Revision Notes for Class 9 Science

Chapter 6 - Tissues

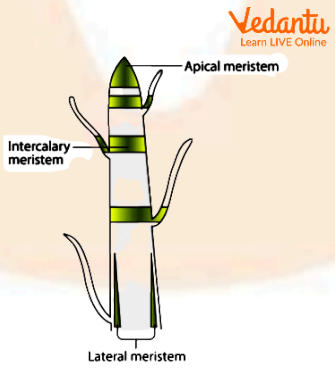
1. Plants can not move from one place to another i.e. show locomotion to meet their requirements. Therefore they are provided with some tissues which are made up of dead cells, which helps in providing mechanical strength. They have the ability to withstand unfavourable conditions like strong winds, storms, floods, etc.

2. Animals on the other hand can move from one to another in search of food, mates, or shelter. They have to consume more energy in comparison to plants. Most of the tissues present in them are living. Cell growth seen in animals is very uniform. The structural organisation of organs and organ systems is quite specialized and localized in animals in comparison to complex plants.

3. Plant Tissues:

i. Meristematic Tissue:

The growth in plants occurs in very specific regions. This is due to the presence of dividing tissue commonly known as meristematic tissue. On the basis of the region where they are present, meristematic tissues are further classified as apical, lateral, and intercalary.



Meristematic Tissue

a. Apical meristem is the meristem present at the apical or growing area mainly the tips of stems and roots. Apical meristem is responsible for the increase in the length of the plant.

b. Lateral meristem is generally found in the radial portion of the stem or root. Lateral meristem is responsible for the increase in the girth of the plant.

c. Intercalary meristem appears at the base of the leaves or at the internodes. Intercalary meristem causes an increase in the length of the internode.

ii. Permanent Tissue:

The older meristematic cells tend to lose the capacity to divide and turn to permanent tissues. This process of attaining a permanent shape, size, and function is known as differentiation.

These cells have lost their capacity to divide but now perform a specified function to provide strength, flexibility and elasticity to the plant. These tissues are divided into simple permanent, complex permanent and special tissues.

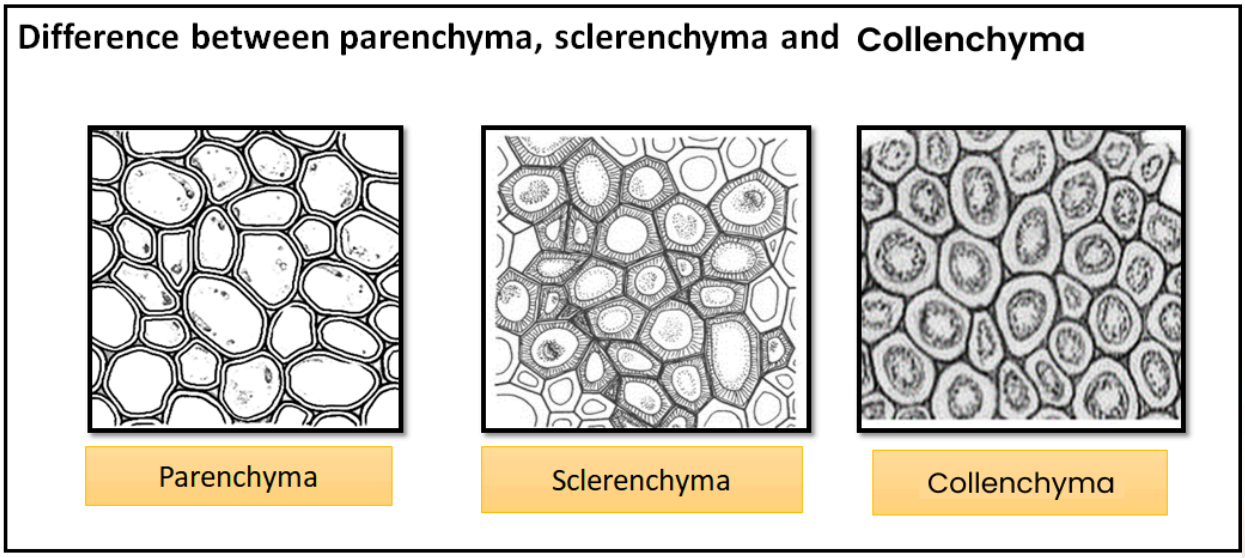
4. Simple permanent tissues are divided into the parenchyma, collenchyma and sclerenchyma and these are divided on the basis of their function.

