



# learnkwniy

**CHAPTER -6**

## **TISSUES**

## **TISSUES**

**A group of cells that are similar in structure and/or work together to achieve a particular function forms a tissue.**

**OR**

**Tissues are groups of cells that have a similar structure and act together to perform a specific function.**

**There are four different types of tissues in animals: connective, muscle, nervous, and epithelial.**

**Plants are stationary or fixed – they don't move. Most of the tissues they have are supportive, which provides them with structural strength. Most of these tissues are dead, since dead cells can provide mechanical strength as easily as live ones, and need less maintenance.**

**Animals on the other hand move around in search of food, mates and shelter. They consume more energy as compared to plants. Most of the tissues they contain are living.**

**The growth in plants is limited to certain regions, while this is not so in animals. There are some tissues in plants that divide throughout their life. These tissues are localised in certain regions. Based on the dividing capacity of the tissues, various plant tissues can be classified as growing or meristematic tissue and permanent tissue.**

### **Plant Tissues**

**Plant tissue is a collection of similar cells performing an organized function for the plant. Each plant**

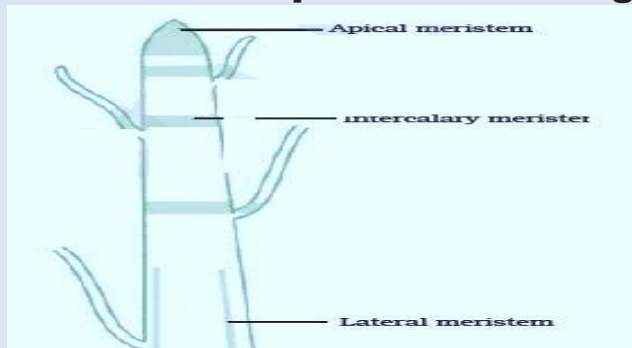
tissue is specialized for a unique purpose, and can be combined with other tissues to create organs such as leaves, flowers, stems and roots. The following is a brief outline of plant tissues, and their functions within the plant.

## Types of Tissue in Plants

### Meristematic Tissue

Meristematic plant tissue is different than all other plant tissue, in that it is the main growth tissue of the plant. All cells originate from one meristem or another. The apical meristem is the plant tissue which drives above ground growth, and decides the direction of the plant. Root meristems dig into the soil in search of water and nutrients. Subapical meristems divide the plant and carry leaves in different directions. Intercalary meristems provide growth from the middle of the plant, to extend the leaves upward into the sunlight.

Meristematic plant tissue, at the central point, is undifferentiated and ready to divide into any other type of plant cell. Meristematic cells divide asymmetrically. This means that one plant remains undifferentiated, while the other cell takes on a more specialized form. This cell will then continue to divide and develop into a plant tissue, which can help form a new organ, such as a leaf.



### PERMANENT TISSUE

**Cells of meristematic tissue differentiate to form different types of permanent tissue.**

## **(i) SIMPLE PERMANENT TISSUE**

### **Epidermis**

**There are several basic forms of plant tissue, formed from mostly identical types of cells. The first is the epidermis. The epidermis in plants serves the same function as it does in animals. It is a plant tissue formed of thin and densely packed cells, meant to separate the inside of the organisms from the outside. The epidermis is often covered in a layer of waxy protection, to stop the plant from burning or drying out in the sun.**

### **Stoma**

**The epidermis also contains guard cells, which operate small opening called stoma. These stoma control the passage of air and water through the leaves, allowing plants to move water and nutrients up from the soil.**

### **Parenchyma**

**The next plant tissue is parenchyma. This tissue is comprised of thin-walled cells with very large central vacuoles. The turgor pressure of these vacuoles is elevated when they are full of water, which gives structure and support to the plant. Parenchyma plant tissue is found in all parts of the plant, and makes up large portions of the leaves, stems and roots. In the leaves, parenchyma plant tissue is highly involved in the process of photosynthesis. All parenchyma plant tissue is living, and carries out functions continually. Parenchyma tissue, when wounded, can revert back into meristematic plant tissue to regrow damaged areas.**

