WELCOME

TO

This is an Education Platform

We Provide PDF Notes for Pharmacy Students

Web Site http://www.fdspharmacy.in/

You tube https://www.youtube.com/c/FDSpharmacy

Telegram https://t.me/Fdspharmacy

App https://play.google.com/store/apps/details?id=com.FDSPharmacyMedia.FDSPharmacy

E-mail fdspharmacyinfo@gmail.com

REMEDIAL BIOLOGY

UNIT 1

TOPIC :

- **Living world :**

  Definition and characters of living organisms

  Diversity in the living world

  Binomial nomenclature

  Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus,

Living World

→ World is full of living and non-living things. But biology deals with the living beings and their functions. There is a great diversity of living beings. The difference between living beings and non-living matter was perceived by early human being. Detailed system of identification, nomenclature began later. This led to the recognition of sharing similarities among organisms. Man could recognize that living organisms are related to each other.

→ Various forms of living organisms are found in different types of habitats in the world like ocean, air, fresh water, forests, cold mountains, deserts, hot water springs etc. which make us to think about the vividness of living organisms and makes us to differentiate between the living and the non-living organisms.

Living organisms

- Living organisms are entities that exhibit life processes such as growth, reproduction, metabolism, responsiveness to stimuli, and adaptation to the environment. They are self-sustaining units of life that perform biological functions necessary for survival and continuity of life.
- In biology, a living organism is defined as:
- “An organized structure that can carry out life activities like nutrition, respiration, reproduction, and response to stimuli either independently or in association with other organisms.”

Characteristics of Living Organisms :

1. Growth

- Living organisms **increase in mass and number of cells**.
- Plants grow throughout life, while animals grow up to a certain age.
- Growth in unicellular organisms (e.g., Amoeba) is seen by **increase in cell number** through cell division.

Note: Increase in body mass due to accumulation of material in non-living things (e.g., crystals) is **not considered biological growth**.

2. Reproduction

- Ability to produce **offspring** or **new individuals** of the same species.
- Occurs through **sexual** or **asexual** means.
- In unicellular organisms, reproduction is by cell division (binary fission).
- Some organisms like **mules, worker bees, and sterile hybrids** do not reproduce but are still living.

Reproduction is not a **defining feature of life**, because all living organisms do not reproduce.

3. Metabolism

- All living organisms perform **chemical reactions** in their body — collectively called **metabolism**.
- It includes:
  - **Anabolism** – building up reactions (e.g., synthesis of proteins).
  - **Catabolism** – breaking down reactions (e.g., digestion, respiration).

Metabolism is a defining feature of all living organisms. No non-living object shows metabolism.

4. Consciousness / Response to Stimuli

- Living organisms **sense and respond** to environmental stimuli (light, heat, chemicals, touch, etc.).
- This property is called **consciousness**.
- Even **plants** respond to stimuli (e.g., sunflower facing the sun).
- **Humans** have the highest level of consciousness with a well-developed nervous system.

This is the **most unique and defining property** of living beings.

5. Cellular Organization

- All living organisms are made up of **cells**, which are the **basic units of life**.
- Organisms may be:
  - **Unicellular** (e.g., Bacteria, Amoeba)
  - **Multicellular** (e.g., Plants, Animals)

Cells perform various life processes such as respiration, digestion, and waste removal.

6. Homeostasis

- Ability to maintain **a stable internal environment** despite external changes.
- Example: Maintaining body temperature, pH, water balance.
- Essential for survival.

Non-living things cannot self-regulate or maintain homeostasis.

7. Energy Transformation

- All living organisms require **energy to perform activities**.
- This energy is obtained through **respiration of food**.
- Energy is essential for:
  - Growth

- Reproduction
- Movement
- Repair of tissues

8. Adaptation and Evolution

- Living organisms show **adaptations** that allow them to survive in their environment.
- Over generations, organisms undergo **evolution** through natural selection.

Example: Camouflage in chameleons, thick fur in polar bears.

9. Life Span

- All living organisms have a **defined life span** — they are born, grow, age, and die.
- Life span varies from organism to organism (e.g., Mayfly: 1 day, Tortoise: over 100 years).

