TISSUE -6

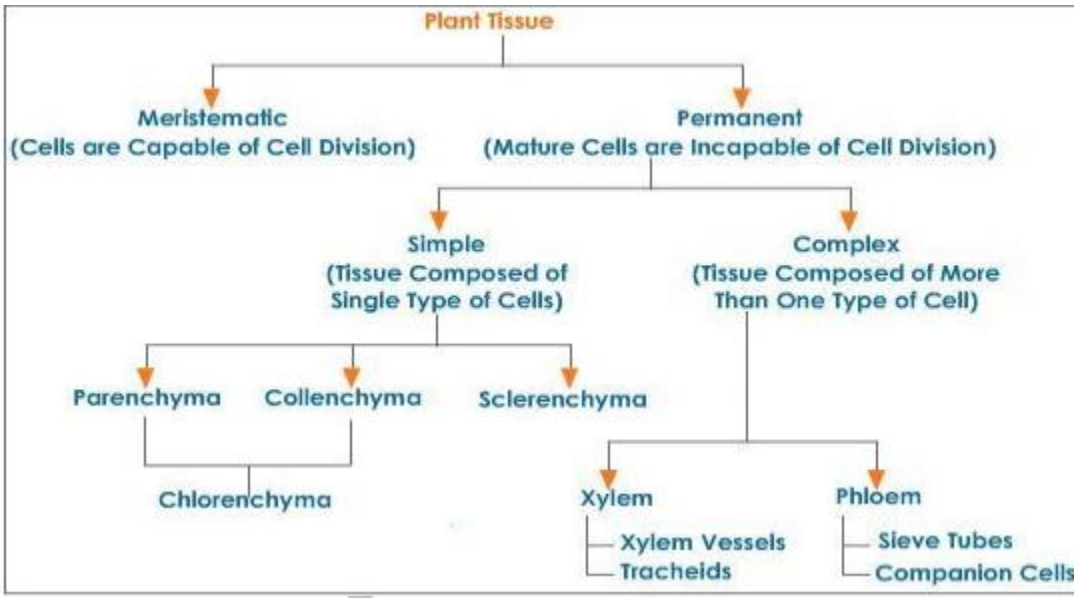
A group of cells that are similar in structure and/or work together to achieve a particular function forms a tissue.

Study of tissues is called Histology.

DIFFERENCE BETWEEN ANIMAL CELL AND PLANT CELL

S. No.	Plant Tissue	Animal Tissue
1.	Tissue organisation is targeted towards Stationery habit of plants.	Tissue organisation is targeted towards mobility of animals.
2.	Organisation is simple.	Organisation is complex.
3.	Many of the tissues are dead. For example, Cork	Most of the tissues are living.
4.	Growth is confined to certain areas.	Growth is not limited to areas
5.	less maintenance energy required	More maintenance energy required
6.	Plants grow continuously throughout life.	After reaching maturity stage animals do not show further growth.

CLASSIFICATION OF PLANT TISSUES



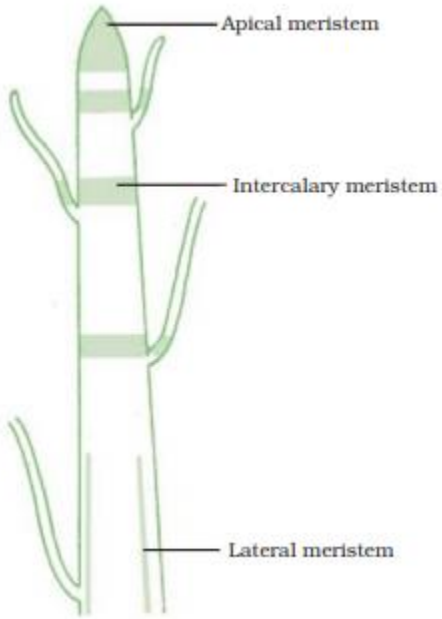
MERISTEMATIC TISSUE

This type of tissue is made up of immature, small and similar cells, which are constantly dividing. As a result of cell division, new cells are constantly being added to the plant.