### **Clerenchyma**

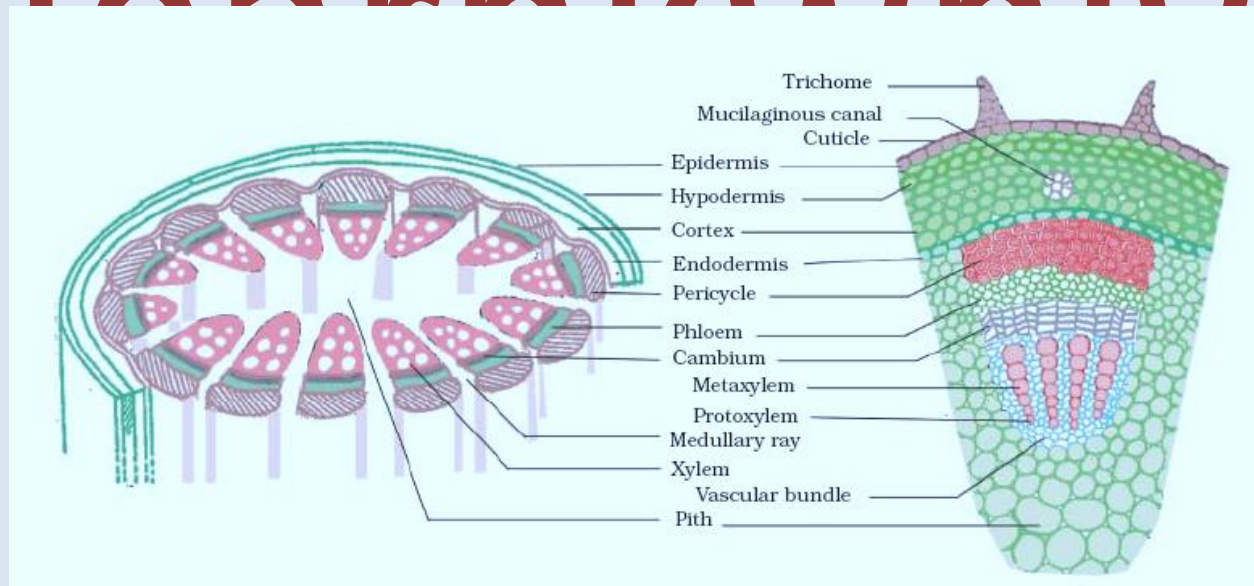
**clerenchyma plant tissue is a structural tissue which dies, but the cell wall and structure remain.**

