Biological Classification

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Class: XI **Biology**

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1. Who proposed two kingdom system of classification? Why was the two-kingdom classification used for a long time found inadequate?

Carolus Linnaeus introduced Two Kingdom system of classification with kingdom Plantae and kingdom Animalia.

It included all plants *and Lichens* and animals respectively. This system was used till very recently.

This system did not distinguish between the prokaryotes and eukaryotes, unicellular and multicellular organisms and photosynthetic and non-photosynthetic organisms.

Hence the two kingdom classification was found inadequate.

2. What might be the criteria for including bacteria, blue green algae, fungi, mosses, ferns, gymnosperms and the angiosperms under 'Plantae' by the two kingdom classification? List the demerits of two kingdom classification.

The character that unified this whole kingdom was that all the organisms included had a cell wall in their cells.

1. Prokaryotes and Eukaryotes have been placed together.

   E.g. Prokaryotic bacteria and blue green algae were placed with eukaryotes.

2. Unicellular and Muticellular organisms were placed together.

   E.g. Chlamydomonas and *Spirogyra* were placed together under algae.

3. Autotrophs and heterotrophs were placed together.

   E.g. Green plants and fungi were placed together.

3. Who proposed five kingdom system of classification? Name the five kingdoms. Mention the main criteria used for the classification?

R.H. Whittaker (1969) proposed a Five Kingdom Classification. The kingdoms defined by him were named **Monera, Protista, Fungi**, **Plantae** and **Animalia.**

The main criteria for classification used by him include;

- Cell structure,
- Thallus organisation,
- Mode of nutrition,
- Reproduction
- Phylogenetic relationships.

4. Explain the merits and demerits of five kingdom classification.

Merits:

It has placed prokaryotic under Kingdom Monera and the unicellular eukaryotic organisms under Kingdom Protista.

It has placed the **unicellular** *Chlamydomonas* **and the multicellular** *Spirogyra* together under algae.

It has placed the heterotrophic fungi in kingdom Fungi and the autotrophic green plants in kingdom plantae.

Demerits:

The kingdom Monera and Protista accommodate both autotrophic and heterotrophic organisms,

Viruses were not included in the system.

5. What are Monera? List the features of Monera.

Bacteria are the sole members of the Kingdom Monera.

They are the most abundant micro-organisms.

They occur almost everywhere. Hundreds of bacteria are present in a handful of soil.

They also live in extreme habitats such as hot springs, deserts, snow and deep oceans where very few other life forms can survive.

Many of them live in or on other organisms as parasites.

6. How will you classify the bacteria based on their shape?

Bacteria are grouped under four categories based on their shape:

- Spherical Coccus (p1: cocci)
- Rod-shaped Bacillus (p1: bacilli)
- Comma-shaped Vibrium (p1: vibrio)
- Spiral Spirillum (p1: spirilla)

No	Classification of Bacteria	Singular	Plural
1	Spherical	Coccus	Cocci
2	Rod-shaped	Bacillus	Bacilli
3	Comma-shaped	Vibrium	Vibrio
4	Spiral	Spirillum	Spirilla

7. What are Archaebacteria? Why are they special?

These are the ancient bacteria found in extreme habitats.
These bacteria are special since they live in some of the harshest habitats such as;

- Extreme salty areas (halophiles)
- Hot springs (thermoacidophiles)
- Marshy areas (methanogens).

Archaebacteria differ from other bacteria in having a different **cell wall structure** and this feature is **responsible for their survival in extreme conditions**.

Methanogens are present in the **guts of several ruminant animals** such as cows and buffaloes and they are responsible for the production of methane (biogas) from the dung of these animals.

8. What are Eubacteria? Explain the types of eubacteria.

The bacteria which have rigid cell wall and motile are called eubacteria. The cell wall is made of peptidoglycan.

1. Photosynthetic Autotrophs

The cyanobacteria (also referred to as blue-green algae) have chlorophyll a similar to green plants and are **photosynthetic autotrophs**.