Hence these tissues play an important role in the growth of the plant.

Depending on the location, Meristematic tissue can be grouped into three types- apical meristem, lateral meristem and the intercalary meristem.

1. **Apical (terminal) meristem:** It is located at the growing tips or apices of the roots and stems.
   This tissue is responsible for the increase in the length of the roots and stems.
2. **Lateral meristem**: Found beneath the bark of trees as cork cambium.
   It is called cambium when it is seen in the vascular bundles of dicot stems and roots .
   This tissue is responsible for the increase in the diameter or girth of the stem.
3. **Intercalary meristem**: It is located at the base of the nodes and internodes.
   This tissue produces an increase in the length of the organ.



CHARACTERISTIC OF CELLS OF MERISTEMATIC TISSUE

- The cells of this tissue are very active,
- They have dense cytoplasm, thin cellulose walls and prominent nuclei.
- They lack vacuoles.

Can we think why they would lack vacuoles?

ANS- ***Meristematic*** *cells divide frequently and give rise to new cells and hence they need dense cytoplasm and thin cell wall.* ***Vacuoles*** *causes hindrance in cell division as it is full of cell sap to provide turgidity and rigidity to the cell.*

SIMPLE PERMANENT TISSUE

This group of tissues is mainly supportive in function, yet they also perform other functions. They are grouped into three types:

a. Parenchyma
b. collenchyma
c. Sclerenchyma

a. Parenchyma:
A few layers of cells form the basic packing tissue. This tissue is parenchyma, a type of permanent tissue.

CHARACTERISTIC OF CELLS OF PARENCHYMA TISSUE

- It consists of relatively unspecialized cells with thin cell walls.
- They are live cells.
- They are usually loosely packed.

TYPES OF PARENCHYMA TISSUE

I. **CHLORENCHYMA-**Parenchyma with chlorophyll which performs photosynthesis is called as chlorenchyma.

II. **Aerenchyma -**The parenchyma with large air spaces to give buoyancy is called as aerenchyma .

Arenchyma provides buoyancy effect to aquatic plants

Parenchyma also stores food and water.

b. **Collenchyma**: Tissue provides mechanical support, thickened at the corners, have very little intercellular space. It allows easy bending of various parts of a plants without breaking

c. **Sclerenchyma:** Tissue makes the plant hard and stiff, thickened due to lignin and no intercellular space. Cells of this tissue are dead and commonly seen in the husk of coconut.

CHARACTERISTICS OF SIMPLE, PERMANENT TISSUE

	PARENCHYMA	COLLENCHYMA	SCLERENCHYMA
Structure	➢ Generally oval or spherical ➢ Thin cellulose cell wall ➢ Single large vacuole present ➢ Nucleus present ➢ Intercellular spaces present	➢ Elongated cells ➢ Cellulose cell wall, unevenly thickened at the corners ➢ Vacuole small ➢ Nucleus present ➢ Intercellular spaces absent	Spindle shaped cells ➢ Cell wall is evenly thickened with lignin ➢ Vacuole absent ➢ Nucleus absent ➢ Intercellular spaces absent
Location	Seen in the soft parts of stems, roots , leaves, flowers	In leaf stalks (petiole). Below epidermis of leaves. Stems of herbaceous, dicot plants.	Found in veins of leaf. Hard covering of seed and nuts. (sclereids) In and around the xylem and phloem of stems.
Function	➢ Storage of food. ➢ Forms the ground tissue of plants. ➢ When chlorophyll is present it is called chlorenchyma and then performs photosynthesis.	➢ Provides mechanical support. ➢ If chloroplasts are present, performs photosynthesis.	➢ Fibres provide mechanical strength, rigidity and flexibility to the plant body. ➢ The sclereids or stone cells impart hardness to the seed coat of certain types of seeds.

