

Chapter 6:- TISSUE

Part:-1

Tissue

A group of cells that are specialized to perform a particular function forms a tissue.

Tissues are mainly classified into two types:

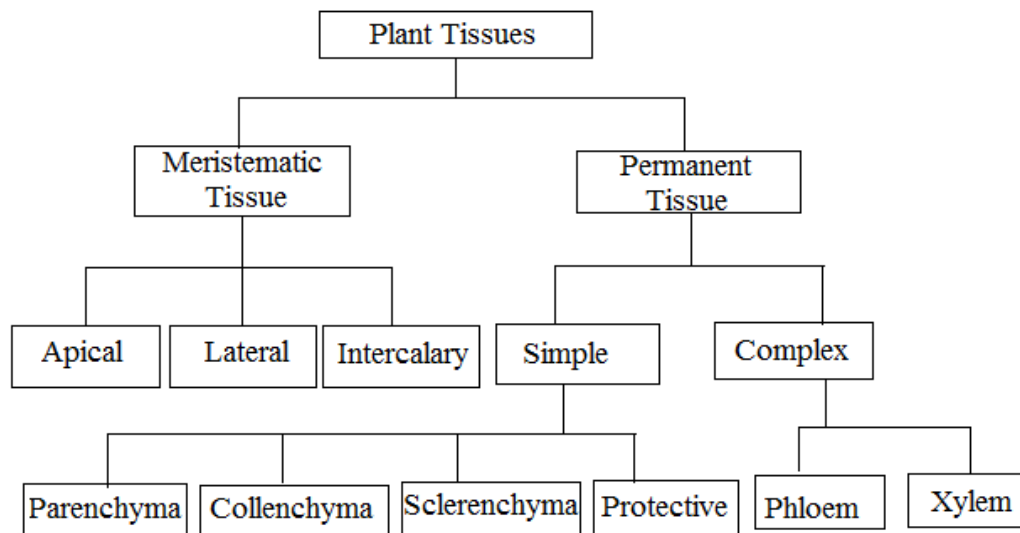
1. Plant Tissues 2. Animal Tissues

1. Plant tissues

- Plants do not move, i.e., they are stationary.
- Most of the tissues they have are supportive, which provides them with structural strength.
- Most of these tissues are dead, as they can provide better mechanical strength than the live ones, and need less maintenance.
- Some of the plant tissues keep on dividing throughout the plant life. These tissues are localised in certain regions.

Types of Plant Tissues:

Based on the dividing capacity of the tissues, various plant tissues can be classified as growing or meristematic tissue and permanent tissue which have further sub-divisions as explained below:



A. Meristematic Tissue

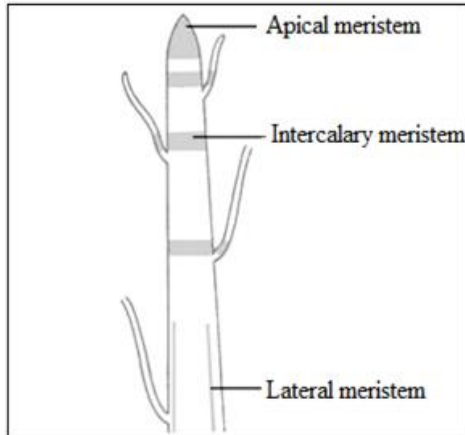
Meristematic tissues are responsible for growth in plants. Cells in these tissues can divide and form new cells.

Meristematic tissues are of three types:

(i) Apical Meristem: It is present at the growing tip of the stem and roots and increases the length. .

(ii) Lateral Meristem (cambium): It is present beneath the bark. It is responsible for growth in girth of trunk.

(iii) Intercalary Meristem: It is present at internodes or base of the leaves and increases the length between the nodes.



**Location of meristematic tissue
in plant body**

Permanent Tissue

- Cells of meristematic tissues change their shape & size to get specialised in performing other functions in plants body. This process is called Differentiation.
- Once the cells of meristematic tissue divide to a certain extent, they become specialized for a particular function.

Permanent tissues are of two types:

Simple tissues and Complex tissues

(i) Simple tissues: This type of tissue is composed of same type of cells. These are again of four types:

(a) Parenchyma simple tissues: Cells of parenchyma tissues are live. They are oval, elongated and loosely packed with large inter-cellular space, forming basic packing of tissue and are found throughout the plant body. Functions of parenchyma:

- They provide mechanical support to the plant body.
- They store food and nutrients in vacuoles.