i. Parenchyma: Parenchyma are living cells and are loosely packed. It plays a role in supporting the plant and storing food. In some cases, it may contain chlorophyll also and perform photosynthesis and then it is known to be chlorenchyma. Parenchyma when contains large air cavities like in aquatic plants, then it is known as aerenchyma. The aerenchyma helps in providing buoyancy in aquatic plants.

ii. Collenchyma: Collenchyma are elongated living cells with very small intercellular spaces. Their cell walls consist of cellulose and pectin. Collenchyma mainly occurs in the peripheral regions of stems and leaves in order to provide mechanical support and flexibility to plants.

iii. Sclerenchyma: These are long, dead cells with deposition of lignin in their cell wall and have no intercellular spaces. Sclerenchyma is found in the vascular tissues in stems, in veins

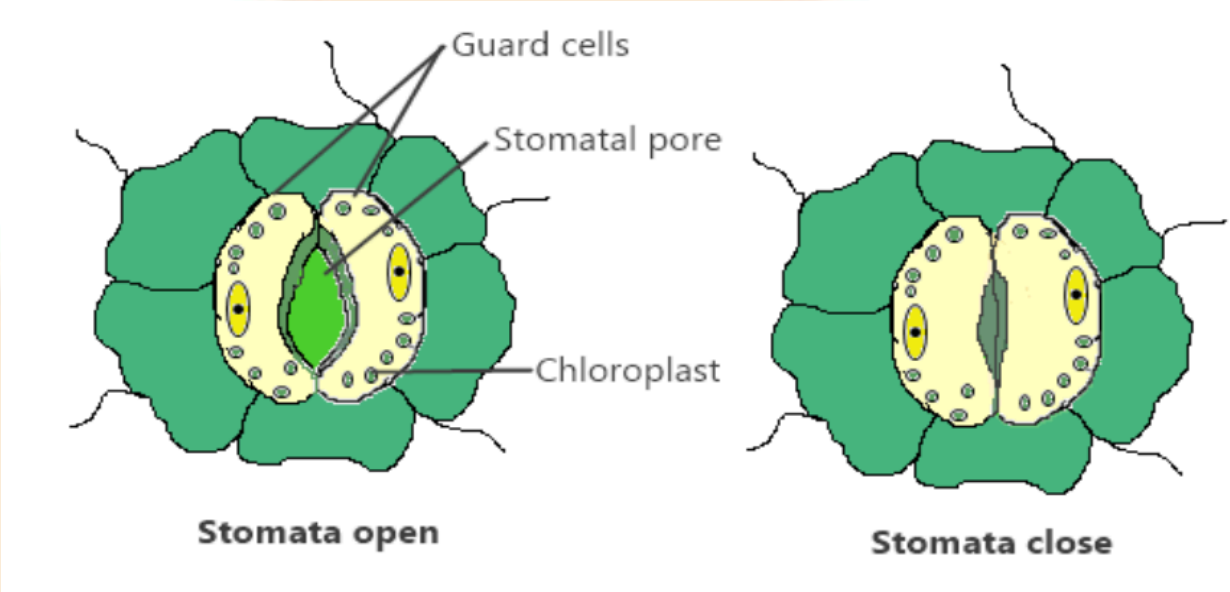
of leaves, and in the hard covering of seeds and nuts. They are responsible for providing strength to the plant.