### **Sclerenchyma**

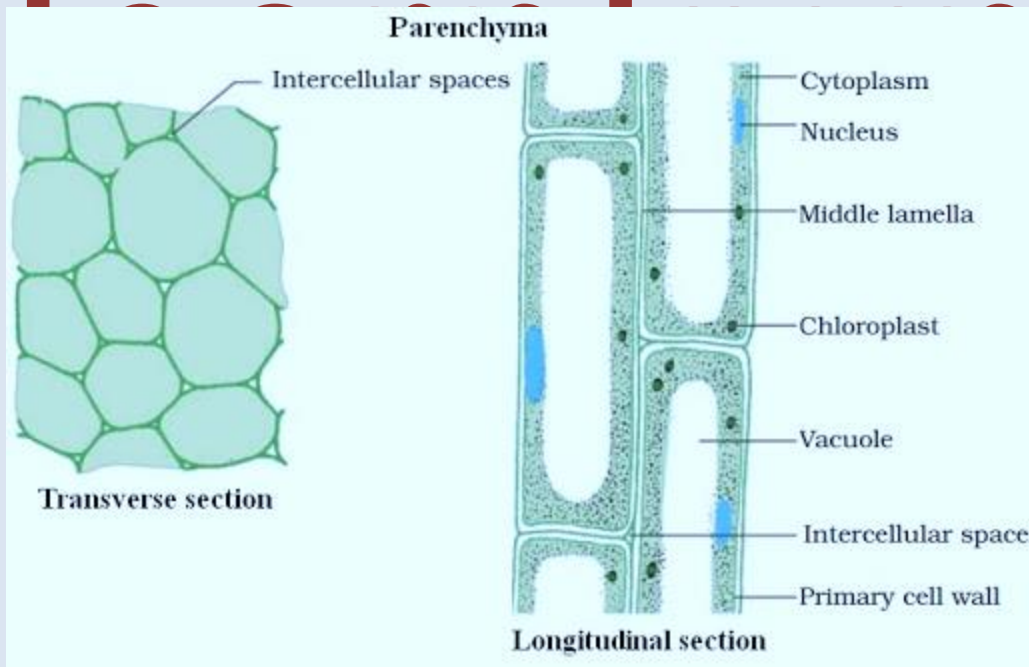
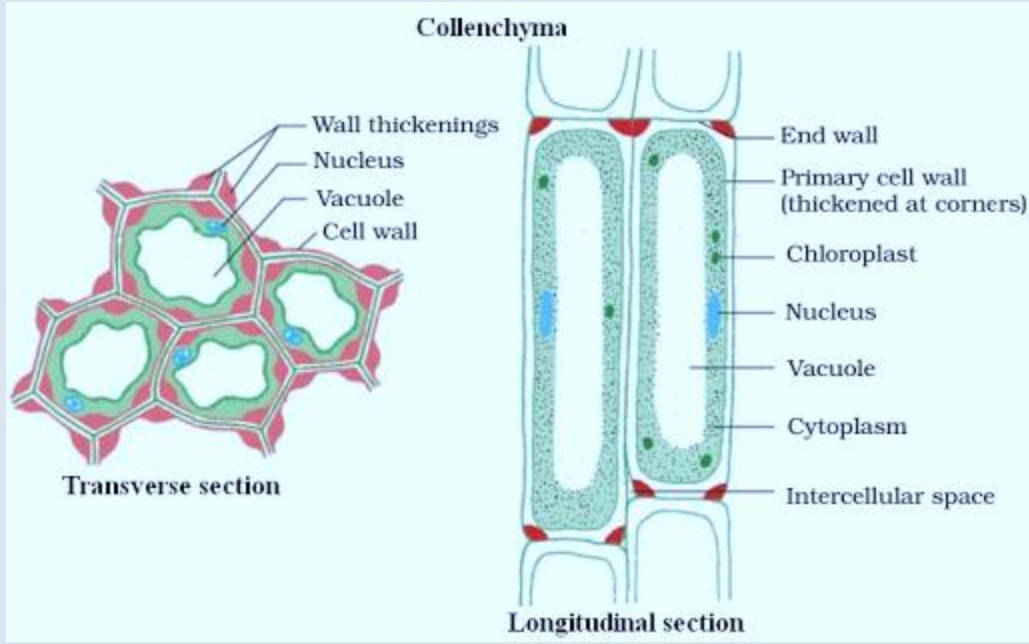
**Sclerenchyma plant tissue forms long, connected fibers called sclereids. These fibers can extend throughout a plant to provide support and strength to various organs. This plant tissue is commonly found in stems, bark, and in the hard shells of some fruits and nuts, such as pears.**

### **Collenchyma**

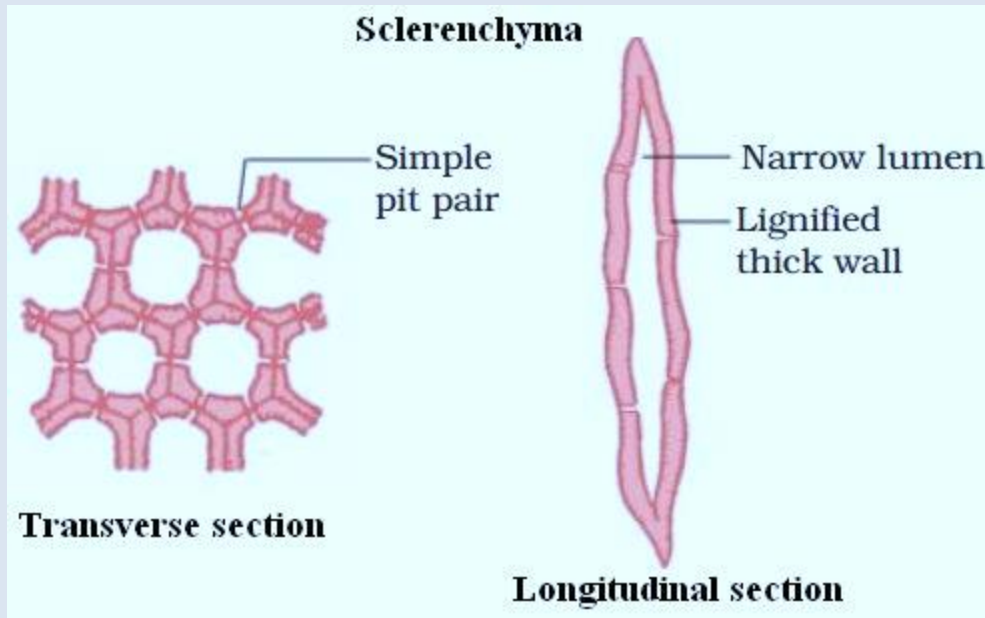
**Collenchyma plant tissue is similar to sclerenchyma, in that it provides support. Often, collenchyma plant tissue is seen in young plants, with a limited number of cells. As such, only a portion of the cell wall in these cells will be thickened for support.**