Chlorenchyma: Parenchyma with chlorophyll which performs photosynthesis is called as chlorenchyma.

Aerenchyma: In aquatic plants, cells of parenchyma have large air cavities to give buoyancy to the plant and is called aerenchyma .

(b) Collenchyma simple Tissues: Cells of collenchyma are live. They are oval and elongated and tightly packed with no inter-cellular spaces. They are found below epidermis in leaves and stem.

Functions of collenchymas tissues:

- They provide mechanical support to plant.
- They also provide flexibility to plants so that they can bend without breaking.

(c) Sclerenchyma Simple Tissues: Cells of sclerenchyma are dead. They are narrow and elongated. The cell wall in sclerenchyma is composed of lignin which makes it hard. Sclerenchyma are found around vascular bundles, veins of leaves in hard covering of seeds and nuts. For example: Sclerenchyma tissues are found in coconut husk.

Functions of sclerenchyma:

- They help to make parts of plant hard and stiff.
- Also provides mechanical strength.

(d) Protective tissues: They protect the plant body by forming an outer layer.

There are two types of protective tissues:

1. Epidermis Simple Tissues: Epidermis tissue covers the entire body of plant. They protect plant from injury, germs and water loss.

Cells of epidermal tissue form a continuous layer without intercellular spaces.

Stomata are small openings on epidermal layer of leaf and soft part of stem to facilitate the gaseous exchange and transpiration in plants. Each stomata is composed of two guard cells which regulate the opening and closing of stomata.

In desert plants, epidermis and cutin (a water proof waxy substance secreted by epidermis) are thicker to reduce loss of water due to transpiration.

2. Cork Simple Tissues: These types of tissue consist dead cells with no intercellular spaces. They form the outer layer of old tree trunks.

Cork cells have a chemical called suberin in their walls that makes them impervious to gases and water.

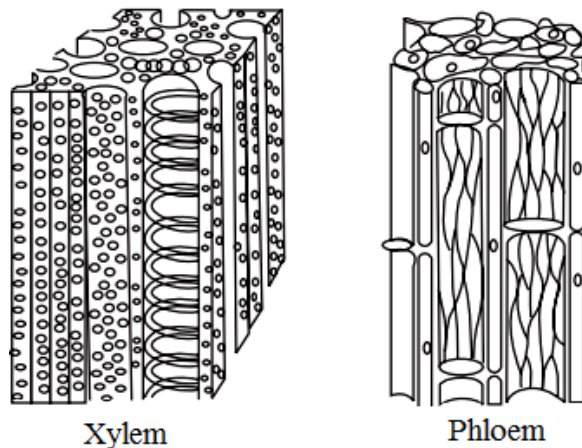
Cork tissue protects plants from injuries, germs and water loss.

Cork being light in weight is used for making several products like bottle stoppers and shuttle cork.

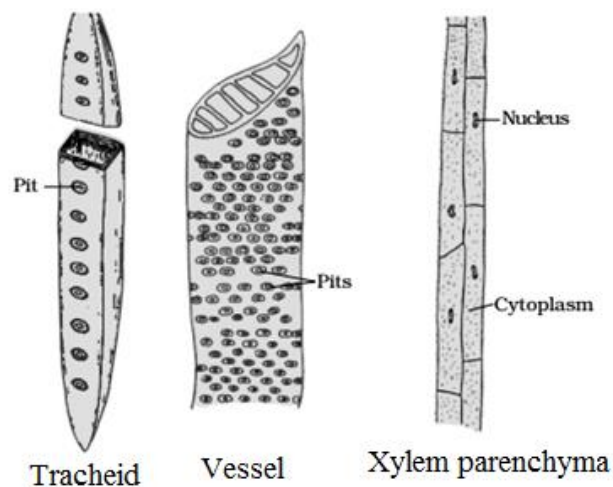
(ii) Complex tissues: Group of different type of cells performing common task together are named as complex tissues.

Complex tissues are of two types:

(a) Xylem (b) Phloem



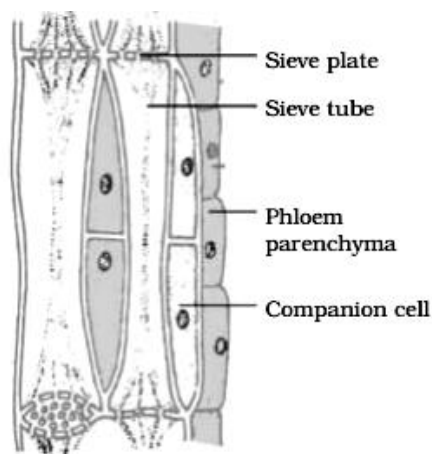
(a) Xylem: This is the tissue that transports water and nutrients from root to upper parts of plant. It is composed of four types of cells i.e., tracheid, vessel, xylem parenchyma and xylem sclerenchyma (fibre).