Epidermis in Plants

- **Function**: The epidermis is the outermost layer of cells on a plant, providing protection to all parts of the plant.
- **Structure**: It is usually a single layer of cells, but in dry habitats, it may be thicker to prevent water loss. Epidermal cells on aerial parts often secrete a waxy layer to reduce water loss, mechanical injury, and fungal invasion.
- **Characteristics**: Epidermal cells are generally flat, with thicker outer and side walls compared to the inner wall. They form a continuous layer with no intercellular spaces.
- **Stomata**: Small pores called stomata are present in the epidermis of leaves, allowing gas exchange with the atmosphere. These pores are surrounded by guard cells and are essential for transpiration (water loss in vapor form).
- **Root Epidermis**: In roots, epidermal cells often have hair-like extensions to increase the surface area for water absorption.
- **Desert Plants**: Some desert plants have a thick waxy coating of cutin on their epidermis to prevent water loss.

- **Changes with Age**: As plants grow, the outer protective tissue can change. Older plants develop cork from a secondary meristem, which is dead and tightly packed to provide additional protection.



Complex Permanent Tissue

Definition: Complex permanent tissues consist of more than one type of cell working together to perform a specific function. Unlike simple tissues, which are made up of identical cells, complex tissues have a variety of cell types that coordinate to carry out their functions.

Examples: The primary examples of complex tissues are the xylem and phloem. Both are conducting tissues that make up vascular bundles, which are crucial for plant survival on land.

Xylem:

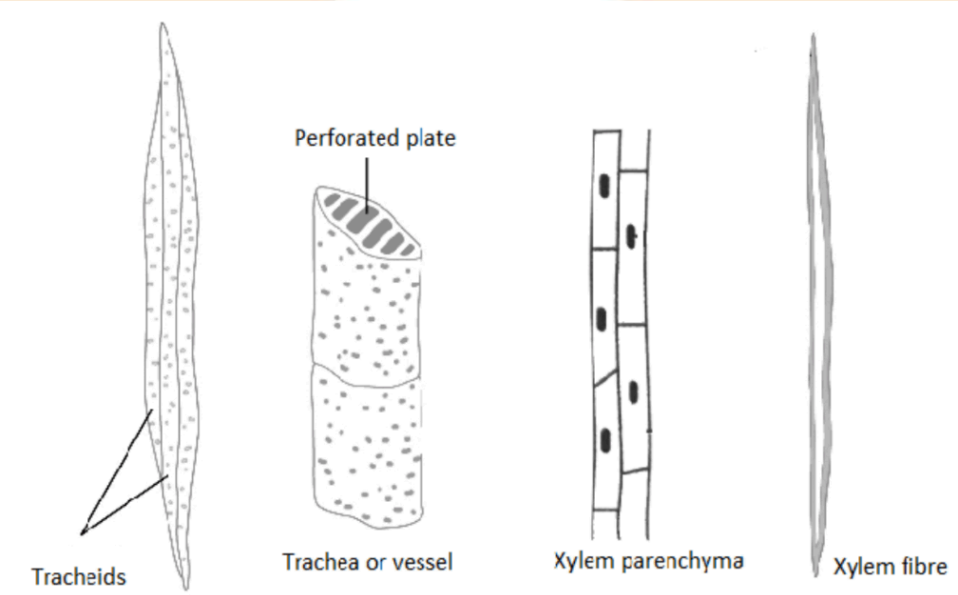
- **Function**: Transports water and minerals from the roots to other parts of the plant.
- **Components**:
    - **Tracheids**: Tubular cells with thick walls; often dead when mature. They help in vertical water transport.

- **Vessels**: Also tubular with thick walls and typically dead at maturity, aiding in efficient water and mineral transport.
- **Xylem Parenchyma**: Living cells that store food and assist in the repair of damaged tissues.
- **Xylem Fibres**: Provide structural support to the plant.

