Biological Classification

Case Study Based Questions

Read the following passages and answer the questions that follow:

1. The organism shown in the given picture is an example of a symbiotic relationship between two organisms in which one of the partners is algae and it is a good pollution indicator. It is also found associated with roots of higher plants as mycorrhiza.

(A) Name the organism shown in the picture given above.
(B) Name the kingdom to which this organism belongs.
(C) Write about the relationship shown above. Explain with example.

Ans. (A) Lichen is shown in the above given picture. It is an association of fungus and algae in which both are mutually benefitted and show mutualism.
(B) Lichens are often referred to as lichenized fungi and they belong to the Kingdom fungi.
(C) Lichens have a symbiotic relationship between a fungus and a chlorophyll- containing partner, such as green algae, cyanobacteria, or both. The fungus creates a proper environment for the partner, which feeds the system with photosynthetically fixed carbon as an energy source.
Examples: Saccharomyces, Penicillium and Aspergillus.

2. The Kingdom Plantae and the Kingdom Animalia are the two kingdoms that were classified by a scientist. The mechanism of nourishment, reproduction, and the presence or absence of a cell wall were used to classify these organisms. However, there were

several flaws in this system, such as the lack of differentiation between eukaryotes and prokaryotes. The three-kingdom classification followed, with single-celled bacteria and protozoans classified as Protista. Additionally, this method failed to classify all living species into relevant categories. Finally, a five-kingdom classification system was devised, which divided all organisms into five kingdoms and was adopted as a modern classification system.

(A) Whittaker's definition of classification does not include:

(a) Algae
(b) Protista
(c) Plantae
(d) Fungi

(B) Linnaeus proposed which kingdom of classification?

(a) Two kingdom
(b) Three kingdom
(c) Four kingdom
(d) Five kingdom

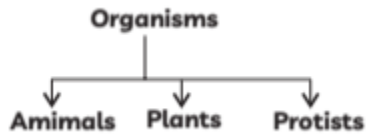
(C) Classification is not based on:

(a) Cell structure
(b) Phylogenetic relationships
(c) Reproduction
(d) Gross morphology

(D) Which among the following is not a significance of classification?

(a) To make identification and the study and research easier for diverse life forms.
(b) Gives a glance of all the organisms in one picture.
(c) To determine inter-relationships among the organisms.
(d) To know the number of total organisms.

(E) Who proposed the following classifica- tion?



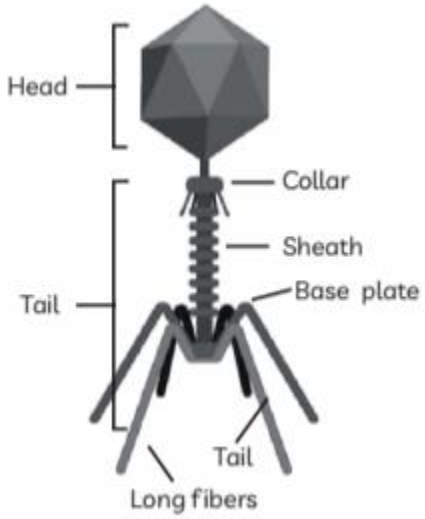
(a) Ernst Haeckel
(b) Linnaeus

(c) R.H. Whittaker
(d) Edward Jenner

Ans. (A) (a) Algae
Explanation: Algae is not included in the classification system proposed by Whittaker.
(B) (a) Two kingdom
Explanation: Linnaeus gave two-kingdom classification ie., Plantae and Animalia which segregated plants and animals. Drawback of this system was that it does not segregate eukaryotes and prokaryotes, unicellular and multicellular, and photosynthetic and non-photosynthetic organisms.
(C) (d) Gross morphology
Explanation: Gross morphology is not a parameter that is used for classification important in taxonomy. The most characteristics for the classification of organisms are: Cell structure-cell wall present or absent. Thallus organisation, Mode of nutrition-autotrophic or heterotrophic. Reproduction - sexual or asexual, Phylogenetic relationships.
(D) (d) To know the number of total organisms.
Explanation: Importance of classification includes:
(1) To make identification and the study, research easier for diverse life forms.
(2) Gives a glance of all the organisms in one picture.
(3) To make us understand and study the similarities, characteristics and differences among organisms so that grouping can be easy.
(4) To trace the ancestry i.e., evolutionary relationships among them, understand missing links, connecting links.
(5) To understand the exact position of an organism in classification.
(6) To determine inter-relationships among the organisms.
(E) (a) Ernst Haeckel
Explanation: Given classification is three- kingdom classification. Ernst Haeckel proposed a three-kingdom categorisation scheme in which he classified organisms into Animalia, Plantae, and Protista.