1. Tracheids are long elongated cells with tapered ending. Tracheid cells are dead. Tracheid transports water through pits.
2. Vessel is a pipe like structure. Vessels are dead and have lignified thick cell wall. Upper and lower portion of cell wall is absent.
3. Parenchyma are living cells. They store food and nutrients.
4. Sclerenchyma (fibres) are dead cells. They provide mechanical support to plant.

(b) Phloem: Phloem is the tissue that transports food from site of photosynthesis to different parts of plants.

It is composed of four types of cell i.e. sieve cells, companion cells, phloem parenchyma, phloem fibre or blast fibre. All types of cells are live except phloem fibres.



Sectional view of phloem

1. Sieve cells are elongated and have thin cell wall. They have cytoplasm but no nucleus and other organelles. These cells are responsible for transportation of food and nutrients
2. Companion cells have cytoplasm, nucleus and other organelles. They perform the tasks required for sieve cells for living.
3. Phloem parenchyma store food.
4. Phloem fibres have thick cell wall and they provide mechanical support to plant.

Try the following questions:

- Q1. Name the tissue which allows easy bending in various parts of a plant.
- Q2. What is the function of xylem?
- Q3. Name the tissues which make up the husk of coconut.
- Q4. Which type of permanent tissue does carrot contain?
- Q5. Name the part of phloem with perforated walls.

Part: -2

Animal Tissues

- Animals move around in search of food, mates and shelter.
- Most of the tissues they contain are living.
- The structural organisation of organs and organ systems is far more specialised and localised in animals than in plants.

Types of Animal Tissues:

Animal tissues are classified into four types based on the functions they perform:

- (i) Epithelial
- (ii) Connective
- (iii) Muscular
- (iv) Nervous

(i) Epithelial tissues

They form the covering of the external surfaces, internal cavities and organs of the animal body.

Epithelial tissue cells are tightly packed and form a continuous sheet.

The skin, the lining of the mouth, the lining of blood vessels, lung alveoli and kidney tubules are all made of epithelial tissue.

Functions of Epithelial Tissue:

- (i) Epithelium covers most organs and cavities within the body.
- (ii) It also forms a barrier to keep different body systems separate.
- (iii) The permeability of the cells of various epithelia play an important role in regulating the exchange of materials between the body and the external environment.

Types of epithelial tissues:

Various types of epithelial tissues are:

(a) Simple squamous epithelium: In cells lining blood vessels or lung alveoli, where transportation of substances occurs through a selectively permeable surface, there is a simple flat and extremely thin kind of epithelium which is named as simple squamous epithelium. It is found in the lining of the mouth, oesophagus, lung, alveoli, etc.

(b) Stratified Squamous Epithelium: The skin, which protects the body, is also made of squamous epithelium.

Skin epithelial cells are arranged in many layers to prevent wear and tear. Since they are arranged in a pattern of layers, the epithelium is called stratified squamous epithelium.

(c) Cuboidal epithelium: This is cuboidal in shape and forms the lining of kidney tubules and ducts of salivary glands.

In some cases, a portion of the epithelial tissue folds inward to form a multicellular gland. This is called glandular epithelium.

It performs a function of secretion and absorption.

(d) Columnar Epithelium: Where absorption and secretion occur, as in the inner lining of the intestine, tall epithelial cells are present and are named as columnar epithelium.

In the respiratory tract, on the outer surfaces of epithelial cells there are hair like projections called cilia. These cilia can move, and their movement pushes the mucus forward to clear it. This type of epithelium is named as ciliated columnar epithelium.

(ii) Connective tissues

The cells of connective tissue are loosely spaced and embedded in an intercellular **matrix**.

They are specialised to connect various body organs.

For example:

Blood (plasma), bones, Cartilage, ligaments and tendons etc.

Plasma: The fluid (liquid) matrix of blood is called plasma.

Plasma is a yellowish liquid like material.

- i. Plasma contains three types of blood cells suspended in it. These are:
 - (i) RBC - Red blood cells
 - (ii) WBC - White blood Cells
 - (iii) Platelets

Bones: It is also a connective tissue that forms the framework that supports the body.

It is a strong and nonflexible tissue.

Bone cells are embedded in a hard matrix that is composed of calcium and phosphorus compounds.

