Biology

(Chapter – 2) (Biological Classification)

(Class – XI)

Exercises

Question 1:

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

Answer 1:

The classification systems have undergone several changes with time. The first attempt of classification was made by Aristotle. He classified plants as herbs, shrubs, and trees. Animals, on the other hand, were classified on the basis of presence or absence of red blood cells. This system of classification failed to classify all the known organisms.

Therefore, Linnaeus gave a two kingdom system of classification. It consists of kingdom Plantae and kingdom Animalia. However, this system did not differentiate between unicellular and multicellular organisms and between eukaryotes and prokaryotes. Therefore, there were large numbers of organisms that could not be classified under the two kingdoms.

To solve these problems, a five kingdom system of classification was proposed by R.H Whittaker in 1969. On the basis of characteristics, such as cell structure, mode of nutrition, presence of cell wall, etc., five kingdoms, Monera, Protista, Fungi, Plantae, and Animalia were formed.

Question 2:

State two economically important uses of:

(a) Heterotrophic bacteria

(b) Archaebacteria

Answer 2:

(a) Heterotrophic bacteria

a) They act as decomposers and help in the formation of humus.
b) They help in the production of curd from milk.
c) Many antibiotics are obtained from some species of bacteria.
d) Many soil bacteria help in fixation of atmospheric nitrogen.

(b) Archaebacteria

a) Methane gas is produced from the dung of ruminants by the methanogens.
b) Methanogens are also involved in the formation of biogas and sewage treatment.

Question 3:

What is the nature of cell-walls in diatoms?

Answer 3:

The cell walls of diatoms are made of silica. Their cell wall construction is known as frustule. It consists of two thin overlapping shells that fit into each other such as a soap box. When the diatoms die, the silica in their cell walls gets deposited in the form of diatomaceous earth. This diatomaceous earth is very soft and quite inert. It is used in filtration of oils, sugars, and for other industrial purposes.

Question 4:

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

Answer 4:

Algal bloom

Algal bloom refers to an increase in the population of algae or blue-green algae in water, resulting in discoloration of the water body. This causes an increase in the biological oxygen demand (BOD), resulting in the death of fishes and other aquatic animals.

Red-tides

Red tides are caused by red dinoflagellates (*Gonyaulax*) that multiply rapidly. Due to their large numbers, the sea appears red in colour. They release large amounts of toxins in water that can cause death of a large number of fishes.

Question 5:

How are viroids different from viruses?

Answer 5:

Viroids were discovered in 1917 by T.O. Denier. They cause potato spindle tuber disease. They are smaller in size than viruses. They also lack the protein coat and contain free RNA of low molecular weight.

Question 6:

Describe briefly the four major groups of Protozoa.

Answer 6:

Protozoa are microscopic unicellular protists with heterotrophic mode of nutrition. They may be holozoic, saprobic, or parasitic. These are divided into four major groups.

(1) Amoeboid protozoa or sarcodines

They are unicellular, jelly-like protozoa found in fresh or sea water and in moist soil. Their body lacks a periplast. Therefore, they may be naked or covered by a calcareous shell. They usually lack flagella and have temporary protoplasmic outgrowths called pseudopodia. These pseudopodia or false feet help in movement and capturing prey. They include free living forms such as *Amoeba* or parasitic forms such as *Entamoeba.*

(2) Flagellated protozoa or zooflagellates

They are free living, non-photosynthetic flagellates without a cell wall. They possess flagella for locomotion and capturing prey. They include parasitic forms such as *Trypanosoma*, which causes sleeping sickness in human beings.

(3) Ciliated protozoa or ciliates

They are aquatic individuals that form a large group of protozoa. Their characteristic features are the presence of numerous cilia on the entire body surface and the presence of two types of nuclei. All the cilia beat in the same direction to move the water laden food inside a cavity called gullet. They include organisms such as *Paramoecium*, *Vorticella*,etc.

(4) Sporozoans

They include disease causing endoparasites and other pathogens. They are uninucleate and their body is covered by a pellicle. They do not possess cilia or flagella. They include the malaria causing parasite *Plasmodium.*

Question 7:

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

Answer 7:

Plants have autotrophic mode of nutrition as they contain chlorophyll pigment. Thus, they have the ability to prepare their own food by the process of photosynthesis. However, some insectivorous plants are partially heterotrophic. They have various means of capturing insects so as to supplement their diet with required nutrients derived from insects, causing proliferation of growth. The examples include pitcher plant (*Nepenthes*), Venus fly trap, bladderwort, and sundew plant.

Question 8:

What do the terms phycobiont and mycobiont signify?

Answer 8:

Phycobiont refers to the algal component of the lichens and mycobiont refers to the fungal component. Algae contain chlorophyll and prepare food for fungi whereas the fungus provides shelter to algae and absorbs water and nutrients from the soil. This type of relationship is referred to as symbiotic.

Question 9:

Give a comparative account of the classes of Kingdom Fungi under the following:

(i) Mode of nutrition

(ii) Mode of reproduction

Answer 9:

(A) Phycomycetes: This group of fungi includes members such as *Rhizopus*, *Albugo*, etc.

(i) Mode of nutrition

They are obligate parasites on plants or are found on decaying matter such as wood.

(ii) Mode of reproduction

Asexual reproduction takes place through motile zoospores or non-motile aplanospores that are produced endogenously in sporangium.

Sexual reproduction may be of isogamous, anisogamous, or oogamous type. It results in the formation of thick-walled zygospore.

(B) Ascomycetes: This group of fungi includes members such as *Penicillium*, *Aspergillus*, *Claviceps*, and *Neurospora.*

(i) Mode of nutrition

They are sporophytic, decomposers, parasitic or coprophilous (growing on dung).

(ii) Mode of reproduction

Asexual reproduction occurs through asexual spores produced exogenously, such as conidia produced on conidiophores.

Sexual reproduction takes place through ascospores produced endogenously in saclike asci and arranged inside ascocarps.

(C) Basidiomycetes: This group of fungi includes members such as *Ustilago*, *Agaricus* and *Puccinia*.