The cyanobacteria are unicellular, colonial or filamentous, marine or terrestrial algae. The colonies are generally surrounded by gelatinous sheath.

They often form blooms in polluted water bodies. Some of these organisms can fix atmospheric nitrogen in specialised cells called **heterocysts,** e.g., *Nostoc* and *Anabaena.*

2. Chemosynthetic Autotrophs

Chemosynthetic autotrophic bacteria oxidise various inorganic substances such as nitrates, nitrites and ammonia and use the released energy for their ATP production.

They play a great role in recycling nutrients like nitrogen, phosphorous, iron and sulphur.

3. Heterotrophs

Heterotrophic bacteria are the most abundant in nature. The majority are important decomposers.

Many of them have a significant impact on human affairs. They are helpful in making curd from milk, production of antibiotics, fixing nitrogen in legume

Eg, blue-green algae — *Nostoc.*

4. Pathogens

Some are pathogens causing damage to human beings, crops, farm animals and pets.

Cholera, typhoid, tetanus and citrus canker are well known diseases caused by different bacteria.

Bacteria reproduce mainly by fission. Sometimes, under unfavourable conditions, they produce by spores.

They also reproduce by a sort of sexual reproduction by adopting a primitive type of DNA transfer from one bacterium to the other.

9. What are Mycoplasmas?

The **Mycoplasmas** are organisms that completely lack a cell wall. They are the smallest living cells known and can survive without oxygen.

Many mycoplasmas are pathogenic in animals and plants.

10. What are Protista? Name the types of protista. Write the features of them.

Protista are **single-celled eukaryotes**

They include Chrysophytes, Dianoflagellates, Euglenoids, Slime moulds and Protozoans.

The protistan cell body contains a well defined nucleus and other membrane-bound organelles.

Some have flagella or cilia.

Protists reproduce asexually by fusion of cell and sexually by zygote formation.

11. Explain the types of protists with examples.

Chrysophytes

Chrysophytes includes **diatoms** and **golden algae** (desmids).

They are found in **fresh water as well as in marine** environments.

They are microscopic and float passively in water currents (plankton). Most of them are photosynthetic.

In diatoms the cell walls form two thin overlapping shells, which fit together as in a soap box. The walls are embedded with silica and thus the walls are indestructible.

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.

Dianoflagellates

Dianoflagellates are mostly marine and photosynthetic. They appear yellow, green, brown, blue or red depending on the main pigments present in their cells.

The cell wall has stiff cellulose plates on the outer surface.

Most of them have two flagella; one lies longitudinally and the other transversely in a furrow between the wall plates.

Very often, red dianoflagellates (Example: *Gonyaulax)* undergo such rapid multiplication that they make the sea appear red (red tides).

Toxins released by such large numbers may even kill other marine animals such as fishes.
Euglenoids

Euglenoids are fresh water organisms found in stagnant water.

Instead of a cell wall, they have a protein rich layer called pellicle which makes their body flexible.

They have two flagella, a short and a long one.

They are photosynthetic in the presence of sunlight, and behave like heterotrophs by predating on other smaller organisms in the absence of light.

The pigments of euglenoids are identical to those present in higher plants. Example: *Euglena*.

Slime Moulds

Slime moulds are saprophytic protists. The body moves along decaying twigs and leaves engulfing organic material.

During favourable conditions, they form an aggregation called plasmodium which may grow and spread over several feet.

During unfavourable conditions, the plasmodium differentiates and forms fruiting bodies bearing spores at their tips. The spores possess true walls.

They are extremely resistant and survive for many years, even under adverse conditions.

The spores are dispersed by air currents.

Protozoans

Protozoans are heterotrophs and live as predators or parasites.

They are believed to be primitive relatives of animals. There are four major groups of protozoans.