SECTION OF STEM



iv



## **(ii) COMPLEX PERMANENT TISSUE**

**Complex tissues are made of more than one type of cells. All these cells coordinate to perform a common function. Xylem and phloem are examples of such complex tissues.**

**The two main forms of plant tissue used in this process are xylem and phloem.**

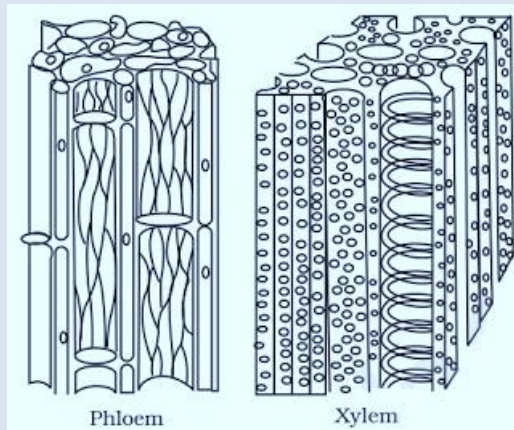
### **xylem**

**Xylem is a plant tissue specially designed for transporting water and nutrients. This plant tissue can come in several forms, depending on the species. Sometimes, the xylem plant tissue is made up of a long chain of small tubes, called vessels, which interconnect and allow water to travel through unimpeded.**

**This main tube is supported by other cells, which help pull nutrients from the water and transport it to the cells within the leaves. Starting at the roots, the water is driven by pressure at the bottom and transpiration at the leaves, which sucks the water through the xylem like as straw. It is**

**estimated that up to 95% of the water used by plants is transpired, rather than used in photosynthesis or in the metabolism. This is thought to be necessary to concentrate nutrients found in the soil.**

**Xylem consists of tracheids, vessels, xylem parenchyma and xylem fibres. The cells have thick walls, and many of them are dead cells. Tracheids and vessels are tubular structures. This allows them to transport water and minerals vertically. The parenchyma stores food and helps in the sideways conduction of water. Fibres are mainly supportive in function.**



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## **Phloem**

**the xylem extends small tubes into the other type of complex plant tissue, the phloem. Like the xylem, the phloem consist of a variety of different cell types which work together to produce a continual interconnected passageway connecting cells of the plant. The phloem, rather than bringing water up from the roots, needs to carry sugar down to the roots and stems. With a little water from the xylem, it can complete this process. It is further aided by companion cells, which surround the actual sieve-tube.**



**The whole structure is then supported by phloem fibers, which give the tube shape and structure.**

**Phloem is made up of four types of elements: sieve tubes, companion cells, phloem fibres and the phloem parenchyma Sieve tubes are tubular cells with perforated walls. Phloem is unlike xylem in that materials can move in both directions init. Phloem transports food from leaves to other parts of the plant. Except for phloem fibres, phloem cells are living cells.**

## **Animal Tissues**

**Animal cells with the same structure and function are grouped together to form tissues. There are four types of animal tissues: epithelial tissue, connective tissue, muscle tissue and nervous tissue.**