(i) Mode of nutrition

They grow as decomposers in soil or on logs and tree stumps. They also occur as parasites in plants causing diseases such as rusts and smuts.

(ii) Mode of reproduction

Asexual reproduction takes place commonly through fragmentation. Asexual spores are absent.

Sex organs are absent but sexual reproduction takes place through plasmogamy. It involves fusion of two different strains of hyphae. The resulting dikaryon gives rise to a basidium. Four basidiospores are produced inside a basidium.

(D) Deuteromycetes: This group of fungi includes members such as *Alternaria, Trichoderma,* and *Colletotrichum.*

(i) Mode of nutrition

Some members are saprophytes while others are parasites. However, a large number act as decomposers of leaf litter.

(ii) Mode of reproduction

Asexual reproduction is the only way of reproduction in deuteromycetes. It occurs through asexual spores called conidia.

Sexual reproduction is absent in deuteromycetes.

Question 10:

What are the characteristic features of Euglenoids?

Answer 10:

Some characteristic features of Euglenoids are as follows.

- Euglenoids (such as *Euglena*) are unicellular protists commonly found in fresh water.
- Instead of cell wall, a protein-rich cell membrane known as pellicle is present.
- They bear two flagella on the anterior end of the body.
- A small light sensitive eye spot is present.
- They contain photosynthetic pigments such as chlorophyll and can thus prepare their own food. However, in absence of light, they behave similar to heterotrophs by capturing other small aquatic organisms.
- They have both plant and animal-like features, which makes them difficult to classify.

Question 11:

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

Answer 11:

Viruses are sub-microscopic infectious agents that can infect all living organisms. A virus consists of genetic material surrounded by a protein coat. The genetic material may be present in the form of DNA or RNA.

Most of the viruses, infecting plants, have single stranded RNA as genetic material. On the other hand, the viruses infecting animals have single or double stranded RNA or double stranded DNA.

Bacteriophages or viruses infecting bacteria mostly have double stranded DNA. Their protein coat called capsid is made up of capsomere subunits. These capsomeres are arranged in helical or polyhedral geometric forms.

A.I.D.S, small pox, mumps, and influenza are some common examples of viral diseases.

Question 12:

Organise a discussion in your class on the topic- Are viruses living or non-living?

Answer 12:

Viruses are microscopic organisms that have characteristics of both living and non-living. A virus consists of a strand of DNA or RNA covered by a protein coat. This presence of nucleic acid (DNA or RNA) suggests that viruses are alive. In addition, they can also respond to their environment (inside the host cell) in a limited manner. However, some other characters, such as their inability to reproduce without using the host cell machinery and their acellular nature, indicate that viruses are non-living. Therefore, classifying viruses has remained a mystery for modern systematics.

Very Short Answer Type Questions

Q. 1. Name the two kingdoms of the living world proposed by Linnaeus.

Ans. The two kingdoms of the living world proposed by Linnaeus are: Plantae and Animalia.

Q. 2. Who introduced five kingdoms classification?

Ans. R. H. Whittaker.

Q. 3. What are eukaryotes?

Ans. Organism in which cells have nuclear envelope around the genetic material are called eukaryotes.

Q. 4. What are prokaryotes?

Ans. Organism with cells devoid of a devoid of a definite nuclear membrane around the genetic material are prokaryotes.

Q. 5. Name the scientist who suggested "three kingdom system of classification".

Ans. E. Haeckel suggested three kingdom system of classification.

Q. 6. Name three major groups of Archaebacteria?

Ans. The three major groups of Archaebacteria are: Methanogens, Halophiles, Thermoacidophiles.

Q. 7. What are protists?

Ans. Protists are eukaryotic unicellular organism.

Q. 8. What are phytoplankton?

Ans. These are microscopic, free-floating Photosynthetic organisms.

Q. 9. In which kingdom are bacteria included?

Ans. Kingdom Monera.

Q. 10. Expand PPLO. What is its other name ?

Ans. PPLO Means pleuropneumonia like organisms. Its other name is Mycoplasma.

Q. 11. Name of the three major groups of protista.

Ans. The Three major groups of Protista are:0

(i) Protistian algae, **(ii)** Slime Moulds, **(iii)** Protozoa.

Q. 12. Name any one parasitic protist and a ciliate protist .

Ans. Parasitic protist: *Trypanosoma*

Ciliate protists: *Paramoecium.*

Q. 13. Name the organism that causes amoebic dysentery.

Ans. *Entamoeba histolyitica* causes amoebic dysentry.

Q. 14. Which protozoan causes malaria?

Ans. *Plasmodium* is a protozoan which causes malaria.

Q. 15. Name the major groups of Monera.

Ans. The major groups of Monera are:

(i) Bacteria **(ii)** Archaebacteria **(iii)** Cyanobacteria.

Q. 16. Name the bacteria which causes Typhoid, Tetanus, Cholera?

Ans. (i) Typhoid – *Salmonella typhi*

(ii) Tetanus – *Clostridium tetani*

(iii) Cholera – *Vibrio cholerae*

Q. 17. Name the cell wall material of eubacteria.

Ans. Murein or peptidoglycan consisting of polysaccharide cross-linked with short amino acid chains.

Q. 18. Name the pigments present in photosynthetic bacteria.

Ans. The pigments present in photosynthetic bacteria

Q. 19. What are heterocysts?

Ans. The filamentous blue-green algae possess special large sized cells called heterocysts. These are the sites of nitrogen fixation.

Q. 20. What are trichomes?

Ans. Each filament of blue-green algae consist of a sheath of mucilage and one or more cellular strands called trichomes.

Q. 21. Name the pigments present in cyanobacteria.

Ans. The pigments present in cyanobacteria are: Chlorophyll 'a', phycobilin, phycoerythrin and phycocyanin.

Q. 22. What are hormogonia?

Ans. Blue-green algae multiply asexually by the formation of small segments called hormogonia.

Q. 23. What do you mean by plasmodium?

Ans. A multinucleate mass of protoplasm of slime moulds which creep like *Amoeba* is known as plasmodium.