12. What are protozoans? Explain the four major groups of protozoans with examples.

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***Amoeboid protozoans*:**

They live in fresh water, sea water or moist soil.

They move and capture their prey by putting out pseudopodia as in *Amoeba*.

Marine forms have silica shells on their surface.

Some of them such as *Entamoeba* are parasites.

Flagellated protozoans:

They are either free-living or parasitic.

They have flagella.

The parasitic forms cause diseases such as sleeping sickness. Example: *Trypanosoma*.

Ciliated protozoans:

They are aquatic and motile due to the presence of thousands of cilia.

They have a cavity (gullet) that opens to the outside of the cell surface.

The coordinated movement of rows of cilia causes the water laden with food to be steered into the gullet. Example: *Paramoecium*.

Sporozoans:

They have an infectious spore-like stage in their life cycle.

The most notorious is *Plasmodium* (malarial parasite) which causes malaria which has a staggering effect on human population.

13. What are fungi? Where do they grow? Give examples.

Fungi are the eukaryotic heterotrophs with cell wall made of chitin.

They grow in warm and humid places.

Eg. Mushroom, bread mould and toadstools.

14. What are the criteria for the classification of kingdom fungi into various classes?

The **morphology of the mycelium, mode of spore formation and fruiting bodies** form the basis for the classifcation of the kingdom fungi into various classes.

Give the economic importance of fungi.

Yeast are used to make bread and beer.

Some fungi are the source of antibiotics, e.g., *Penicilliuim.*

15. What is the cell wall of fungi made of? Describe the structure of fungi.

The cell walls of fungi are composed of chitin and polysaccharides.

Yeasts are unicellular and other fungi are filamentous.

The body of fungi is mycelium. The mycelium is made of long, slender thread-like structures called hyphae.

The hyphae are of two types such as septate and aseptate

Septate hyphae have cross walls which are uninucleated.

Aseptate hyphae do not have cross walls. They are continuous tubes filled with multinucleated cytoplasm which are also called coenocytic hyphae.

	Structure of Fungi
Mycelium.	It is the body of fungi, made of a network of hyphae
Hyphae	They are long, slender thread-like structures
Coenocytic Hyphae	Aseptate hyphae do not have cross walls. They are continuous tubes filled with multinucleated cytoplasm which are also called coenocytic hyphae.
Septate Hyphae	Septate hyphae have cross walls which are uninucleated.

16. Describe the mode of nutrition in fungi.

Fungi are heterotrophic

Some are saprophytes which derive nutrition from dead organic matter.

Some are parasites which derive nutrition from living plants and animals**.**

Some are **symbionts.**

Lichen is an association between fungi and algae.

Mycorrhiza is an association between fungi and roots of higher plants**.**

	Mode of Nutrition of Fungi
Saprophytes	Saprophytes derive nutrition from dead organic matter.
Parasites.	Parasites derive nutrition from living plants and animals**.**
Symbionts	Lichen is an association between fungi and algae. Mycorrhiza is an association between fungi and roots of higher plants**.**

17. Explain the various modes of reproduction takes place in fungi.

Vegetative propagation occurs by means of fragmentation, fission and budding.

Asexual reproduction occurs by spores called conidia or sporangiospores or zoospores

Sexual Reproduction:

Sexual reproduction occurs by oospores, ascospores and basidiospores.

The various spores are produced in distinct structures called fruiting bodies.

The sexual cycle involves the following three steps:

(i) Fusion of protoplasms between two motile or non-motile gametes called **plasmogamy.**

(ii) Fusion of two nuclei called **karyogamy.**

(iii) Meiosis in zygote resulting in haploid spores.

When a fungus reproduces sexually, two haploid hyphae of compatible mating types come together and fuse.

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.

Later, the parental nuclei fuse and the cells become diploid.

The fungi form fruiting bodies in which reduction division occurs, leading to formation of haploid spores.

18. What are phycomycetes? Describe the reproduction in phycomycetes.

Members of phycomycetes are found in aquatic habitats and on decaying wood in moist and damp places or as obligate parasites on plants.

