CLASS 9th NOTES

SCIENCE

TISSUES

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- Tissues are groups of cells that are similar in structure and work together to achieve a specific function in multicellular organisms.
- Tissues represent clusters of specialized cells organized in a way that maximizes efficiency in performing a particular function.
- Examples of tissues include blood, phloem, and muscle.

PLANT TISSUES	ANIMAL TISSUES
1. In plant tissue, the cells have a cell wall.	1. In animal tissue, the cells do not comprise a cell wall.
2. Some tissues are dead, while some are living.	2. In animals, all the tissues are living.
3. As plants do not move so the tissues in plants require less energy and maintenance.	3. The tissues in animals need more energy and maintenance due to extensive movement.
4. Growth is confined to the tips of roots and stems.	4. Growth is uniform all over the body.
5. Tissues organization is Simple.	5. Tissues organization is Complex.
6. Less Maintenance Energy required.	6. More Maintenance Energy required.

PLANT TISSUE- Meristematic & Permanent Tissues

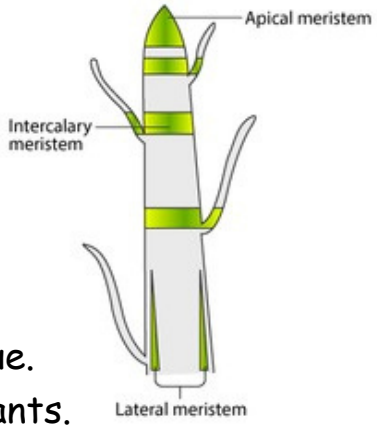
Meristematic Tissue (growth tissue)

These are simple living tissues consisting of thin-walled, compactly arranged immature cells capable of division and the formation of new cells. The main features of meristematic tissues include:.

Main features of Meristematic tissues are :

- Thin primary cell wall (cellulosic).
- Absence of intercellular spaces (compact tissue).
- Generally, vacuoles are absent, while dense cytoplasm and prominent nuclei are present.

Classification on the Basis of Origin



(A) Primary Meristem (Promeristem)

- Derived directly from the meristems of the embryo.
- Consists of cells derived from primary meristem.
- Contributes to the primary growth of plants.

(B) Secondary Meristem

- These cells are derived from primary permanent tissue.
- They usually contribute to the diameter growth of plants.
- Classification on the Basis of Location

(i) Apical Meristem

- Present at the growing tips of stems and roots.
- Cell division in this tissue leads to the elongation of stems and roots, contributing to the primary growth of the plant.

(ii) Intercalary Meristem

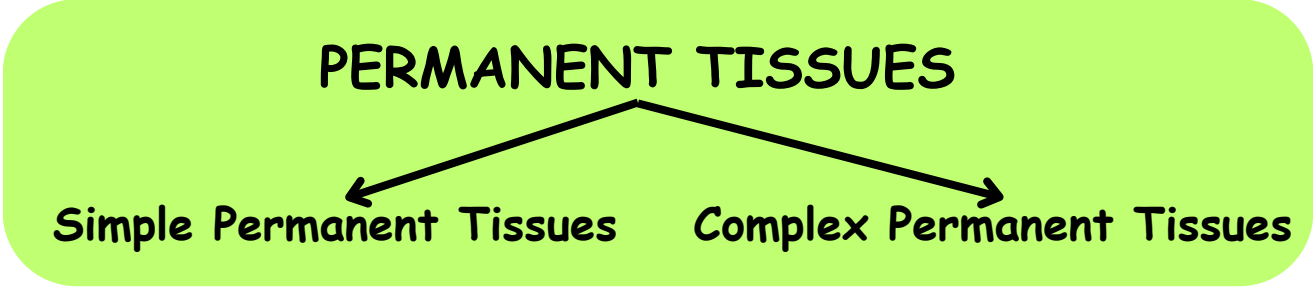
- Present behind the apex and aids in longitudinal growth.
- This is the part of apical meristem left behind during the growth period.
- Found at the base of the leaf and internode region, leading to an increase in the length of the leaf (Primary), e.g., in grass stem, bamboo stem, mint stem, etc.