Q. 24. Give two examples of archaebacteria?

Ans. Methanogens and thermoacidophiles.

Short Answer Type Questions-I

Q.1. Why have unicellular algae been not kept in kingdom Protista by Whittaker ?

Ans. A distinction between unicellular and multicellular organisms is not possible in case of algae. It is because of this that unicellular green algae have not been included in kingdom Protista by Whittaker.

Q. 2. Name two features of Prokaryotes.

Ans. (i) Prokaryotes have a naked genetic material without being organised into a nucleus, a single envelope organisation, absence of spindle apparatus, meiosis and sexual reproduction.

(ii) They are mainly unicellular.

Q.3. What is two kingdom classification ? Give its drawback.

Ans. Carolus Linnaeus anciently divided all living organisms into two kingdoms : Plantae and Animalia.

The drawbacks of this classification are:

(i) First formed animals were neither plants nor animals.

(ii) Fungi differ in structure, physiology and reproductive details from plants.

(iii) At lower level of organisation there are several instances where the distinction of plant and animal disappears .

Q. 4. List out the major groups of protozoans. (KVS 2017)

Ans. Major groups of protozoans are:

(i) Amoeboid protozoa

(ii) Flagellated protozoans.

(iii) Ciliated protozoans.

(iv) Sporozoans.

Q. 5. Give the features of kingdom protista.

Ans. The common features of kingdom protista are:

(i) It consists of unicellular or colonial eukaryotic organisms.

(ii) They have diverse modes of nutrition photosynthetic, saprobic, parasitic etc.

(iii) They bear cilia or flagella for locomotion. Some move with the help of pseudopodia.

(iv) The cellular organisation is of two envelope type, $i.e.$, plasma membrane, internal membranes.

(v) Genetic material is organised in the form of nucleus.

(vi) They are either haploid or diploid

Q.6. Write a short note on slime moulds.

Ans. (i) Slime moulds are both plant and animal like.

(ii) They are plant like in the production of spores during reproduction and animal like in the mode of nutrition.

(iii) Their somatic structures consist of wall-less, multinucleate mobile mass of protoplasm called plasmodium.

(iv) They absorb nutrients directly substratum**.**

(v) The reproductive stage consists of sporangia and spores formed after meiosis.

Q. 7. What is the nature of cell wall in diatoms ?

Ans. (i) In diatoms, the cell walls form two thin overlapping shells which fit together as in a soap box.

(ii) Their walls are embedded with silica making it indestructible.

Q. 8. Write a short note on reproduction of blue-green algae.

Ans. (i) Blue-green algae multiply asexually by binary fission, fragmentation or by the formation of small segments called hormogonia.

(ii) Typical sexual reproduction is absent.

Q. 9. What are cellular slime moulds ?

Ans. (i) In cellular slime moulds *eg.,* Dictyostelium, thousands of individual amoeboid cells, named the myxamoebae, aggregate into slimy mass.

(ii) Nuclei of the multicellular plasmodia are haploid (n). As there is no fusion of individual cells, this aggregated mass of cells is called the pseudoplasmodium.

Q. 10. What are archaebacteria ?

Ans. (i) some bacteria can survive in extreme environmental conditions like high temperature, high concentration, in absence of oxygen or in presence of oxygen in high acidic or alkaline pH. Such bacteria are called archaebacteria.

(ii) Their cell wall consists of non-cellulosic polysaccharide or protein and lacks peptidoglycan. This allows them to survive in extreme conditions.

Long Answer Type Questions

Q.1. Describe the various salient features of Protista. Name the major groups of this kingdom.

OR

Write the distinguish features of kingdom Protista.

OR

Write the features of unicellular eukaryotic organisms.

Ans. Features of Protista:

(i) They are single celled colonial, filamentous eukaryotes.

(ii) These grow in humid and moist environments.

(iii) Some are photosynthetic but some are non- photosynthetic.

(iv) Some forms are like animals whereas some are like plants.

(v) They have membrane bound cell organelles.

(vi) Examples are protozoa, slime moulds, Euglenoids, Chrysophytes protistan algae such as diatoms, dinoflagellates or phytoplanktons etc.

(vii) The protozoan are unicellular (single celled) heterotrophs. *Euglena* is autotroph.

(viii) Slime moulds are plant like or animal like.

Theirsomatic body is called plasmodium (acellular, multinucleate, mobile mass of protoplasm lacking the cell wall).

The major groups of this kingdom are:

(a) Photosynthetic protist or protistan algae.

(b) Consumer decomposer protists - Slime moulds.

(c) Protozoan protists.

Q. 2. Compare the salient features of Monera and Protista.

Ans.

S. No.	Salient Features	Monera	Protista
(i)	Cell types	Prokaryotic Type	Eukaryotic type.
(ii)	Cell wall	Non-Cellulosic	Cellulosic
(iii)	Chloroplasts	Absent	Found in some $e.g., Euglena.$
(iv)	Body Organization	Cellular	Celluar

(v)	Mode of Nutrition	Autotrophic	Autotrophic and heterotrophic.

Q. 3. Classify bacteria on the basis of their shape.

Ans. Bacteria are classified as given below:

(i) Cocci : They are oval or spherical in shape. When they occur singly, they are called *Micrococcus;* if in pairs *Diplococcus;* if in a chain, *Streptococcus;* and if occur in clusters, *Staphylococcus.*

(ii) Bacilli: They are rod-like, with or without flagella. Flagella may be present at one or both the ends or around cells. Bacteria may occur singly, *Bacillus;* or in pairs, *Diplobacillus* or may form filaments, *Streptobacillus.*

(ii) Vibrio : They are small and curved like commas. These are mostly motile.

(iv) Spirillum : These are twisted like a screw. They have flagella at one end or both the ends. Certain bacteria possess flagella for locomotion.

Q. 4. Describe the major groups of Protista.

Ans. The kingdom Protista includes unicellular, eukaryotic organisms. They include both Posynthetic and non-photosynthetic forms. The kingdom Protista includes protistan algae, slime moulds and protozoans.