Diversity in the Living World

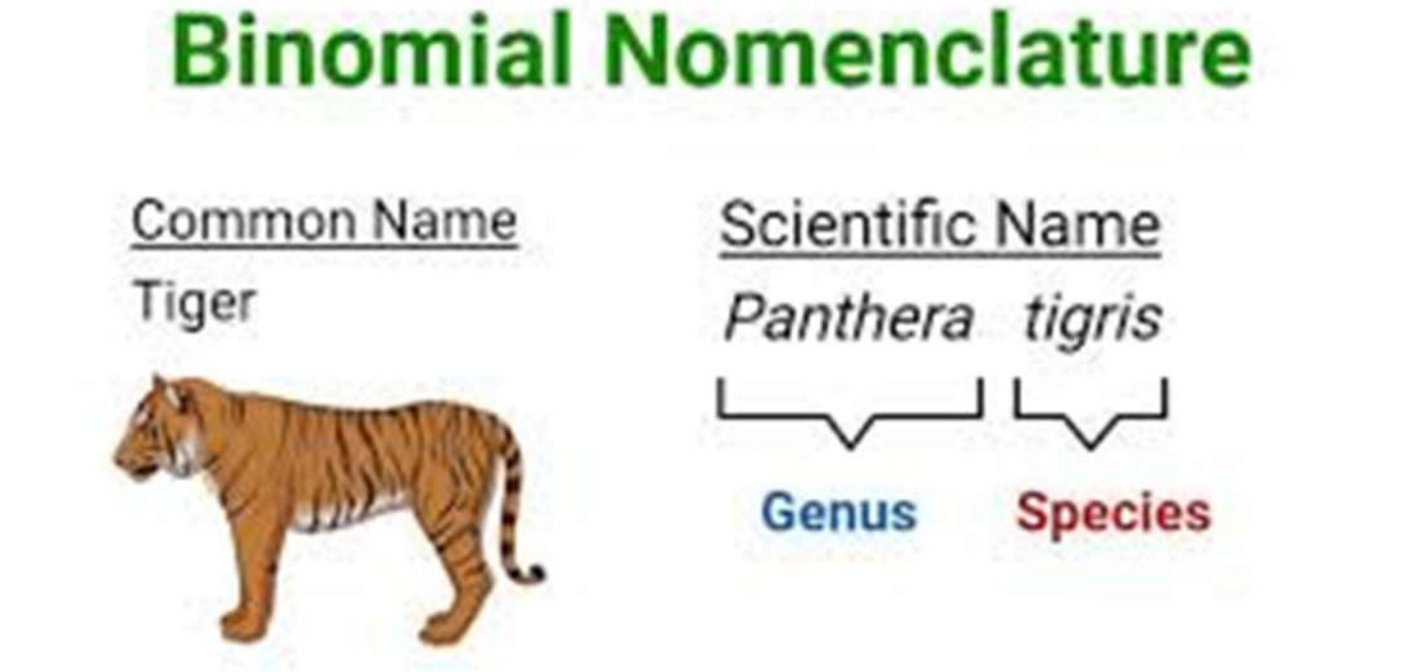
- The diversity in the living world refers to the vast variety of living organisms found on Earth, ranging from microscopic bacteria to large mammals and flowering plants.
- This variety, known as **biodiversity**, includes differences in species, genetic makeup, and ecosystems. Organisms differ in their structure, habitat, nutrition, reproduction, and evolutionary relationships.
- To understand and study this diversity, scientists use classification systems to group organisms based on similarities and differences.
- This scientific organization helps in identifying species, studying their relationships, and conserving biological resources.
- Tools like herbaria, museums, keys, and botanical gardens assist in the study of biodiversity. The modern system of classification, such as the Five Kingdom classification, allows us to organize the immense variety of life into manageable categories.
- Understanding this diversity is essential for the advancement of biological sciences, environmental protection, and sustainable development.
- Thus, the study of the living world's diversity forms the foundation of biology and helps us appreciate the richness and interconnectedness of life on Earth.

Importance of Studying Diversity

- To understand the complexity of life
- To study relationships among organisms (taxonomy and evolution)
- To protect endangered species and ecosystems
- To identify useful species for medicine, agriculture, and industry
- To maintain balance in nature and ecosystems

Binomial Nomenclature

- In the vast diversity of life, organisms often have different local or common names in different regions and languages. To avoid confusion and ensure uniform identification, scientists use a standardized system called Binomial Nomenclature.
- Binomial Nomenclature is the system of naming organisms using two Latin or Latinized words — the genus name and the species name.
- This system was developed by Carl Linnaeus in the 18th century and is universally accepted.
- Binomial Nomenclature is a scientific method to give each organism a unique, standard name. It reduces confusion caused by local names and allows scientists around the world to study and communicate about organisms in a unified language.
- By following a fixed set of rules, it brings clarity, precision, and global consistency to the field of biology.