Differences between sclerenchyma fibres and sclereids

Fibres	Sclereids or stone cells

➢ Elongated cells, tapering at both ends. Occur in bundles. ➢ Gives mechanical strength. ➢ Used for making ropes, mats (coir, jute) and textile materials such as linen and hemp	➢ Spherical or irregular cells ➢ Found scattered ➢ Gives hardness to seed coat. ➢ The presence of stone cells in walnut shells, almond shells make them hard. ➢ The gritty nature of pulp of pears and guava is also due to the sclereids present in them.

PROTECTIVE TISSUES

These tissues include:
1. Epidermis
2. Cork

1. **Epidermis:** forms one cell thick outermost layer of the organs of plants, such as, leaves, flowers, stems and roots. This layer of cells is covered from the outside by the cuticle.

2. **Cork**: is made up of dead cells with thick walls, with no intercellular spaces, found in older stems and roots of dicot plants. As the dicot plants get older, the single layer of epidermis is replaced by a multi-layer cork cells.

COMPLEX PERMANENT TISSUE

The complex tissue consists of more than one type of cells which work together as a unit. This tissue is also known as conducting tissue or vascular tissue as their main function is to transport water, mineral salts and food materials.

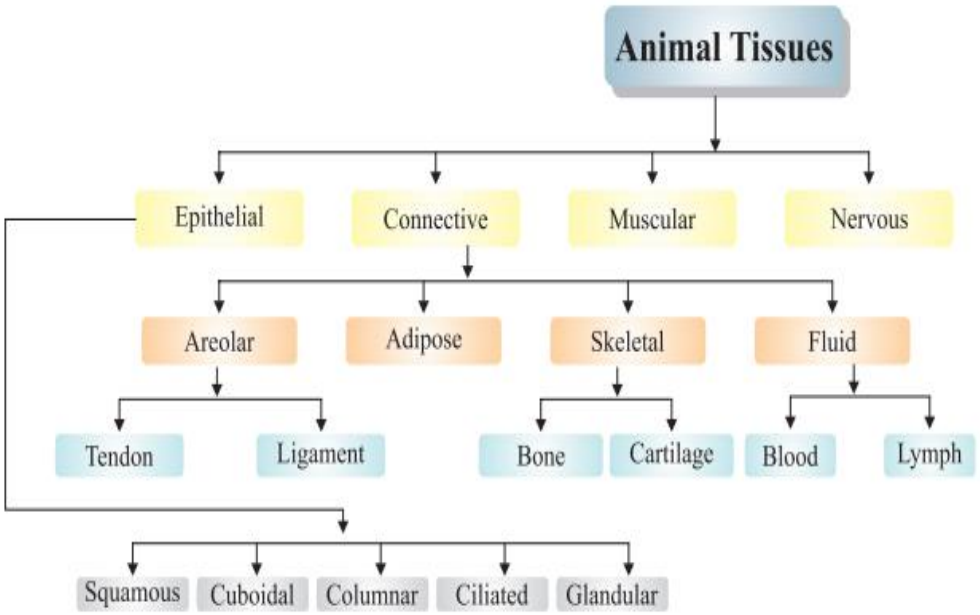
The two types of complex permanent tissue are:
1. Xylem or wood
2. Phloem or bast

Xylem and phloem together form vascular bundles.

Xylem	Phloem
1.It consists of tracheids, vessels, xylem parenchyma and xylem fibres. *2. Mainly made up of dead cells.* *3. It conducts water and dissolved minerals from the roots to the aerial parts in an upward direction.*	*1. Phloem tissue comprises of the sieve tubes, companion cells, phloem parenchyma and phloem fibres.* *2. Mainly made up of living cells.* *3. It translocates food from the leaves to the storage organs of the plant*

Note: The rings present in the trunk of an old tree are the xylem rings. By counting the number of rings, we can determine the age of a tree.

