyll in chloroplasts and are autotrophs. They are called algae (e.g., Euglena, diatoms).
 - (b) **Animal-like protists** are heterotrophs and ingest food. They have no cell wall. They are called protozoans (e.g., Amoeba, Paramecium).
 - (c) **Fungus-like protists** produce hyphae-like structure and are saprophytic e.g., slime molds and water molds.
 - (iii) Certain protists are parasitic and cause diseases e.g., Plasmodium causes malaria, Entamoeba histolytica causes amoebic dysentery, and Trypanosoma causes sleeping sickness.
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Figure 2.5: Common Protists

2. Kingdom Fungi

- i. This kingdom consists of fungi which are eukaryotic, heterotrophic organisms and are unicellular or multicellular.
- ii. Their cells are covered by cell wall made of chitin (a polysaccharide).
- iii. Fungi get nutrients in a unique way. They do not ingest food like animals and some protists. They absorb food from surroundings.
- iv. Examples are mushrooms, rusts, smuts and molds.
- v. Some fungi are used in the production of bread, cheese and beer. Others have medicinal properties, such as penicillin, an antibiotic derived from the fungus Penicillium.

3. Kingdom Plantae

- i. It includes plants which are eukaryotic, multicellular organisms with cell walls made of cellulose.
 - ii. They are autotrophic and prepare food through photosynthesis.
 - iii. All plants develop from embryos.
 - iv. Examples are mosses, ferns, conifers and flowering plants.
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Figure 2.6: Common Plants

4. Kingdom Animalia

- i. This kingdom of eukaryotes includes animals which are eukaryotic, multicellular and heterotrophic.
- ii. They develop from embryos.
- iii. They ingest food and digest it within their bodies.

Table 2.2: Distinguishing Characteristics of the Six Kingdoms of Life

Domain	Bacteria	Archaea	Eukarya			
Kingdom	Eubacteria	Archaeobacteria	Protista	Fungi	Plantae	Animalia
Cell Type	Prokaryotic	Prokaryotic	Eukaryotic	Eukaryotic	Eukaryotic	Eukaryotic
Nuclear Envelope	Absent	Absent	Present	Present	Present	Present
Cell Wall	Peptidoglycan in Eubacteria	Various chemicals in Archaeobacteria	Absent	Present in some, various types	Chitin	Cellulose and other polysaccharides
Mode of Nutrition	Autotroph or heterotroph	Autotroph	Autotroph or heterotroph or combination	Absorptive	Autotrophs	Ingestive Heterotroph
Multicellularity	Absent in All	Absent in most	Absent in most	Present in most	Present in all	Present in all

Q.8. Describe the Challenges of classifying viruses within the traditional three domains of life.

Ans.

Challenges of Classifying Viruses

Following are the challenges of classifying viruses within the traditional three domain of life:

- i. Viruses typically lack many of the genes that are universal among the three domains of cellular life, in particular genes for translation system components.
- ii. However, a small core of viral "hallmark genes" have been discovered that are missing in cellular life forms.
- iii. Viruses lack any of the characteristics of the three realms of life.

Status of Viruses in Classification

- (a) Viruses are ultramicroscopic creatures that are at the borderline of living and non-living.
- (b) They are acellular i.e., they are not made of cells and do not have organelles.

- (c) A virus consists of nucleic acid (DNA or RNA) surrounded by a protein coat.
- (d) They cannot run any metabolism and depend upon the host cell (including plants, animals, and bacteria) to replicate and synthesize their proteins.
- (e) Because they lack any of the characteristics of the three domains of life, viruses are not included in those categories.
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Figure 2.7: Two common viruses - left; A bacteriophage and Right; Influenza virus

Q.9. Describe briefly about prions and viroids.

Ans.

- Prions and viroids are also acellular particles and are also not included in classification system.
 - Prions are composed of proteins only and viroids are composed of circular RNA only.
 - Both these particles cause infectious diseases in certain plants.
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Q.10. Write a note on coronavirus.

Ans.

Introduction

Coronavirus is a virus, identified in late 2019 in Wuhan, China. It caused a pandemic of respiratory illness, called COVID-19.

Spreading

- The virus primarily spreads through respiratory droplets when an infected person coughs, sneezes, talks, or breathes.
- It can also spread by touching surfaces contaminated with the virus.