(i) Protistan algae: They are photosynthetic protists. They include dinoflagellates and diatoms.

(a) Dinoflagellates: These are golden brown biflagellated Photosynthetic protists. They possess cellulose wall in the form of distinct interlocking plates.

(b) Diatoms: They are group of golden brown Photosynthetic protists which are covered by two valved silicious wall called shell or frustule. They pile up at the bottom water reservoirs and form big heap called diatomite.

(ii) Slime moulds : Slime moulds are both plants and animals like. They are plant like in the production of spores, and animal like in the mode of nutrition and somatic organisation. It moves freely on the substratum and feeds on bacteria, fungal and algal spores and also absorb nutrients directly from the substratum.

(iii) Protozoa : These are microscopic unicellular organisms with varied shapes and forms. This may be free living, commensal or parasitic. They lack cell wall, but some possess proteinaceous flexible pellicle.

Locomotion occurs by pseudopodia, flagella or cilia. These reproduce asexually by binary fission. Some reproduce sexually by conjugation.

Q. 5. Write Short notes on:

(i) Methanogens

(ii) Halophiles

(iii) Thermoacidophiles.

Ans. (i) Methanogens: (1) The archaebacteria are strict anaerobes. Nutritionally they are "autotrophs" which obtain both energy and carbon from decomposition products. (2) They occur in marshy areas where they convert formic acid and carbon dioxide into methane. (3) This capability is commercially exploited in the production of methane and fuel gas inside gobar gas plants. *e.g., Methanobacterium, Methanococcus.*

(ii) Halophiles: (1) Halophiles are named so because they usually occur in salt rich substrata like salt plant, and salt marshes $e.g.$, *Halobacterium, Halococcus.* (2) They are aerobic chemoheterotrophs. Their cell membrane have red carotenoid pigment for protection against harmful solar radiations. (3) Halophiles are able to live under high salt conditions due to three reasons:

(a) Presence of special lipids in the cell membranes.

(b) Occurence of mucilage covering.

(c) Absence of sap vacuoles and hence plasmolysis

(iii) Thermoacidophiles : (1) These archaebacteria have dual ability to tolerate high temperature as well as high acidity. **(2)** They often live in hot sulphur springs where the temperature may be as high as 80°C and pH as low as 2, $e.g., Thermoplasma\ thermoproteus$. **(3)** These archaebacteria are chemosynthetic. **(4)** Under aerobic conditions they usually oxidise sulphur to sulphuric acid.

$2S + 2H_2O + 3O_2 \rightarrow 2H_2SO_4$

Thermoacidophiles are able to tolerate high temperature and high acidity due to two reasons:

(a) Branched chain lipids in the cell membranes.

(b) Presence of special resistant enzymes capable of operating under acidic conditions.

Q.6. Briefly describe the cell structure of blue-green algae.

Ans. (i) Cyanobacteria or blue-green algae are gram(+) photosynthetic prokaryotes which perform oxygenic photosynthesis

(ii) Cell structure is typically prokaryotic-one envelope organisation with peptidoglycan wall naked DNA, 70S ribosomes, devoid of membrane bound cell organelles.

(iii) The outer part of the protoplast contains a number of photosynthetic thylakoids. It is called as chromoplasm.

(iv) Their membranes contain chlorophyll a, carotenes and xanthophylls. Chlorophyll b is absent.

(v) DNA lies coiled generally in central part of the cytoplasm known as centroplasm.

(vi) Small circular DNA segments may also occur in nucleoid, known as plasmid or transposons.

Q. 7. What are the salient features of kingdom Fungi?

Ans. Kingdom Fungi : The kingdom fungi, includes achlorophyllous, spore producing, multicellular, eukaryotic organisms .

Salient features:
(i) The body of fungi is filamentous called mycelium. The filaments are known as hyphae.

(ii) The hyphae are either multicellular or coenocytic *i.e.* multinucleate and without cross walls.

(iii) The cell wall contain chitin and non-cellulosic polysaccharides N-acetyl - glucosamine.

(iv) They have two envelop type of cellular organisation.

(v) The are heterotrophic with absorptive type of nutrition. It is either saprobic or parasitic. Saprobic fungi excrete digestive enzymes in the external medium to make complex organic matter soluble for absorption. Parasitic fungi absorb nourishment directly from another living organism called host.

(vi) Reserve food is glycogen and fat.

(vii) Reproduction is both asexual and sexual. Asexual reproduction takes place by spores like zoospores, conidia, ascospores and basidiospores. Sexual reproduction involves fusion of similar gametes. In some fungi, the fusion of two haploid (n) cells results in diploid (2n) cell or zygote.

(viii) Many fungi act as decomposers and mineralisers and thus, play an important role in nutrient cycling in the biosphere.

Q. 8.. Explain in detail the various methods of asexual reproduction in fungi.

Ans. Special types of reproductive cells are formed in asexual reproduction in fungi. They are known as spores. Spores formed by mitosis are known as mitospores whereas some spores are produced after meiosis and they are called meiospores.
Many kinds of asexual spores are formed in fungi :

(i) Zoospores: Zoospores are motile, $e.g.$ Phycomycetes. They may have one or two flagella. On germination, zoospores produces new mycelium.

(ii) Sporangiospores: They are non-flagellate spores that develop inside sporangia. They are usually dispersed by air currents, *e.g*., *mucor, Rhizopus.*

(iii) Oidia : Some oval or spherical spores are found in $Rhizopus$. They are formed by the small segment of hyphae under condition of excess water, sugar and salts.

(iv) Conidia: Conidia are formed in some fungi as a means of asexual reproduction. They are born on conidiospores *e.g*. *Penicillium.*

(v) Chlamydospores: Thick walled resting spores are produced in some fungi. They may be terminal or intercalary.

Q.9. Give the salient features of kingdom Plantae.

Ans. Kingdom Plantae contains all photosynthetic eukaryotic multicellular organisms and their non-photosynthetic relatives..

