



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

Solution:

Biological classification is the scientific procedure of arranging organisms in a hierarchical series of groups and sub-groups on the basis of their similarities and dissimilarities. Scientists have proposed different systems of classification which have undergone several changes from time to time.

Earlier Aristotle proposed artificial system of classification, which divided animals and plants on basis of habitat. E.g., Aquatic (fish, whale), terrestrial (e.g., reptiles, cattle) and aerial (e.g., bat, birds). Then, natural system of classification was based on morphology anatomy, physiology, reproduction, ontogeny, cytochemistry, etc. After natural system, organisms were classified on basis of evolutionary relationships called phylogenetic system. It is based on cytotaxonomy, chemotaxonomy, numerical taxonomy and cladistic taxonomy.

2. State two economically important uses of:

(a) heterotrophic bacteria

(b) archaebacteria

Solution:

(a) Heterotrophic bacteria: They include saprotrophic, symbiotic and parasitic bacteria. They act as natural scavengers as they dispose off the dead bodies, organic wastes, release raw materials for reutilisation. They also help in sewage disposal, manure production etc. Symbiotic bacteria help in nitrogen fixation. Some bacteria are employed in the production of a number of industrial products like lactic acid, curd, cheese, butter, vinegar etc. Some bacteria are used in preparation of serum, vaccines, vitamins, enzymes, antibiotics etc. e.g., *Pseudomonas*, *Xanthomonas*, etc.

(b) Archaebacteria : Archaebacteria are employed in the production of gobar gas from dung and sewage and in ruminants, they cause fermentation of cellulose.

3. What is the nature of cell-wall in diatoms?

Solution:

The cell walls of diatoms are called frustules. The cell wall is chiefly composed of cellulose impregnated with glass-like silica. It is composed of two overlapping halves (or theca) that fit together like two parts of a soap box or petri dish. The upper half (lid) is called epitheca and the lower half (case) is called hypotheca. The outer covering possesses very fine markings, pits, pores and ridges. The siliceous frustules of diatoms do not decay easily. They pile up at the bottom of water reservoirs and form big heaps called diatomite or diatomaceous earth. It may extend for several hundred metres in certain areas from where the same can be mined.

4. Find out what do the terms 'algal bloom' and 'red tides' signify.

Solution:

The rapid increase in populations of algae and other phytoplanktons, in particular cyanobacteria, in water bodies rich in organic matter is called algal bloom. The density of the organisms may be such that it may prevent light from passing to lower depths in the water body. Algal blooms are caused by an increase in levels of nitrate, a mineral ion essential for algal and bacterial growth.

The source of increased nitrate may be from agricultural fertilizers, which are leached - into water systems from the land, or sewage effluent.

Red tides are caused by a sudden, often toxic proliferation of marine phytoplankton, notably dinoflagellates, that colour the sea red, brown, or yellowish due to the high concentration of the photosynthetic accessory pigments. Some dinoflagellates, such as *Gonyaulax*, produce potent toxins, which may kill fish and invertebrates outright or accumulate in the food chain, posing a hazard to humans eating shellfish and other seafood. These phytoplanktonic blooms may be related to nutrient-rich inputs from the land, or upwelling oceanic waters, and are initiated by the activation of cyst-like forms lying on the sea bed.

5. How are viroids different from viruses?

Solution:

Viroids are the smallest known agent of infectious diseases that contain small single-stranded RNA molecule. They lack capsid and have no proteins associated with them. Viroids infect only plants. Whereas, viruses have genetic material surrounded by a protective coat of protein or lipoprotein. The genetic material of viruses are of 4 types - double-stranded DNA, double-stranded RNA, single-stranded DNA, single-stranded RNA. They infect both plants and animals.

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