(iii) Lateral Meristem (Cambium)

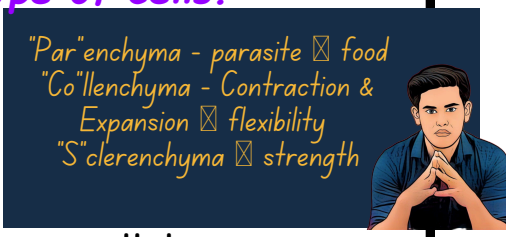
- Also called secondary meristem.
- Occurs along the side of the longitudinal axis of the plant.
- Gives rise to vascular tissues.
- Causes growth in the girth of the stem and root, responsible for secondary growth by increasing the girth.

Permanent Tissue

Formed from meristematic cells that have lost their capability to divide. The division and differentiation of the cells of meristematic tissues give rise to permanent tissues.



Simple Permanent Tissues: consists of only one type of cells.



Types of Simple Permanent Tissues:

A. Parenchyma:

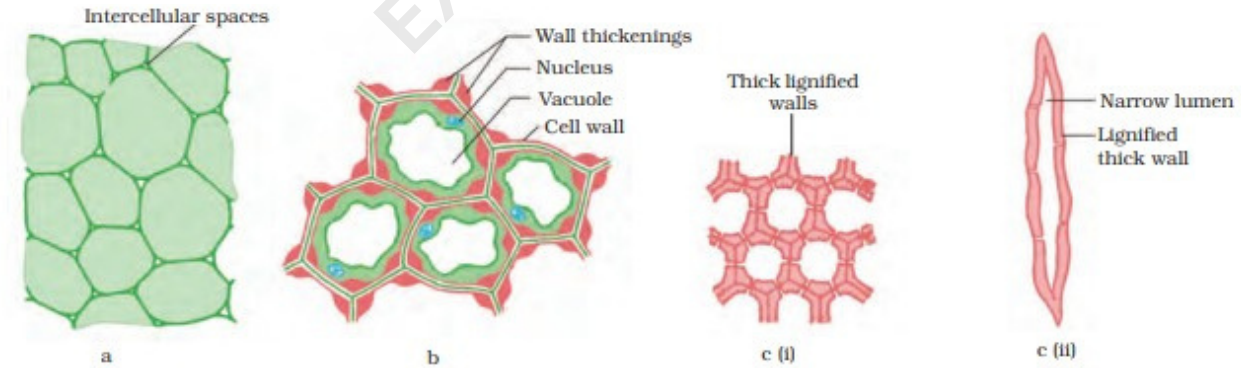
- Found a few layers beneath the epidermis.
- Comprised of relatively unspecialized living cells with thin walls. Loosely arranged, allowing large intercellular spaces.
- Functions include food storage; chlorophyll presence leads to chlorenchyma.
- In aquatic plants, parenchyma forms aerenchyma with large air cavities for floating.

B. Collenchyma:

- Provides flexibility in plants, preventing breakage in bending parts like tendrils.
- Found below the epidermis in leaf stalks.
- Living cells, elongated and irregularly thickened at corners.
- Minimal intercellular space.

C. Sclerenchyma:

- Imparts hardness and stiffness to plants.
- Cells are dead, long, and narrow with thickened walls due to lignin.
- Common in stems, around vascular bundles, veins of leaves, and hard coverings of seeds.
- Strengthens plant parts.



Various types of simple tissues: (a) Parenchyma (b) Collenchyma (c) Sclerenchyma (i) transverse section, (ii) longitudinal section.

Complex Permanent Tissues: made up of more then one type of cells.

Complex permanent tissue consists of multiple types of cells that work together to perform a common function. Examples include xylem and phloem, which make up the vascular bundle in plants. These tissues are essential for transporting water, nutrients, and food, enabling plants to survive in terrestrial environments.

