

Revision Notes

Class 11 Biology

Chapter 2- Biological classification

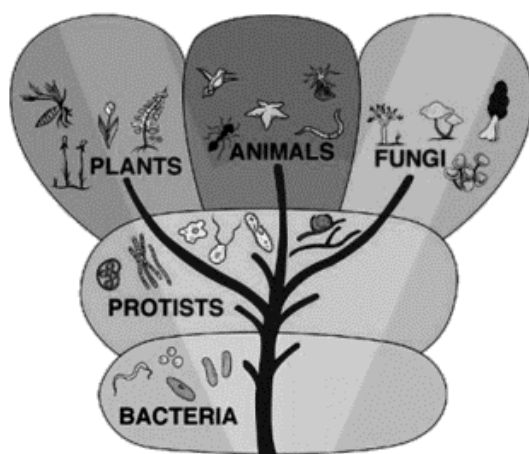
Biological classification

Biological classification is defined as the process of grouping organisms according to certain similarities.

Linnaeus proposed the two kingdoms of classification, He classified organisms in the animal kingdom which is called **Animalia**, and in the plant kingdom which is called **Plantae**. There were certain limitations with the classification of two kingdoms as it does not distinguish between eukaryotes and prokaryotes, unicellular and multicellular organisms, and photosynthetic and non-photosynthetic organisms.

Five Kingdoms Classification

RH Whittaker suggested the five-kingdom classification. The classification of these five kingdoms is as follows: Monera, Protista, Fungi, Plantae, and Animalia. The classification was based on the organization of the thallus, the cell structure, mode of nutrition, the phylogenetic relationship, and the mode of reproduction.



Five Kingdom Classification

Kingdom Monera

The bacteria are one of the main members of Monera.

All organisms found in this kingdom are prokaryotes, It includes blue-green algae and bacterium. They can be found in terribly extreme habitats such as hot springs, deserts, snow, and deep oceans. All monerans are prokaryotes, i.e., do not have a definite nucleus. They can be autotrophs, heterotrophs moreover as parasites. Cell wall is present.

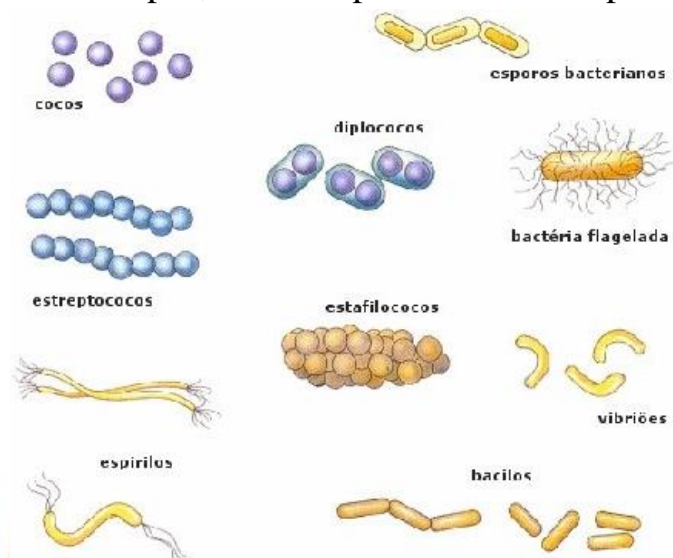


Fig.2. Examples of Kingdom Monera

They are divided into *Archaeobacteria* and *Eubacteria*.

Archaeobacteria

Archaeobacteria can be thermoacidophilic (can survive in hot springs), halophilic (survive in high salt concentrations), and methanogenic (Live in swampy areas). Their cell wall structure differs from other monerans. Methanogens are found in the intestines of some ruminants such as buffalo and cows and help to produce biogas from animal dung.

Eubacteria

They are called "true bacteria". They are characterized by the presence of a mobile flagellum and a rigid cell wall. Contains cyanobacteria (blue-green algae). They are similar to plants as they contain chlorophyll a. For this reason, they are called photosynthetic autotrophs.

Cyanobacteria are unicellular, filamentous algae that form colonies which are surrounded by a gelatinous sheath. Some have special structures known as heterocysts that help in nitrogen fixation in place. For example *Nostoc*.



Fig.3. *Nostoc*

Chemosynthetic autotrophs- These bacteria can oxidize certain inorganic substances such as nitrites, nitrates. The energy which is released during the process of oxidation is used in the production of ATP.

