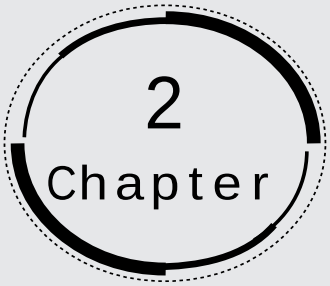
Biological Classification



1. Discuss how classification systems have undergone several changes over a period of time?

Ans: Biological categorization is the scientific method of grouping organisms into hierarchical groups and subgroups based on their similarities and differences. Scientists have developed various classification systems, which have undergone several revisions over time. Previously, Aristotle developed an artificial classification system that classified animals and plants according to their habitat. Aquatic (fish, whales), terrestrial (reptiles, cattle), and aerial (birds) are examples (e.g., bat, birds). Morphology, anatomy, physiology, reproduction, ontogeny, cytochemistry, and other factors were used to classify organisms back then. Following that, creatures were categorized using a phylogenetic framework based on evolutionary links. It uses cytotaxonomy, chemotaxonomy, numerical taxonomy, and cladistic taxonomy to classify organisms.

2. State two economically important uses of:

(a) Heterotrophic bacteria

Ans: Some heterotrophic bacteria are decomposers; they are used as natural scavengers, decomposing dead bodies and organic wastes to release raw resources, allowing organic matter to be reused. They also assist with sewage disposal, manure production, and other tasks.

- Symbiotic bacteria aid in nitrogen-fixing in the atmosphere.
- Bacteria are used in the manufacturing of lactic acid, curd, cheese, butter, vinegar, and other industrial products. Pseudomonas, Xanthomonas, and other bacteria are utilized in the production of serum, vaccines, vitamins, enzymes, antibiotics, and other products.

(b) Archaebacteria

Ans: Archaebacteria:

- Archaebacteria are used to produce gobar gas from manure and sewage, and they cause cellulose fermentation in ruminants.
- Archaebacteria can be found in the guts of ruminants like cows and buffaloes, and they aid in digestion.

3. What is the nature of cell walls in diatoms?

Ans: Diatoms' cell walls are known as frustules. The cell wall is primarily made up of cellulose that has been impregnated with glass, similar to silica. It is made up of two overlapping halves (or theca) that fit together like the two halves of a soapbox or a petri dish. Epitheca refers to the upper half (lid), whereas hypotheca refers to the lower half (case). Fine patterns, pits, pores, and ridges can be found on the outer layer. Diatoms' siliceous frustules are resistant to degradation. They generate large mounds of diatomite or diatomaceous earth at the bottom of water reservoirs. It may extend for hundreds of meters in some regions, from which it can be mined.

4. Find out what do the terms ‘algal bloom’ and ‘red tides’ signify?

Ans: An algal bloom is a fast growth in populations of algae and other phytoplankton, particularly cyanobacteria, in organically rich water bodies. The creatures’ density may prevent light from reaching lower depths in the water body. A rise in nitrate levels, a mineral ion required for algal and bacterial growth, causes algal blooms. Agricultural fertilizers, which are leached — into water systems from the soil, or sewage effluent could be the source of increasing nitrate. Because of the high concentration of photosynthetic accessory pigments, red tides are generated by a sudden, often dangerous growth of marine phytoplankton, particularly dinoflagellates, which color the seared, brown, or yellowish. Some dinoflagellates, such as Gonyaulax, create toxins that can harm fish and invertebrates or accumulate in the food chain, providing a risk to humans who consume shellfish and other seafood. These phytoplanktonic blooms are thought to be caused by nutrient-rich

inputs from the land, upwelling oceanic waters, and the activation of cyst-like structures on the seabed.

5. How are viroids different from viruses?

Ans: Viroids are the tiniest known infectious disease pathogens, consisting of a single-stranded RNA molecule. They don't have a capsid and don't have any proteins attached to them. Only plants are infected by viruses. Viruses, on the other hand, have genetic material that is protected by a protein or lipoprotein coat. Viruses have four forms of genetic material: double-stranded DNA, double-stranded RNA, single-stranded DNA, and single-stranded RNA. They can infect both plants and mammals.

6. Describe briefly the four major groups of protozoa.

Ans: Protozoans are all heterotrophic, meaning they exist as predators or parasites. Animal relatives are thought to be their ancestors. Based on locomotory organelles, they are divided into four classes.

1. Amoeboid protozoans: Amoeboid protozoans are creatures that dwell in freshwater, seawater, or moist soil. As in Amoeba, they move and seize their prey by generating pseudopodia (fake feet). Some of them are parasites, such as Entamoeba.

