

CHAPTER 5 : Cell—A Basic Unit of Life

Key Points and Concepts

- **Cell** : An autonomous self-replicating structure that forms the structural, functional and biological unit of all living organisms.
- In 1665, scientist Robert Hooke saw a little room in the cork (the bark of a tree) with the help of primitive microscope, which resembled the structure of a honeycomb.
- The cell theory was proposed by Schleiden (1838) and Schwann (1839). It states that all the plants and animals are composed of cells and cell is the basic unit of life.
- The cell theory was further expanded by Virchow (1855) by suggesting that “all cells arise from the pre-existing cells”.
- Each kind of cell performs specific function.
- A single cell may constitute a whole organism and are called as unicellular organisms. E.g., *Amoeba*, *Chlamydomonas*, *Paramecium* and bacteria.
- In multicellular organisms (like human beings), many cells group together in a single body and assume different functions in it to form various body parts.
- A cell generally contains plasma membrane, nucleus and cytoplasm.
- **Plasma membrane** : It is the outermost covering of the cell.
 - It is called as selective permeable membrane (because it prevents movement of some materials).
 - It helps in diffusion and osmosis.
- **Diffusion** : It is the spontaneous movement of a substance from a region of its higher concentration to a region of its lower concentration. E.g., exchange of carbon dioxide or oxygen with external environment.
- **Osmosis** : It is the movement of water through a semi-permeable membrane from a region of high water concentration to a region of low water concentration.
- **Endosmosis** : If the medium surrounding the cell has a higher water concentration (hypotonic solution) then cell gains water. The cell swells up.
- When the cell maintains the same water concentration as the cell (isotonic solution), water crosses the cell membrane in both directions. The cell will stay of same size.
- **Exosmosis** : If the medium has lower water concentration (hypertonic solution) than the cell, then the cell loses water. The cell will shrink.
- *Amoeba* acquires food through endocytosis and excrete solid through exocytosis.
- **Cell wall** : It is a rigid outer covering composed of cellulose. It provides structural strength to plant cells.
- When a living cell loses water, there is shrinkage of contents of a cell away from the cell wall. This phenomenon is called as **plasmolysis**.
- The cell walls permit the cells of plants, fungi and bacteria to withstand very dilute (hypotonic) external media without bursting.
- **Nucleus** : The nucleus has a double layered covering called nuclear membrane which has pores which allow the transfer of material from inside the nucleus to its outside. It plays a central role in cellular activities/reproduction. The chromatin material gets organized into chromosomes.
- The chromosomes contain information for inheritance of features from parents to next generations in the form of DNA (Deoxyribo Nucleic Acid) and protein molecules.
- The functional segments of DNA are called genes.
- **Cytoplasm** is the fluid content of the cell, occurring between nucleus and plasma membrane. It stores several vital chemicals and is the site of certain important metabolic pathways.
- Important cell organelles present in cytoplasm are endoplasmic reticulum (ER), Golgi apparatus, lysosomes, mitochondria, plastids and vacuoles.
- **Endoplasmic reticulum (ER)** is an extensive, interconnected membrane bound network of tubes and sheets. They are of two types : SER (site of lipid synthesis) and RER (site of protein synthesis).

- Ribosomes are attached to the surface of Rough Endoplasmic Reticulum (RER) and are absent in Smooth Endoplasmic Reticulum (SER).
- **Golgi apparatus** consists of a system of membrane-bound vesicles arranged approximately parallel to each other in stacks called cisterns.
- Golgi apparatus carries out the storage, modification and packaging of substances manufactured in the cell and is also involved in lysosome formation.
- The spherical, sac-like **lysosomes** contain powerful digestive enzymes and form the waste disposal system of the cell. They are also known as 'suicide bags'.
- **Mitochondria** are the 'power houses of the cell', providing energy for various metabolic activities. They are formed of two membrane coverings.
- **Plastids** : They are present only in plant cells. There are two types of plastids – chromoplasts (coloured plastids) and leucoplasts (white or colourless plastids). Plastids containing the pigment chlorophyll are known as chloroplasts which are important for photosynthesis.
- **Vacuoles** : These are storage sacs, small sized in animals while plants have large sized. They help to provide turgidity and rigidity to the cell. Many substances like amino acids, sugars, organic acids and proteins are stored in vacuoles.
- **Difference between Plant Cells and Animal Cells:**

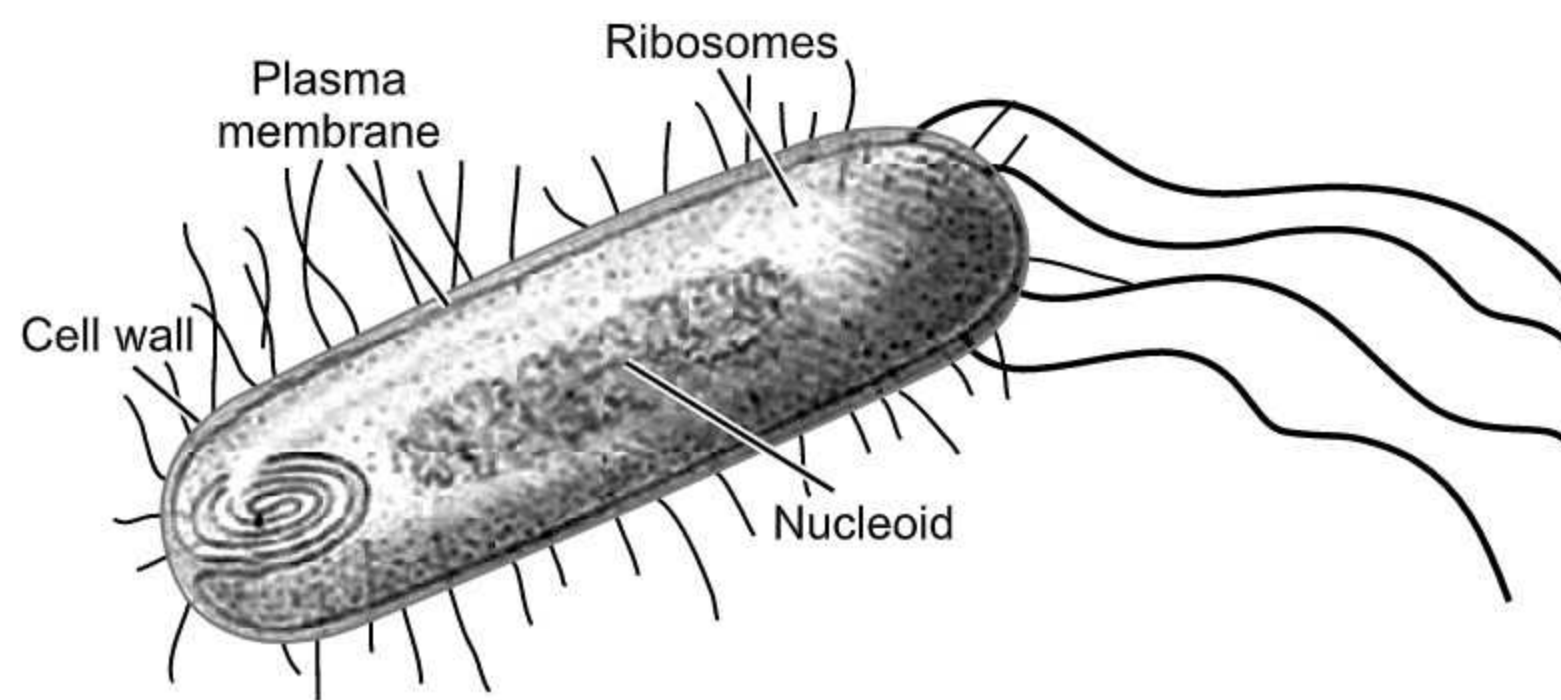
S.No.	Plant Cells	Animal Cells
1.	Plant cells are larger in size.	Animal cells are comparatively smaller in size.
2.	They contain cell wall made of cellulose, which is present outside the plasma membrane.	Cell wall is absent.
3.	They contain plastids, <i>i.e.</i> chloroplast, leucoplast and chromoplast.	Plastids are absent.
4.	Centrosome is absent.	Centrosome is present.
5.	Larger vacuoles are present.	Vacuoles either absent or very small in size.
6.	Food is stored in the form of starch.	Food is stored in the form of glycogen.
7.	Lysosomes either absent or very few in number.	More number of prominent lysosomes are present.

- **Difference between Eukaryotic and Prokaryotic cells**

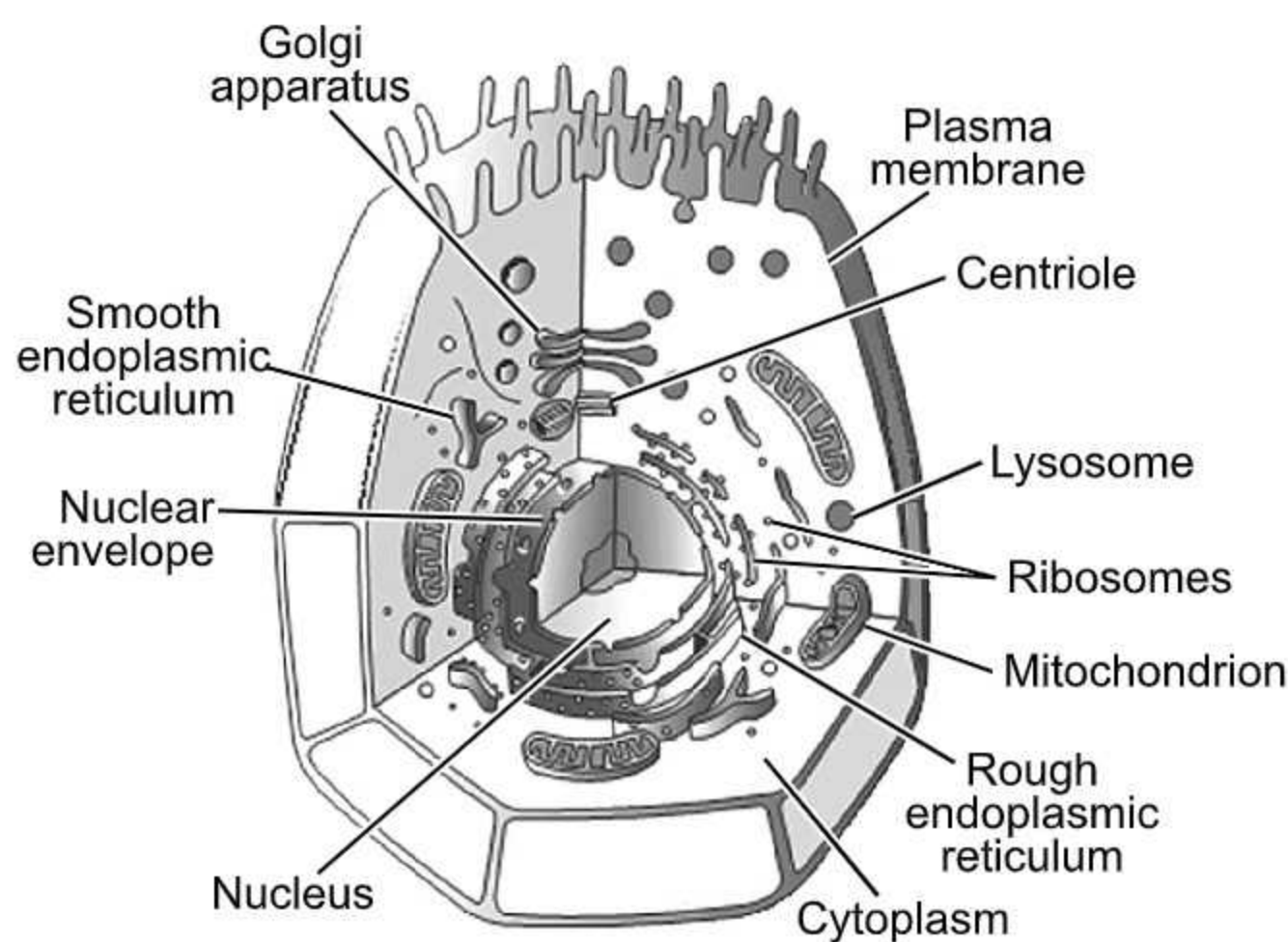
S.No.	Prokaryotic cell	Eukaryotic cell
1.	Size : Generally small (1-10 μm).	Size : Generally large (5-100 μm).
2.	Nuclear region : Contains only nucleic acid and is undefined due to the absence of nuclear membrane and known as nucleoid.	Nuclear region : Well defined and surrounded by a nuclear membrane.
3.	Chromosome : Single.	Chromosome : More than one chromosome.
4.	Membrane bound cell organelles absent.	Membrane bound cell organelles (<i>e.g.</i> chloroplasts, golgi bodies etc.) present.