Bacteria can reproduce asexually by a process called the binary fission. They can also reproduce through spores if the situation is not favorable. Mycoplasma is also classified found under Monera. They have no cell wall and can easily survive under anaerobic conditions. Mycoplasmas are known to be the smallest living organism.

Kingdom Protista

Single-celled eukaryotes placed under the kingdom Protista. They are mostly aquatic in nature. They are found to be unicellular, eukaryotic organisms. They have a well-defined nucleus that is surrounded by the nuclear membrane. They can move through both cilia and flagella, respiration -can be both aerobic and anaerobic, and the mode of reproduction can be both sexual and asexual.

They are divided into **Chrysophytes, Dinoflagellates, Euglenoids, Slime moulds, and Protozoans.**

1. Chrysophytes

It consists of both diatoms and golden algae. They live in both fresh and marine water. They are mostly photosynthetic. Silica is found in their cell wall and this is the reason that their cell wall is indestructible and is responsible for the formation of diatomaceous earth. They are the main producers found in the oceans. They are mostly unicellular flagellates.

they are amoeboid.



Fig.4. Diatoms

2. Dinoflagellates

These types of organisms are marine and perform photosynthesis. They can be of different colours, for example, yellow, brown, red, or blue. The appearance of colour is due to the presence of different coloured pigments present in the cells of the dinoflagellates. The cell wall is made up of cellulose. They have 2 flagella, with one flagellum placed longitudinally and the other flagella placed transversely. Some of the examples are- *Gonyaulax catenella*, *Noctiluca scintillans*.



Fig.5. Example of Dinoflagellates

3. Euglenoids

Euglenoids are freshwater organisms found in stagnant water; They are surrounded by a protein-rich layer called pellicle They have one -short flagellum and one long flagellum; they can behave as both autotrophic

and heterotrophic organisms; for example *Euglena*.

Most euglenoids have chloroplasts so that they can synthesize their own food. The food reserves found in the euglenoids are the paramylon (carbohydrate).



Fig.6. *Euglena*

4. Slime moulds

They are saprophytic in nature, and under favourable conditions form aggregates known as plasmodium.

They form fruiting bodies with spores under unfavourable conditions, they have true cell walls and are extremely resistant to adverse conditions.

5. Protozoan like protists

They are known to be heterotrophs. They can live as both predators as well as parasites. Protozoans are of four types-

- **Amoeboid protozoa** are found in freshwater, moist soil, or seawater and have pseudopodia to ingest food particles such as in *Amoeba*
- **Flagellate protozoa** can be of both types i.e free-living or parasitic. This group of organisms is responsible for various parasitic diseases. For example; *Trypanosoma* causes sleeping sickness.
- **Ciliated protozoa** have thousands of cilia. The movement of the cilia helps them to move forward or backwards. It also helps in getting nourishment from the outside. For example; *Paramecium*.

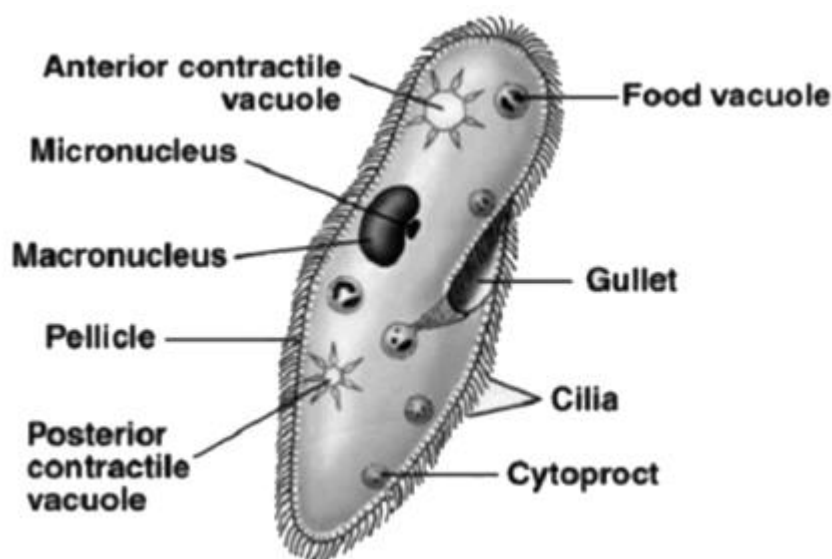


Fig.7. *Paramecium*

- **Sporozoa** forms reproductive cells known as spores. They are pathogenic and parasitic. For example, the *Plasmodium* species causes malaria. Reproduction can be of both types i.e asexual or sexual.