The salient features of kingdom Plantae are:

(i) Organisms are multicellular except for some algae.

(ii) They are eukaryotic.

(iii) Body form is less regular and Growth is usually indefinite.

(iv) Mode of nutrition is oxygenic photosynthesis.

(v) The photosynthetic regions contain chlorophyll.

(vi) The plants are usually fixed or free-floating.

(vii) Structural differentiation into tissues is found except for certain algae.

(viii) The cells contain central vacuoles.

(ix) Food reserve is usually starch and fat.

(x) Some of the plants are heterotrophic such as insectivorous plants.

(xi) Reproduction is both asexual and sexual. Accessory spores are present in lower plants.

Short Answer Type Questions-II

Q. 1. Compare photosynthesis with chemosynthesis.

Ans.

S. No.	Photosynthesis	Chemosynthesis
(i)	Photosynthesis occurs in sunlight.	It occurs day and night both.
(ii)	Light is necessary.	Light is not necessary.
(iii)	Photosynthetic bacteria have bac-terio-chlorophyll which help in trapping the solar energy and converting it into chemical energy.	The energy required for synthesis of food is obtained by oxidizing chemical substances found in the surrounding medium.

Q. 2. Distinguish between autotrophic and heterotrophic bacteria.

Ans.

S. No.	Autotrophic Bacteria	Heterotrophic Bacteria
(i)	The bacteria synthe-sise their own food.	The bacteria obtain organic food or organic growth factors from outside sources.
(ii)	They depend on an external sources of energy for synthesis of food.	An external source of energy is not required.
(iii)	Autotrophic bacteria live on inorganic substrata.	Heterotrophic Bacteria live on organic substratum Or living host.

Q. 3. Give the important features of Protozoa.

Ans. (i) They are microscopic unicellular organisms with varied forms and shapes.

(ii) They lack cell wall.

(iii) Locomotion occurs by pseudopodia, flagella and cilia.

(iv) They Show heterotrophic mode of nutrition which may be holozoic, parasitic or saprobic.

(v) These reproduces asexually by binary fission.

Q. 4. Draw a well labelled diagram to show E.M view of a cyanobacterial cell.

Ans.

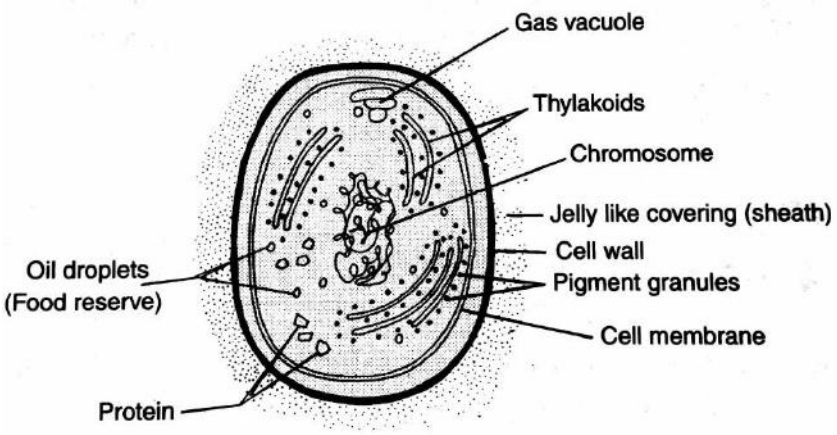

Fig. Structure of a cyanobacterial cell : Revealed by Electron Microscope

Q. 5. What are chemoautotrophic bacteria? How they obtain energy+?

Ans. Chemoautotrophic Bacteria : (i) They are bacteria which are able to manufacture their organic food from inorganic raw materials with the help of energy derived from exergonic chemical reactions involving oxidation of an inorganic substance present in the external medium.

(ii) The chemical energy obtained from oxidation reaction is trapped in ATP molecules

(**iii**) For example, nitrifying bacteria, sulphur oxidizing bacteria and iron bacteria.

Q.6. Write a short note on Mycoplasma.

Ans. (i) Mycoplasma are the simplest unicellular prokaryotes.

(ii) They are often called as PPLO (pleuropneumonia like organisms).

(iii) They occur in soil, sewage, human and plants.

(iv) Plasma membrane is present.

(v) Due to absence of cell wall they can change their shape easily

(vi) They lack organised nucleus, endoplasmic reticulum, plastids, mitochondria, golgi bodies, lysosomes. etc.

(vii) A single naked DNA duplex lies coiled in the cytoplasm.

(viii) They cause several diseases such as Pneumonia in man and animals.

Q.7. Write a brief note on the economic importance of bacteria.

Ans. (i) Bacteria are very important for humans. They causes decay and decomposition of dead bodies of plants and animals, so they help in cleaning the earth.

(ii) They fix atmospheric N_2 into nitrates, lactic acid bacteria convert milk sugar lactose into lactic acid.

(iii) They convert ethyl alcohol into vinegar, produces butyl alcohol and acetone.

(iv) A number of antibiotics are obtained from mycelial bacterium like streptomycin from Streptomyces bacterium.

Q.8. What are hormogonia ? Give one examples of cyanobacteria which reproduce by binary fission.

Ans.(i) Hormogonia are motile filaments of cells formed by some cyanobacteria.

(ii) They are formed during asexual reproduction unicellular, filamentous cyanobacteria.

(iii) The thick walled hormongonium is referred to as hormocyst. Hormocysts are helpful in reproduction.

(iv) Unicellular cyanobacteria which reproduce binary fission is *Chroococcus*.

Q.9. What are the economic importance of diatoms ?

Ans. (i) Diatoms are an important source of food to aquatic animals.

(ii) Diatomite is porous and chemically inert, therefore used in filtration of sugar, alcohols and antibiotics.

(iii) It is also employed as a cleansing agent in tooth pastes and metal polishes.

(iv) It is also employed as insulation material in refrigerators, boilers and furnaces.