Symptoms

Common symptoms of this disease include fever, cough, shortness of breath, fatigue, body aches, loss of taste or smell, sore throat, and headache. In some cases, it can lead to severe respiratory problems, especially in older adults and people with underlying health conditions.

Prevention

- Wearing a mask over nose and mouth can help prevent the spread of disease.
 - Washing hands frequently with soap for at least 20 seconds or use hand sanitizer with at least 60% alcohol can also prevent the spread of disease.
 - Vaccination plays a crucial role in protecting from COVID-19. Vaccines help immune system recognize and fight the virus, reducing the severity of the disease.
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Binomial Nomenclature

Q.11. Explain rules and guidelines for suggesting scientific names to organisms. / What is binomial nomenclature? Describe aims, principles and importance of binomial nomenclature using local examples.

Ans.

Introduction

The great Swedish naturalist Carolus Linnaeus was the founder of the scientific naming system of organisms. The scientific name of an organism consists of two parts. The first part is the name of the genus to which the organism belongs. The second part is the name of the species. The system of scientific naming of organisms is termed as binomial nomenclature.

Examples

Common Names

Onion

Scientific Names

Allium cepa

Common Names	Scientific Names
Potato	<i>Solanum tuberosum</i>
Tomato	<i>Solanum esculentum</i>
Honey bee	<i>Apis cerana</i>
Tiger	<i>Panthera tigris</i>
Human being	<i>Homo sapiens</i>

Significance of Binomial Nomenclature

- i. **Same Names:** In binomial nomenclature, two organisms cannot have the same name.
- ii. **Scientific Names from Latin Language:** The words of scientific name are taken from Latin language (spoken by no country) so that no country is favoured. The scientific name of an organism is the same anywhere in the world. This system provides a standard way of communication, whether the language of a particular biologist is Chinese, Arabic, Spanish, or English.
- iii. **Different Names for the Same Organisms:** Various regions have different names for the same organism e.g. the common name of onion in Urdu is 'Piyaz' but in different regions of Pakistan it is also known as 'ganda' or 'bassal' or 'vassal'. In other countries it has other sets of names.
- iv. **Common Names:** In some cases, several different organisms are called by the same common name, e.g. 'blue bell' is used for dozens of plants with bell shaped flowers. Similarly, 'black bird' is used for crow as well as for raven.
- v. **No Scientific Basis for Common Names:** Common names have no scientific basis. For example; a fish is a vertebrate animal with a backbone, fins and gills. But several common names of 'silver fish', 'cray fish', 'jell fish', and 'star fish' do not fit to the true definition of fish.

Rules of Binomial Nomenclature

The scientific naming of an organism is done in accordance with some international rules. Some important rules of binomial nomenclature are:

1. For scientific naming, words are taken from Latin language.
2. Every scientific name has two parts. The genus name always comes first followed by the species name.
3. Every scientific name should have to be unique because the same name cannot be used for naming two different organisms.
4. The first part of the name i.e. genus name should begin with a capital letter. The second part of the name i.e. species name should begin with small letter.
5. At the time of printing of a scientific name, it should be typed in Italics.
6. When a scientific name would be hand written, two parts of it should be separately underlined.

Multiple Choice Questions (Exercise)

1. Which of the following taxonomic ranks represents the broadest rank of classification?
 - (a) Species
 - (b) Genus
 - (c) Kingdom
 - (d) Domain
2. Which characteristics is unique to organisms in the domain Archaea?
 - (a) Cell walls made of peptidoglycan

- (b) Presence of a nucleus
 - (c) Ability to live in extreme environments
 - (d) Lack of ribosomes
3. Which of these statements is NOT related to bacteria?
- (a) Do not have a nucleus.
 - (b) Cell wall made of peptidoglycan
 - (c) Most are heterotrophic
 - (d) Have chlorophyll in their chloroplast.
4. Which of these organisms belong to the domain Eukarya?
- (a) Escherichia coli
 - (b) Yeast
 - (c) Coronavirus
 - (d) None of these
5. Which of the following is a key characteristic that distinguishes eukaryotic cells from prokaryotic cells?
- (a) Lack of a cell wall
 - (b) Presence of a nucleus
 - (c) Absence of ribosomes
 - (d) Smaller size
6. Which kingdom includes organisms that are primarily unicellular, eukaryotic, and often heterotrophic?
- (a) Archaea
 - (b) Protista
 - (c) Fungi
 - (d) Plantae
7. Why are fungi classified as heterotrophs?
- (a) Have chitin in cell wall
 - (b) Absorb nutrients
 - (c) Reproduce by spores
 - (d) Form symbiotic relationships with plants
8. Why are viruses challenging to classify within traditional biological kingdoms?
- (a) They lack cellular structure and organelles
 - (b) They can perform photosynthesis
 - (c) They are larger than most bacteria
 - (d) They have a complex nervous system
9. Which of the following is the correct way for writing the scientific name of humans?
- (a) Homo sapiens
 - (b) Homo sapiens
 - (c) Homo Sapiens
 - (d) homo sapiens
10. Which information you can get if you know the scientific name of an organism?
- (a) Kingdom and Phylum
 - (b) Phylum and genus
 - (c) Genus and species
 - (d) Class and species
-