Structure of Binomial Names

- Each organism is given a scientific name that has two components:

Component	Explanation
Genus Name	The first word. It indicates the group to which the organism belongs. It is always capitalized.
Species Name	The second word. It represents the specific identity within the genus. It is always in lowercase.

Example:

- Human: *Homo sapiens*
  - *Homo* → Genus
  - *sapiens* → Species

Rules of Binomial Nomenclature (According to ICBN & ICZN):

- The name must be in Latin or Latinized form.
- Genus name is written first and begins with a capital letter.
- Species name is written after the genus and starts with a small letter.
- Both words are italicized in print or underlined separately when handwritten.
  Example: Canis lupus or Canis lupus
- The name should be unique and universally accepted.
- One species cannot have more than one scientific name (principle of priority).
- The names should be descriptive, short, and easy to pronounce.

CLASSIFICATION

- It is the arrangement of organisms in specific group or categories based on certain characters. These categories are called taxa.

Taxonomy

→ It is the science of identification, nomenclature and classification of organisms based on external and internal structure with cell structure, development process and ecological information

Systematics

- It is the study of organisms with reference to identification, nomenclature. classification and evolutionary relationship.

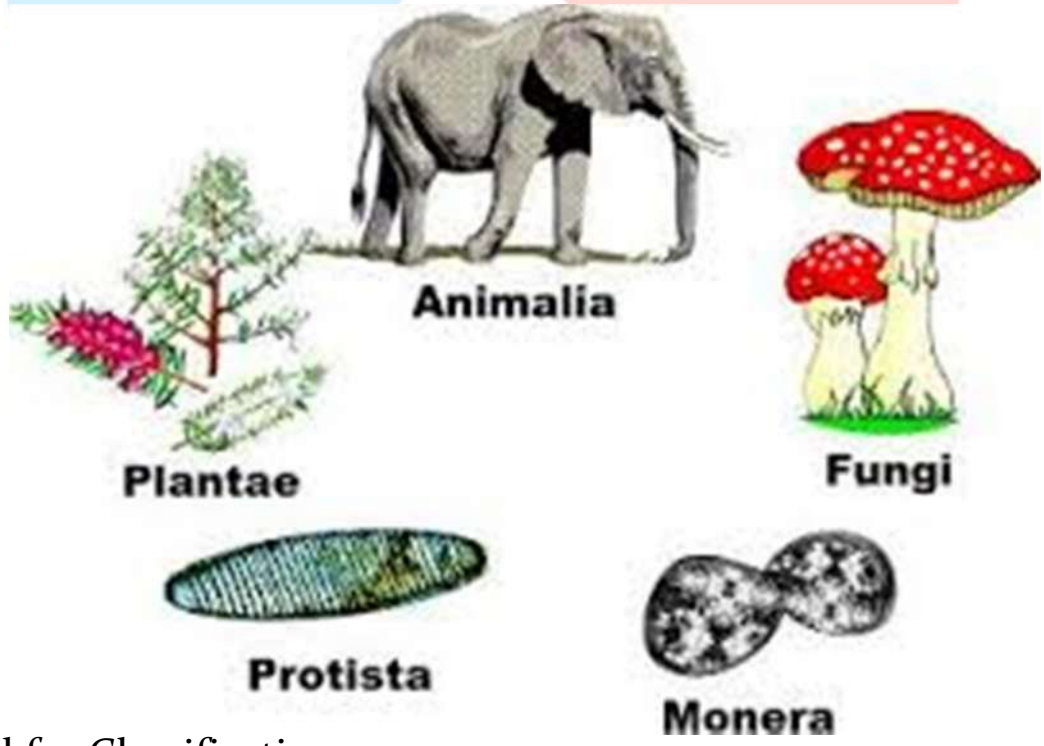
→ The descending order of taxa used in classification are - Kingdom, Phylum or Division, Class, Order, Family, Genus and Species.

1. **Kingdom :** Kingdom comprises of various phyla of animals and various divisions of plants.
2. **Phylum/Division :** Phylum in animals and Division in plants includes related classes.
3. **Class :** Several related orders are induced in a class.
4. **Order :** The order includes several related families.
5. **Family :** Family is a group of related families.
6. **Genus :** Genus is a group of related species which have co-related characters.
7. **Species :** It is the basic unit in classification. The members of a species are closely related, derived from a common ancestor and can interbreed to produce fertile offsprings.

- This system was finalized by Carolus Linnaeus and is known as Binomila nomenclature. It is followed by all biologists of the world.
- Besides the above categories taxonomists developed sub-categoires in the hierarchy to help more precise placement of various taxa.