Types of Complex Permanent Tissues:

Characteristic	Xylem	Phloem
Conduction	Conducts water and minerals	Conducts organic solutes or food materials
Direction of Flow	Mostly unidirectional (roots to apical)	May be bidirectional (leaves to storage organs or vice versa)
Conducting Channels	Tracheids and vessels	Sieve tubes
Cell Vitality	Three of four elements are dead (tracheids, vessels, fibers); only xylem parenchyma is living	Three of four elements are living (sieve tubes, companion cells, phloem parenchyma); phloem fibers are dead
Additional Function	Provides mechanical strength to the plant	Performs no mechanical function for the plant

Protective Tissues:

In plants, there are important layers that keep them safe. One is the outer skin called the epidermis, which protects against things like bad weather and water loss. Inside, there's another layer called cork that helps with the plant's shape. Both of these layers work together to make sure the plant stays strong and safe in its environment.

Epidermis:

The outermost shield for plant organs is the epidermis, typically formed by a single layer of cells that are elongated and flattened, lacking intercellular spaces. These living cells, resembling parenchyma cells internally, bear small pores called stomata in leaves. In plants adapting to arid conditions, the epidermis may be thicker, emphasizing the crucial role in shielding against water loss.

Functions of Epidermis:

The primary role of the epidermis is to safeguard the plant from injuries and infections. Additionally, the cuticle on the epidermis serves to minimize water loss by preventing excessive evaporation and desiccation. The presence of stomata within the epidermis facilitates gaseous exchange during both respiration and photosynthesis, while also playing a key role in the process of transpiration.

Cork/Phellem :

Cork cells are lifeless cells found at the outer edges of roots and stems as they mature and expand. These cells lack spaces between them. Moreover, they contain a substance called suberin in their walls, making them impermeable to gases and water.

Functions of Cork

The primary role of cork in the plant body is to offer protection by shielding plants from external injuries and infections. Additionally, it plays a crucial role in preventing desiccation. Due to its resistance to catching fire, cork is utilized for insulation, acting as a shock absorber and finding applications in products like linoleum. Furthermore, cork is employed in crafting sports equipment such as shuttlecocks, table tennis paddles, and cricket balls.

Animal Tissue:

-Animal tissue are of 4 types:

a. Muscular tissue
b. Nervous tissue
C. Connective tissue
d. Epithelial tissue

a. Muscular tissue

Muscles are made up of long cells called muscle fibers. These cells help us move by getting shorter and longer. Inside them, special proteins help make this happen by contracting and relaxing, causing our movements.

- Muscular tissue are of 3 types:

- **Smooth:**

Smooth muscle cells are shaped like spindles and each has a single nucleus. They're found in organs where movement happens automatically, like the muscles in the stomach.

- **Cardiac**

Heart muscles are shaped like branches and are found in the heart. They have many nuclei and stripes. These muscles keep beating in a rhythmic pattern throughout our life.

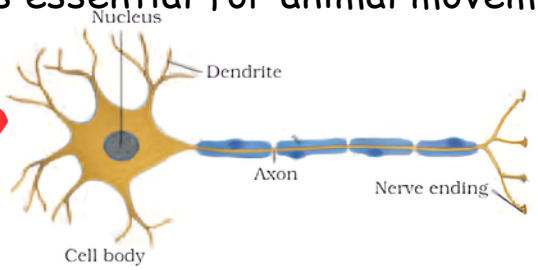
- **Straited (Skeletal)**

Muscles with stripes, called striated muscles, have long, unbranched fibers. They have many nuclei and stripes on the fibers. These muscles are found in parts of our body where we can move voluntarily, like our hands, legs, neck, and back.

b.Nervous Tissue:

Nervous tissue is specialized for responding to stimuli and transmitting signals quickly within the body. It forms the brain, spinal cord, and nerves. The primary cells, called neurons, consist of a cell body with a nucleus and cytoplasm, from which long thin projections arise. Each neuron typically has a single long axon and many short, branched dendrites. Neurons can be up to a meter long. Bundles of neurons form nerves. Nerve impulses travel along these nerve fibers, enabling muscle movement and rapid responses to stimuli. This functional combination of nerve and muscle tissue is essential for animal movement and reaction

Diagram dekhlena



c:Connective Tissue:

Connective tissues consist of cells embedded in a matrix, which is a chemical substance present in solid, liquid, or jelly-like form.