Multiple Choice Questions (Additional)

Biodiversity

11. What does biodiversity refer to:

- (a) The variety of living organisms in an area

- (b) The quantity of water bodies in a region
- (c) The speed at which species evolve
- (d) The number of cells in an organism

Classification

12. The branch of biology which deals with classification is:

- (a) Taxonomy
- (b) Systematic
- (c) Botany
- (d) Genetics

13. Who is considered the father of modern taxonomy?

- (a) Albert Einstein
- (b) Gregor Mendel
- (c) Charles Darwin
- (d) Carl Linnaeus

Taxonomic Ranks

14. A related group of genera consists of:

- (a) A phylum
- (b) A class
- (c) An order
- (d) A family

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

- (a) Phylum
- (b) Order
- (c) Family
- (d) Genus

16. The correct sequence of hierarchy from small to large units is:

- (a) Genus → family → order → class
- (b) Family → order → class → genus
- (c) Genus → family → class → order
- (d) Species → family → genus → order

17. Which one is the basic unit of classification?

- (a) Genus
- (b) Species
- (c) Family
- (d) Order

18. Which of the following is NOT a taxonomic rank?

- (a) Kingdom
- (b) Phylum
- (c) Class
- (d) Scientific name

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

	Animal	Prokaryote	Fungi	Plant
(a)	Heterotrophic	Heterotrophic	Ingestive	Autotrophic
(b)	Ingestive	Absorptive	Autotrophic	Heterotrophic

	Animal	Prokaryote	Fungi	Plant
(c)	Ingestive	Heterotrophic	Absorptive	Photosynthetic
(d)	Absorptive	Autotrophic	Ingestive	Autotrophic

History of Classification

20. Into which kingdom you place a multicellular land organism that performs photosynthesis?

- (a) Monera
- (b) Protista
- (c) Plantae
- (d) Animalia

21. Which kingdom is mismatched with the characteristics?

- (a) Fungi - usually saprotrophic
- (b) Animalia - rarely ingestive
- (c) Protista - various modes of nutrition
- (d) Plantae - photosynthetic

22. The kingdom to which the algae belongs is:

- (a) Animalia
- (b) Protista
- (c) Plantae
- (d) Fungi

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

- (a) Saprotrophs
- (b) Autotrophs
- (c) Heterotrophs
- (d) Parasites

24. Colonial organization feature of kingdom:

- (a) Animalia
- (b) Protista
- (c) Fungi
- (d) Plantae

25. All prokaryotic organisms are included in kingdom:

- (a) Eubacteria
- (b) Archaeobacteria
- (c) Fungi
- (d) Both A and B

26. Which kingdom includes eukaryotic, multicellular and absorptive heterotrophs?

- (a) Monera
- (b) Protista
- (c) Fungi
- (d) None of above

27. Which of the following character is not related to Animalia?

- (a) Eukaryotic
- (b) Multicellular
- (c) Heterotrophs
- (d) Autotrophs

28. All of these are characteristics of Fungi except:

- (a) Absorptive mode of life
- (b) Multicellular eukaryotes
- (c) Mostly decomposers
- (d) Cell wall is made of cellulose

29. Who suggested the first system of classification of organisms?

- (a) Al-Jahiz
- (b) Aristotle
- (c) John Ray
- (d) Averroes

30. Euglena belongs to the kingdom protista because:

- (a) It is unicellular
- (b) It is eukaryotic
- (c) It has both plant and animal like characters
- (d) It lives in water

31. The kingdom which contains eukaryotic autotrophic organism is:

- (a) Protista
- (b) Fungi
- (c) Monera
- (d) None of them

32. Which of the following kingdoms possesses the simplest organism?

- (a) Fungi
- (b) Eubacteria and Archaeobacteria
- (c) Protista
- (d) Plantae

33. Cell wall of fungi is made up of:

- (a) Cellulose
- (b) Amino acid
- (c) Chitin
- (d) Both 'a' and 'b'