The mycelium is aseptate and coenocytic.

Some common examples are *Mucor*, *Rhizopus* (the bread mould mentioned earlier) and *Albugo* (the parasitic fungi on mustard).

Reproduction

Asexual Reproduction:

Asexual reproduction takes place by zoospores (motile) or by aplanospores (non-motile). These spores are endogeneously produced in sporangium.

Sexual Reproduction:

Zygospores are formed by fusion of two gametes.

These gametes are similar in morphology (isogamous) or dissimilar (anisogamous or oogamous).

19. What are ascomycetes? Describe the reproduction in ascomycetes.

Ascomycetes are commonly known as sac-fungi.

They are unicellular, e.g., yeast *(Sacharomyces)* or multicellular, e.g., *Penicilliuim.*

They are saprophytic, decomposers**.** They are parasitic or coprophilous (growing on dung). The mycelium is branched and septate.

Many members like morels and buffles are edible and are considered delicacies.

Reproduction

Asexual Reproduction:

The asexual spores are conidia produced exogenously on the special mycelium called conidiophores. Conidia on germination produce mycelium.

Sexual Reproduction:

Sexual spores are called ascospores which are produced endogenously in sac like asci (singular ascus).

These asci are arranged in different types of fruiting bodies called ascocarps.

Eg. *Aspergillus*, *Claviceps* and *Neurospora*. *Neurospora* is used extensively in biochemical and genetic work.

20. What are basidiomycetes? Describe the reproduction in basidiomycetes.

Basidiomycetes are mushrooms, bracket fungi or puffballs.

They grow in soil, on logs and tree stumps and in living plant bodies as parasites, e.g., rusts and smuts.

The mycelium is branched and septate.

Some common members are *Agaricus* (mushroom), *Ustilago (smut)* and *Puccinia* (rust fungus).

Reproduction

Asexual Reproduction:

The asexual spores are not found

Vegetative propagation:

Vegetative reproduction by fragmentation is common.

Sexual Reproduction:

The sex organs are absent, but plasmogamy is brought about by fusion of two vegetative or somatic cells of different strains or genotypes.

The resultant structure is dikaryotic which ultimately gives rise to basidium. Karyogamy and meiosis take place in the basidium producing four basidiospores.

The basidiospores are exogenously produced on the basidium (p1: basidia).

The basidia are arranged in fruiting bodies called basidiocarps.

21. What are deuteromycetes? Give examples.

They are commonly known as imperfect fungi because only the asexual or vegetative phases of these fungi are known.

Some members are saprophytes or parasites while a large number of them are decomposers of litter and help in mineral cycling.

Eg. *Alterniaria, Colletotrichum* and *Trichoderma.*

The deuteromycetes reproduce only by asexual spores known as conidia. The mycelium is septate and branched.

When the sexual forms of these fungi were discovered they were moved into classes like dueteromycetes ascomycetes and basidiomycetes..

22. Describe the features of kingdom of Plantae.

The members of Kingdom Plantae are eukaryotic chlorophyll-containing organisms and have cell wall mainly made of cellulose.

A few members are partially heterotrophic such as the insectivorous plants or parasites. Bladderwort and Venus fly trap are examples of insectivorous plants.

Cuscuta is a parasite.

Plantae includes algae, bryophytes, pteridophytes, gymnosperms and angiosperms.

Life cycle of plants has two distinct phases — **the diploid sporophytic and the haploid gametophytic** - that alternate with each other.

This phenomenon is called **alternation of generation.**

23. Describe the features of kingdom of Animalia.

This kingdom is characterised by heterotrophic eukaryotic organisms that are multicellular and their cells lack cell walls.

Nutrition:

They directly or indirectly depend on plants for food.

They digest their food in an internal cavity and store food reserves as glycogen or fat.

Their mode of nutrition is holozoic.