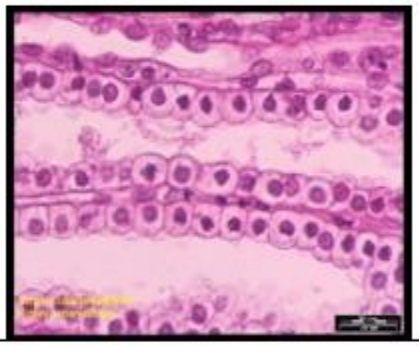
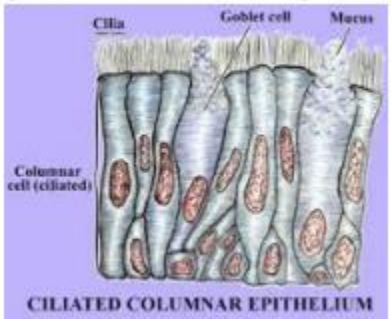
ANIMAL TISSUE



EPITHELIAL TISSUE

- Always grows on some other types of tissue.
- Cells of epithelium are set very close to each other and the tissue rests on
- a non-cellular basement membrane.
- Consists of single layer of cells.
- Blood vessels are absent and non-nervous in nature.
- It covers all the organs and lines the cavities of hollow organs like stomach.
- It is primarily protective in function.

Depending on shape and function they are classified as

TISSUE	NATURE	OCCURENCE	FUNCTION
SQUAMOUS EPITHELIUM 	Compact, flat plates like cells with no inter cellular spaces.	Lining the skin and cavities of ducts. Whenever it forms a lining as that of blood vessels, it is called by the special name of endothelium.	Protects underlying parts from injury, entry of germs, chemicals and drying up.
COLUMNAR AND GLANDULAR EPITHELIUM 	Cells are taller than broad with nucleus towards the base. Certain cells adapted for secretion.	Intestinal lining, sweat gland, tear gland, salivary gland, kidney tubules.	Gives mechanical strength, concerned with secretions.
CUBOIDAL EPITHELIUM 	Cube like cells which are square in section but the free surface appears hexagonal.	Kidney tubules, salivary glands, inner lining of the cheek.	Gives mechanical strength.
CILIATED EPITHELIUM 	Cuboid or columnar cells with protoplasmic outgrowth called cilia.	Lining of trachea of vertebrates, kidney tubules and oviduct.	Keeps out unwanted particles.

CONNECTIVE TISSUE

- **The cells of the connective tissue are widely spaced and embedded in an intercellular matrix.**
- **The mature of matrix decides the function of tissue.White and yellow fibres are present in the matrix.**
- **Their basic function is to provide support to different organs & keeping them in place.**

a) Blood: The Blood is a fluid connective tissue. Blood plasma has RBCs (Red BloodCells) WBCs (White Blood Cells) and platelets. Blood plasma contains proteins, salts and hormones. Blood flows and transports gases, digested food, hormones and waste materials.

(b) Bone: The bone is a connective tissue with hard matrix, composed of calciumand phosphorus. A bone is connected by another bone with another connective tissue called ligaments. A bone is connected by muscle with another connective tissue called tendon.

c) Cartilage: The cartilage is a connective tissue with solid matrix composed ofproteins and sugars. It is commonly seen in nose, ear, trachea, and larynx.

d) Areolar Connective Tissue: It is found between the skin and muscles, aroundthe blood vessels. It supports internal organs and aids in repair of tissues.

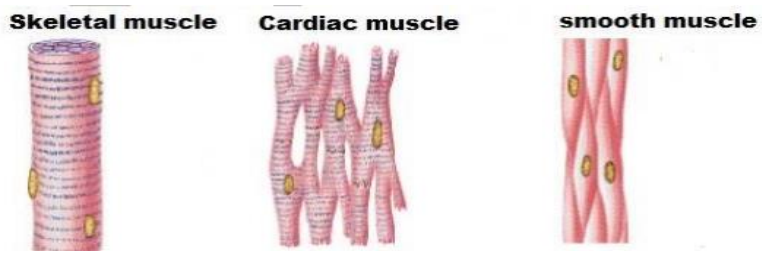
e) Adipose Connective Tissue: It is filled with fat globules for the storage of fat. It acts as insulator.