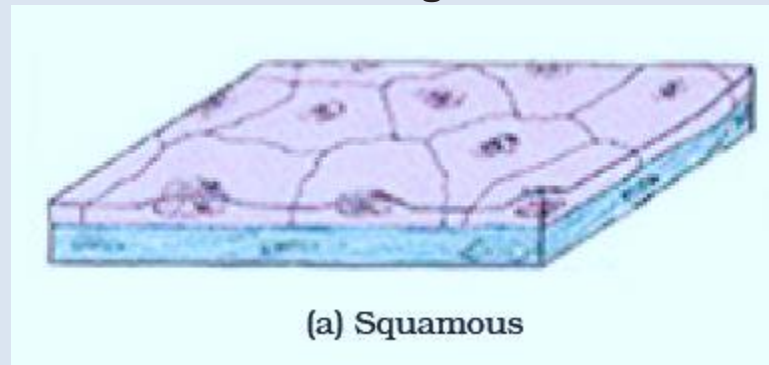
### **EPITHELIAL TISSUE**

**The covering or protective tissues in the animal body are epithelial tissues. Epithelium covers most organs and cavities within the body. It also forms a barrier to keep different body systems separate.**

**Epithelial tissue cells are tightly packed and form a continuous sheet. They have only a small amount of cementing material between them and almost no intercellular spaces. 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 and also between different parts of the body. all epithelium is usually separated from the underlying tissue by an extracellular fibrous basement membrane.**

## **Simple squamous epithelium**

cells lining blood vessels or lung alveoli, where transportation of substances occurs through a selectively permeable surface, there is a simple flat kind of epithelium. This is called the simple squamous epithelium. Simple squamous epithelial cells are extremely thin and flat and form a delicate lining.



(a) Squamous

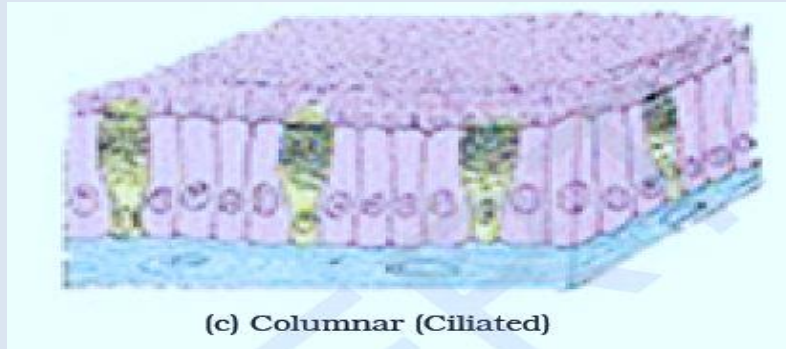
## **stratified squamous epithelium.**

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.

## **Ciliated columnar epithelium**

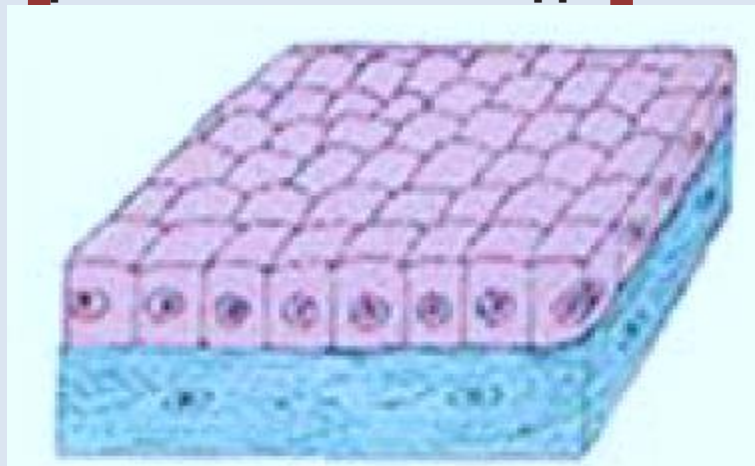
Where absorption and secretion occur, as in the inner lining of the intestine, tall epithelial cells are present. This columnar (meaning 'pillar-like') epithelium facilitates movement across the epithelial barrier. In the respiratory tract, the columnar epithelial tissue also has cilia, which are hair-like projections on the outer surfaces of epithelial cells. These cilia can move, and