- Muscular tissue are of 3 types:

- **Bones:**

Bone cells are surrounded by a matrix made of calcium and phosphate compounds. Bones create the framework of the body, supporting muscles and enabling movement. Despite being hard and inflexible, bones contain blood vessels.

- **Cartilages:**

Soft tissues in the ear, nose, trachea, larynx, and between bone joints are known as cartilage. Cartilage helps to make bone joints smooth. It consists of cells spread out in a solid matrix of proteins and sugars but doesn't have blood vessels.

- **Tendons:**

Tendons, composed predominantly of white fibers, serve as crucial connectors linking bones to muscles in the body's intricate framework, facilitating the coordinated movement and support essential for various physical activities.

- **Ligament:**

Ligaments, comprised of both white and yellow fibers, play a vital role in connecting bone to bone. Notably more flexible than tendons, ligaments contribute to the overall flexibility and stability of joints within the body.

- **Areolar:**

Comprising cells and fibers within a matrix, areolar tissue is situated between the skin and underlying muscles, surrounding blood vessels, nerves, and bone marrow. This tissue is robust enough to bind various types of tissues and maintain structure, yet soft enough to allow flexibility.

- **Adipose:**

Adipose tissue stores fat beneath the skin and around internal organs. Excessive amounts lead to obesity. It not only provides cushioning to internal organs but also shapes body parts like limbs and breasts. Additionally, adipose acts as an insulator, offering protection from the cold.

- **Blood:**

Blood is a fluid consisting of blood cells, platelets, and plasma (a liquid matrix). It circulates throughout the body, transporting various materials such as gases, digested food, and waste substances.

- **Blood Plasma contains two types of blood cells:**
  a. Red Blood cells (RBC)
  b. White Blood Cells (WBC).

- **Lymph & Liquid:**

Lymph, a whitish fluid derived from the blood, includes blood plasma, white blood cells (WBCs), and platelets, but lacks red blood cells. It serves as a transport system for food materials, waste, and gases that cannot be carried by the blood.

- **Epithelial Tissue (Epithelium):**

Epithelium, like the skin, covers and shields our entire body. It is also present as the inner lining of the mouth, linings of blood vessels, and covering various organs and cavities within the body. Cells in epithelial tissue are closely packed, with no significant intercellular spaces.

Functions:

a. It serves as a protective layer for the organs it covers.
b. It maintains the separation of different organs.
c. Epithelium forms a selectively permeable layer over the body.
d. It enables the passage of certain substances while preventing others.
e. In certain cases, it functions by secreting and acting as glands.

Types of Epithelial Tissue :

1. Squamous:

Epithelial tissue is characterized by thin, flat, disc-like cells with polygonal or irregular shapes, accompanied by round and flat nuclei. These cells form linings in various parts of the body, such as the nose, pericardial cavity, and blood vessels. An essential function of epithelium is to protect underlying body parts from mechanical injuries and prevent the entry of harmful germs. Additionally, this tissue facilitates the diffusion of gases, contributing to vital physiological processes within the body.

2.Cuboidal:

Cuboidal tissue is characterized by cube-like cells that have almost equal height and width. This tissue type is commonly found in various bodily structures such as kidney tubules and salivary glands. One of its key functions is to provide mechanical support to organs, contributing to their structural integrity. Additionally, cuboidal cells play a vital role in absorption and excretion processes within the body, showcasing their significance in physiological functions.

3.Columnar:

Columnar tissue is characterized by tall, cylindrical cells with finger-like projections at their free ends. This type of tissue is prevalent in the inner surfaces of organs such as the stomach and intestine. The unique structure of columnar cells contributes to their functional roles, which include aiding in the absorption of nutrients, secretion of gastric juices, and providing mechanical support to these vital organs. The distinctive features of columnar tissue highlight its importance in the physiological processes essential for maintaining the body's health and functionality.

4.Glandular Epithelium :

Glandular epithelium tissues form multicellular glands, producing various chemicals. These glands play crucial roles in secretion processes throughout the body, contributing to essential functions such as digestion, hormone release, and maintaining overall physiological balance.