34. The kingdom protista includes:

- (a) Unicellular and simple multicellular organisms with prominent nucleus
- (b) True multicellular organisms with no prominent nucleus
- (c) True multicellular organisms with prominent nucleus
- (d) Unicellular organisms with no prominent nucleus

35. In which kingdom, would you classify unicellular eukaryotes?

- (a) Fungi and Plantae
- (b) Fungi and Monera
- (c) Only Protista
- (d) Only Fungi

36. A certain organism is multicellular, adapted for photosynthesis and has multicellular sex organs. To which kingdom does it belong?

- (a) Animalia
- (b) Fungi
- (c) Plantae
- (d) Protista

37. The domain of bacteria is:

- (a) Archaea

- (b) Bacteria
- (c) Eukarya
- (d) None

38. The two-kingdom classification system divided into which of the following?

- (a) Animalia and Fungi
- (b) Plantae and Monera
- (c) Animalia and Plantae
- (d) Archaea and Bacteria

39. Which of the following kingdoms contains their DNA float freely within the cell?

- (a) Protista
- (b) Eubacteria
- (c) Fungi
- (d) Plantae

Domains of Living Organisms

40. Which is not one of the three broad domains of living organisms?

- (a) Bacteria
- (b) Archaea
- (c) Fungi
- (d) Eukarya

Status of Virus in Classification

41. Which is composed of only protein?

- (a) Viruses
- (b) Prions
- (c) Viroids
- (d) Both 'b' and 'c'

42. Which one is acellular?

- (a) Bacteria
- (b) Fungi
- (c) Cyanobacteria
- (d) Viruses

43. Viruses are assigned to the kingdom:

- (a) Plantae
- (b) Protista
- (c) Fungi
- (d) Not included in any kingdom

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

- (a) Respiration
- (b) Protista
- (c) Infectious nature
- (d) Excretion

45. 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

46. The body of which organism consists only of RNA?

- (a) Prions
- (b) Viroids

- (c) Viruses
- (d) Algae

47. Select the one which is "NOT" the characteristics of a prion:

- (a) Composed of protein only
- (b) Can replicate
- (c) Cause disease in sheep
- (d) Do not contain circular RNA

48. Which character of viruses make their resemblance with living organism?

- (a) They can be crystallized
- (b) They can not live outside host body
- (c) They contain DNA or RNA
- (d) All of the above

Binomial Nomenclature

49. 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

50. Binomial nomenclature was introduced by:

- (a) Aristotle
- (b) Carolus Linnaeus
- (c) Ernest Haeckel
- (d) R.H Whittaker

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

- (a) Genus
- (b) Class
- (c) Species
- (d) Family

52. Scientific name of brinjal is:

- (a) Bauhinia cepa
- (b) Solanum melangena
- (c) Bauhinia rebens
- (d) Oryza sativa

53. The scientific name of rice is:

- (a) Oryza Sativa
- (b) Oryza sativa
- (c) oryza sativa
- (d) ORYZA SATIVA

54. What is binomial nomenclature?

- (a) Classifying organisms on seven levels
- (b) Naming system developed by Aristotle
- (c) Grouping animals based on their habitat
- (d) Naming system in which each organism is given two-part name

55. Which one is the correct way of writing scientific name of an organism?

- (a) Canis lupus
- (b) Saccharum
- (c) Giant's gazelle
- (d) Escherichia coli

56. The scientific name of human being is:

- (a) Homo sapiens
- (b) Pisum sativum
- (c) Amanita muscaria
- (d) E. coli

Answer Key

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

Short Answer Questions (Exercise)

Q.1. What is the term used to describe the variety of life on Earth?

Ans. The term used for the variety of life on Earth is biodiversity, or biological diversity.

Definition

Biodiversity means the variety of organisms in a particular area including all living things and their interactions. It encompasses the variety of genes, species, ecosystems and functions.

Q.2. How is the biodiversity crucial for humans and for the planet Earth?

Ans.

Importance of Biodiversity

Biodiversity provides many essential services for humans and the planet. Here are some key benefits of biodiversity:

1. **Ecosystem Stability:** Biodiversity helps maintain the balance of ecosystems by contributing to the biogeochemical cycles.
-

Q.4. Can you provide the taxonomic classification for lions and corn?

