

**Tissue:** A groups of cells which is meant for a specific task is called tissue.

**Tissue and Division of Labour:** In complex organisms, different tasks are carried out by different organs and organ systems. Tissues are the first step towards division of labour in complex organisms.

### **Plant Tissues:**

Plant tissues are of two main types, viz. meristematic tissue and permanent tissue.

#### **1 - Meristematic Tissue:-**

Plant tissues in which cells keep on dividing are called meristematic tissue.

Meristematic tissues are present in those parts of plants which keep on growing.

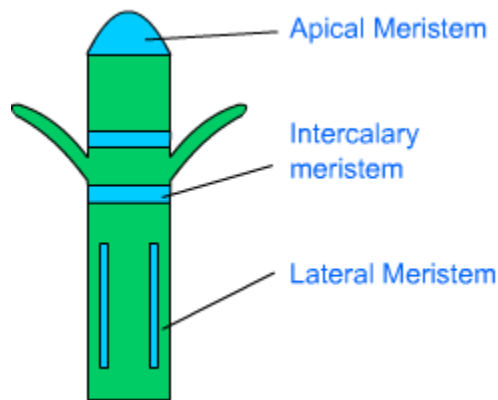
Meristematic tissues are classified on the basis of their location. They are of following types:

**Apical Meristem:-** Apical meristem is present on root apex, stem apex, leaf buds and flower buds. They are responsible for growth in length, i.e. primary growth.

**Lateral Meristem:** Lateral meristem is present along the side of the stem. They are responsible for growth in girth, i.e. secondary growth.

**Intercalary Meristem:** Intercalary meristem is present at the base of leaf or internodes. They are present on either side of the node.

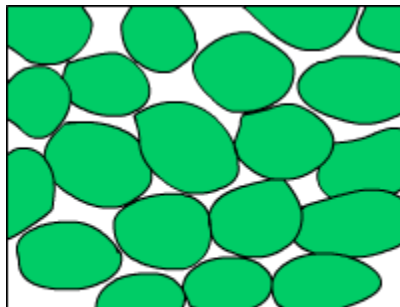
Since cells of meristematic tissue are highly active so they have dense cytoplasm. Vacuole is absent in these cells.



#### **2 - Permanent Tissue:**

Once the cells of meristematic tissue divide to a certain extent, they become specialized for a particular function. This process is called differentiation. Once differentiation is accomplished, the cells lose their capability to divide and the tissue becomes permanent tissue. Permanent tissues are of two types, simple

permanent tissue and complex permanent tissue.



**Parenchyma**

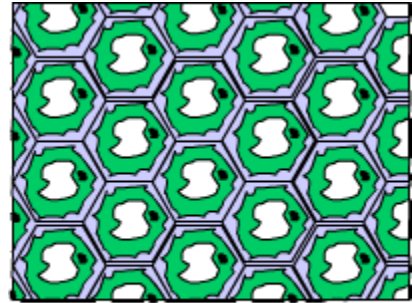
(a) **Simple Permanent Tissue:** Simple permanent tissue is composed of similar types of cells. Simple permanent tissues are of three types, viz. parenchyma, collenchyma and sclerenchyma.

(1) **Parenchyma:** The cells of parenchyma have thin cell wall. They are loosely packed; with lot of intercellular spaces between them. Parenchyma makes the largest portion of a plant body. Parenchyma mainly works are packing material in plant parts. The main function of parenchyma is to provide support and to store food. In

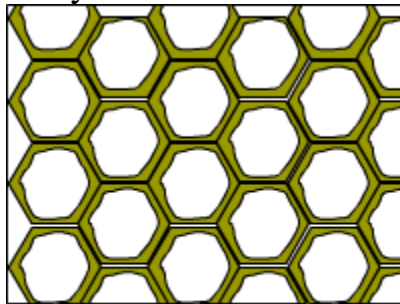
some plant parts, parenchyma has chlorophyll as well. In that case, parenchyma

carries out photosynthesis and is then termed as chlorenchyma. In aquatic plants, large air cavities are present in parenchyma. This provides buoyancy to the plant, and then the parenchyma is known as aerenchyma.