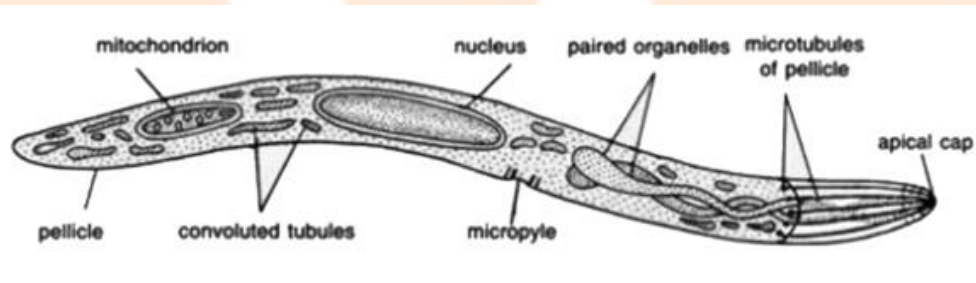


Fig.8. *Plasmodium species*

Kingdom Fungi

Fungi are naturally heterotrophic; some feed on dead organic matter and are called saprophytes, and some can feed on living organisms known as parasites. Some fungi can live in mutual relationships with other organisms such as algae, they are called lichens. These types of fungi are called symbionts.

Lichens are symbiotic relationship between fungi and algae and **mycorrhiza** is the symbiotic relationship between fungi and the roots of higher plants.

Reproduction in fungi can occur by many methods such as **budding**, **fragmentation**, and **fission**. Asexual reproduction occurs by means of

spores, which are known as **conidia, zoospores, or sporangiospores**.

Sexual reproduction takes place through different spores known as oospores, ascospores, and basidiospores.

In fungi, there are three steps in a sexual cycle:

the first step is **protoplasmic fusion**, known as plasmogamy, then the fusion of nuclei occurs known as **karyogamy** which leads to the formation of the **zygote**. Then finally, the meiosis of the zygote leads to the formation of the **spores**.

The Mycelium is known as the vegetative part of the fungus. The hypha network is called the mycelium. During the sexual cycle of fungi, two haploid hyphae fuse to form diploid cells. The kingdom fungi are divided into different classes.-

- **Phycomycetes (lower fungi)**- Asexual reproduction occurs through motile spores known as zoospores, and immobile spores are known as aplanospores. The spores are produced within the sporangium. The zygospore is formed by the fusion of the gametes. The mycelium is coenocytic (several nuclei) and multicellular. For example, *Mucor*, *Rhizopus*, *Albugo*.

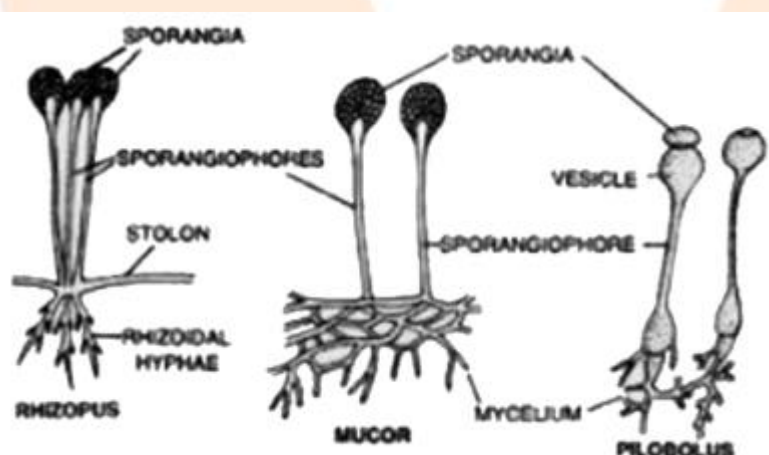


Fig.9. Common Fungi

- **Ascomycetes (sac fungi)**- They can be both saprophytic and parasitic. Asexual reproduction occurs through conidia. Sexual reproduction occurs through ascospores; branched and septate mycelium is found in Ascomycetes; for example *Penicillium*, *Aspergillus*, *Claviceps*, etc.