Important Diagrams

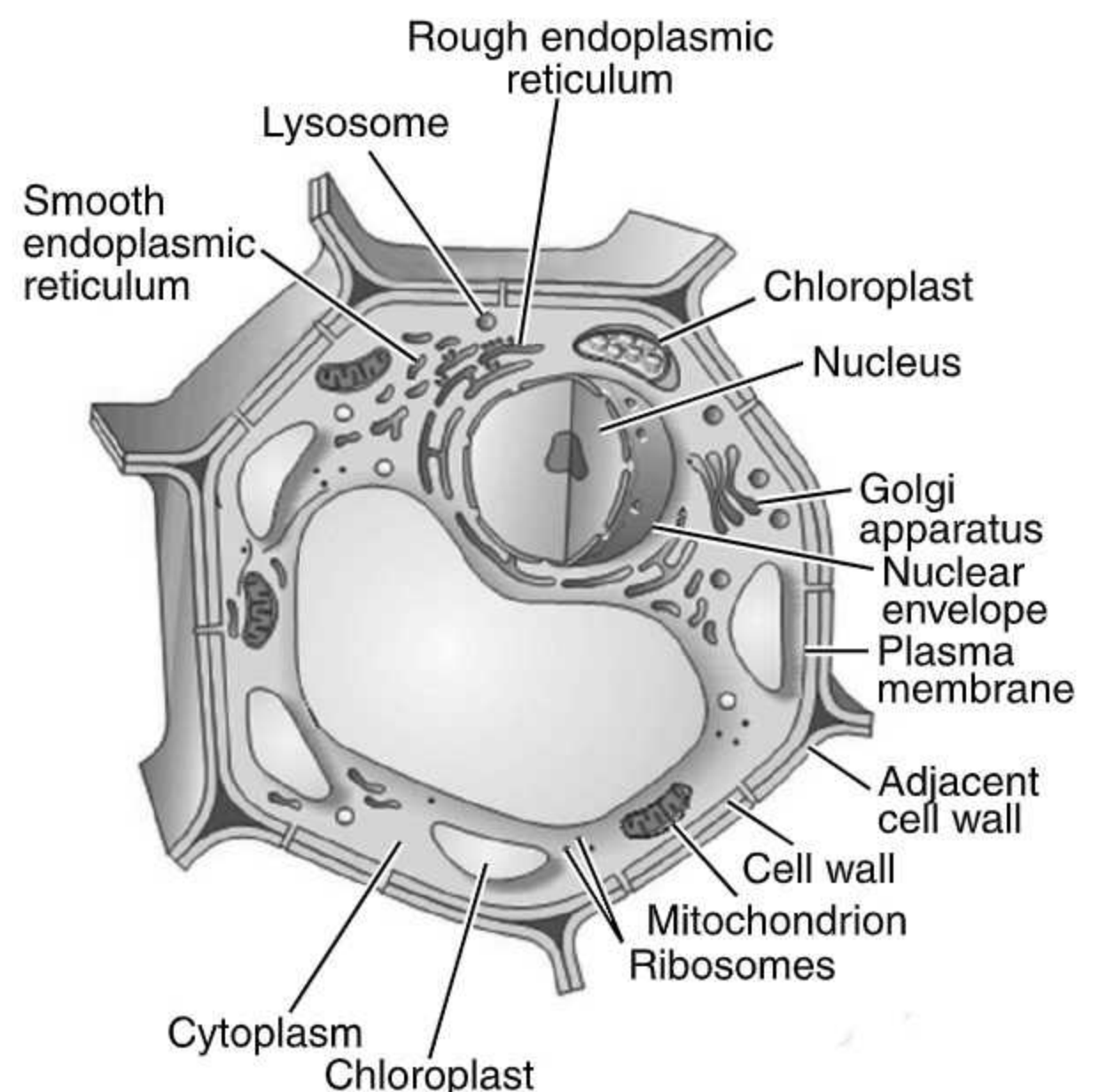
➤ Prokaryotic Cell



➤ Animal Cell



➤ Plant Cell



CHAPTER 6 : Tissues

Key Points and Concepts

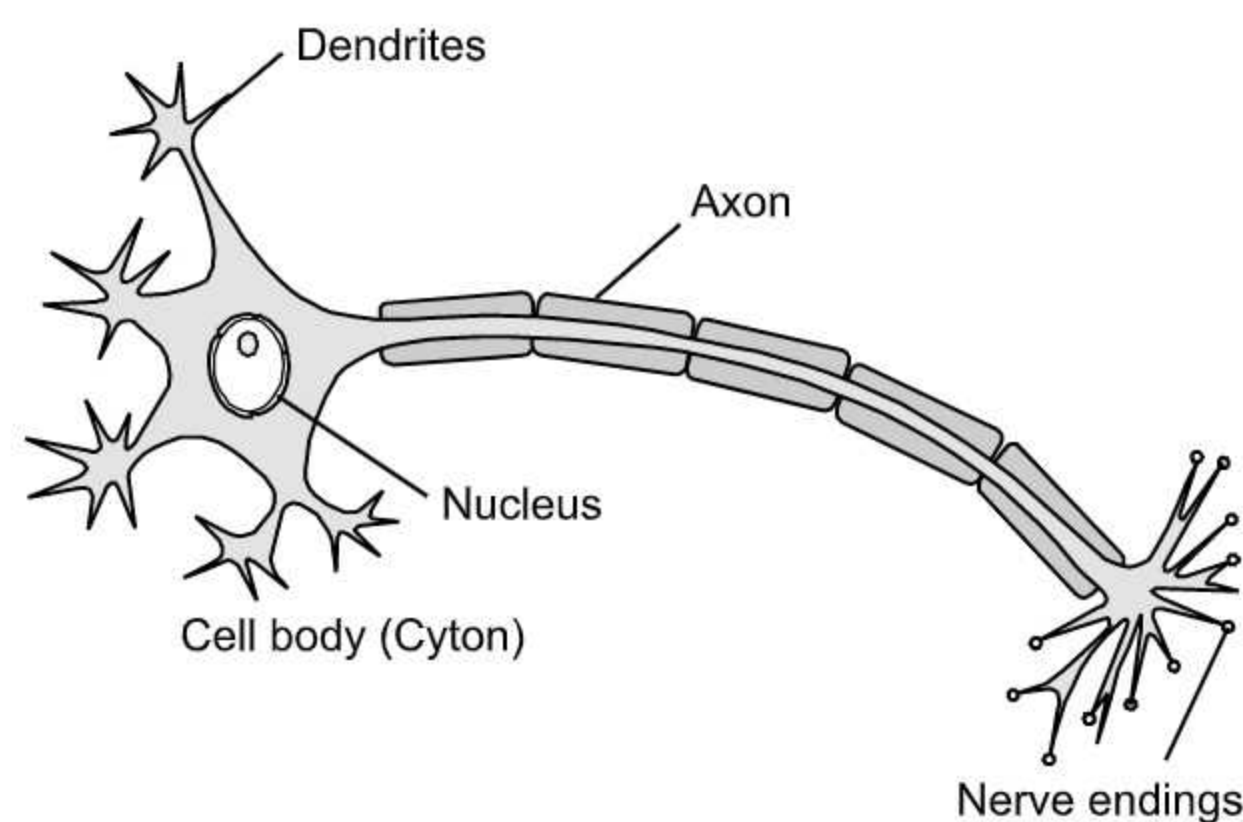
- **Tissues** : A group of specialized cells with similar structure, working together to perform a common function.
- Plant tissues are of two main types – meristematic tissues and permanent tissues.
- **Meristematic tissues** may be apical, lateral or intercalary, depending on their location in the plant.
- **Permanent tissues** are classified into simple and complex tissues. Simple tissue shows only one type of cells whereas complex tissues consist of more than one type of cells, functioning as a unit.
- Parenchyma, collenchyma and sclerenchyma are three types of simple tissues.
 - Parenchyma is a supporting and storing tissue, composed of unspecialized, thin-walled cells with large intercellular spaces.
 - Collenchyma cells are elongated, with irregularly thickened cell walls. It provides mechanical support and elasticity to the plant.
 - The main supporting tissue, sclerenchyma, consists of long and narrow cells with thick and lignified cell walls.
- Parenchyma and collenchyma are living tissues whereas sclerenchyma is a dead tissue.

- Xylem and phloem are types of complex tissues.
 - Xylem is composed of tracheids, vessels, xylem parenchyma and xylem fibres. It conducts water and minerals from roots to aerial parts of the plant.
 - Phloem consists of sieve tubes, companion cells, phloem fibres and phloem parenchyma. It transports food from leaves and storage organs to all other parts of the plant.
- Animal tissues can be epithelial, connective, muscular and nervous tissue.
- **Epithelial tissues** are the covering or protective tissues which act as a barrier between the various systems of the body. It rests on a basement membrane and is composed of tightly packed cells. The skin, the lining of the mouth, the lining of blood vessels, lung alveoli and kidney tubules are all made of epithelial tissue.

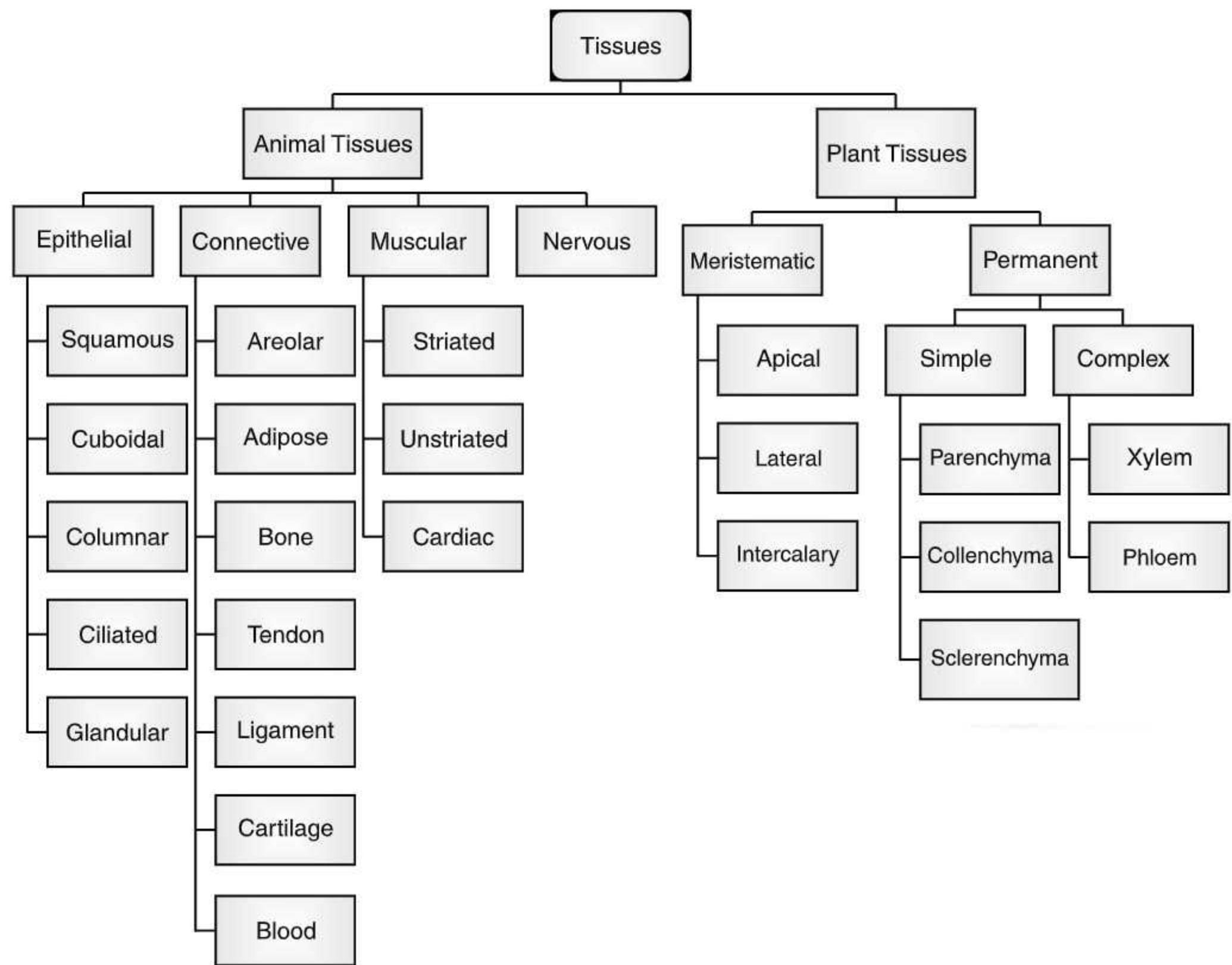
Types: Simple squamous (thin and flat), cuboidal (cube shaped), columnar (ciliated), stratified squamous (arranged in layers) and glandular (folded to form multicellular gland).
- **Connective tissue** is the binding and supporting tissue of the animal body. Matrix forms the main bulk of this tissue, whereas the cells are loosely spaced and less in number. E.g., Blood, bone, ligament, tendon, cartilage, areolar tissue and adipose tissue.
 - Blood is a fluid connective tissue in which RBCs, WBCs and platelets are suspended and plays a significant role in the process of transportation.
 - Functions of protection, providing skeletal framework and anchoring are carried out by the strong and hard bone tissue.
 - Ligaments connect bones to bones whereas tendons connect bones to muscles.
 - Cartilage provides support and flexibility to the body parts.
 - Areolar tissue repairs the injured tissues and fills spaces within organs. These are found between the skin and muscles, around blood vessels and nerves and in bone marrow.
 - Adipose tissue serves as a fat reservoir and also carries out the function of insulator. It is found below the skin and between internal organs.
- All movements in our body are brought about by the muscular tissue through the contraction and relaxation of their contractile proteins. Striated, unstriated and cardiac are three types of muscle tissues.
 - **Voluntary/skeletal striated muscles:** Muscles which move when we want them to, and stop when we so decide. They are cylindrical, unbranched and multinucleate. *e.g.*, muscles in limbs.
 - **Involuntary/smooth/unstriated muscles:** Muscles which we cannot start or stop simply by wanting to do so. They are spindle-shaped and uninucleate. *e.g.*, muscles in iris of eye.
 - **Cardiac muscles:** Involuntary muscles of the heart show rhythmic contraction and relaxation throughout life. They are cylindrical, branched and uninucleate.
- **Nervous tissue** is present in the brain, spinal cord and nerves.
- Neuron is made up of cell body containing nucleus and cytoplasm, dendrites and axon. Each neuron has a single long part, called the axon and many short, branched parts called dendrites.
- Neurons are specialized to receive and conduct impulses rapidly.