(2) Collenchyma: The cell wall of collenchyma is thickened at corners. Intercellular spaces are very few. Collenchymas provides some degree of structural rigidity with flexibility. Collenchymas is present in leaf stalk; below the epidermis. Due to this, the leaf stalk can easily bend but does not break.



Collenchyma



Sclerenchyma

(3) Sclerenchyma: The cell wall in sclerenchyma is highly thickened all around. The cells are dead and intercellular space is absent. Sclerenchyma provides structural rigidity to plant parts. Bark is composed of sclerenchyma. Another example of sclerenchyma can be seen in the coconut husk.

Stomata: The epidermis of leaves has small pores called stomata. A stoma is composed of two guard cells which regulate the opening and closing of stoma. Stomata facilitates exchange of gases and transpiration.

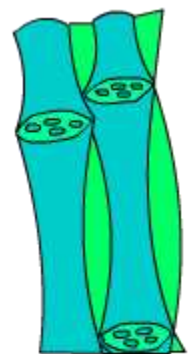
(b) Complex Permanent Tissue:

Complex permanent tissue is composed of different types of cells. Complex permanent tissues are of two types, viz. xylem and phloem. Xylem and phloem together make the vascular bundle in plants.

Xylem: Xylem is composed of tracheids, vessels, xylem parenchyma and xylem fibres. The cells of xylem are dead; except the cells of xylem parenchyma. Tracheids and vessels are tubular structures and thus they provide a channel for conduction of water and minerals. Xylem fibre provides structural support to the tissue. Xylem parenchyma stores food.



Xylem



Phloem

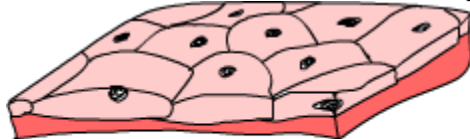
Phloem: Phloem is composed of sieve tubes, companion cells, phloem fibre and phloem parenchyma. Sieve tubes are tubular cells with perforated walls. Sieve tubes are the conducting elements of phloem. Phloem is responsible for translocation of food in plants. The transport of food in phloem is a two way movement.

Animal Tissues

Animal tissues are of four types, viz. epithelial tissue, connective tissue, muscular tissue and nervous tissue.

## Epithelial Tissue:

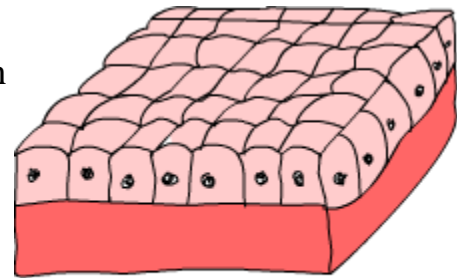
The epithelial tissue forms the covering or lining of most of the organs. The cells of epithelial tissue are tightly packed and form a continuous sheet. There is small amount of cementing materials between the cells and no intercellular space is present. Permeability of the epithelial tissue plays a great role in exchange of materials among various organs it also plays an important role in osmoregulation. All epithelial tissues are separated by the underlying tissue by an extracellular fibrous basement membrane. Epithelial tissues are of following types:



Simple Epithelium

**Simple Epithelium:** The simple epithelium is composed of a single layer of cells. This type of epithelial tissue forms the lining of blood vessels and alveoli. Thin layer of cells facilitates exchange of substances; in such cases.

**Cuboidal Epithelium:-** The cells are cube-shaped in cuboidal epithelium. Linings of kidney tubules and ducts of salivary glands are composed of cuboidal epithelium. Cuboidal cells provide mechanical support. Cells of epithelium may play the role of secretion and then they are called glandular epithelium.