Chapter 2 (BIOLOGICAL CLASSIFICATION)

Multiple Choice Questions
Single Correct Answer Type

Q1. All eukaryotic unicellular organisms belong to
(a) Monera (b) Protista (c) Fungi (d) Bacteria
Ans: (b) Monera—Kingdom of prokaryotes
• All eukaryotic unicellular organisms belong to protista.

Q2. The five kingdom classification was proposed by
(a) R.H. Whittaker . (b) C. Linnaeus
(c) A. Roxberg (d) Virchow
Ans: (a) This phylogenetic classification was proposed by R.H. Whittaker (1969). He created new kingdom 'Fungi'. The five kingdom classification are as follows: 1. Plantae, 2. Animalia, 3. Protista. 4. Monera and 5. Fungi.
Whittaker has used 5 criteria for the 5 kingdom classification and are as follows:
1. Reproduction,
2. Cell structure,
3. Phylogenetic relationships,
4. Mode of nutrition,
5. Thallus organisation

Q3. Organisms living in salty areas are called as
(a) Methanogens (b) Halophiles
(c) Heliophytes (d) Thermoacidophiles
Ans: (b)
• Halophiles: Bacteria living in extremely salty areas.
• Thermoacidophiles: Bacteria living in hot springs/deep sea water.
E.g.: Thermococcus

• Methanogens: Bacteria living in marshy areas and produce methane gas.
• Heliophytes: Sun loving plants

Q4. Naked cytoplasm, multinucleated and saprophytic are the characteristics of
(a) Monerans (b) Protists (c) Fungi (d) Slime moulds
Ans: (d) Slime moulds are saprophytic protists, without cell walls. The spores of slime moulds possess true walls. Thalloid multinucleate body of a slime mould is called plasmodium. Spores are dispersed by air currents.
E.g.: Acellular slime mould—Physarum, Cellular slime mould—Dictyostelium.

Q5. An association between roots of higher plants and fungi is called .
(a) Lichen (b) Fern (c) Mycorrhiza (d) BGA
Ans: (c) Lichens are symbiotic associations, i.e. mutually useful associations, between algae and fungi. This relationship is best known as helotism.

Q6. A dikaryon is formed when
(a) Meiosis is arrested
(b) The two haploid cells do not fuse immediately
(c) Cytoplasm does not fuse
(d) None of the above
Ans: (b) In some fungi the fusion of two haploid cells immediately results in diploid cells (2n). However, in other fungi (ascomycetes and basidiomycetes), an intervening dikaryotic stage (n + n, i.e. two nuclei per cell) occurs. Such a condition is called a dikaryon and the phase is called dikaryophase of fungus. A dikaryotic cell has two dissimilar haploid nuclei.

Q7. Contagium vivum fluidum was proposed by
(a) D. J. Ivanowsky (b) M. W. Beijerinck
(c) Stanley (d) Robert Hooke
Ans: (b) D.J. Ivanowsky (1892) discovered the virus and has recognised certain microbes as causal organism of the mosaic disease of tobacco. M.W. Beijerinck (1898) demonstrated that the extract of the infected plants of tobacco could cause infection in healthy plants and called the fluid as Contagium vivum fluidum (infectious living fluid). W. M. Stanley (1935) first time showed that viruses could be crystallised and crystals consist largely of proteins.

Q8. Association between mycobiont and phycobiont are found in
(a) Mycorrhiza (b) Root (c) Lichens (d) BGA
Ans. (c) Association between mycobiont and phycobiont are found in lichens.

Q9. Difference between virus and viroid is
(a) Absence of protein coat in viroid but present in virus
(b) Presence of low molecular weight RNA in virus but absent in viroid
(c) Both (a) and (b)
(d) None of the above
Ans: (a) Viroids are smaller than viruses and the cause of potato spindle tuber disease, chrysanthemum stunt disease. It was found to be a free RNA and lacked the protein coat that is found in viruses, hence the name viroid.

Q10. With respect to the fungal sexual cycle, choose the correct sequence of events.
(a) Karyogamy, plasmogamy and meiosis
(b) Meiosis, plasmogamy and karyogamy
(c) Plasmogamy, karyogamy and meiosis
(d) Meiosis, karyogamy and plasmogamy
Ans: (c) The sexual cycle involves the following three steps:
1. Fusion of protoplasms between two motile or non-motile gametes called

plasmogamy.
• Plasmogamy is fusion of two haploid cells without nuclear fusion.
2. Fusion of two nuclei is called karyogamy.
3. Meiosis in zygote resulting in haploid spores.

Q11. Viruses are non-cellular organisms but replicate themselves once they infect the host cell. To which of the following kingdom do viruses belong to?
(a) Monera (b) Protista (c) Fungi (d) None of these
Ans: (d) Viruses did not find a place in classification since they are not truly 'living' if we understand living as those organisms that have a cell structure. Viruses are neither prokaryotes nor eukaryotes. They are inert outside their specific host cell and cannot multiply of their own because they lack cellular machinery to use its genetic material. Viruses can only multiply in host or living cell.

Q12. Members of Phycomycetes are found in
(1) Aquatic habitats
(ii) On decaying wood
(iii) Moist and damp places
(iv) As obligate parasites on plants Choose from the following options.
(a) None of the above (b) (i) and (iv)
(c) (ii) and (iii) (d) All of the above
Ans: (d) Members of Phycomycetes are found in aquatic habitats, on decaying wood, moist and damp places and as obligate parasites on plants.

Very Short Answer Type Questions
Q1. What is the principle underlying the use of cyanobacteria in agricultural fields for crop improvement?
Ans: Cyanobacteria (BGA) are autotrophic microbes. Cyanobacteria are widely distributed in aquatic and terrestrial environments. Nostoc, Ariabaena and Oscillatoria are BGA that can fix atmospheric nitrogen. These organisms can fix atmospheric nitrogen in specialised cells called heterocysts, e.g., Nostoc and Anabaena. In paddy fields cyanobacteria serve as an important biofertiliser. BGA also add organic matter to the soil and increase its fertility.