Ans.

Taxa	Lion	Corn
Kingdom	Animalia	Plantae
Phylum	Chordata	Tracheophyta
Class	Mammal	Liliopsida
Order	Carnivora	Poales
Family	Felidae	Poaceae
Genus	Panthera	Zea
Species	Panthera leo	Zea mays

Q.5. What are the basic differences between archaea and bacteria?

Ans.

Archaea

- i. These are the most primitive organisms on Earth.
- ii. They are prokaryotes but their cell wall does not contain peptidoglycan. Their rRNA (ribosomal RNA) is more closely related to eukaryotes than to bacteria.
- iii. Their cell membrane contains unique lipids which enable them to live in extreme environments e.g., hot springs, salt lakes, deep-sea hydrothermal vents, and acidic or alkaline waters. However, they also exist in more common environments like soil and oceans.
- iv. Some archaea obtain energy from inorganic compounds such as sulphur or ammonia. Other groups perform photosynthesis but do not

Bacteria

- i. They are the true bacteria. They are unicellular. Many live solitary although some form chains, clusters, or colonies of cells.
- ii. They are also prokaryotic and have cell wall made of peptidoglycan.
- iii. Bacteria are found everywhere including soil, water, air, and living organisms.
- iv. This domain contains kingdom Eubacteria.

Archaea

Bacteria

produce oxygen.

v. The domain Archaea contains kingdom Archaeobacteria (ancient bacteria).

v. Major groups in this kingdom are bacteria and cyanobacteria.

vi. Major archaeobacteria include Methanogens, Halophiles, Thermophiles and Acidophiles.

Q.6. What were the shortcomings of the three kingdom classification system?

Ans.

Drawbacks / Shortcomings

- i. Some taxonomists disagreed about the position of fungi in kingdom Plantae.
 - ii. Fungi resemble plants in many ways but are heterotrophs which get their food by absorption.
 - iii. They do not have cellulose in their cell wall but possess chitin.
-

Q.7. Which kingdom includes organisms that are multicellular, heterotrophic and lack cell walls?

Ans. The Kingdom Animalia of eukaryotes includes organisms which are eukaryotic, multicellular heterotrophic and lack cell walls. They develop from embryos. They ingest food and digest it within their bodies.

Q.8. Enlist the distinguishing characteristics of fungi.

Ans.

Kingdom Fungi

- i. This kingdom consists of fungi which are eukaryotic, heterotrophic organisms that are unicellular or multicellular.
 - ii. Their cells are covered by cell wall made of chitin (a polysaccharide).
 - iii. Fungi get nutrients in a unique way. They do not ingest food like animals and some protists. They absorb food from surroundings.
 - iv. Examples are mushrooms, rusts, smuts and molds.
 - v. Some fungi are used in the production of bread, cheese and beer. Others have medicinal properties, such as penicillin, an antibiotic derived from the fungus *Penicillium*.
-

Q.9. List the three domains that encompass all living organisms.

Ans. Classification into three domains is based on difference in the sequence of nucleotides in the rRNA (ribosomal ribonucleic acid) of the cell, the cell membranes lipid structure and its sensitivity to antibiotics. The three domains are:

- i. Domain Archaea
 - ii. Domain Bacteria
 - iii. Domain Eukarya
-

Q.10. Why cannot we classify viruses in any Kingdom?

Ans. Viruses are not included in any kingdom because they lack any of the characteristics of the three domains of life.

Q.11. How does binomial nomenclature facilitate clear communication about organisms across different languages?

Ans.

- i. It facilitates by providing a universal naming system for species.
 - ii. It provides an unambiguous universally recognized way of naming living things via a genus name followed by a more specific species name.
 - iii. This system provides a standard way of communication, whether the language of a particular biologist is Chinese, Arabic, Spanish, or English.
-

Short Answer Questions (Additional)

Classification

Q.12. Define.