**their movement pushes the mucus forward to clear it. This type of epithelium is thus ciliated columnar epithelium.**



### **Cuboidal epithelium**

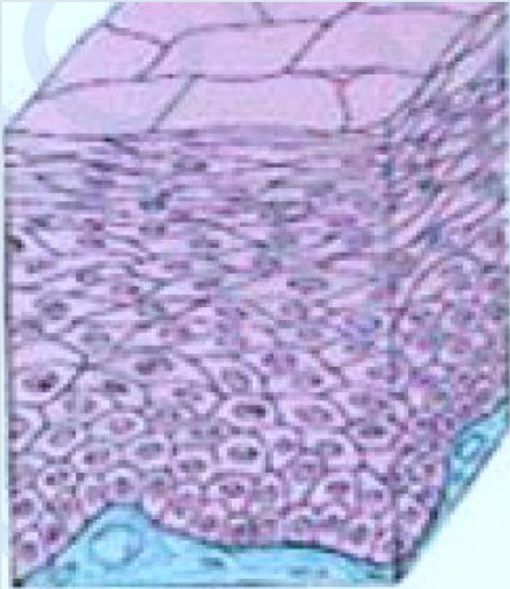
**Cuboidal epithelium (with cube-shaped cells) forms the lining of kidney tubules and ducts of salivary glands, where it provides mechanical support.**



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### **Glandular epithelium**

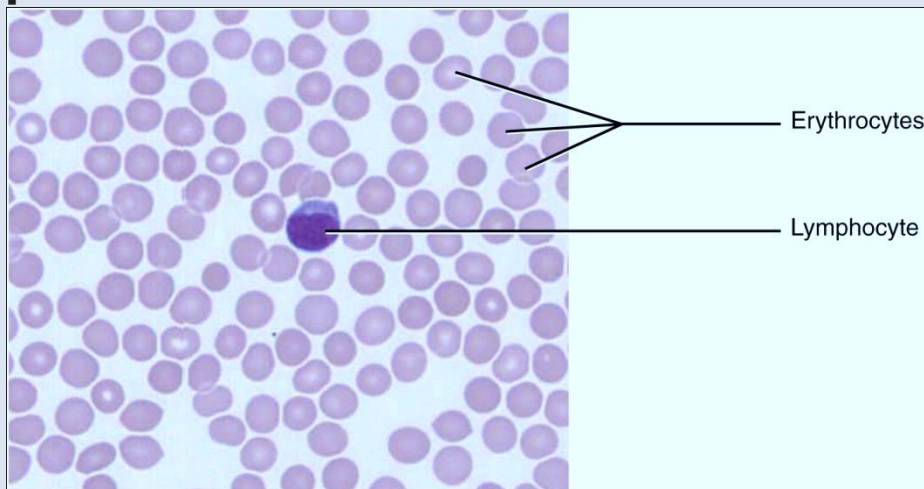
**Epithelial cells often acquire additional specialisation as gland cells, which can secrete substances at the epithelial surface. Sometimes a portion of the epithelial tissue folds inward, and a multicellular gland is formed. This is glandular epithelium.**



## **CONNECTIVE TISSUE**

The connective tissue is an animal tissue that is predominantly composed of extracellular components (such as fibers and intercellular substances). The cells of connective tissue are loosely spaced and embedded in an intercellular matrix

The matrix may be jelly like, fluid, dense or rigid. The nature of matrix differs in concordance with the function of the particular connective tissue.



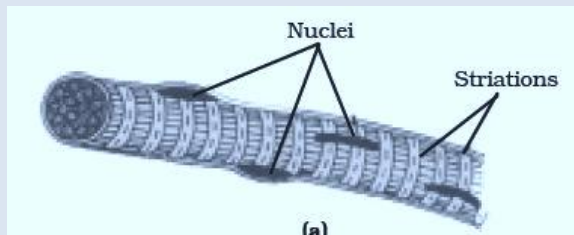
## **MUSCULAR TISSUE**

**Muscular tissue consists of elongated cells, also called muscle fibres. This tissue is responsible for movement in our body. Muscles contain special proteins called contractile proteins, which contract and relax to cause movement. Muscle tissue is a specialized tissue found in animals which functions by contracting, thereby applying forces to different parts of the body. Muscle tissue consists of fibers of muscle cells connected together in sheets and fibers.**