Important Diagrams

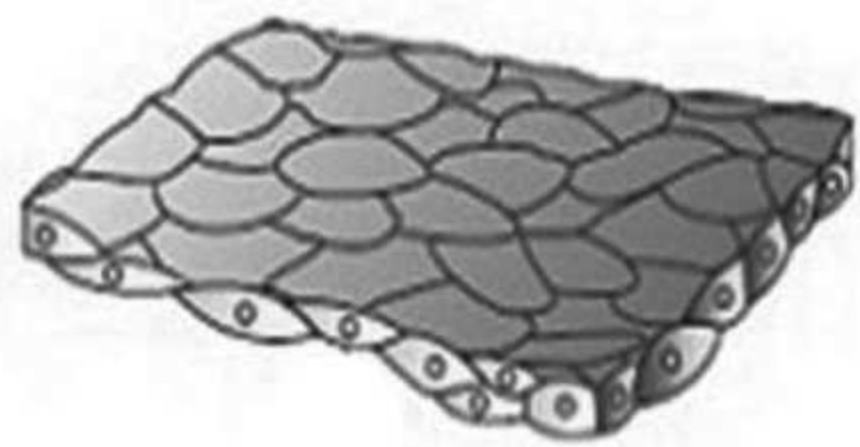
- **A neuron :**



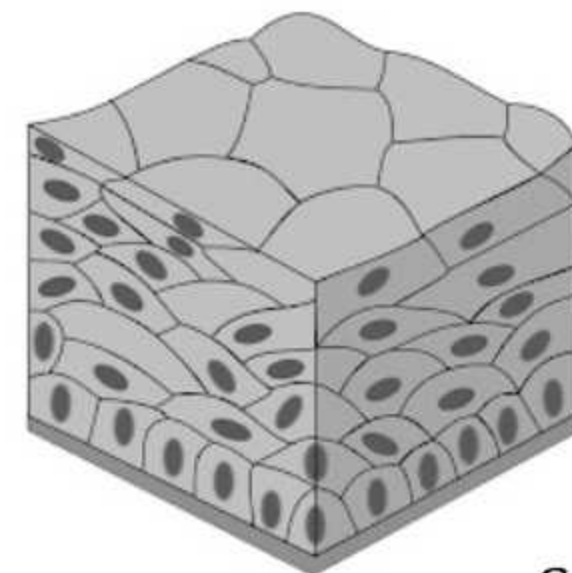
➤ **Tissues Chart :**



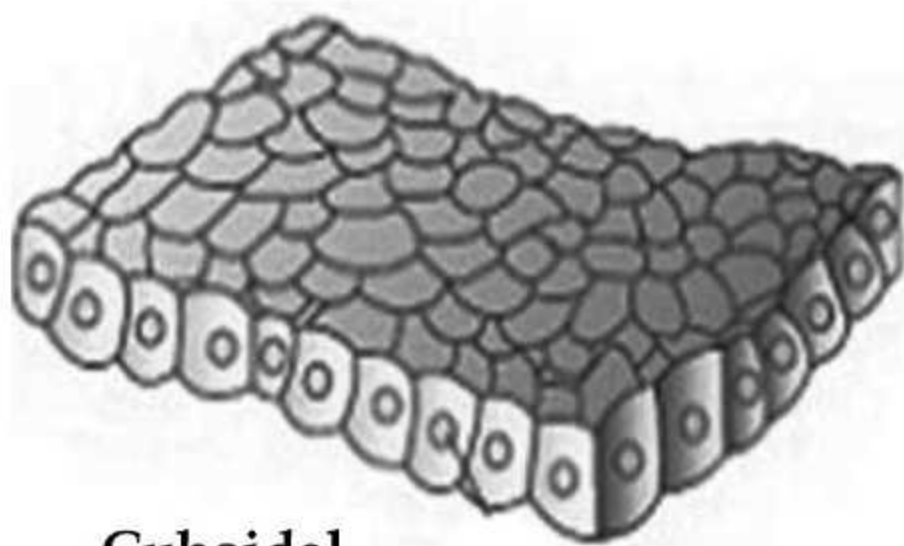
➤ **Different types of Epithelial Tissues:**



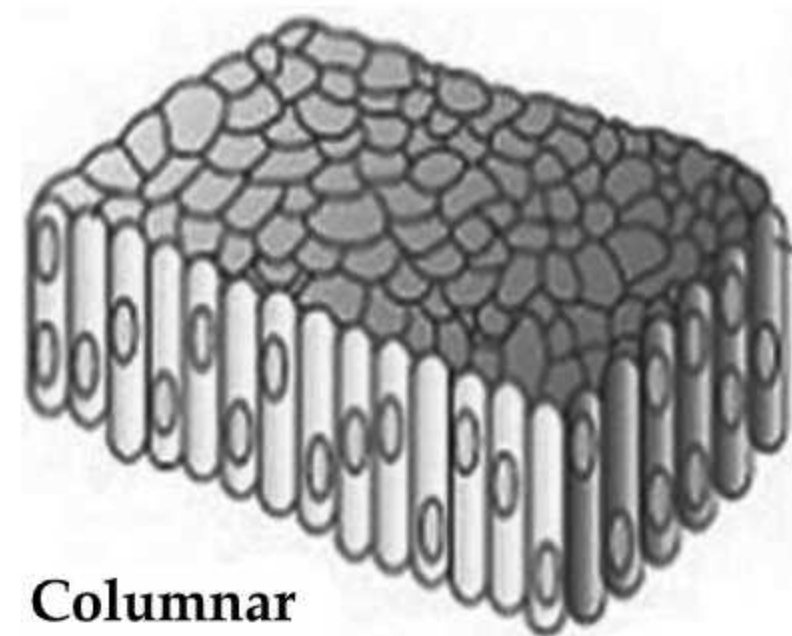
Squamous



Stratified

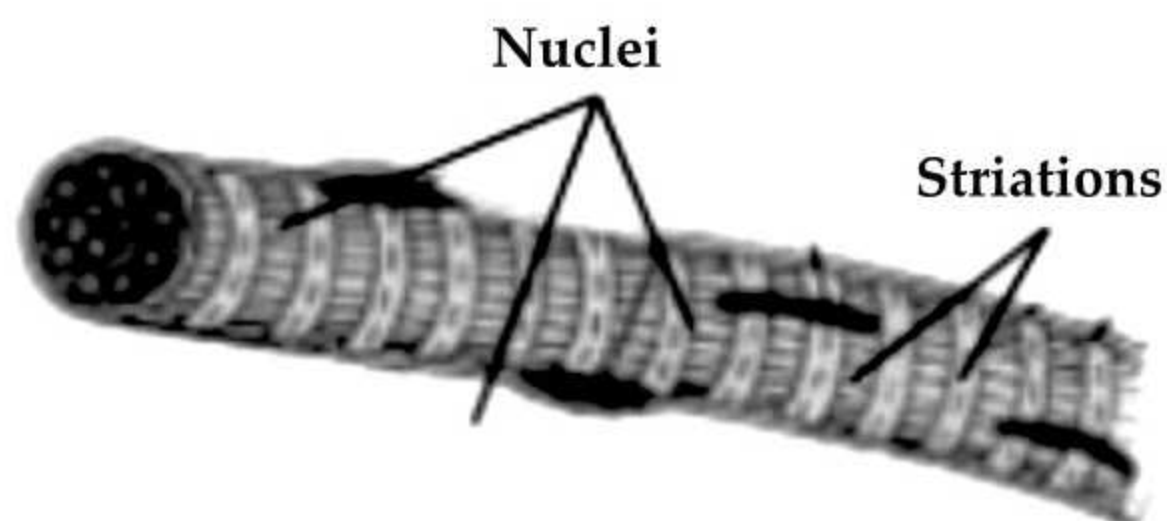


Cuboidal

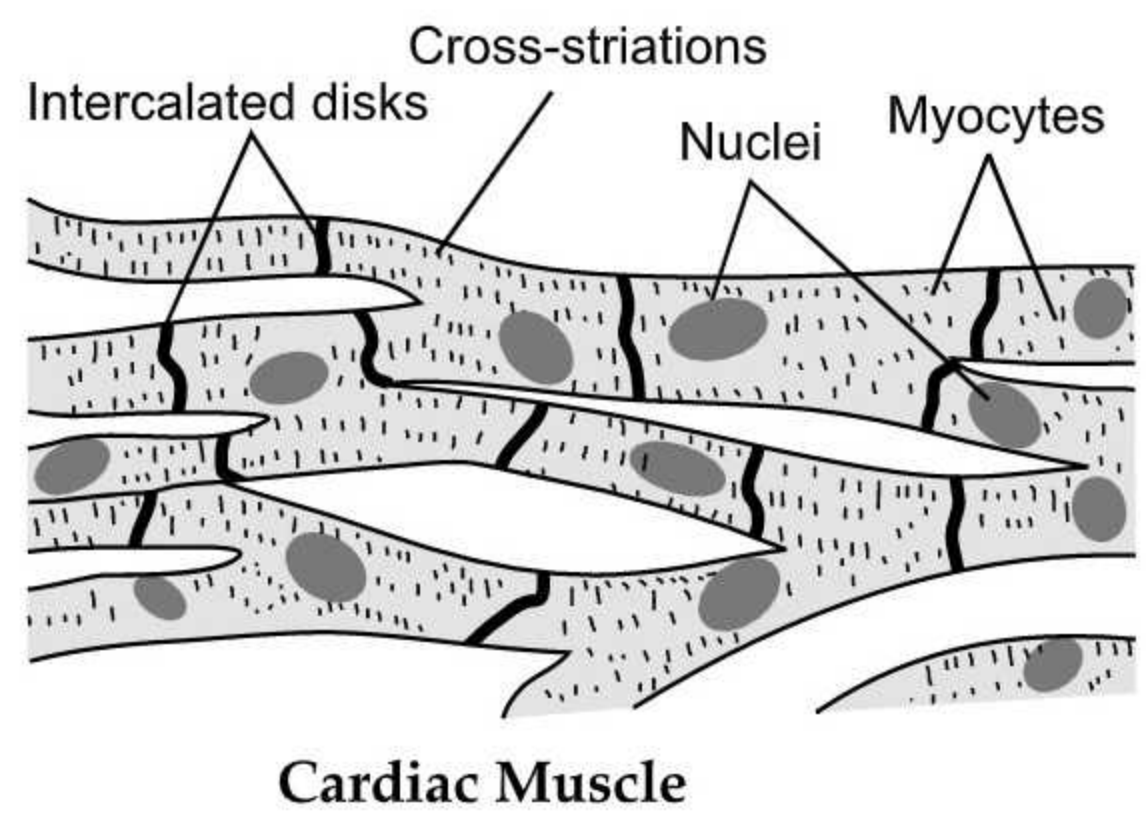
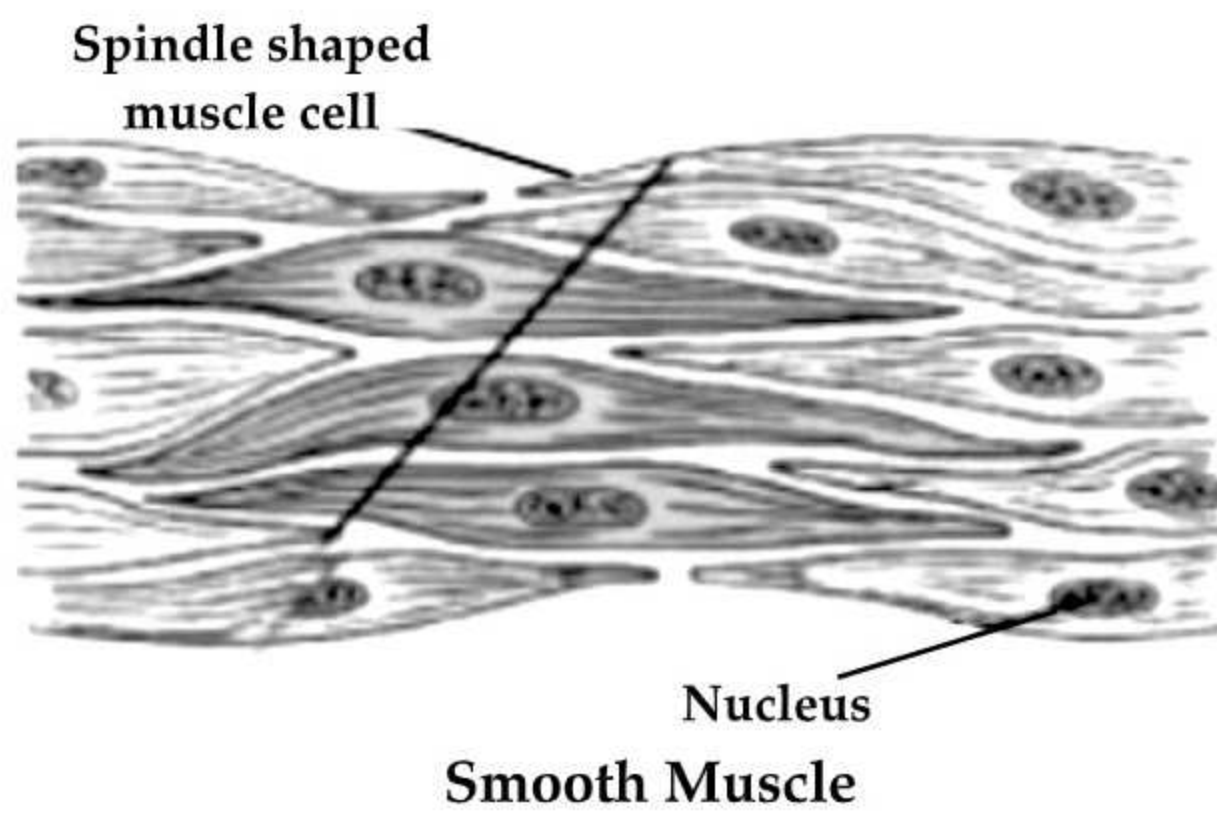