Cuboidal Epithelium

**Columnar Epithelium:-** Cells are column-shaped in columnar epithelium. Columnar epithelium facilitates secretion and absorption. For example; the lining of intestine is composed of columnar epithelium. In some organs, columnar epithelium has cilia present on the outer surface. Cilia facilitate movements of certain substances. The ciliated epithelium in the respiratory tract pushes the mucus forward.

**Stratified Epithelium:-** Cells of the stratified epithelium are in many layers. Skin is an example of stratified epithelium. Stratification of layers prevents wear and tear.

## Connective Tissue:

The cells of a connective tissue are loosely scattered in a matrix. The matrix can be a fluid, jelly like, dense or rigid. The nature of matrix depends on the function a connective tissue serves. Following are the various connective tissues:

**Areolar Connective Tissue:** Areolar tissue is found between skin and muscles, around blood vessels and nerves and in bone marrow. Areolar tissue fills the gap between tissues and provides support. It also helps in repair of tissues.

**Adipose Tissue:** Adipose tissue is composed of fat globules. This tissue is found below the skin and beneath the organs. Adipose tissue provides insulation and works as a cushion.

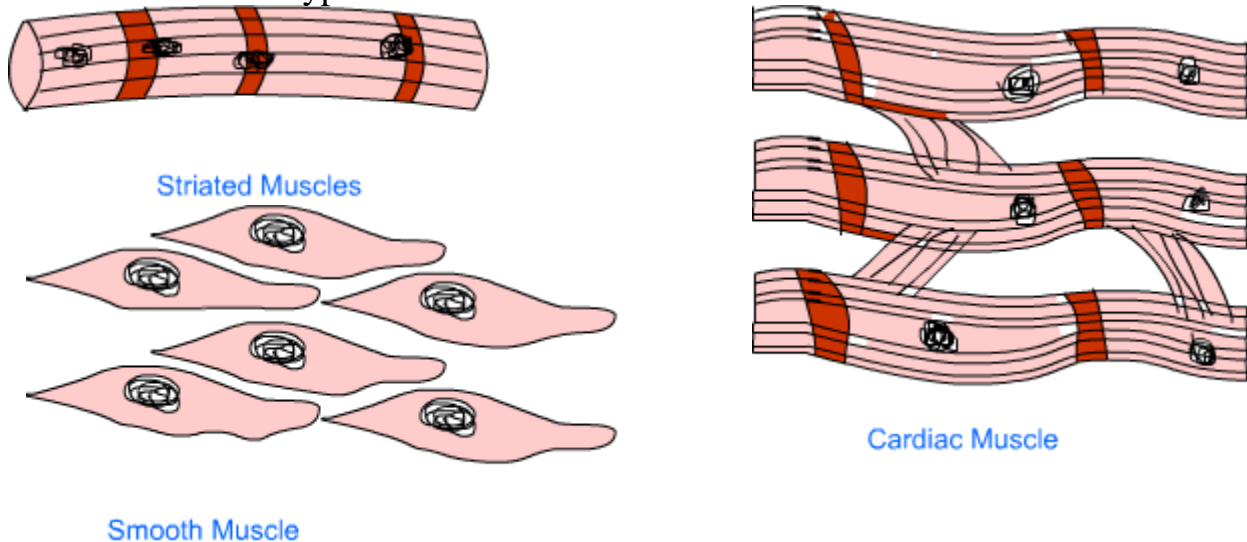
**Bone:** Bone is mainly composed of osteoblasts. Bone makes the skeletal system. Skeletal system is responsible for providing structural framework to the body. It provides protection to important organs and facilitates movements.

**Cartilage:** Cartilage is mainly composed of chondrioblasts. Cartilage is present at the ends of articulatory bones. Cartilage is also present in external ear, bronchii, etc.

**Blood:** Blood is composed of blood cells, platelets and plasma. Blood plays an important role in transportation of various substances in the body. It also helps in osmoregulation and temperature control.