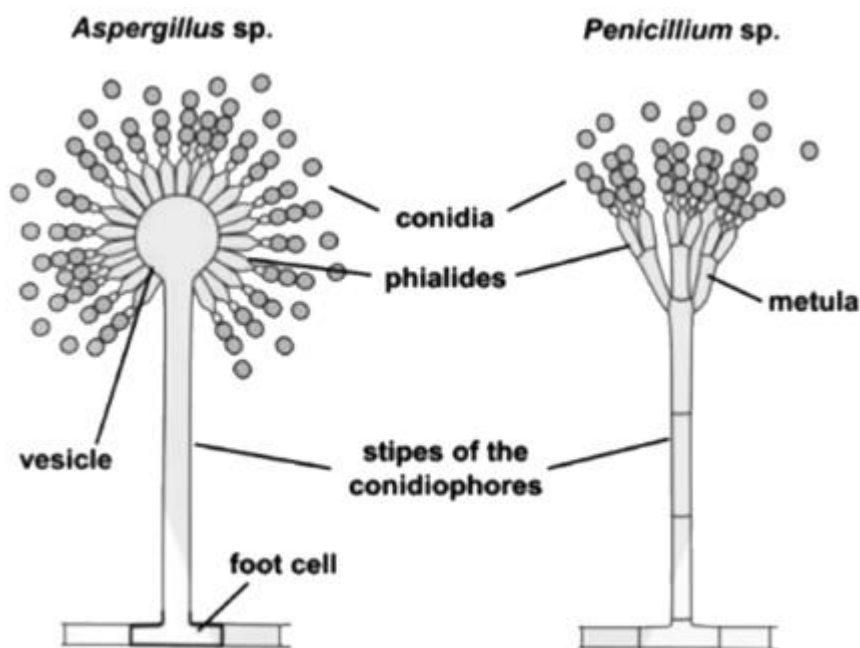


Fig.10. Ascomycetes

- **Basidiomycetes (club fungi)**- Vegetative reproduction takes place through the process of fragmentation. Sexual organs are absent. Plasmogamy between two vegetative or somatic cells leads to the formation of the basidium. The basidium undergoes karyogamy and meiosis to form four basidiospores, for example, *Agaricus* (mushrooms), *Ustilago* (fire rot), etc.
- **Deuteromycetes** are commonly known as imperfect fungi because they do not reproduce sexually at any stage of their life cycle. Sexual reproduction occurs through conidia. The mycelium is septate and branched; for example *Alternaria*, *Trichoderma*, etc.
- **Zygomycetes (conjugation fungi)** are a primitive group of fungi. Asexual reproduction takes place by non-motile sporangiospores. For example, *Rhizopus*.

Kingdom Plantae

It includes all eukaryotic, multicellular, and photosynthetic plants.

The characteristics of the members of Plantae are as follows:

- Most of them are eukaryotic in nature.
- The main pigment present is chlorophyll.
- Its cell wall is made up of cellulose.

- Photosynthesis helps in the synthesis of food.
- The process of reproduction can be both sexual and asexual.
- They represent the phenomenon of alternation of generations, i.e., diploid sporophytes, and haploid gametophytes.

Kingdom Animalia

These types of organisms are heterotrophic and eukaryotic. Some of the characteristics of the members of Animalia are as follows:

- They are multicellular organisms of various size.
- The organ systems are well developed such as the skeletal system, circulatory system, respiratory system, etc.
- They are found to be bilaterally symmetrical.
- They also have well-developed locomotory organs.
- Breathing takes place through gills, book lungs, book gills, skin, lungs, etc.
- Membrane-bound cell organelles are present and nucleus is bounded by a nuclear membrane.
- The circulation takes place through the blood, blood vessels, and the heart.
- Reproduction takes place through the formation of haploid gametes. The fusion of the gametes forms a diploid zygote that divides to form a new diploid organism.
- The kidneys are the most important excretory organ.

Viruses

The viruses are acellular structures and therefore do not find a place in Whittaker's five kingdom classification. They consist of nucleic acid (either DNA or RNA) that is surrounded by a protein coat. These viruses can grow and multiply only within a host cell. Viruses exist as crystals outside the host cell. They cause disease and severely damage the host. For example; *variola* causes smallpox, HIV (human immunodeficiency virus) causes AIDS, etc.

Viroids

They are the smallest known infectious structures and consist only of nucleic acid without a protein shell.

Lichens

They are known to be the symbiotic associations of algae and fungi. The algal component are autotrophic and synthesize and provide food. The fungal component offers protection and shelter.