Columnar

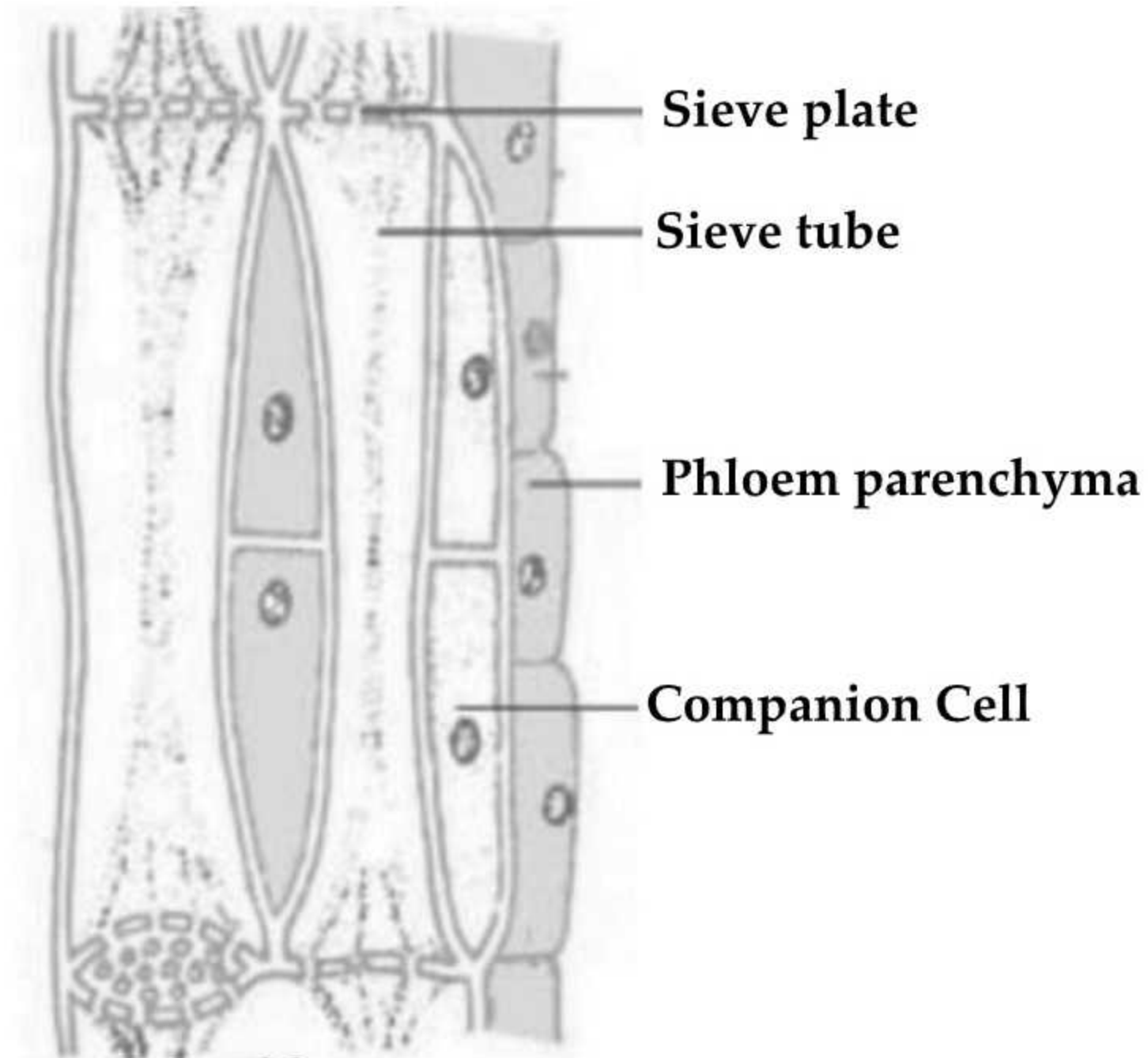
➤ **Types of Muscles Fibres:**



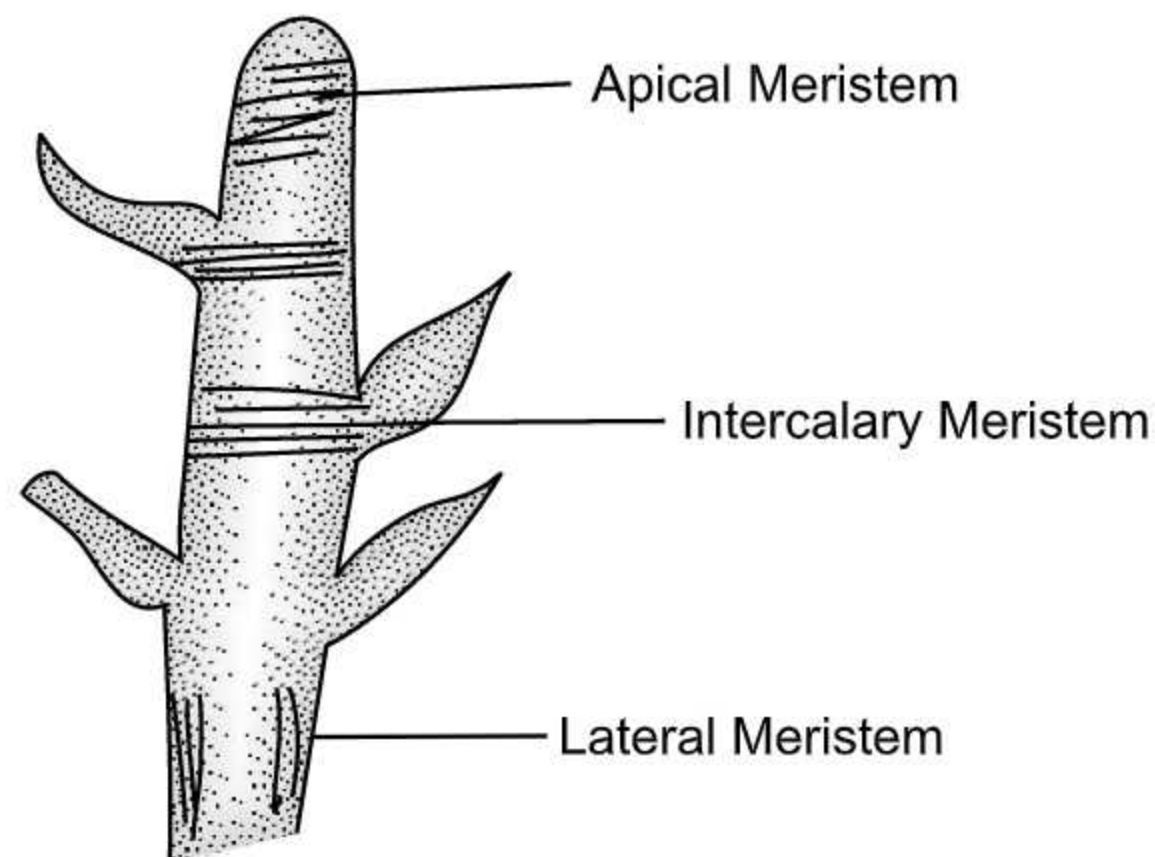
Striated Muscle



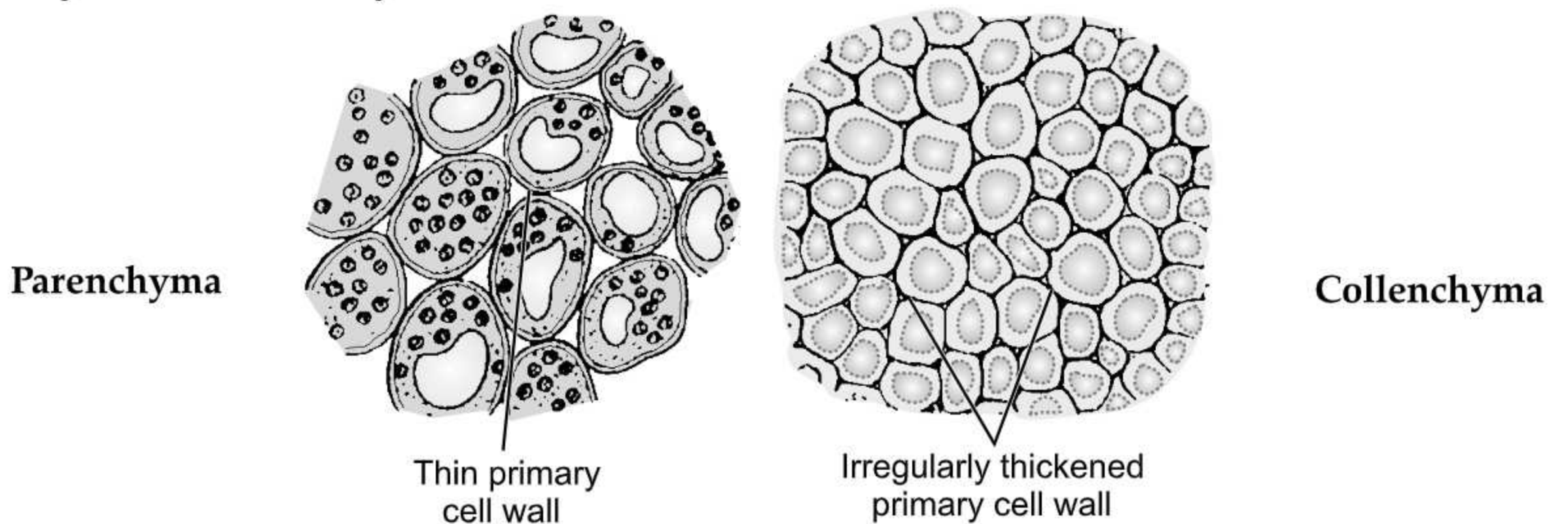
➤ Section of Phloem :



➤ Meristematic Tissues in Plants :

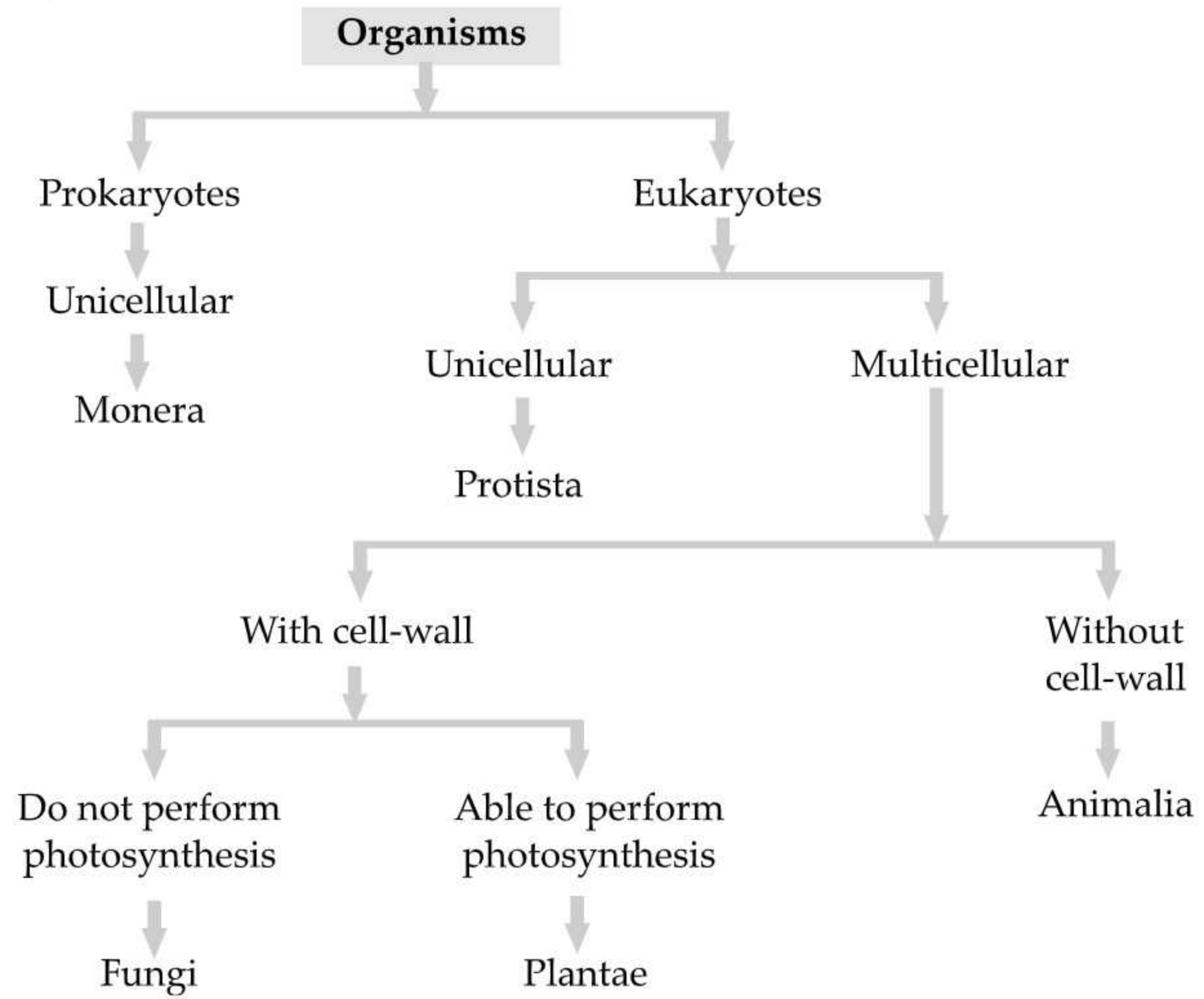


➤ Parenchyma and Collenchyma :