Q2. Suppose you accidentally find an old preserved permanent slide without a label. In your effort to identify it, you place the slide under microscope **and observe the following features:**
a. Unicellular '
b. Well defined nucleus
c. Biflagellate—one flagellum lying longitudinally and the other transversely.
What would you identify it as? Can you iiame **the kingdom it belongs to?**
Ans: Dinoflagellates are unicellular eukaryotes. Most of them have two flagella; one lies longitudinally and the other transversely in a furrow between the wall plates. Dinoflagellates belongs to kingdom protista.

Q3. How is the five-kingdom classification advantageous over the two kingdom classification?
Ans: Two Kingdom system of classification with Plantae and Animalia kingdoms.
1. Two kingdom classification did not distinguish between the prokaryotes and eukaryotes. E.g.: It brought together the prokaryotic bacteria and blue green algae with other groups (like plant, fungi and animals) which were eukaryotic.
2. Two kingdom classification did not distinguish between the unicellular and multicellular organisms. E.g:: Chlamydomonas (unicellular) and Spirogyra (multicellular) were placed together under algae.
3. This system did not distinguish between autotrophic/photosynthetic (green algae and plants) and the heterotrophic/non-photosynthetic organisms (fungi).

Five Kingdom Classification:

1. Fungi were placed in a separate kingdom—kingdom fungi.
2. It has put together organisms which were placed in different kingdoms in earlier classifications.

Kingdom Protista brought together Chlamydomonas, Chlorella (earlier placed in algae within plants and both having cell walls) with Amoeba and Paramoecium (earlier plaeed in the animal kingdom and both lacking cell walls).

3. Animal and plant kingdoms become more homogenous than they are in the two kingdom classification. So, it is the advantageous over the two kingdom classification.

Q4. Polluted water bodies have usually very **high abundance of plants like Nostoc and Oscillitoria. Give reasons.**

Ans: Polluted water bodies (Ponds, ditches and rivers etc.) have usually nutrient contents (such as nitrate, phosphates) domestic sewage primarily contains biodegradable organic matter. Presence of large amount of nutrients in waters also causes excessive growth of Planktonic (free floating algae) called an algal bloom, which imparts a distinct colour to water bodies.

Algal bloom causes deterioration of the water quality and fish mortality. Some bloom forming algae mainly Nostoc and Oscillitoria are extremely toxic to human beings and animals.

Q5. Are chemosynthetic bacteria—autotrophic or heterotrophic?

Ans: Chemosynthetic bacteria oxidise various inorganic substances such as nitrates, nitrites and ammonia and use the released energy for their ATP production. So chemosynthetic bacteria are autotrophic in nature.

Q6. The common name of pea is simpler than its botanical (scientific) name Pisum sativum. Why then is the simpler common name not used instead of the complex scientific/botanical name in biology?

Ans: As we know that pea (vernacular name or local name) is simpler than its botanical (scientific) name Pisum sativum. These local names would vary from place to place, even within a country. Probably one would recognise the confusion that would be created if we did not find ways and means to talk to each other, to refer to organisms we are talking about. Hence, there is a need to standardise the naming of living organisms such that a particular organism is known by the same name all over the world.

Q7. A virus is considered as a living organism and an obligate parasite when inside a host cell. But virus **is not classified along with bacteria or fungi. What are the characters of virus that are similar to non-living objects?**

Ans: Virus are living organisms inside a host cell. But virus is not classified along with bacteria or fungi because they having an inert crystalline structure outside the living cell. They are inert outside their specific host cell and cannot multiply of their own because they lack cellular machinery to use its genetic material.

Q8. In the five kingdom **system of Whittaker, how many kingdoms are eukaryotes?**

Ans: In the five kingdom system of Whittaker, four kingdoms (Protista, fungi, plantae and animalia) belong to eukaryotes.

Short Answer Type Questions

Q1. Diatoms are also called as 'pearls of ocean', why? What is diatomaceous earth?

Ans: The diatoms are the unique organisms, because of their distinctive cell walls. The walls are embedded with silica and thus the walls are indestructible. It show sculpturing and ornamentation that why Diatoms are also called as 'Pearls of Ocean'.

Diatoms have left behind large amount of cell wall deposits in their habitat; this accumulation

over billions of years is referred to as 'diatomaceous earth'. Being gritty this soil is used in polishing, filtration of oils and syrups. Diatoms are the chief 'producers' in the oceans.

Q2. There is a myth that immediately after heavy rains in forest**, mushrooms appear in large number and make a very large ring or circle, which may be several** metres **in diameter. These are called as 'Fairy rings'. Can you explain this myth of fairy rings in biological terms?**
Ans: After heavy rains in forest, moisture and nutrients pass down in soil and activates the growth of mushroom mycelium. The basidiocarps of Agaricus (mushroom) arise from the mycelium present in the soil. They appear in a circle like a ring. As these basidiocarps resemble buttons and grow in rings, they are known as fairy rings.

Q3. Neurospora—an ascomycetes fungus has been used as a biological tool to understand the mechanism of plant genetics much in the same way as Drosophila has been used to study animal genetics. What makes Neurospora so important as a genetic tool?
Ans: Neurospora is used as a genetic tool because it is easy to grow and has a haploid life cycle that makes genetic analysis simple since recessive traits will show up in the offspring. Beadle and Tatum exposed Neurospora crassa to X-rays, causing mutations. This led them to propose the "one gene, one en2yme" hypothesis that specific genes code for specific proteins.

Q4. Cyanobacteria and heterotrophic bacteria have been clubbed together in Eubacteria of kingdom Monera as per the "Five Kingdom Classification" even though the two are vastly different from each other. Is this grouping of the two types of taxa in the same kingdom justified? If so, why?
Ans: Cyanobacteria and heterotrophic bacteria have been clubbed together in Eubacteria of Kingdom Monera as per the "Five Kingdom Classification" because they do not have nuclear envelope and membrane bound organelles. Their genetic material is naked. They have 70S type of ribosomes. So, cyanobacteria and heterotrophic bacteria are prokaryotes and belong, to Kingdom Monera.