### **Types of Muscle Tissue**

#### **Skeletal Muscle Tissue**

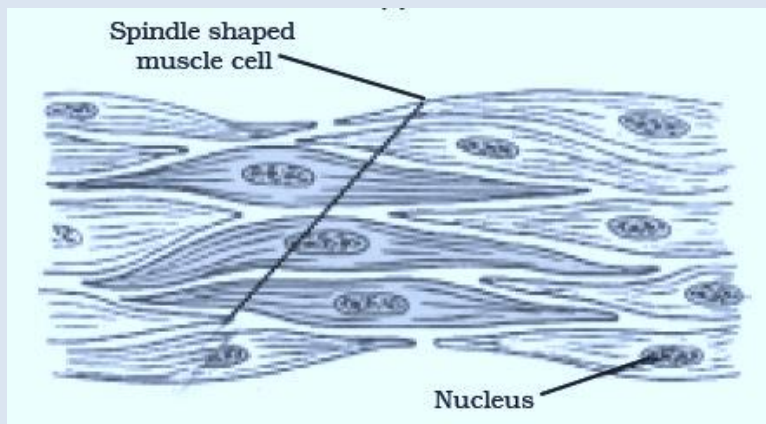
**Muscles present in our limbs move when we want them to, and stop when we so decide. Such muscles are called voluntary muscles. These muscles are also called skeletal muscles as they are mostly attached to bones and help in body movement. Under the microscope, these muscles show alternate light and dark bands or striations when stained appropriately. As a result, they are also called striated muscles. The cells of this tissue are long, cylindrical, unbranched and multinucleate**



#### **Involuntary muscles**

**The movement of food in the alimentary canal or the contraction and relaxation of blood vessels are involuntary movements. We cannot really start them or stop them simply**

by wanting to do so! **Smooth muscles** or **involuntary muscles control such movements**

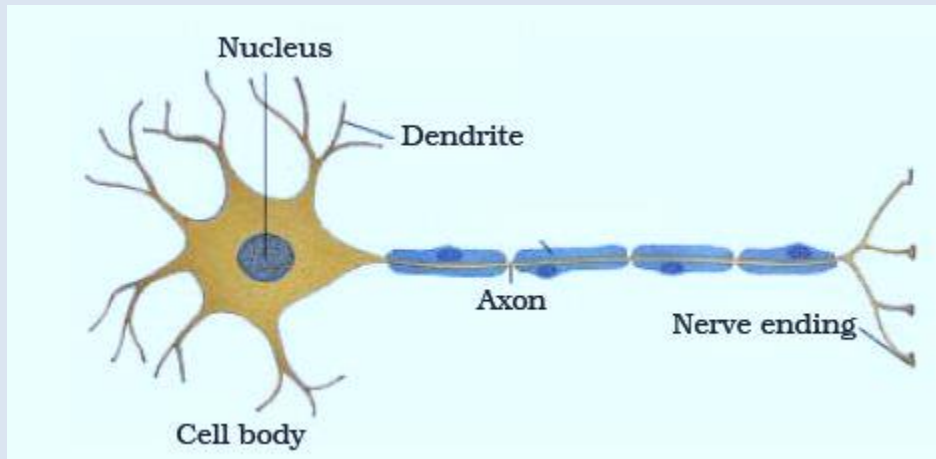


### **Cardiac muscle**

The muscles of the heart show rhythmic contraction and relaxation throughout life. These involuntary muscles are called **cardiac muscles**. Heart muscle cells are cylindrical, branched and uninucleate.

### **NERVOUS TISSUE**

The brain, spinal cord and nerves are all composed of the nervous tissue. The cells of this tissue are called nerve cells or neurons. A neuron consists of a cell body with a nucleus and cytoplasm, from which long thin hair-like parts arise. Usually each neuron has a single long part, called the axon, and many short, branched parts called dendrites. An individual nerve cell may be up to a metre long. Many nerve fibres bound together by connective tissue make up a nerve.



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