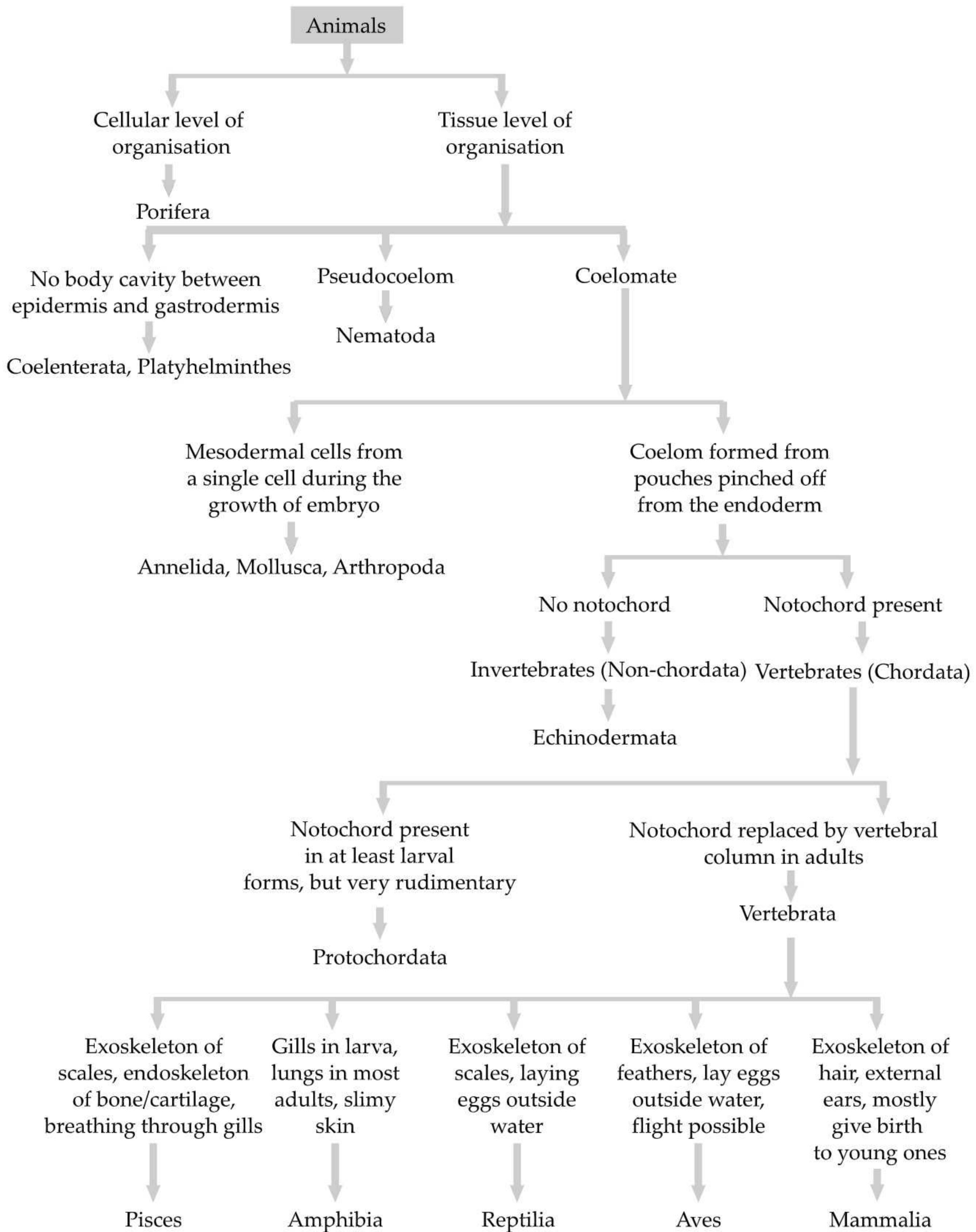


CHAPTER 7 : Biological Diversity

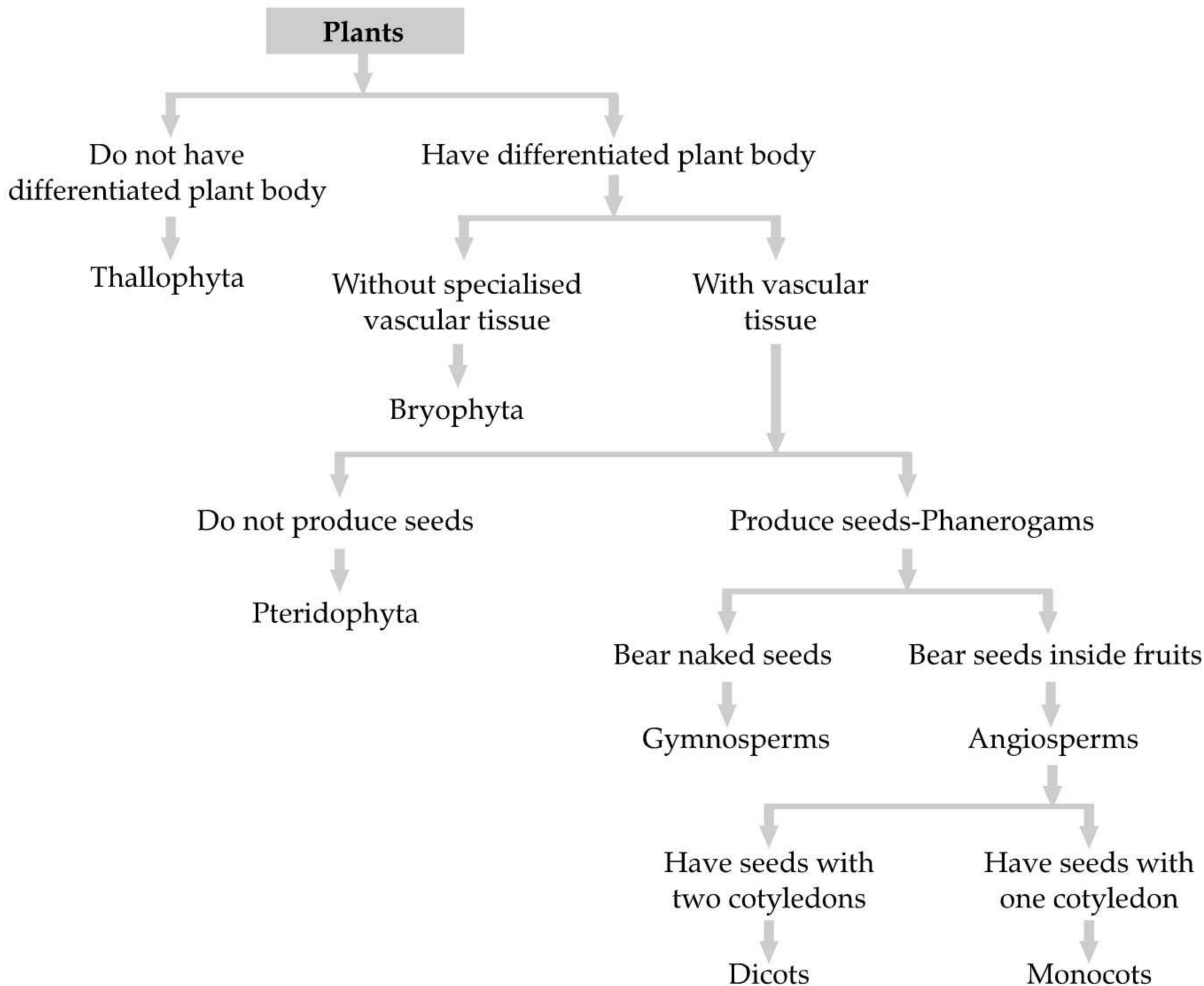
➤ The five kingdom classification :



