3. Diversity in Living Things and their Classification

- **Autotrophic Nutrition**
  - Synthesis of food by photosynthesis, Photosynthesis equation

$$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + 6O_2$$

  - Leaves are the sites for the synthesis of food.
  - The green pigment called chlorophyll is present in leaves.
  - Chlorophyll traps solar energy, which is used to prepare food from CO_2 and water. Sun is the ultimate source of energy.
  - Green plants absorb CO_2 from atmosphere through tiny pores called stomata.
  - Stomata are present on the surface of leaves.
  - Water and minerals are absorbed from soil and are transported to leaves via tiny vessel-like structures present in roots.
  - Chlorophyll, sunlight, CO_2, and water are essential raw materials for photosynthesis.
  - Carbohydrates such as starch and oxygen are the product of photosynthesis.
  - All green plants including green algae show autotrophic nutrition.
  - Since the autotrophs manufacture their own food, they are called producers.
  - They form the first link in the food chain and all organisms on the earth obtain the energy directly or indirectly from them.

- **Heterotrophic Nutrition**
  - Generally derive energy from plants and animal sources.
  - The heterotrophs that derive their energy directly from plants are called herbivores and those who derive their energy indirectly i.e. by eating herbivores are called carnivores.
  - **Omnivores**- feed on both plants and animals e.g. bear, rat, man etc.
  - **Decomposers**- obtain nutrients by breaking down remains of dead plants and animals, includes some bacteria and fungi.
  - **Mainly of three types**—holozoic, parasitic, and saprophytic.
  - **Digestion**- mechanical and chemical reduction of ingested nutrients.
  - **Human digestive system**- consists of the long alimentary canal.
  - **Alimentary canal includes**- mouth, pharynx, oesophagus, stomach, small intestine, and large intestine
  - **Accessory organs**- pancreas, liver.

- **Morphology**
  - It is the branch of biology which deals with the study of external structures of plants and animals.
  - A plant consists of a root system (underground part) and a shoot system (above the ground parts).
  - Roots are the parts of the root system; and stem, leaves, flowers, and fruits are parts of the shoot system.
- **Roots**
  - It helps in anchoring plant and absorbing water and minerals.
  - Developed from the radicle part of a cotyledon

    - It consists of a region of meristematic activity covered by a root cap, a region of elongation, and a region of maturation having root hairs.
- **Types of roots system:**
  1. Tap root system
    - It consists of a primary root that grows deep inside the soil.
    - It also bears lateral roots referred to as secondary and tertiary roots.
    - Example- Dicotyledons (mustard)
- **2.Fibrous root system**
    - Primary root is short-lived and is replaced by a large number of secondary roots.
    - Example- Monocotyledons (wheat)
- **3. Adventitious roots**
    - Roots arise from parts other than the radicle.
    - Example- Banyan tree

- **Root modifications**
    - **Prop roots** – Example: banyan tree
    - **Stilt roots** – Example: maize and sugarcane
    - **Pneumatophores** (that helps in respiration) – Example: Rhizophora
- **Characteristics of Root for Absorbing Water**
    - Enormous surface area
    - Root hairs containing cell sap at higher concentration
    - Thin walled root hairs

Stem

- Bears branches, leaves, flowers, and fruits
- Conducts water and minerals to all parts of the plant body
- Bears nodes and internodes

Stem modifications

- For storage – Example: Potato, ginger, turmeric.
- For support – Tendrils in cucumber, pumpkins, watermelon.
- For protection – Thorns in *Citrus*, *Bougainvillea*.
- For vegetative propagation – Tubers and rhizomes in potato and ginger respectively.

Leaf

 A leaf has a petiole and a lamina.

 Leaves prepare their food in the presence of sunlight and chlorophyll by a process

known as photosynthesis.

 The leaves lose water by the process of transpiration.

 The design made by leaf veins is known as leaf venation.

 Leaf venation is of two types - reticulate venation and parallel venation.

Leaf Modifications

 Tendrils- Example: peas

 Spines- Example: cactus

 Fleshy leaves for storage- Example: onion and garlic

- Those plants that have flowers are called **flowering plants** while those that do not contain flower, seeds are called **non-flowering plants.**
- Parts of flower
  - Calyx, Corolla, Androecium and Gynoecium are the parts of a flower.
  - Sepals, petals, stamens, and pistil are their subparts.
  - Collection of sepals is known as calyx
  - Collection of petals is known as corolla.
  - Ovary contains one to numerous ovules.
  - Anther and filament are the parts of a stamen and collection of stamen is known as androecium
  - Stigma, style, and ovary are the parts of a pistil and collection of pistils are known as gynoecium.
- Types of flower
  - Bisexual flowers: Contain both male and female parts
  - Unisexual flowers: Contain either male or female part

- **Types of plants**
  - Plants are usually grouped into herbs, shrubs, and trees.
  - Herbs are plants with green and tender stems. They are usually short. E.g. Wheat, rice.
  - Shrubs are plants with hard but not very thick stems. Their stem branches near the base. E.g. Rose plant
  - Trees are very tall plants with hard and thick brown stem. E.g. Mango, Apple.

- **Classification of plants depending upon the time required to complete their life cycle**

  - Annuals - They complete their life cycle in one growing season. e.g., paddy, wheat, maize, etc.

  - Biennials - They complete their life cycle in two years e.g., cabbage, turnip, etc.
  - Perennials - They complete their life cycle in several years. e.g., mango

- Plants that spread on ground are known as creepers.
- E.g. of creepers are Pumpkin, watermelon.
- Plants that take support of neighbouring structures to climb up are known as climbers.
- E.g. of climbers are Pea, Money plant.

- The animals that live in water are known as **aquatic animals.** Few examples - fish, crabs, octopus.
- The animals that live on land are called **terrestrial animals.** Few examples **-** dogs, cats, elephants.
- The animals that live both on land and in water are called **amphibians.** Few examples **-** crocodile, frog, tortoise.
- The animals that naturally fly in the air are called **aerial animals.** Few examples - pigeons, vultures.
- The animals that possess a vertebral column and a fully developed brain covered by a skull are called **vertebrates**. Few examples - humans, dogs, cats.

- The animals that do not possess a vertebral column and are slow moving are called **invertebrates**. Few examples - cockroach, snail, star fish.

- **Oviparous animals**
  - The animals that lay eggs are called **oviparous animals**. The examples include all kinds of birds, lizards, snakes, and frogs.
- **Viviparous animals**
  - The animals that give birth to young ones are called **viviparous animals**. The examples include cows, dogs, and humans.