### **Muscular Tissue:**

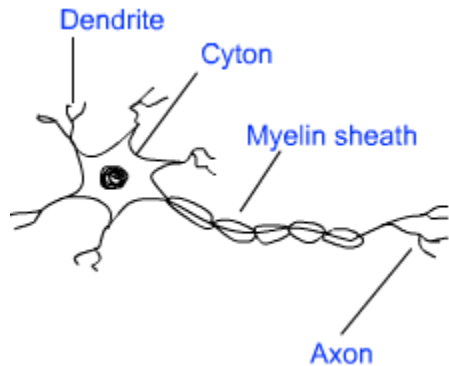
Muscular tissue is composed of muscle cells. Muscle cells are specialized cells which have the capability to contract and expand. Due to contraction and expansion, muscles facilitate various kinds of movements in the body. Muscular tissues are of three types:



**Striated Muscles:** The cells of striated muscles are in the form of long, unbranched fibres. Cells are multinucleate. Light and dark bands (striations) are present on muscle fibres; which gives the name striated muscles. Striated muscles are found in those organs where voluntary movement is possible, e.g. hands, legs, back, neck, etc.

**Smooth Muscles:** The cells of smooth muscles are spindle shaped and each has one nucleus. Smooth muscle is found in those organs where involuntary movement is possible, e.g. alimentary canal.

**Cardiac Muscles:** The cells of cardiac muscles are in the form of branched fibres. Striations are present and cells are uninucleate. These are found in the heart. Cardiac muscles are capable continuous contraction and relaxation throughout the life.



### **Nervous Tissue:**

Nervous tissue makes the nervous system and is composed of specialized cells called neuron. A neuron can be divided into two distinct parts, viz. head and tail. The head is somewhat star-shaped and contains nucleus and some other cell organelles. This is called cyton. There are numerous hair-like outgrowths coming out of the cyton. These are called dendrites. The tail ends in axon terminals. Dendrites receive the nerve impulse, while axon relays the nerve signals.

Question – 1 - Define the term “tissue”.

Answer:- A group of cells which is meant to perform a specific function is called tissue.

Question – 2 - How many types of elements together make up the xylem tissue? Name them.

Answer:- Xylem is composed of these elements: tracheids, xylem vessel, xylem parenchyma and xylem fibre.

Question – 3 - How are simple tissues different from complex tissues in plants?

Answer: Simple tissues are composed of similar cells, while complex tissues are composed of different types of cells.

Question – 4 - Differentiate between parenchyma, collenchyma and sclerenchyma on the basis of their cell wall.

Answer:-

Parenchyma	Collenchyma	Sclerenchyma
Cell wall is thin.	Cells wall is thickened at corners.	Cell wall is thickened all around.

Question – 5 - What are the functions of the stomata?