Ligaments: Two bones are connected to each other by a connective tissue called the ligament.

This tissue is flexible or elastic in nature.

Tendons: Bones are connected to muscles by another type of connective tissue named as Tendons.

Tendons are fibrous tissue with great strength but limited flexibility.

Cartilage: Cartilage is another type of connective tissue which has widely spaced cells. The solid matrix of this tissue is composed of proteins and sugars.

Cartilage smoothens bone surfaces at joints and is also present in the nose, ear, trachea and larynx.

Cartilage of ear can be folded.

Types of connective tissue:

Various types of connective tissues are:

(a) Areolar tissue: They are found in the skin and muscles, around the blood vessels, nerves, etc.

Function of areolar tissue:

- It fills the space inside the organs, supports internal organs and helps in repair of tissues.

(b) Adipose tissue: It is found between the internal organs and below the skin.

Function of adipose tissue:

- It stores fats.
- It acts as an insulator.

(iii) Muscular tissues

Muscular tissue consists of elongated cells, also called muscle fibres. This tissue is responsible for movement in our body.

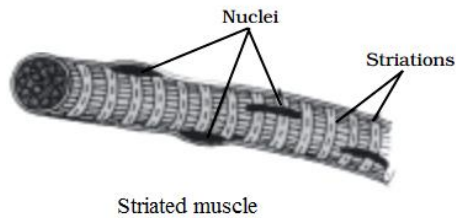
Main function of muscular tissues is to provide movement to the body.

Muscles contain special proteins called contractile proteins, which contract and relax to cause movement.

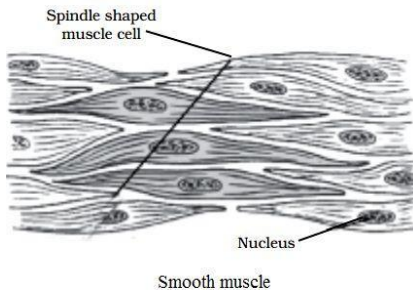
Types of Muscular Tissues:

Muscular tissues are of three types:

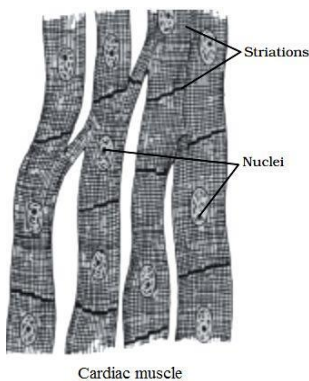
(a) Striated muscles or skeletal muscles or voluntary muscles: These muscles are also called skeletal muscles as they are mostly attached to bones and help in body movement. Cells are cylindrical, unbranched and multinucleate.



(b) Smooth muscles or involuntary muscles: They are found in the iris of the eye, in ureters and in the bronchi of the lungs. Cells are long, spindle-shaped and possess a single nucleus.



(c) Cardiac muscles or involuntary muscles: They help in rhythmic contraction and relaxation of the heart. Cells are cylindrical, branched and uninucleate.

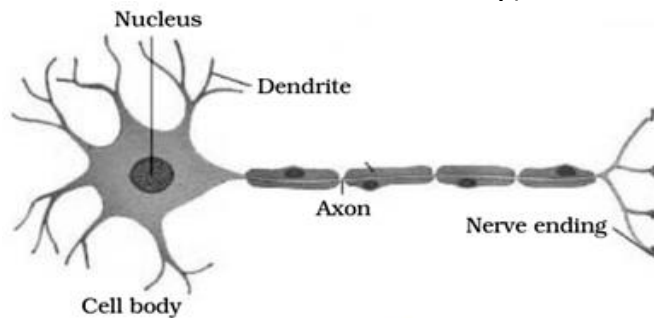


(iv) Nervous Tissues

Cells of the nervous tissue are highly specialised for being stimulated and then transmitting the stimulus very rapidly from one place to another within the body.

The brain, spinal cord and nerves are all composed of the nervous tissue.

Neuron: Cells of the nervous tissue are called neurons.
A neuron consists of a cell body, an axon and a dendrite.



Structure of neuron

Try the following questions:

- Q1.** Which tissues are called covering or protective tissues?
 - Q2.** Where do you find simple squamous in an animal body?
 - Q3.** What is the shape of cuboidal epithelium? Where do we find these tissues? State one of their main function.
 - Q4.** What type of epithelium tissues are found in respiratory tract and in intestinal lining?
 - Q5.** Name the fat-storing tissues? Where are they located?
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