➤ **Animal Classification :**



➤ **Classification of Plants :**

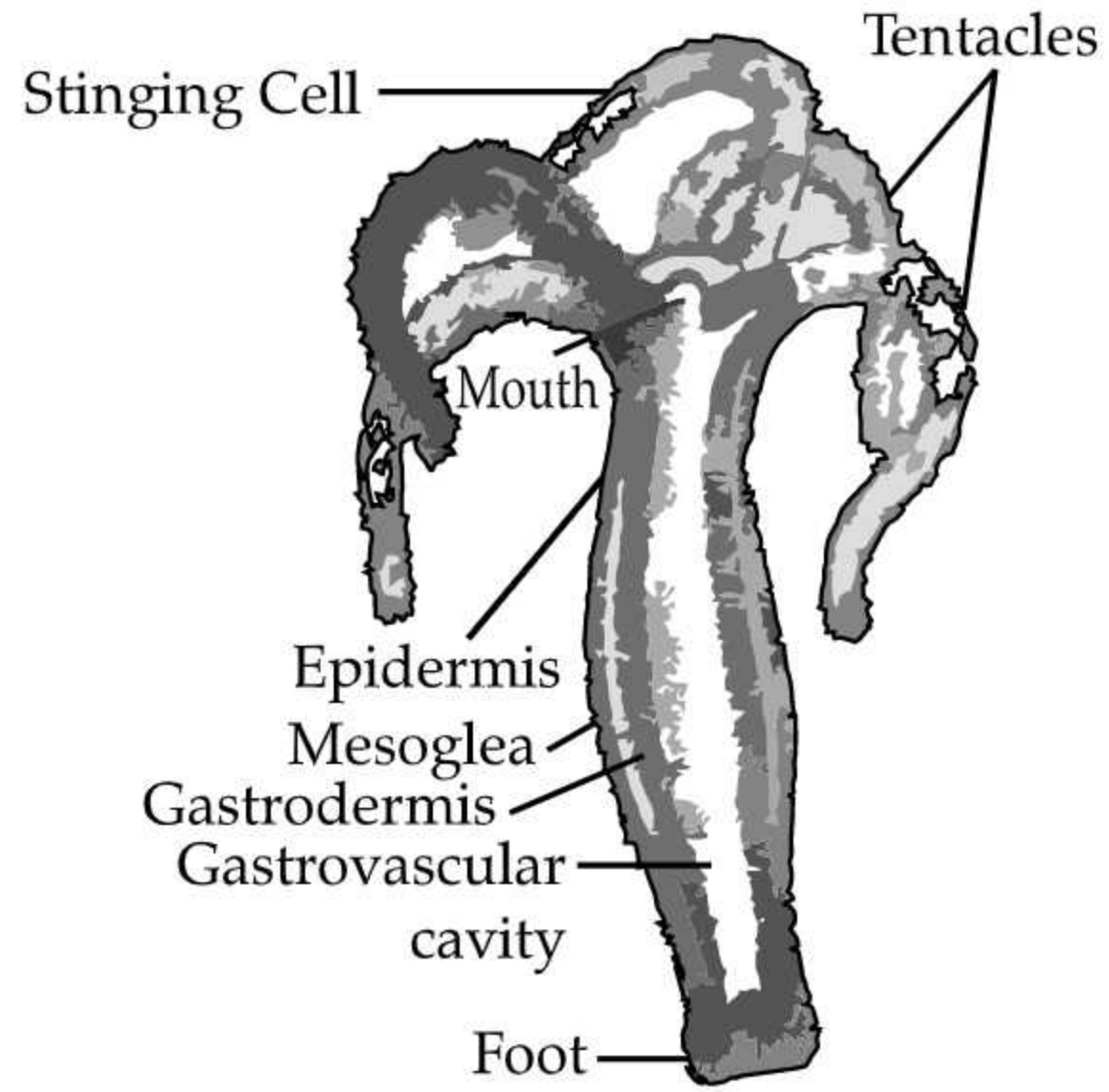


➤ **Classes of Vertebrates :**

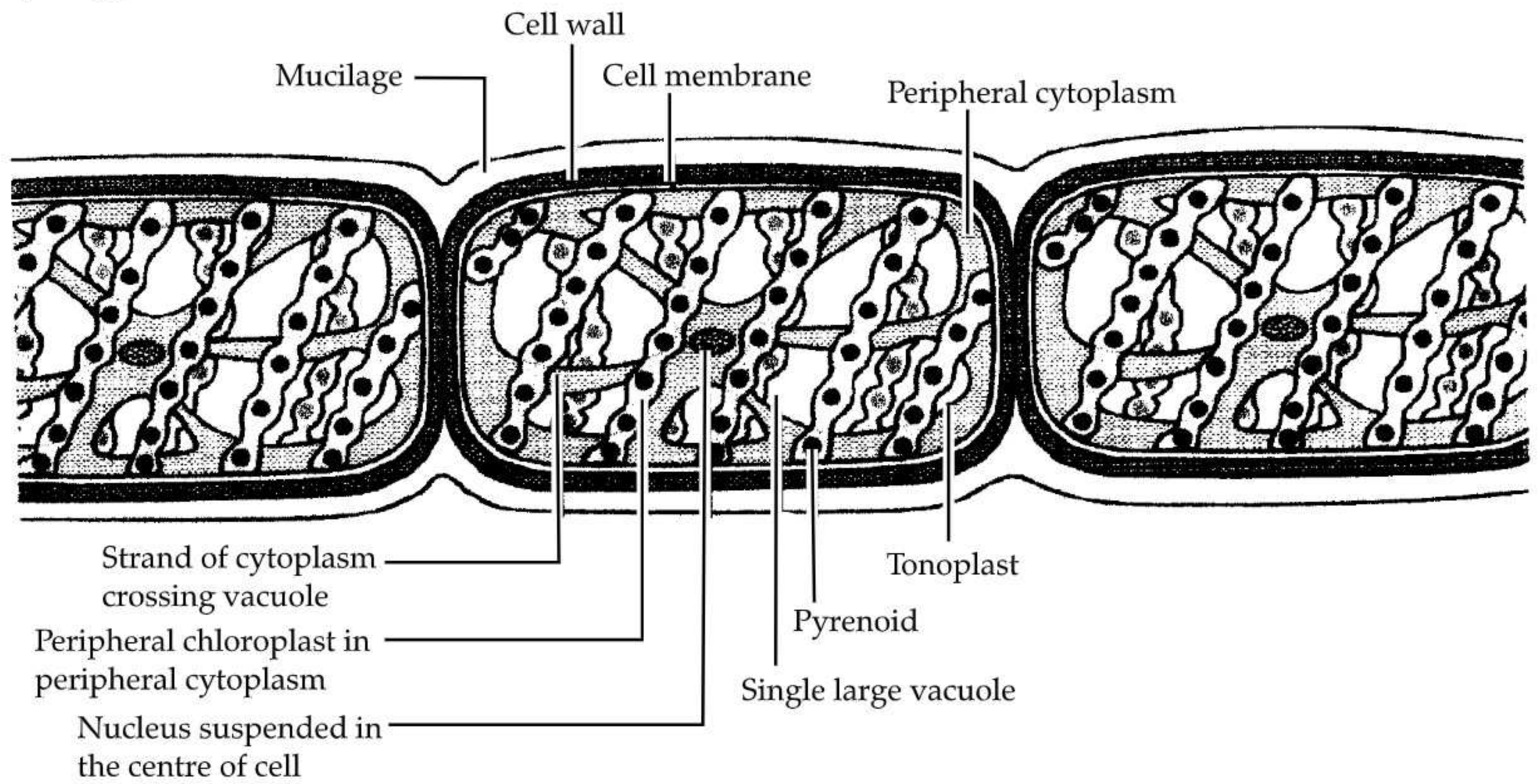
Characteristics	Pisces	Amphibia	Reptilia	Aves	Mammalia
Habitat	Aquatic	Terrestrial and aquatic	Terrestrial and aquatic	Land, aerial	Mainly land
Skin Cover	Scales	Mucus gland in skin	Scales	Feather	Hair, Nails
Respiratory Organ	Gills	Gills, skin and lungs	Lungs	Lungs	Lungs
Chambers of Heart	2	3	3	4	4
Reproduction	Lay eggs in water	Lay eggs in water	Lay eggs on land	Lay eggs on trees	Give birth to babies/young ones

Important Graphs and Diagrams

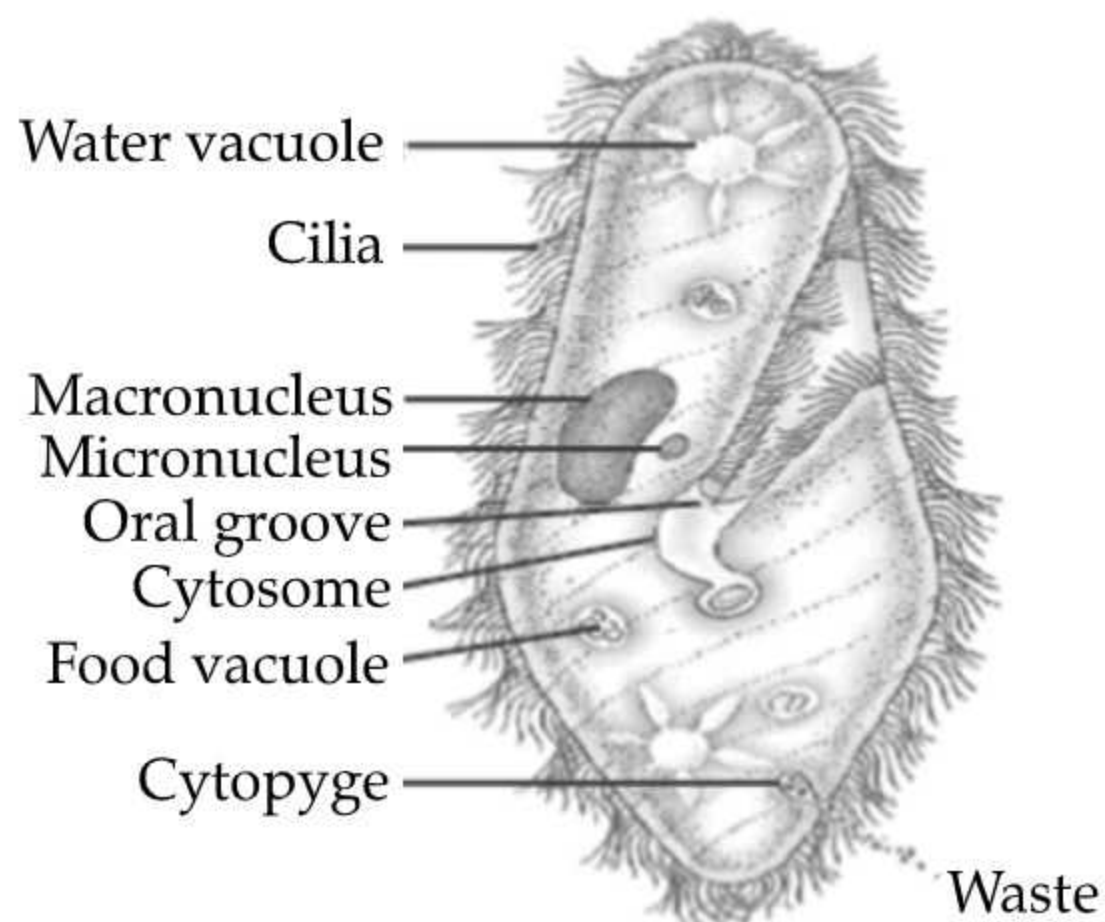
➤ *Hydra* :



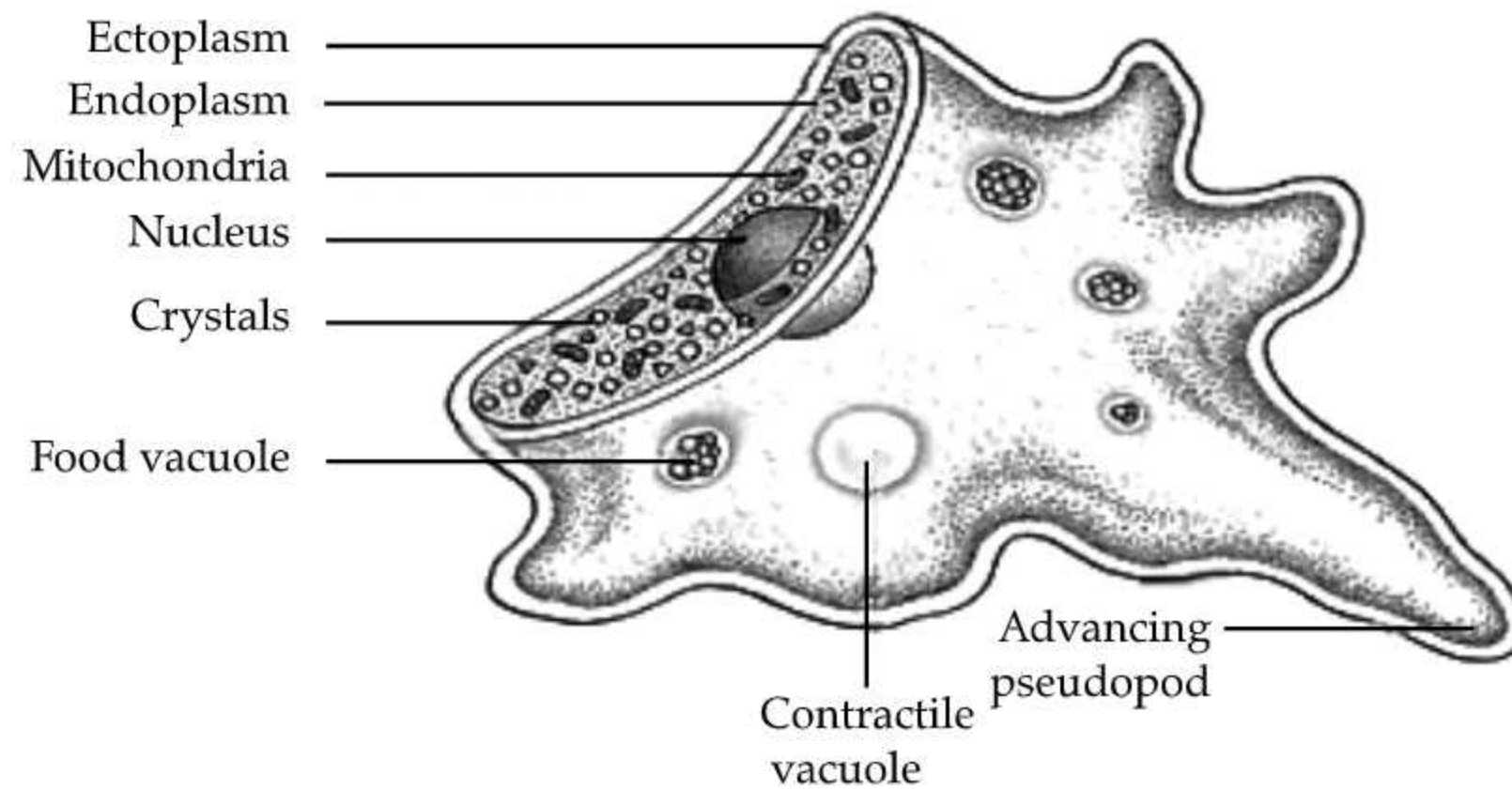
➤ *Spirogyra* :



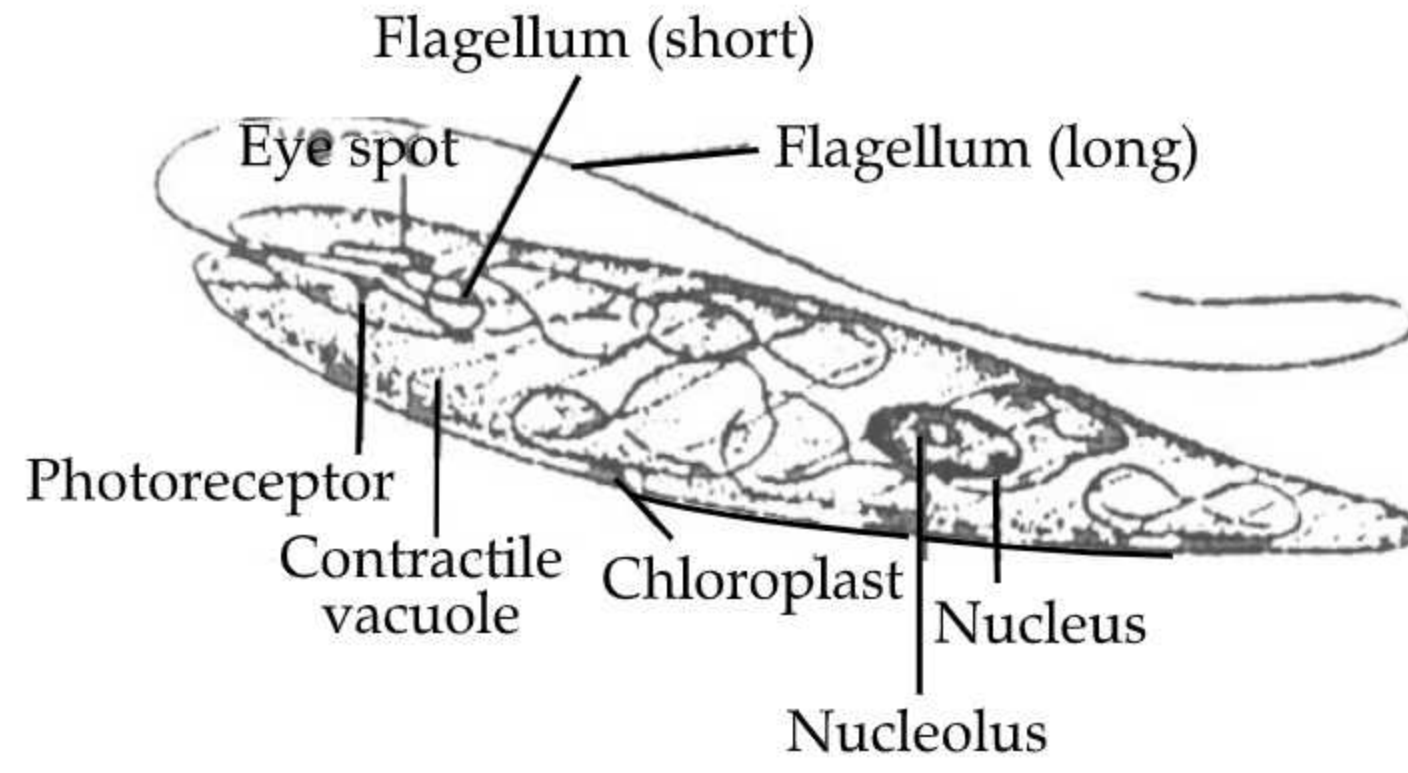
➤ *Paramecium* :