- (a) Biodiversity
- (b) Classification
- (c) Taxonomy
- (d) Systematics
- (e) Domain
- (f) Taxa
- (g) Species

Ans.

a) Biodiversity

Biodiversity is defined as "the variety of living organisms on Earth."

b) Classification

The grouping of organisms is called classification.

c) Taxonomy

Taxonomy is the branch of biology concerned with identification, naming and classification of organisms.

d) Systematics

The scientific study of diversity of organisms and their evolutionary relationship is called systematic.

e) Domain

In 1990 Carl Woese introduced a three domains system of classification. The three domains of life are Archaea, Bacteria and Eukarya.

f) Taxa

The groups into which organisms are classified are known as taxonomic categories or taxa (singular 'taxon'). The taxa form a ladder, called taxonomic hierarchy. There are seven main taxonomic ranks: Kingdom, phylum or division, class, order, family, genus and species.

g) Species

Species is a group of similar organisms capable of interbreeding or exchanging genes among themselves and producing fertile offspring.

Q.13. Describe aims of classification.

Ans.

Aims of Classification

The main aims and objectives of classification are:

1. To determine similarities and differences between organisms.
 2. To arrange organisms on the basis of similarities and differences.
 3. Identify the organisms to study them systematically.
 4. To find out evolutionary relationship among organisms.
-

Q.14. Why mule is not regarded as a species?

Ans.

Definition

Species is a group of similar individuals capable of interbreeding among themselves and producing fertile offspring.

Explanation

Cross between a male donkey and a female horse produces mule. It is infertile, because of the odd number of chromosomes, they can't reproduce. So, it is not species. Species is the most basic unit of classification, as well as a taxonomic rank.

History of Classification

Q.15. Why are the following scientists famous for?

- (a) Aristotle
- (b) Carolus Linnaeus
- (c) Carl Woese

Ans.

a) Aristotle

The Greek Philosopher Aristotle was the first person who classified the living organisms.

b) Carolus Linnaeus

He grouped species according to similar physical characteristics. According to earlier classification system, organisms were classified into two kingdoms, then three kingdom and then five-kingdom system. He also introduced binomial nomenclature.

c) Carl Woese

In 1990 Carl Woese introduced a three domains system of classification. The three domains of life are:

- i) Archaea
 - ii) Bacteria
 - iii) Eukarya
-

Q.16. Can you differentiate between:

- (a) Bacteria and Protists
- (b) Fungi and Plants
- (c) Plants and Animals

Ans.

(a) Bacteria and Protists

Bacteria

(i) Prokaryotic organisms.

(ii) They are unicellular, filamentous or colonial and are relatively simple in structure.

Examples: Bacteria and Cyanobacteria

Protists

(i) Eukaryotic organisms.

(ii) Unicellular or simple multicellular and mostly aquatic.

Examples: Amoeba, Euglena, and Slime Molds.

(b) Fungi and Plants

Fungi	Plants
(i) Eukaryotic organisms.	(i) Eukaryotic organisms.
(ii) Mostly multicellular and some fungi are unicellular.	(ii) Multi-cellular.
(iii) Fungi may be saprotrophic decomposers.	(iii) Plants are autotrophic with chloroplasts containing chlorophyll.
(iv) Fungi have chitin in their cell walls.	(iv) Plants cell wall is made of cellulose.
(v) Fungi have absorptive mode of nutrition.	(v) Plants have photosynthetic mode of nutrition.
(vi) Examples; black bread mold, yeast, mushroom etc.	(vi) Examples; moss, mustard.

(c) Plants and Animals

Plants	Animals
(i) Eukaryotic multi-cellular.	(i) Eukaryotic multi-cellular.
(ii) Autotrophic with chloroplast containing chlorophyll.	(ii) Heterotrophic and lack chlorophyll.
(iii) They have cellulose in cell walls.	(iii) Animals lack cell wall.
(iv) They cannot move.	(iv) They can move from place to place.
(v) Examples; moss, mustard.	(v) Examples: (a) Invertebrates e.g., Insects, star fish. (b) Vertebrates e.g., fish, frogs.

Q.17. Answer the following with supportive reasons.

- Which is the simplest domain?
- Which is the complex domain?
- Are most bacteria harmful?
- Which domains can flourish or survive in most adverse conditions?

Ans.

a) Archaea domain is the simplest one. This domain is comprised of organisms that are prokaryotic or cells without nuclei. They are single celled and reproduce asexually.

b) Domain Eukarya is the complex one. It consists of all eukaryotic organisms or those with the largest, most complex cells and the most advanced compartmentalization.

c) Most bacteria are harmless, but certain types can make you sick. These bacteria are a type of pathogen. Pathogens are microorganisms that can cause diseases.

d) Archaea can be found in every ecosystem and environment on Earth. They can survive and thrive in extreme environments. The archaeal cytoplasmic membrane contains unique lipids that cannot easily be degraded, are temperature and mechanically resistant and highly salt tolerant.