Growth:

They follow a definite growth pattern and grow into adults that have a definite shape and size.

Higher forms show elaborate sensory and neuromotor mechanism.

Locomotion: Most of them are capable of locomotion.

Reproduction:

The sexual reproduction is by copulation of male and female followed by embryological development.

24. Name the diseases caused by virus in plants and human.

In plants viruses cause mosaic formation, leaf rolling and curling, yellowing and vein clearing, dwarfing and stunted growth.

In human, viruses cause diseases like mumps, small pox, herpes, influenza and AIDS in humans.

25. What are viruses? Explain the discovery of viruses?

The viruses are acellular nucleoproteins.

Once they infect a cell they take over the machinery of the host cell to replicate themselves, killing the host.

Discovery of Virus:

The name virus means venom or poisonous fluid was given by Pasteur. D.J. Ivanowsky (1892) recognised certain microbes as causal organism of the mosaic disease of tobacco.

These were found to be smaller than bacteria because they passed through bacteria-proof filters.

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) showed that viruses could be crystallised and crystals consist largely of proteins.

They are inert outside their specific host cell. Viruses are obligate parasites.

26. Give an account of the genetic material of viruses.

In addition to protein coat, viruses also contain genetic material that could be either RNA or DNA.

No virus contains both RNA and DNA.

A virus is a nucleoprotein and the genetic material is infectious.

Viruses that infect plants have single stranded RNA and viruses that infect animals have either single or double stranded RNA or double stranded DNA.

Bacterial viruses or bacteriophages (viruses that infect the bacteria) are usually double stranded DNA viruses.

27. Describe the structure of Tobacco Mosaic Virus with a neat and labelled diagram. Name the disease caused by it.

A virus is a nucleoprotein and the genetic material is infectious. TMV has a protein coat and a single stranded RNA.

Protein coat

The protein coat called capsid is made of small subunits called capsomeres, protects the nucleic acid.

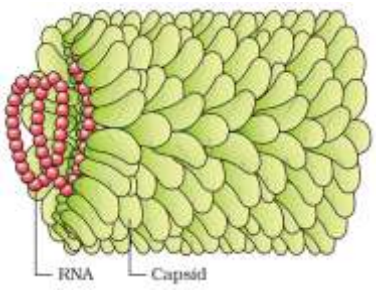
These capsomeres are arranged in helical or polyhedral geometric forms.

Genetic Material of TMV:

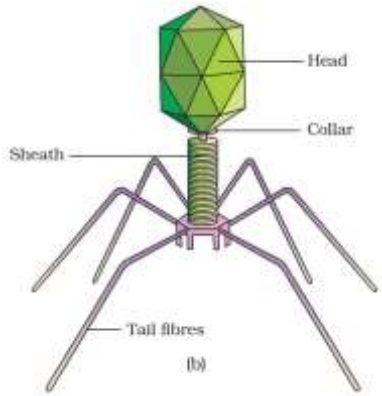
TMV is a plants virus and has a single stranded RNA.as the genetic material.

Diseases caused by TMV:

TMV causes mosaic disease in tobacco plants.



28. Draw the diagram of bacteriophage and labell the parts.



29. What are viroids? Who discovered it? Name a disease caused by viroids.

In 1971 T.O. Diener discovered a new infectious agent that was smaller than viruses and caused potato spindle tuber disease.

It was found to be a free RNA; it lacked the protein coat that is found in viruses, hence the name viroid.

The RNA of the viroid was of low molecular weight.

30. What are lichens? Why are they called pollution indicators?

Lichens are symbiotic associations i.e. mutually useful associations, between algae and fungi.

The algal component is known as **phycobiont** and fungal component as **mycobiont,** which are autotrophic and heterotrophic, respectively.

Algae prepare food for fungi and fungi provide shelter and absorb mineral nutrients and water for its partner.
Lichens are very good pollution indicators as they do not grow in polluted areas.

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