3. The emergence of pathogenic bacteria resistant to most, if not all, currently available antimicrobial agents has become a critical problem in modern medicine, particularly because of the concomitant increase in immunosuppressed patients. The concern that humankind is reentering the "pre antibiotic" era has become very real, and the

development of alternative anti-infection modalities has become one of the highest priorities of modern medicine and biotechnology. Prior to the discovery and widespread use of antibiotics, it was suggested that bacterial infections could be prevented and/or treated by the administration of bacteriophages. Observe the diagram of bacteriophage shown alongside and answer the following questions:



(A) The viruses which attack the bacterial cells are:

(a) Bacteriophages

(b) Cyanophages

(c) Plasmid

(d) None of these

(B) The genome of bacteriophage consist of:

(a) either DNA or RNA

(b) both DNA or RNA

(c) DNA only

(d) RNA only

(C) When viral genome is integrated into the bacterial genome they are known as:

(a) Prophage

(b) Plasmid

(c) Peplomers

(d) Capsid

(D) The structure of head of bacteriophage is:

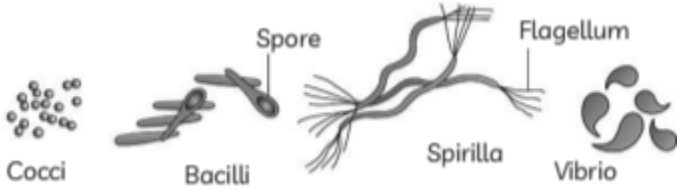
(a) spirally coiled

(b) hexagonal
(c) cylindrical
(d) elongated rod-shaped

(E) Which of the following is the example of the figure shown above?
(a) TMV
(b) Pseudomonas
(c) T4 virus
(d) Retrovirus

Ans. (A) (a) Bacteriophages
Explanation: The virus which infects bacteria is called bacteriophage.
(B) (a) either DNA or RNA
Explanation: Bacteriophages have either DNA or RNA as their genetic material.
(C) (a) Prophage
Explanation: When the viral genome integrates with a bacterial genome it is called Prophage. They carry DNA that can behave as genetic material (episome) in bacteria.
(D) (b) hexagonal
Explanation: The head of bacteriophage is polyhedral i.e., hexagonal prism shaped with pyramidal ends.
(E) (c) T4 virus
Explanation: T4 virus is a bacteriophage which invades E.coli for its life cycle.

4. The first issue to get settled is that the shape of a bacterium has biological relevance. One argument favouring this assertion is that even though bacteria have a wide variety of shapes, any one genus typically exhibits a limited subset of morphologies, hinting that, with a universe of shapes to choose from, individual bacteria adopt only those that are adaptive. Another clue is that some bacteria can modify their morphology in response to environmental cues or during the course of pathogenesis, suggesting that shape is important enough to merit regulation. The figures show different types of bacterial cells on the basis of their shape. Observe the figures and answer the following questions.



(A) What type of shape does the genus of bacteria Bacillus have?

(B) Name the organism which has one or more flagella at one pole and are rod-shaped with a single curve.
(C) (i) Name the organism whose body is filamentous like a fungal mycelia.
(ii) What do you mean by pleomorphic?

Ans. (A) Bacillus bacteria are straight rod or cylindrical-shaped. Its ends may be pointed or flat.
(B) Vibrio
(C) (1) Thiothrix.
(ii) Those bacteria who are able to change their shape under environmental conditions are called pleomorphic.