2. Flagellated protozoans: This group includes both free-living and parasitic protozoans. For locomotion, they have flagella. The parasitic forms, such as Trypanosoma, cause disorders like sleeping sickness.

3. Ciliated protozoans: Ciliated protozoans are aquatic, actively moving organisms with thousands of cilia. They have a cavity (gullet) on the cell surface that opens to the outside. Water packed with food, such as paramecium, is directed into the gullet by the coordinated movement of rows of cilia.

4. Sporozoans are parasitic organisms that go through a life cycle that includes an infectious spore stage. There are no locator organs. N. Plasmodium has a

bad effect on the human population because it causes malaria.

7. Plants are autotrophic. Can you think of some plants that are partially heterotrophic?

Ans: Plants that eat insects, such as Drosera, Nepenthes, and Utricularia, are somewhat heterotrophic. The nitrogen content of these plants is low, although they are otherwise autotrophic. They capture a variety of insects to get nitrogen from them. The rest of the food, namely carbohydrates, is produced by the photosynthesis process.

8. What do the terms phycobiont and mycobiont signify?

Ans: A lichen is a structurally organized object made up of a fungus and an alga that is permanently associated. Mycobiont refers to the fungal component of lichen, while phycobiont refers to the algal component. Both mycobiont and phycobiont are part of a symbiotic relationship in which the fungus is the dominant partner and the algae are the submissive. The fungus provides the structural covering that protects alga from adverse conditions like drought, heat, and other environmental factors. It also absorbs moisture from the air and binds the lichen to rock, tree bark, leaves, and other similar structures. By converting carbon dioxide into organic food, the alga prepares organic food. Cyanobacteria (blue-green algae) can fix atmospheric nitrogen in addition to preparing food if the algal component is cyanobacteria (blue-green algae).

9. Give a comparative account of the classes of kingdom Fungi under the following:

(i) mode of nutrition (ii) mode of reproduction

Ans:

Class of fungi	Mode of nutrition	Mode of reproduction

Phycomycetes (Includes oomycetes and zygomycetes)	Oomycetes are primarily parasitic (they feed on the protoplasm of living plants or animals, such as phytophthora infestans). Saprophytes (those that absorb sustenance from dead or decaying organic debris) make up the majority of zygomycetes. Some are coprophilous (fungi that grow on manure, such as Rhizopus), parasitic (Absidiacornealis), and some are parasitic (Absidiacornealis).	Asexual reproduction occurs in oomycetes via zoospores (aquatic form) and aplanospores (terrestrial form). Sexual reproduction can be either isogamous or monogamous, and sexual fusion is a sort of gametangia contact. Antheridium is the male sex organ, while oogonium is the female sex organ. After plasmogamy, karyogamy, and meiosis occur (oospore formation). Conjugation is the process of sexual reproduction that involves gametangial copulation (two identical gametangia). Diploid zygospore is formed by sexual reproduction
Ascomycetes (Sac fungi)	The majority are terrestrial and exist as saprophytes (e.g., Aspergillus) or parasitic organisms (e.g., Aspergillus) (Claviceps). Some thrive in humus-rich soil in deciduous woodlands (Morchella).	Conidia or conidiospores (Aspergillus), budding (Saccharomyces), and fission (Saccharomyces) are examples of asexual reproduction (Schizosaccharomyces). Gametic copulation (e.g., yeast), gametangial touch (e.g., pyronema), spermatization (Ascobolus),

		and somatogamy are all examples of sexual reproduction (Peziza). Plasmogamy (protoplast fusion), karyogamy (nucleus fusion), and meiosis are the three steps of sexual reproduction. The ascus is where ascospores are created. Each ascus usually has eight ascospores. Ascocarps (cleistothecium, e.g., penicillium, perithecium, e.g., Neurospora, and apothecium, e.g., peziza) are the result of fructification.
Basidiomycetes	Mostly saprophytes (Agaricus), found on humus, bark, decaying wood, etc. Some are obligate parasites (e.g., rusts, powdery mildews, which live entirely on their hosts' living protoplasm and can never grow on dead tissue), while others are facultative saprophytes (e.g., some smuts, which are parasitic in their mode of life but may later pass their mode of life as saprophytes).	Although asexual spores are rare, vegetative reproduction by fragmentation is prevalent. The sex organs are absent, but plasmogamy occurs when two vegetative or somatic cells of different strains or genotypes fuse. The dikaryotic structure that results is what gives rise to basidium. The basidium undergoes karyogamy and meiosis, resulting in four basidiospores.

		The basidiospores are formed exogenously on the basidium (pl.:basidia). Basidia are arranged in basidiocarps, which are fruiting bodies.