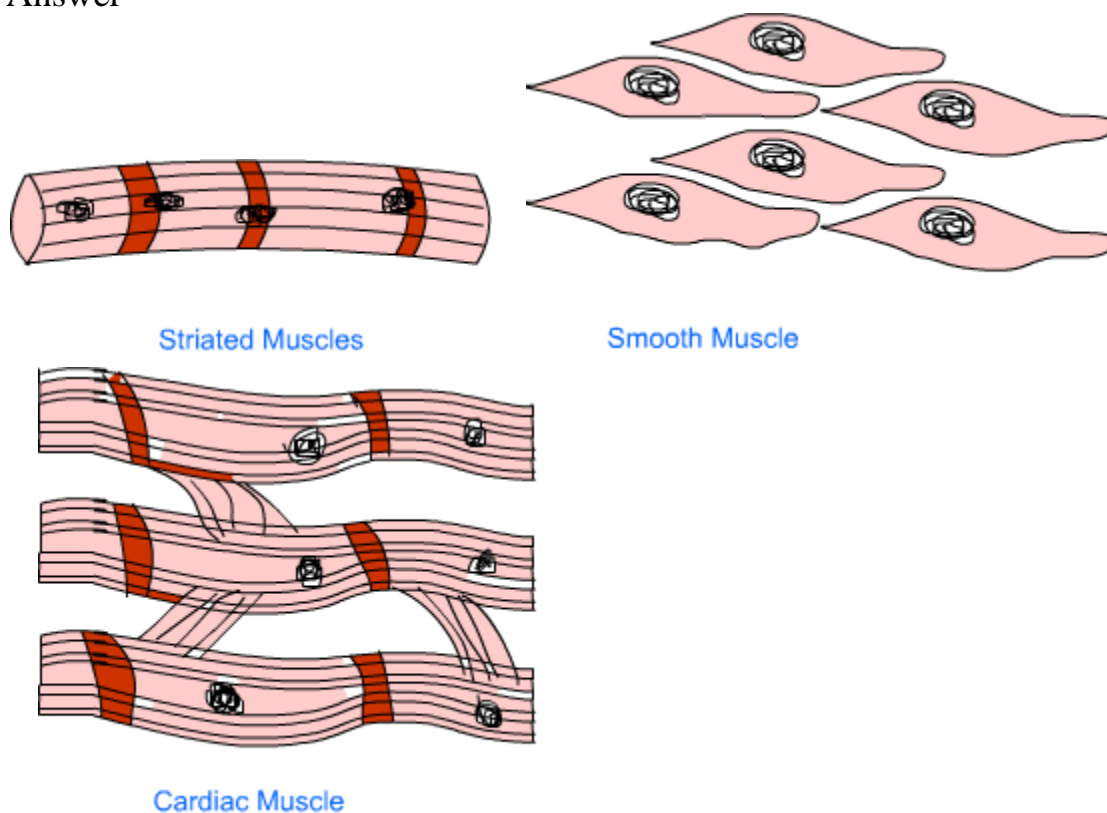
Answer: Functions of stomata are as follows:

Exchange of gases

Transpiration

Question – 6 - Diagrammatically show the difference between the three types of muscle fibres.

Answer



Question – 7 - What is the specific function of the cardiac muscle?

Answer: Cardiac muscles facilitate contraction and relaxation of heart; which results in pumping action of the heart.

Question – 8 - Differentiate between striated, unstriated and cardiac muscles on the basis of their structure and site/location in the body.

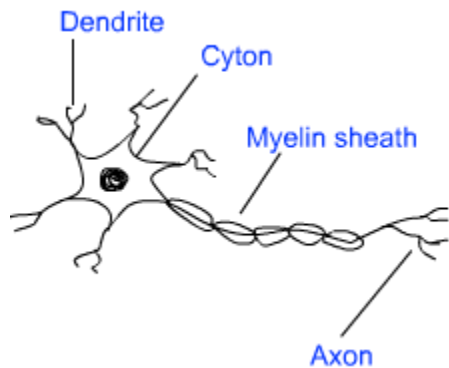
Answer:

Striated Muscles	Unstriated Muscles	Cardiac Muscles
Unbranched fibres; with striations.	Unbranched fibres; with striations.	Branched fibres with striations.
Present in voluntary organs.	Present in involuntary organs.	Present in the heart.



Question – 9 - Draw a labelled diagram of a neuron.

Answer



Question – 10 - Name the following.

Tissue that forms the inner lining of our mouth.

Answer: Simple epithelium

Tissue that connects muscle to bone in humans.

Answer: Tendon

Tissue that transports food in plants.

Answer: Phloem

Tissue that stores fat in our body.

Answer: Adipose tissue

Connective tissue with a fluid matrix.

Answer: Blood

Tissue present in the brain.

Answer: Nervous tissue

Question – 11 - Identify the type of tissue in the following: skin, bark of tree, bone, lining of kidney tubule, vascular bundle.