➤ *Amoeba* :



➤ *Euglena* :



CHAPTER 8 : Health and Diseases

Key Points and Concepts

- "Health" is a state of being well enough to function well physically, mentally, and socially.
- "Disease" is the lack of feeling of ease or distress due to impairment of health or a condition of abnormal functioning or structural disorder.
- Diseases are basically two types- Acute disease and Chronic disease.
- The disease which lasts for only a short period of time and do not cause major health effects is called **acute disease**. E.g., common cold.
- The disease which lasts for long period of time and hence, cause prolonged ill health is called **chronic disease**. E.g., tuberculosis.
- Based on the causes, diseases are of two types : Non-infectious diseases and infectious diseases.
- **Non-infectious diseases** : Diseases not caused by infectious agents, mostly internal and non-infectious cause. E.g. cancer.
- **Infectious diseases** : Diseases caused by microbes or by infectious agents. E.g., measles.
- **Different Infectious agents** :

Category of infectious agent	Examples of diseases caused
Virus	Common cold, influenza, dengue fever, AIDS
Bacteria	Typhoid, cholera, tuberculosis, anthrax
Fungi	Skin infections
Protozoans	Malaria, kala-azar
Worms	Intestinal worm infections, elephantiasis

- **Modes of transmission of communicable diseases** :

(1) Direct transmission :

- a. Contact with infected person; example : Smallpox.
- b. Airborne diseases; example : Influenza.
- c. Contact of open wounds or injuries with soil; example : Tetanus.
- d. Animal bites; example : Rabies.
- e. Through placenta, blood to blood contact; example : AIDS.
- f. Through sexual contact; example : AIDS, Syphilis

(2) Indirect transmission :

- a. By carriers or vectors; example : Malaria.
- b. Through blood; example : Hepatitis-B.
- c. Through food and water; example : Cholera.
- d. Through contaminated articles; example : HIV.
- e. By unclean hands and fingers; example : Hepatitis-A.
- f. through sexual contact; example : AIDS, syphilis.

- **Causes of Diseases** :

- a. Biological agents; example : Bacteria, virus, protozoa.
- b. Nutrient agents; example : Deficiency of proteins, minerals, vitamins.
- c. Endogenous chemicals; example : Urea, uric acid.
- d. Exogenous chemicals; example : Pollutants, pollens.
- e. Physical agents; example : Temperature, humidity, radiation.
- f. Mechanical agents; example : Friction or other mechanical forces which result in injury, sprain.

- **Antibiotic** is a medicine (such as penicillin or its derivatives) that inhibits the growth of or destroys microorganisms.
- Antibiotics do not work against viral infections.
- An infectious disease can be treated in two ways :
 - (i) Reduce the symptoms of the disease by providing treatment.
 - (ii) Kill the infectious agent causing the disease.
- There are three limitations, which are normally confronted while treating an infectious disease :
 - a. Once someone has disease, their body functions are damaged and may never recover completely.
 - b. Treatment will take time, which means that someone suffering from a disease is likely to be bedridden for some time even if we can give proper treatment.
 - c. The person suffering from an infectious disease can serve as the source from where the infection may spread to other people.
- AIDS virus can also spread through blood transfusions, use of infected needles or during pregnancy and breast feeding by an infected mother.
- **General ways of preventing infectious disease are :**
 - a. **Air-borne** : We can prevent exposure by providing living condition that are not over crowded.
 - b. **Water-borne** : Can be prevented by providing safe drinking water. This is done by treating the water to kill any microbial contamination.
 - c. **Vector-borne** : We can provide clean environment, which would not allow mosquito breeding.
- Proper nutrition is essential to maintain body immunity.
- There are vaccines against tetanus, diphtheria, whooping cough, measles, polio and many other diseases.
- **Hygiene** is the condition and practices that help to maintain health and prevent the spread of diseases. Public hygiene measures include providing safe drinking water, clean environment and adequately spacious conditions for living.
- **Vaccination** is another way to prevent the disease in which killed microbes are introduced into the body to develop antibodies and can prevent occurrence of disease during actual entry of disease causing microbes.
- The process by which a person is made immune or resistant to an infectious disease, mainly by the administration of a vaccine is called **immunization**.

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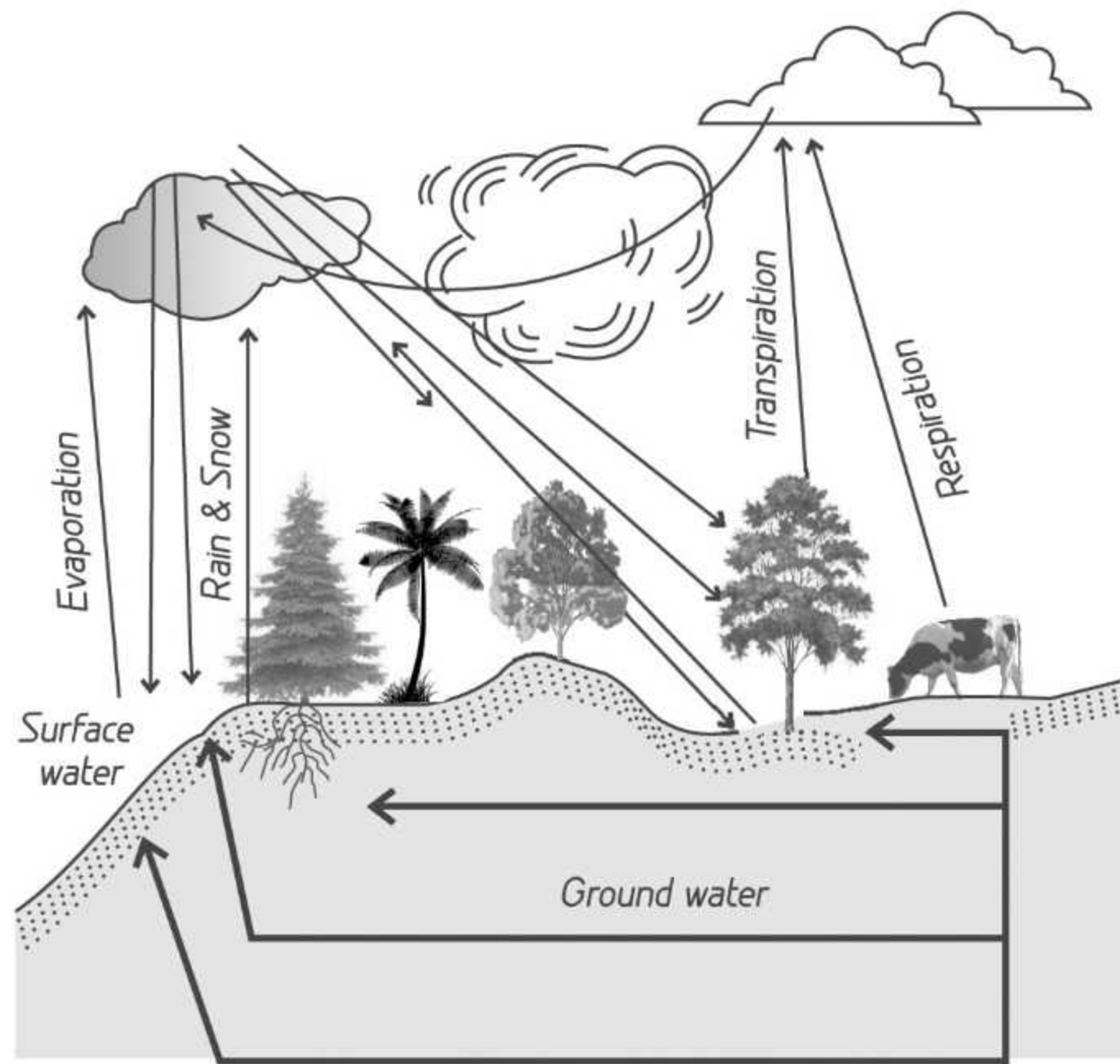
CHAPTER 15 : Natural Resources

Key Points and Concepts

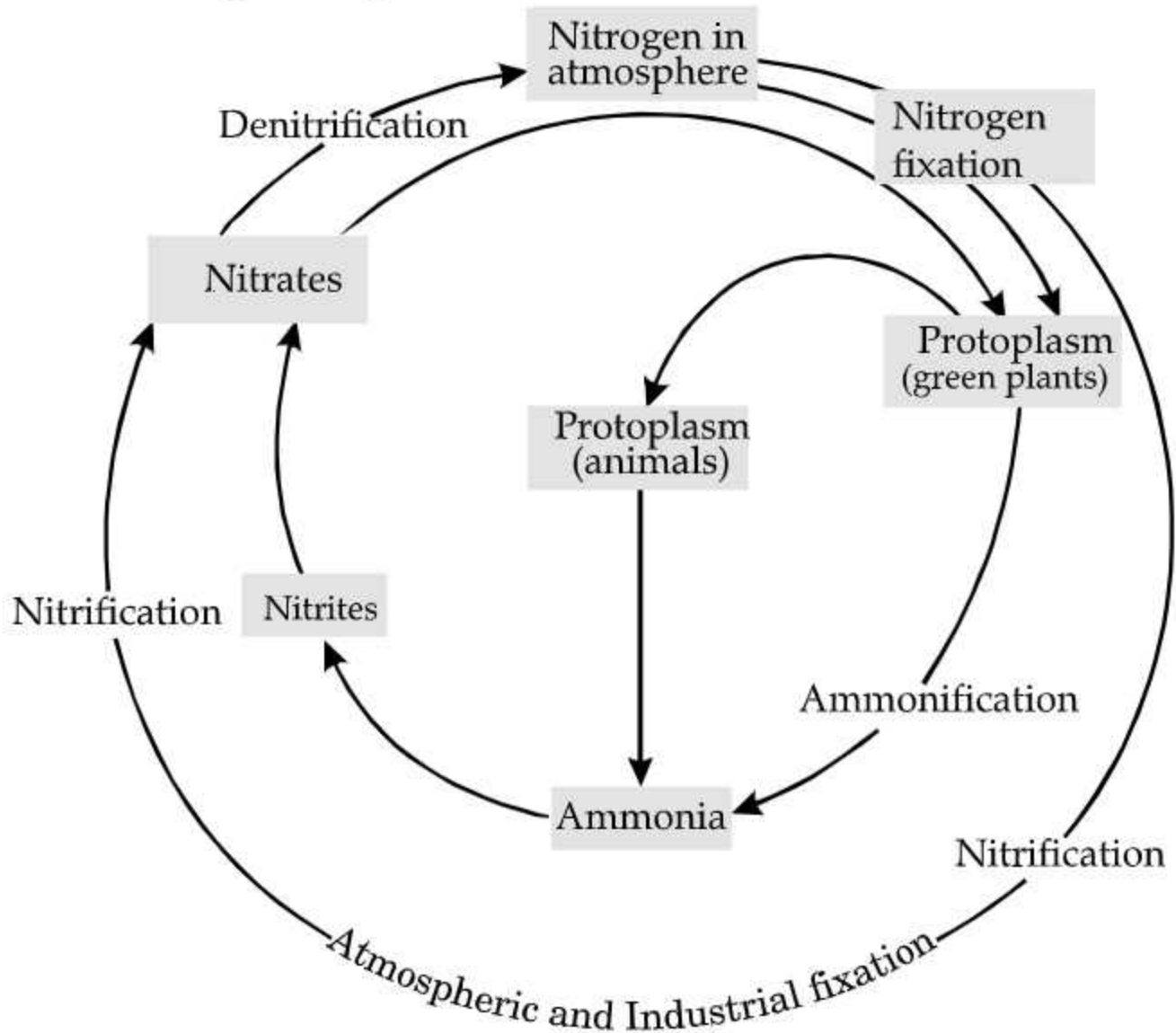
- Life on earth is responsible for the present atmosphere of earth, consisting of gases like nitrogen (78%), oxygen (21%), carbon dioxide (0.03%) and water vapour.
- **Biosphere** comprises of biotic (living components of the environment) and abiotic (non-living components of the environment) factors, which interact with each other and maintains a balance.
- Atmosphere acts as a protective blanket for the earth.
- Wind is caused by uneven heating of air over land and water-bodies.
- The wind patterns in a particular region direct the rainfall patterns of that region.
- **Air pollution** is an undesirable change in the physical, chemical or biological characteristics. It is caused due to an increase in the content of harmful substances (pollutant) such as oxides of nitrogen and sulphur, etc.
- Burning of fossil fuels releases harmful oxides of sulphur and nitrogen, which gives rise to acid rain.
- **Water is important to living organisms because :**
 - (i) All cellular processes require an aqueous medium.
 - (ii) Dissolved substances are needed for body reactions as well as for transportation.
- **Water pollution is caused by addition of following to water bodies :**
 - (i) Fertilizers and pesticides
 - (ii) Sewage
 - (iii) Waste from factories
 - (iv) Heated water from factories
 - (v) Cold water from dams.
- **Soil** is a mixture of rock particles, humus and microscopic and small organisms.
- The average size of particles decides the type of soil and the quality of the soil is decided by the amount of humus and the microscopic organisms present in it
- Ozone is present in the upper atmospheric strata and contains three atoms of oxygen.
- The ozone layer absorbs the sun's harmful ultraviolet radiations, thus preventing them from reaching the Earth's surface and damaging life.
- **CFC's** are carbon compounds that have both fluorine and chlorine which are very stable and cannot be degraded by any biological process.
- CFCs and other man-made compounds react with the ozone molecules and causes ozone layer depletion.
- **Green-house effect** : The process in which green-house gases like carbon dioxide, cause thermal radiation emitted by the Earth's surface to be reflected back down, therefore causing the increase in worldwide average temperatures.
- **Global warming** : An increase in the average temperature of the earth's atmosphere, brought about by the enhanced greenhouse effect.
- **Biogeochemical cycle** : The cyclic transformation of chemicals through interacting biological, geological and chemical processes that causes transfer of energy and matter amid the various components of the biosphere, leading to a balance between them.
- **Water cycle** : The whole process in which water evaporates and falls on the land as rain and later flows back into the sea via rivers.
- **Nitrification** : The process of converting reduced nitrogen (as ammonia or ammonium) to its more oxidized forms (nitrite or nitrate ions).
- **Denitrification** : A process in which anaerobic bacteria convert nitrate ions into nitrogen gas.
- **Ammonification** : The process in which organic forms of nitrogen are converted into ammonia or ammonium ion by heterotrophic bacteria.