Phloem:

- **Function**: Transports food (mainly sugars) from leaves to other parts of the plant.
- **Components**:
  - **Sieve Tubes**: Tubular cells with perforated walls that facilitate nutrient transport.
  - **Sieve Cells**: Similar to sieve tubes but found in some plants.
  - **Companion Cells**: Support the function of sieve tubes.
  - **Phloem Parenchyma**: Living cells involved in nutrient storage and transport.
  - **Phloem Fibres**: Provide support and are usually dead cells.

Importance: The xylem and phloem together form the vascular bundle, a key feature of complex plants that enables them to transport essential substances and survive in terrestrial environments.

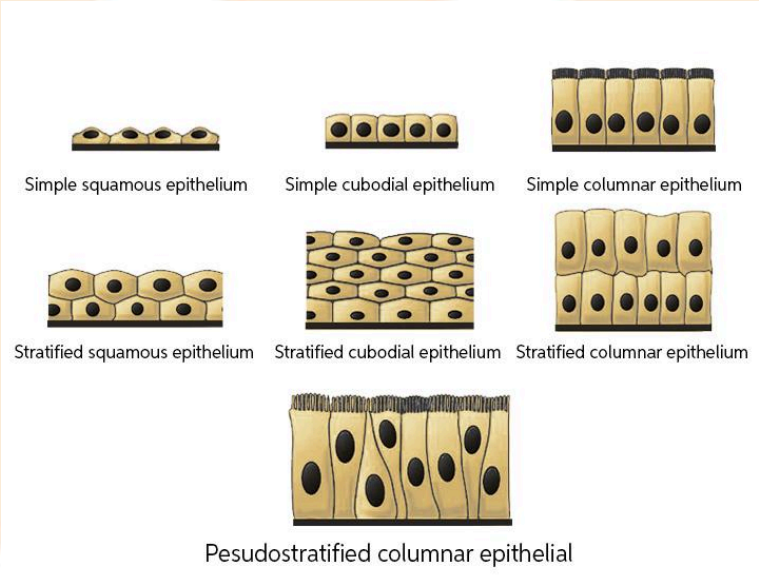


Animal Tissues

Overview: Animal tissues are groups of specialized cells that work together to perform specific functions in the body. Key types include epithelial tissue, connective tissue, muscular tissue, and nervous tissue.

Epithelial Tissue:

- **Function**: Acts as a covering or protective layer for organs and body cavities. It forms barriers to keep different body systems separate.
- **Locations**: Found in the skin, lining of the mouth, blood vessels, lung alveoli, and kidney tubules.
- **Structure**: Cells are tightly packed with minimal intercellular space and only a small amount of cementing material between them. They form continuous sheets that are crucial for maintaining barriers and controlling permeability.



Muscle Tissue:

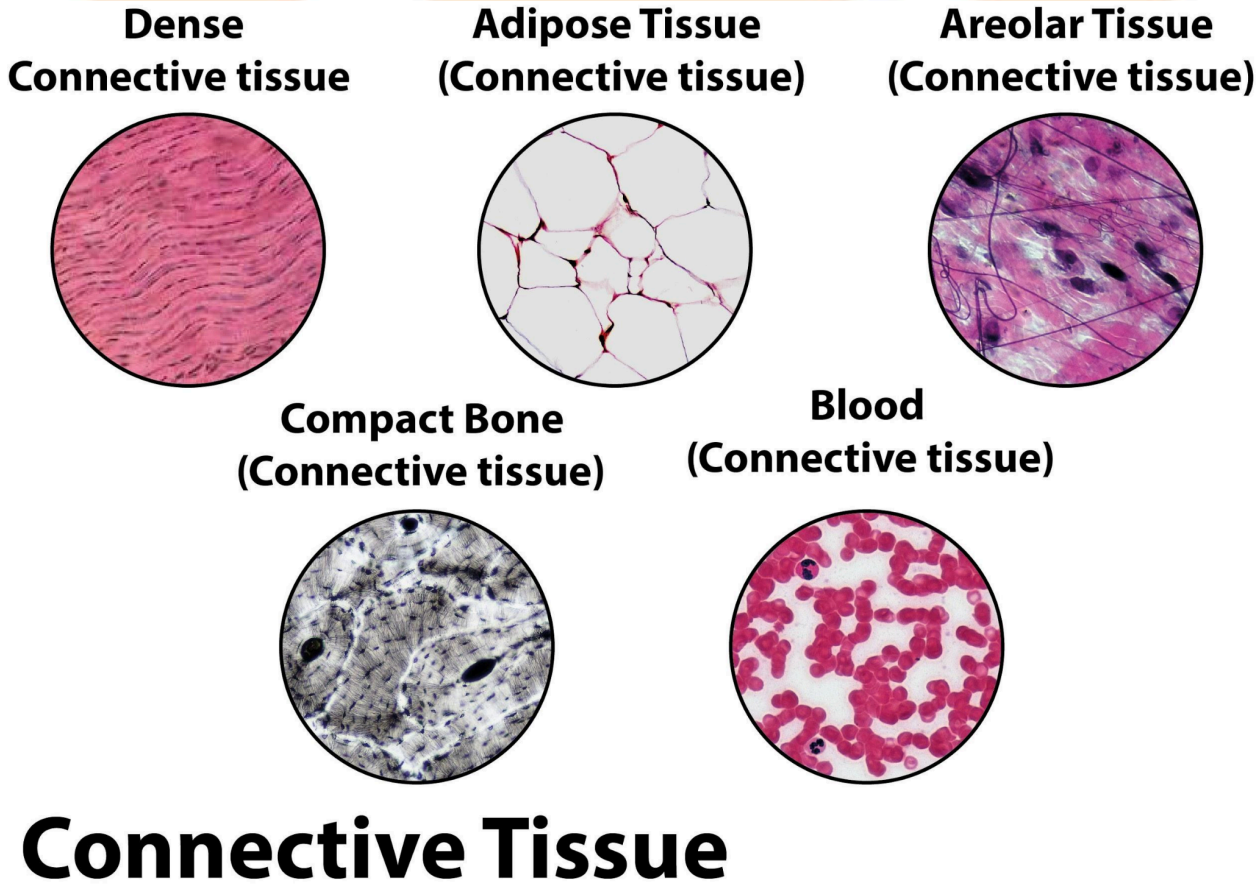
- **Function**: Responsible for movement through contraction and relaxation of muscle cells. This is essential for activities like breathing and other bodily movements.

- **Types**: Includes skeletal muscle (attached to bones), cardiac muscle (found in the heart), and smooth muscle (found in organs and blood vessels).

Blood:

- **Function**: A type of connective tissue that transports oxygen, nutrients, and waste products throughout the body. It plays a crucial role in maintaining homeostasis by carrying substances to and from cells.

Connective Tissue



Overview: Connective tissue supports, binds together, and protects various parts of the body. It has a diverse range of types, each with a unique structure and function.

Key Types of Connective Tissue:

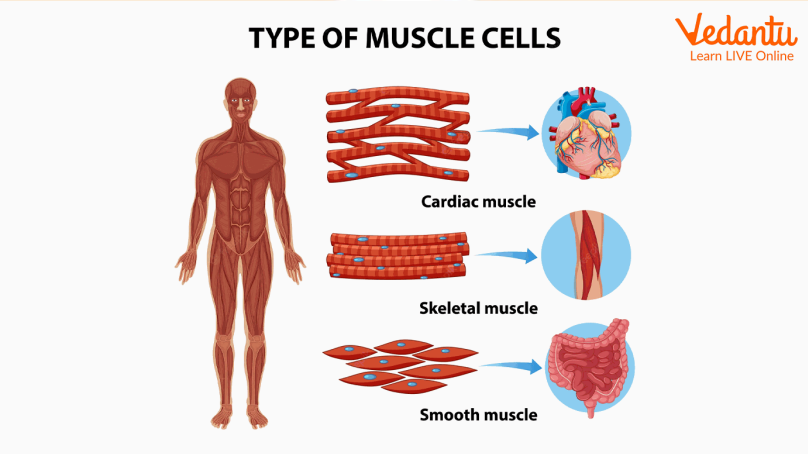
1. **Blood**:
    - **Matrix**: Fluid (liquid) matrix called plasma.
    - **Components**: Red blood cells (RBCs), white blood cells (WBCs), and platelets suspended in plasma.
    - **Function**: Transports gases, nutrients, hormones, and waste materials throughout the body.
2. **Bone**:
    - **Matrix**: Hard matrix composed of calcium and phosphorus compounds.
    - **Function**: Provides structural support, anchors muscles, and protects vital organs. The rigidity of bone offers strength and durability, which are essential for supporting the body and maintaining its shape.
3. **Ligaments**:
    - **Matrix**: Minimal matrix; composed of elastic fibers.
    - **Function**: Connects bones to bones, providing stability to joints while allowing some flexibility. Ligaments are strong and elastic to handle the stress of joint movements.
4. **Tendons**:
    - **Matrix**: Fibrous tissue with a dense, limited matrix.
    - **Function**: Connects muscles to bones. Tendons are strong and capable of withstanding tension but have limited flexibility, which is crucial for transmitting muscle forces to bones.
5. **Cartilage**:
    - **Matrix**: Solid matrix composed of proteins and sugars.
    - **Function**: Smoothens bone surfaces at joints, and provides flexible support in structures like the nose, ears, trachea, and larynx. Cartilage is more flexible than bone but still provides structural support.

Muscular Tissue

Overview: Muscular tissue is specialized for movement and consists of elongated cells known as muscle fibers. This tissue contains contractile proteins that enable contraction and relaxation, leading to movement.

Types of Muscular Tissue:

1. **Skeletal Muscle**:
    - **Structure**: Long, cylindrical, unbranched cells with multiple nuclei. Under the microscope, they show alternating light and dark bands, known as striations.
    - **Function**: Attached to bones and responsible for voluntary movements (e.g., walking, lifting).
    - **Characteristics**: Also called striated muscle due to the visible bands.
2. **Smooth Muscle**:
    - **Structure**: Spindle-shaped cells with pointed ends and a single nucleus. These cells lack striations.
    - **Function**: Controls involuntary movements such as the movement of food in the alimentary canal, and contraction and relaxation of blood vessels. Found in the iris of the eye, ureters, and bronchi.
    - **Characteristics**: Also known as unstriated muscle because it does not show visible striations.
3. **Cardiac Muscle**:
    - **Structure**: Cylindrical cells that are branched and have a single nucleus. The cells are connected by intercalated discs.
    - **Function**: Responsible for the rhythmic contractions of the heart, which pump blood throughout the body. This muscle works involuntarily.
    - **Characteristics**: Shows continuous, rhythmic contractions essential for heart function.



Nervous Tissue

Overview: Nervous tissue is specialized for rapidly receiving, processing, and transmitting signals throughout the body. It is crucial for communication between different body parts and coordinating responses to stimuli.

Components:

1. **Neurons (Nerve Cells)**:
    - **Structure**: Each neuron consists of a cell body with a nucleus and cytoplasm. From the cell body, long, thin extensions called axons and shorter, branched extensions called dendrites arise.
    - **Function**: Neurons transmit nerve impulses. The axon carries signals away from the cell body, while the dendrites receive signals from other neurons.

2. **Nerve Fibres**:
    - **Structure**: Bundles of long axons are bound together by connective tissue to form a nerve.
    - **Function**: Nerve fibres carry nerve impulses to and from the brain and spinal cord, facilitating communication across the body.

3. **Nerve Impulses**:
    - **Definition**: Electrical signals that travel along nerve fibres.
    - **Function**: Allow for rapid communication between different parts of the body, enabling responses such as muscle movements and reflex actions.

Key Structures:

- **Brain and Spinal Cord**: Composed of nervous tissue, these structures process and relay information throughout the body.

- **Nerves**: Extend from the CNS to various body parts, transmitting signals and facilitating coordination and response.