Answer: Skin: Epithelium, Bark of tree: Epidermis, Bone: Connective tissue, Lining of kidney tubule: Cuboidal Epithelium, Vascular bundle: Complex plant tissue

Question – 12 - Name the regions in which parenchyma tissue is present.

Answer: Parenchyma is present in mesophyll of leaves, fruits, flowers and young stem.

Question – 13 - What is the role of epidermis in plants?

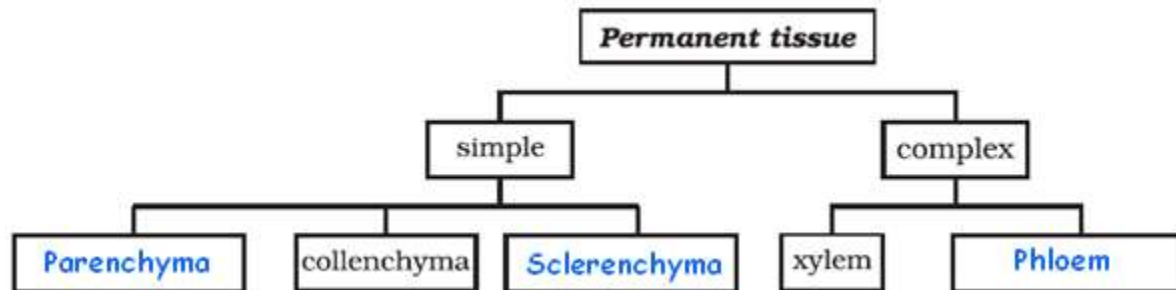
Answer: Epidermis in plants provides protective covering to the underlying tissues. In xerophytes, epidermis has a waxy coating which prevents water loss.

Question – 14 - How does the cork act as a protective tissue?

Answer: Cork forms an impervious layer over underlying tissues. Cork prevents entry of water to the underlying tissue.

Question – 15 - Complete the table:

Answer:



### In Text Questions

Question – 1 - What is a tissue?

Answer: A group of cells which is meant to serve a special function is called tissue.

Question – 2 - What is the utility of tissues in multicellular organisms?

Answer: Tissues facilitate division of labour. Different tissues are responsible for different functions, which is important for the functioning of a multicellular organism.

Question – 3 - Name types of simple tissues.

Answer: Simple tissues are as follows:

Parenchyma

Collenchyma

Sclerenchyma

Question – 4 - Where is apical meristem found?

Answer: Apical meristem is found at root apex, shoot apex, leaf buds, etc.

Question – 5 - Which tissue makes up the husk of coconut?

Answer: Sclerenchyma

Question – 6 - What are the constituents of phloem?

Answer: Phloem is composed of sieve tubes, companion cells, phloem fibres and phloem parenchyma.

Question – 7 - Name the tissue responsible for movement in our body.

Answer: Muscular tissue

Question – 8 - What does a neuron look like?

Answer: Neuron looks like a star-shaped cell with a tail.

Question – 9 - Give three features of cardiac muscle.

Answer: Three features of cardiac muscle are as follows:

Cells are branched fibres.

Striations are present on cells.

Cells are capable of continuous contraction and relaxation.



Q1 Which cells can contract and relax?
Q2 Name the substance that makes cork compact.
Q3 What are root hair?
Q4 What is transpiration?
Q5 What is aerenchyma?
Q6 Name the parenchyma tissue which has chlorophyll.
Q7 Where is meristematic tissue found in plants?
Q8 What is the difference between bone and cartilage?
Q9 Where are tendons and ligaments found?
Q10 Describe the functions of xylem. Write the function of each component.
Q11 What are complex tissues? Write their different kinds.
Q12 What are cork cells?
Q13 What are stomata? Write about their structure and function?
Q14 What are protective tissues?
Q15 Write the characteristics and functions of collenchyma.
Q16. On the basis of structural and functional difference, write the characteristics of plant and animal tissues.