Important Graphs and Diagrams

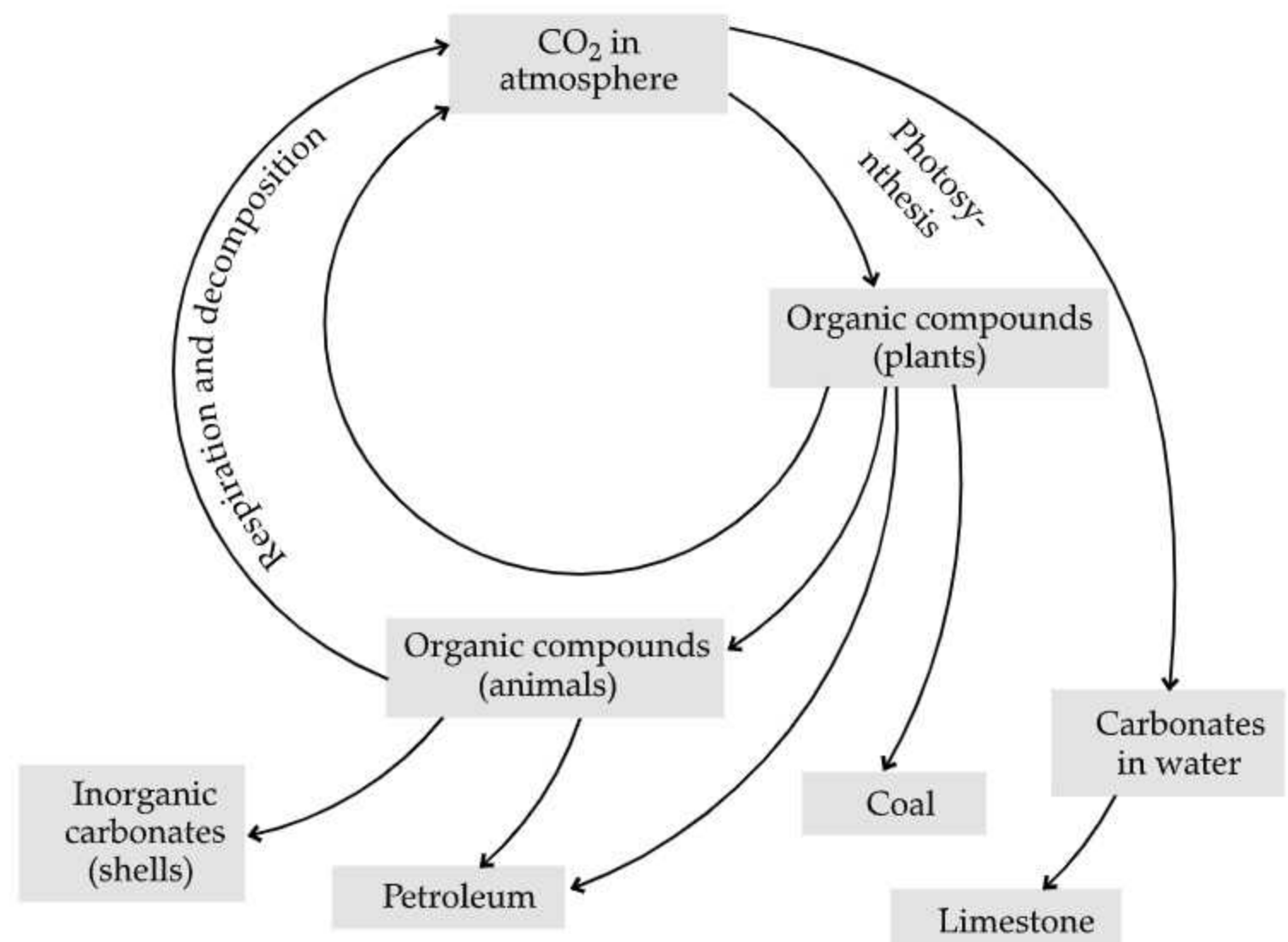
➤ Water cycle :



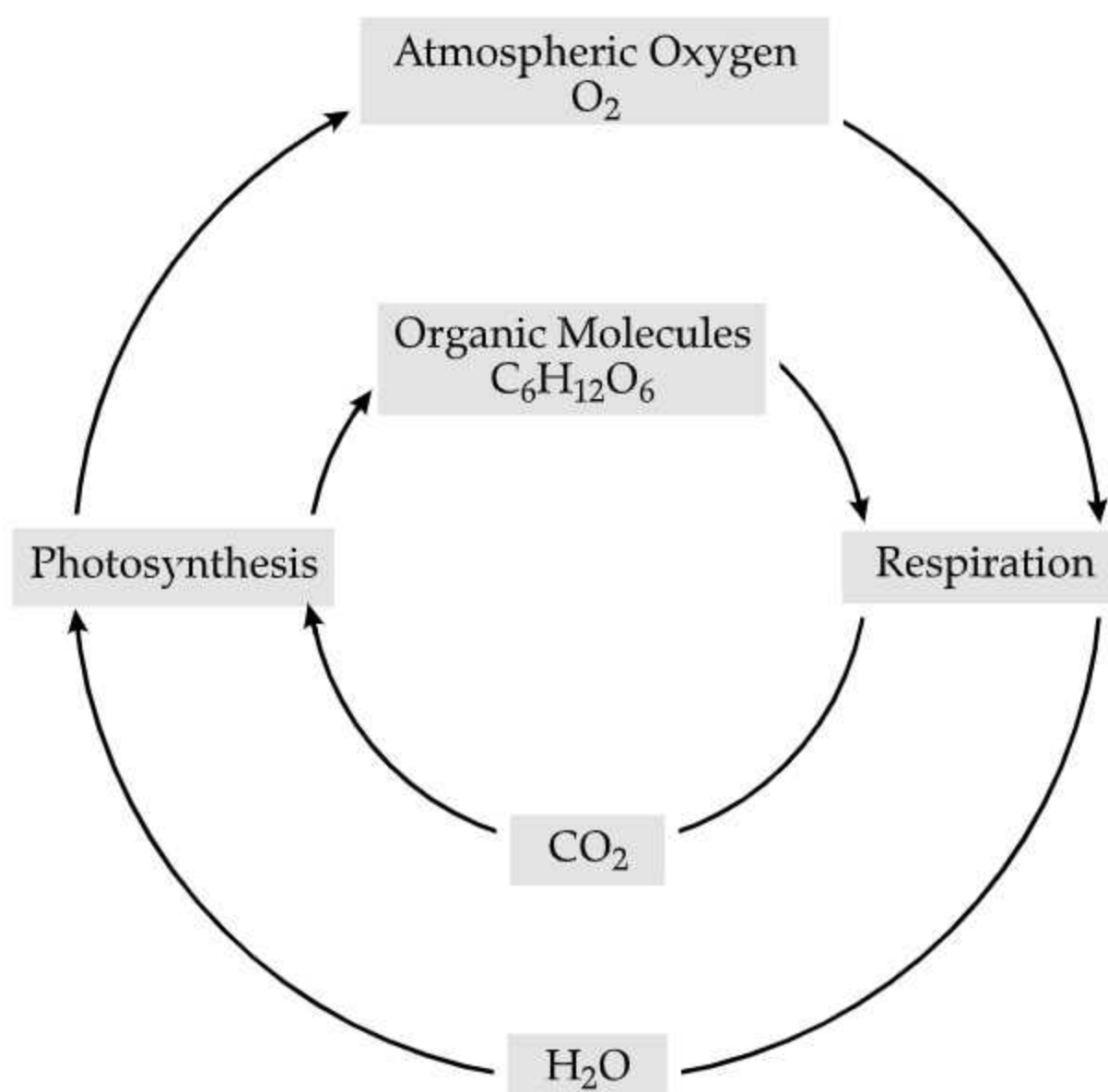
➤ Nitrogen Cycle :



➤ Carbon Cycle :



➤ Oxygen Cycle :



CHAPTER 16 : Improvement in Food Resources

Key Points and Concepts

- Agriculture and animal husbandry provide us with all our animal and plant food.
- Kharif season lies in the month of June to October, and Rabi season lies in the month of November to April.
- Kharif crops like paddy and cotton are grown in rainy season whereas Rabi crops like wheat and mustard are grown in winter season.
- **The characteristics desirable in crop plants are :**
 - (i) Increased yield.
 - (ii) Improved quality (such as baking quality in wheat, protein quality in pulse, etc.)
 - (iii) Resistance to a biotic and abiotic factors, especially those harming the plant.
 - (iv) Reduction in duration of plant maturity.
 - (v) Broad range adaptability of the crop plant under various environmental conditions.
 - (vi) Desired agronomic characteristics particular to a plant.
- The sixteen nutrients required by plants are obtained through air, water and soil.
 - (i) **Macronutrients (nutrients required in large quantities):** Nitrogen, phosphorus, potassium, calcium, magnesium and sulphur.
 - (ii) **Micronutrients (nutrients required in small quantities) :** Iron, manganese, boron, zinc, copper , molybdenum and chlorine.
- **Manure :** Organic substances of animal or plant origin that is added to the soil to increase its fertility and structure.
- **Fertilizer :** Commercially produced plant nutrients that enriches the soil fertility and increases the crop yield.
- **Organic farming :** A farming system with minimal or no use of chemicals as fertilizers, pesticides etc. and with a maximum input of organic manures, recycled farm-wastes, along with use of bio-agents and healthy cropping systems.
- **Mixed cropping :** The practice of growing two or more crops simultaneously on the same field. E.g., wheat + gram, or wheat + mustard, or groundnut + sunflower.
- **Inter-cropping :** The practice of growing two or more crops simultaneously on the same field in a definite pattern. E.g., soyabean + maize, or finger millet (bajra) + cowpea (lobia).
- **Crop rotation :** The growing of different crops on a piece of land in a pre-planned succession.
- **Hybridisation** refers to crossing between genetically dissimilar plants or animals.
- **Weeds :** Unwanted plants in the cultivated field (e.g., *Xanthium*, *Parthenium*, *Cyperus rotundus*).
- **Watershed Management :** Scientific conservation of soil and water.
- **Animal Husbandry :** Animal husbandry is the scientific management of animal livestock. It includes various aspects such as breeding, feeding and disease control.
- **Milch Animals :** Milk producing female animals.
- **Draught Animals :** Animals used for farm labour.
- *Bos indicus* and *Bos bubalis* are the two species of Indian cattle.
- The ways of obtaining fish is from natural resources, called capture fishing and by fish farming, called culture fishery.
- Marine fisheries is concerned with obtaining fish from oceans and seas.
- Inland fishery include capture fishing from fresh water resources.
- **Local and Exotic Bees :**
 - (a) Indian bee - *Apis cerana indica*,
 - (b) The rock bee variety - *Apis dorsata*, } (Indigenous)
 - (c) The little bee - *Apis florea*
 - (d) Italian bee variety - *Apis mellifera*. } (Exotic)