Q.18. Define the following terms

- (a) Autotrophs
- (b) Heterotrophs
- (c) Saprotrophs

Ans.

(a) Autotrophs

The organisms that are capable of producing their own food are called autotrophs (photosynthetic mode of nutrition) e.g., green plants, cyanobacteria, and algae.

(b) Heterotrophs

Organisms which eat other things as food are called heterotrophs (ingestive mode of nutrition) e.g., animals, animal like protists, etc.

(c) Saprotrophs

The organisms that depend on dead, decaying matter are called saprotrophs (absorptive mode of nutrition) e.g., fungi, bacteria. These are decomposers.

Q.19. Define prokaryotes and eukaryotes.

Ans.

Prokaryotes

The organisms which lack nucleus in their cells are called prokaryotes e.g. bacteria.

Eukaryotes

The organisms which have true nucleus in their cells e.g. plant cells.

Q.20. Which kingdom does Euglena belong to? Give reason for its placement. Enlist any three characteristics of that kingdom.

Ans.

Euglena belongs to kingdom Protista.

Reason for Placement

It is a unicellular organism. Euglena has both plant-like (presence of chlorophyll) and animal-like (heterotrophic mode of nutrition in darkness and lack of cell wall) characters. Due to this it is placed in the kingdom Protista.

Characteristics

- i) Kingdom Protista includes eukaryotic organisms with a unicellular or simple multicellular structure.
 - ii) Most organisms belonging to this kingdom are aquatic.
 - iii) It includes animal like protists called protozoa e.g., Amoeba, Plant like protists called algae e.g., Euglena. Fungi like protists e.g., slime molds.
-

Domains of Living Organisms

Q.21. What is domain? Name three domains of life.

Ans. In biology, a domain means the largest of all groups in the classification of life. Domain is group of kingdoms or taxonomic category above the kingdom. The three domains of life are Archaea, Bacteria and Eukarya.

Q.22. What are basis of classification of life into domains?

Ans.

Basis of Three Domain System

Classification into three domains is based on difference in the sequence of nucleotides in the rRNA (ribosomal ribonucleic acid) of the cell, the cell membrane lipid structure and its sensitivity to antibiotics.

Q.23. Compare two kingdom, three kingdom, and five kingdom classification system.

Ans.

Two Kingdom Classification System	Three Kingdom Classification System	Five Kingdom Classification System
(i) It includes two Kingdoms: Plantae and Animalia.	(i) It includes three kingdoms: Plantae, Animalia, Protista.	(i) It includes five kingdoms: Monera, Protista, Fungi, Plantae and Animalia.
(ii) Bacteria and Cyanobacteria were placed in plant kingdom.	(ii) Euglena was placed in kingdom Protista.	(ii) Bacteria and cyanobacteria are placed in kingdom Monera.
(iii) Unicellular or simple multicellular eukaryotes wrongly placed in kingdom Plantae and Animalia.	(iii) Multicellular microscopic organisms were separated from unicellular microscopic organisms.	(iii) Unicellular or simple multicellular eukaryotes placed in kingdom Protista.
(iv) Fungi are wrongly placed in kingdom Plantae.	(iv) Fungi were placed in kingdom Plantae.	(iv) Fungi are placed in kingdom Fungi.

Q.24. Compare the three domain system of classification.

Ans.

i) The Domain Archaea

The domain Archaea have the following characteristics:

- Archaea are prokaryotic cells.
- The cell walls of Archaea contain no peptidoglycan.
- The rRNA (ribosomal RNA) are not found in Bacteria and Eukarya.

ii) The Domain Bacteria

The domain Bacteria have the following characteristics:

- Bacteria are prokaryotic cells.
- The cell walls of bacteria contain peptidoglycan.
- They contain rRNA that is unique to bacteria.

iii) The Domain Eukarya

The domain Eukarya has the following characteristics:

- Eukarya have eukaryotic cells.
 - Not all Eukarya have cells with a cell wall. Their cell wall contains no peptidoglycan.
 - Eukarya contains rRNA that is unique to Eukarya.
-

Binomial Nomenclature

Q.25. Define binomial nomenclature.

Ans. Binomial nomenclature is the method of giving scientific names to living organisms. Since each name has two parts so it is called binomial nomenclature e.g., biological name of human being is Homo sapiens. Our genus name is Homo and species name is sapiens.