Q5. At a stage of their cycle, ascomycetes fungi produce the fruiting bodies like apothecium, perithecium or cleistothecium. How are these three types of fruiting bodies different from each other?
Ans: An apothecium is a wide, open, saucer-shaped or cup-shaped fruit body. It is sessile and fleshy. A cleistothecium is a globose, completely closed fruit body with no special opening to the outside. Perithecium are flask shaped structures opening by a pore or ostiole (short papilla opening by a circular pore).

Q6. What observable features in Trypanosoma would make you classify it under Kingdom Protista?
Ans: Trypanosoma is classified under the Kingdom Protista because it is unicellular eukaryotes. It has well defined nucleus with nuclear envelope, membrane bound organelles, 80S ribosomes and flagella with 9 + 2 organisation.

Q7. Fungi are cosmopolitan, write the role of fungi in your daily life.
Ans: Dough which is used for making bread, is fermented by fungi Saccharomyces cerevisiae (Baker's yeast).
Roquefort cheese are ripened by growing a specific fungi on them, which gives them a particular flavour.
Microbes mainly yeasts used for the production of beverages like wine, beer, whisky, brandy or rum. For this purpose the yeast (Saccharomyces cerevisiae) used for fermenting malted cereals and juices to produce ethanol and commonly called Brewer's yeast

Antibiotics produced by Fungi:

1.	Penicillin	Penicillium notatum and Penicillium chrysogenum
2.	Griseofulvin	Penicillium griseofulvum
3.	Cephalosporin	Cephalosporium acremonium
4.	Gentomycin	Micromonospora purpurea

- Cyclosporin A is produced by Trichoderma polysporum (Fungus). Cyclosporin A is used as an immunosuppressive agent in organ transplant patients.
- Statins produced by Monascus purpureus(Yeast). Statins used as blood- cholesterol lowering agent.
- Mushrooms, morels (Morchella) and truffles are edible fungi.
- Fungi causes several diseases in plants and animals including human beings.

Long Answer Type Questions

Q1. Algae are known to reproduce asexually by variety **of spores under different environmental conditions. Name these spores and the conditions under which they are produced.**

Ans: Asexual reproduction is by the production of different types of spores, the most common being the zoospores. They are flagellated (motile) and on germination gives rise to new plants.

Types of asexual reproduction:

1. **Zoospores:** Motile and formed in favourable condition.
2. **Aplanospores:** Thin walled, non-motile and formed in unfavourable condition.
3. **Hypnospore:** Thick walled, non-motile and formed in unfavourable condition.
4. **Akinete:** Under unfavourable condition, entire cell becomes thick.
5. **Palmella stage**: In condition of drought, protoplast is surrounded by gelatinous covering.

Q2. Apart from chlorophyll, algae have several other pigments in their chloroplast. What pigments are found in blue-green, red and brown algae that are responsible for their characteristic colours**?**

Ans: Apart from chlorophyll, algae have several other pigments in their chloroplast like carotenoids, xanthophylis (fucoxanthin) and r-phycoerythrin. In blue- green algae phycocyanin and r-phycoerythrin pigments are present beside chlorophyll a.

• Brown algae possess chlorophyll a, c, carotenoids and xanthophylls. They vary in colour from olive green to various shades of brown depending upon the amount of the xanthophyll pigment, fucoxanthin present in them.

• Red algae possess chlorophyll a, d and phycoerythrin in their body. The members of rhodophyceae are commonly called red algae because of the predominance of the red pigment, r-phycoerythrin in their body.

Q3. Make a list of algae and fungi that have commercial value as source of food, chemicals, medicines **and fodder.**

Ans:

A. Economic **importance of Algae:**

1. Many species of Porphyra, Laminaria and Sargassum are among the 70 species of marine, algae used as food. Chlorella and Spirullina are unicellular algae, rich in proteins and are used as food supplements even by space travellers.
2. Certain marine brown and red algae produce large amounts of hydrocolloids (water holding substances) or phycocolloids, e.g.: algin (brown algae) and carrageen (red algae) are used commercially. Agar, one of the commercial products obtained from Gelidium and Gracilaria are used to grow microbes and in preparations of ice-creams and jellies.
3. Bromine is obtained from red algae Polysiphonia. Macrocystis is the source of Potash. Laminaria and Fucus are the source of Iodine.

B. Economic **importance of Fungi:**

1. Mushrooms, morels (Morchella) and truffles are edible fungi.
2. Microbes mainly yeasts used for the production of beverages like wine, beer, whisky, brandy or rum. For this purpose the yeast {Saccharomyces cerevisiae) used for fermenting malted cereals and juices to produce ethanol and commonly called Brewer's yeast.

• Cyclosporin A is produced by Trichoderma polysporum (Fungus). Cyclosporin A is used as an immunosuppressive agent in organ transplant patients.

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Griseofulvin	Penicillium griseofulvum
Cephalosporin	Cephalosporium acremonium
Gentomycin	Micromonospora purpurea

Q4. 'Peat' is an important source of domestic fuel in several countries. How is 'peat' formed in nature?

Ans: Species of Sphagnum, a moss, provide peat that have long been used as fuel and because of their capacity to hold water as packing material for trans-shipment of living material. Peat forms when plant material decaying fully by acidic and anaerobic conditions. Peat is soft and easily compressed. Under pressure, water in the peat is forced out. Upon drying, peat can be used as fuel.

Q5. Biological classification is a dynamic and ever evolving phenomenon which keeps changing with our understanding of life forms. Justify the statement taking any two examples.

Ans: Kingdom Protista brought together Chlamydomonas, Chlorella (earlier placed in algae within plants and both having cell walls) with Amoeba and Paramoecium (earlier placed in the animal kingdom and both lacking cell walls). Five kingdom classification has put together organism (like Chlamydomonas and Amoeba) which were placed in different kingdoms in earlier classifications. This change happened because the criteria for classification changed. This kind of changes will take place in future too depending on the improvement in our understanding of characteristics and evolutionary relationships. So, biological classification is a dynamic and ever evolving phenomenon which keeps changing with our understanding of life forms.