10. What are the characteristic features of Euglenoids?

Ans: The most fascinating species are the euglenoid flagellates, which combine animal and plant features. The following are the distinguishing characteristics:

- They are flagellates with only one cell.
- There is no defined cellulose cell wall in these protists. Instead, a thin membrane known as a pellicle protects the cells. Protein, fat, and carbs make up the pellicle.
- These protists have one or two flagella, which aid them in swimming. If there are two flagella, one is long and the other is short. They have two longitudinal rows of fine hairs and are tinsel-shaped. Each flagellum has its granule at the base. A bulge known as the paraflagellar body connects the two flagella.
- The cell's anterior end has an eccentric mouth, or cytostome, that leads into a flask-shaped chamber, such as the gullet or cytopharynx. The gullet is a big basal reservoir that opens up.
- The cytoplasm of one end of the reservoir has an orange-red stigma (eyespot). The eyespot is a curving plate that contains the red pigment astaxanthin and is covered with orange-red granules. Photoreceptors are found in both the paraflagellar body and the eyespot.
- A contractile vacuole with several feeding channels can be detected just below the reservoir. Osmoregulation is aided by the contractile vacuole. It expands and pumps the contents of its fluid into the reservoir.
- Euglenoids are either holophytic or photoautotrophic in their feeding.

- Ectoplasm and endoplasm are two types of cytoplasm. The nucleus is big and located in the center of the cell. During cell division, the envelope and nucleolus remain.
- Each chloroplast is made up of a granular matrix with 10-45 dense bands running through it and a three-membraned envelope. Chlorophyll –b is a photosynthetic pigment found in them. Carbohydrates are stored in the form of paramylon bodies, which are dispersed throughout the body. Carbohydrates are stored as paramylon bodies, which are dispersed throughout the cytoplasm.
- Longitudinal binary fission is used in asexual reproduction. Before cell division, the flagellum is replicated.
- When conditions are unfavorable, the euglenoids produce cysts to prolong the dry period.
- There is no evidence of sexual reproduction.

11. Give a brief account of viruses with respect to their structure and nature of genetic material. Also, name four common viral diseases.

Ans: Virus (L. toxic fluid) is a category of ultramicroscopic, non-cellular, extremely infectious organisms that reproduce exclusively intracellularly — within the living host cells – without the need for growth or division. They are inert particles outside of the host cells. They are nucleoproteins that have one or more nucleic acid molecules, such as DNA or RNA, enclosed in a protein or lipoprotein sheath. The nucleoid (genome) and capsid are the two sections of a virus. In some circumstances, an envelope and a few enzymes are present.

- Nucleoid: The viral chromosome is represented by the nucleoid, which is a nucleic acid found in the virus. It is made of a single nucleic acid molecule. It might be linear or circular, using DNA or RNA as the nucleic acid. It is the section of the virus that uses the host cell's metabolic machinery to synthesize and assemble viral components.
- Capsid: It's a protein that encases genetic material. Capsomeres are protein

components found in capsids. The nucleoid is protected by the capsid from physical and chemical agents.

- Envelope: The envelope is a loose outer covering seen on some viruses, such as animal viruses (e.g., HIV), but not on plant or bacterial viruses. It is made up of viral protein, as well as lipids and carbohydrates from the host. Spikes, or outgrowths, may be present. Peplomers are components of envelope proteins. A virus that does not have an envelope is known as a naked virus.

  Influenza, polio, measles, chickenpox, hepatitis, AIDS, bird flu, SARS (Severe Acute Respiratory Syndrome), and other viral infections are common.

12. Organise a discussion in your class on the topic – 'Are viruses living or nonliving?

Ans: Viruses are thought to be a bridge between non-living and living things. It's tough to tell whether they're alive or dead. Viruses have some characteristics that indicate their non-living nature, while others indicate their alive nature.

They have the appearance of non-living items.

- Protoplast deficiency.
- Crystallization ability.
- Inability to live without the assistance of a living cell.
- A high specific gravity that can only be found in non-living things.
- The inability to breathe.The lack of an energy storage system.
- Lack of division and development. Different sections are synthesized independently instead.

Viruses are similar to living organisms in that they are made up of organic macromolecules that are only found in living organisms.

- Genetic material is present.

- The ability to multiply or reproduce, but only inside the confines of a live cell.
- Mutation occurrence.
- Enzyme transcriptase is found in the majority of viruses.
- Vitamins such as riboflavin and biotin are found in some viruses, such as the Pox virus.
- Autoclaving and ultraviolet light both ‘kill' viruses.
- They reproduce by Penicillium type. Even variances can be passed on.
- They take over the host cell's biosynthetic machinery and manufacture substances necessary for their replication.