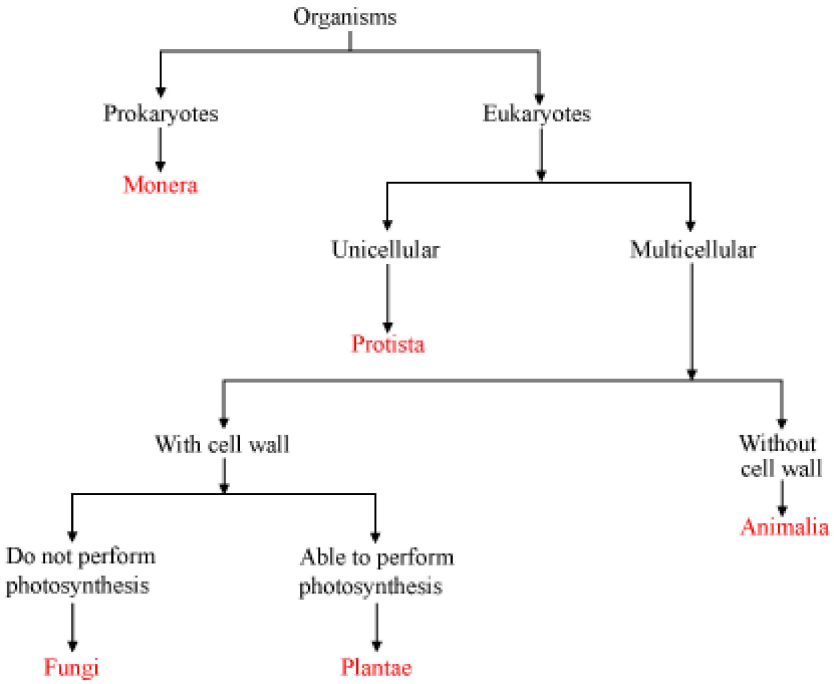
1. Living World and Classification of Microbes

- **Diversity**: It refers to the variety and variability among living organisms from all sources including land, water, and other ecosystems.
- **Classification**
  - It refers to the identification, naming, and grouping of organisms into a formal system based on similarities in internal and external structures or evolutionary history
  - It helps in organising the diversity of life forms in detail.
  - Characteristic - A feature that helps identify or describe a person or a thing
  - There are certain characteristics that are considered more fundamental than others. These fundamental characteristics make broad divisions in living organisms.

- **Principles of classification**
  - **Nature of cell (Fundamental characteristic):** On the basis of the nature of cell, living organisms are classified as: **prokaryotes and eukaryotes**
  - **Cellularity:** On the basis of cellularity, organisms are classified as: **unicellular and multicellular**
  - **Mode of nutrition**: On the basis of mode of nutrition, organisms are classified as: **Autotrophs and heterotrophs**

- R.H. Whittaker (in 1969) proposed a five-kingdom classification of living organisms
- The five kingdoms proposed by Whittaker are: Monera, Protista, Fungi, Plantae, and Animalia



Kingdom Monera: It includes mainly bacteria, blue-green algae, or cyanobacteria

- **Important features of Monera**:
    - Absence of well-defined nucleus or membrane-bound organelles- prokaryotic organisms.
    - All of them are unicellular
    - Can be autotrophic or heterotrophic

Kingdom Protista: It Includes protozoans such as, *Amoeba*, *Paramecium*, diatoms etc

- **Important features of protista**:
    - Unicellular, eukaryotic organism
    - Can be autotrophic or heterotrophic

Kingdom Fungi: Commonly known fungi are *Yeast*, mushroom, *Penicillium*, *Aspergillus*, etc.

- **Important features of fungi**:
    - Multicellular eukaryotic organisms
    - Always heterotrophic (saprophytes)
    - Cell wall made of chitin

Kingdom Plantae

- **Important features of Plantae**:
    - Multicellular eukaryotic organisms
    - Most of the plants contain chlorophyll. Hence, they are autotrophic
    - Cell wall is made of cellulose

Kingdom Animalia

- **Important features of Animalia**:
    - Multicellular eukaryotic organisms
    - Chloroplast is absent. Hence, they have heterotrophic mode of nutrition
    - Cell wall is absent

- **Classification of microorganisms**
    - There are five major groups of microorganisms.

- **Bacteria**
    - Single-celled organisms
    - Found in wide range of habitats ranging from glaciers to deserts and hot springs
    - For example – curd bacteria (*Lactobacillus*)

- **Fungi**
    - Multicellular, heterotrophic organisms
    - Lack chlorophyll and are generally found in colonies
    - For example – *Penicillium*, *Aspergillus*

- **Protozoa**
    - Unicellular or multicellular microorganisms
    - Usually found in water
    - For example – *Amoeba* and *Paramecium*

- **Algae**

    - Unicellular or multicellular autotrophic organisms
    - Contain chlorophyll pigment and carry out photosynthesis
    - For example – *Chlamydomonas* and *Spirogyra*

- **Viruses**
    - Ultramicroscopic organisms
    - Require host cells to reproduce and complete their life cycle.
    - For example – Influenza virus, polio virus
- **Favourable conditions for growth of microbes**
    - Temperature plays an important role in the growth of microorganisms.
    - Neutral pH is best suited for bacterial growth.
    - Microorganisms also require water as they absorb all the essential nutrients from theor surrounding water.
    - Gases like carbon, hydrogen and oxygen are also needed for their development.