Five Kingdoms of Life

- The Five Kingdom Classification was proposed by Robert H. Whittaker in 1969. It classifies all organisms into five major groups based on cell structure, body organization, mode of nutrition, reproduction, and ecological role.



Criteria Used for Classification :

- **Cell type** – Prokaryotic or Eukaryotic
- **Level of organization** – Unicellular or Multicellular
- **Cell wall composition** – Presence/absence and chemical nature
- **Mode of nutrition** – Autotrophic (photosynthesis) or Heterotrophic (ingestion/absorption)
- **Mode of reproduction** – Asexual or sexual
- **Phylogenetic relationship** – Evolutionary history

The Five Kingdoms

Monera

- These are unicellular prokaryotes.
- They lack a true nucleus.
- They may or may not contain a cell wall.
- They may be heterotrophic or autotrophic.
- Examples- Bacteria (heterotrophic), Cyano-bacteria or Blue green algae Anabaena and (autotrophic).

1. Kingdom Monera

Includes: Bacteria and Cyanobacteria (Blue-Green Algae)
Type: Prokaryotic, unicellular

Characteristics:

- **Prokaryotic**: No nucleus or membrane-bound organelles
- **Unicellular and microscopic**
- **Cell wall** made of peptidoglycan
- Some are **autotrophic** (photosynthetic/chemosynthetic), others are **heterotrophic**
- Reproduce **asexually** (binary fission)
- Found in extreme habitats (hot springs, salty lakes, etc.)

Examples:

- *Escherichia coli*
- *Streptococcus*
- *Nostoc*
- *Anabaena*

2. Kingdom Protista

Includes: Unicellular eukaryotes like Protozoa, Diatoms, and Algae
Type: Eukaryotic, mostly unicellular

Characteristics:

- **Eukaryotic**: With true nucleus and membrane-bound organelles
- Mostly **unicellular**, some colonial
- **Motile** with cilia, flagella, or pseudopodia
- Nutrition: **Autotrophic** (e.g., Euglena) or **Heterotrophic** (e.g., Amoeba)
- **Reproduce** sexually or asexually
- Found in **aquatic** and moist environments

Examples:

- *Amoeba*
- *Paramecium*
- *Euglena*
- *Plasmodium*
- *Diatoms*

3. Kingdom Fungi

Includes: Molds, Mushrooms, Yeasts
Type: Eukaryotic, multicellular (except yeast)

Characteristics:

- **Eukaryotic** and mostly **multicellular** (yeast is unicellular)
- **Cell wall** made of **chitin**
- **Heterotrophic** – absorb nutrients (saprophytic/parasitic)
- Act as **decomposers** in nature
- Reproduce by **spores** (asexual/sexual)
- Do not perform photosynthesis

Examples:

- *Rhizopus* (bread mold)
- *Agaricus* (mushroom)
- *Penicillium*
- *Yeast* (unicellular fungus)

4. Kingdom Plantae

Includes: Mosses, Ferns, Gymnosperms, Angiosperms
Type: Eukaryotic, multicellular autotrophs

Characteristics:

- **Eukaryotic** and **multicellular**
- **Cell wall** made of **cellulose**
- **Autotrophic** – photosynthesize using chlorophyll
- Show **alternation of generations**
- **Non-motile**
- Important for **oxygen production and food**

Examples:

- *Mango tree*
- *Neem*
- *Chlamydomonas*
- *Ferns*
- *Pine*
- *Bryophytes*

5. Kingdom Animalia

Includes: All animals (invertebrates and vertebrates)
Type: Eukaryotic, multicellular heterotrophs

Characteristics:

- **Eukaryotic**, **multicellular**
- **No cell wall**
- **Heterotrophic** – ingest food
- Most show **movement** and complex organ systems
- Reproduce **sexually** (mostly)
- Show **growth, development, and sensory coordination**

Examples:

- *Hydra*
- *Earthworm*
- *Insects*
- *Frog*
- *Birds*
- *Humans*

Virus

- The viruses are non-cellular organisms that are characterised by having an inert crystalline structure outside the living cell.
- A virus is nucleoprotein and its genetic material is infectious. When they infect acell, they take over the machinery of that host cell to replicate themselves.
- The name virus that means venom or poisonous fluid was given by Ivanowsky (1892). Viruses are smaller than bacteria and were called as 'infectious living fluid' by Beijerinek (1898).
- They are inert outside thehost cell but become active when infected a cell and replicate fast.
- In addition to protein coat, they contain genetic material either RNA or DNA. In general, the virus which infect plants, have single stranded RNA and which infect animals, have either single or double stranded DNA.
- Examples- Tobacco Mosaic virus, Corona virus