ANIMAL MUSCLE TISSUE

All types of movements are brought about in the body with the help muscular tissue.

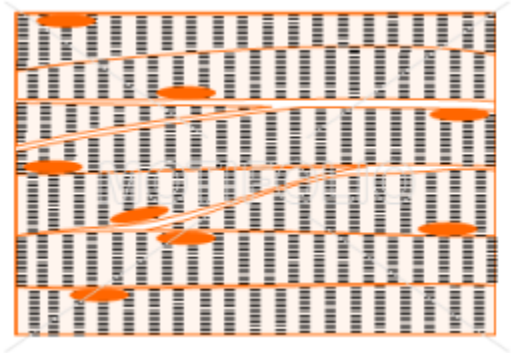
Classification of muscular tissue: The muscular tissue is of three types

i) Striped or striated or skeletal or voluntary muscle.
ii) Unstriped or non- striated or smooth or visceral muscle.
iii) Cardiac muscle.



i) Skeletal or voluntary muscle :

- They are striated, multinucleated, unbranched fibres.
- The muscle fibres are bounded by an elastic but tough covering called sarcolemma.
- Bounded by the sarcolemma is a clear fluid called sarcoplasm which contains contractile fibrils called myofibrils.
- The myofibrils show alternate dark and light bands giving a characteristic striped or striated appearance.
- These muscles can get tired and need rest.

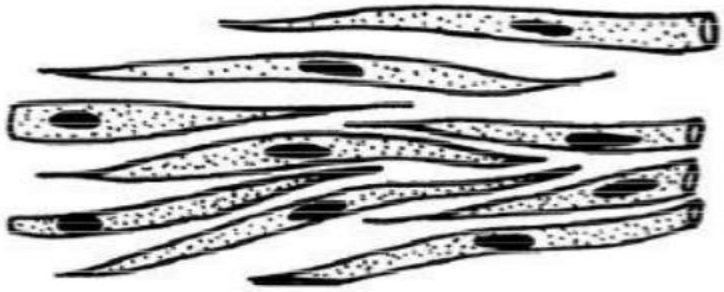


Location: Attached primarily to bones.

Function: Striated muscles help in bringing about all voluntary movements of the body. Provide the force for locomotion.

Smooth or Involuntary muscle :

- They are non - striated , uni – nucleated, spindle shaped fibres.
- The nucleus is in the centre and the ends of the cell may branch.
- Myofibrils do not show alternate dark and light band. Hence, they are smooth or non - striated muscles.
- The muscle fibres lack sarcolemma but several fibres are joined together in bundles by loose connective tissue.



Location : They are found in the walls of hollow organs like stomach, intestine, urinary bladder ; blood vessels , iris , erector muscle in skin.

Function :

- Unstriated muscles cause slow and prolonged contractions which are involuntary i.e not under the control of the will.
- Peristaltic contractions in the alimentary canal are brought about by the smooth muscles.
- These contractions push the food ball in the alimentary canal.

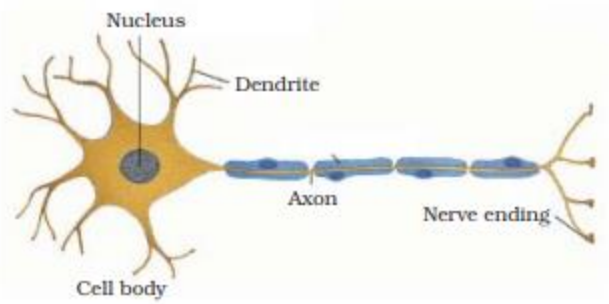
Cardiac muscle

- They are only involuntary muscles.
- Only found in the walls of heart.
- Their structure is in between the striated and non-striated muscles.
- They are uninucleated and branched. Branches are united by intercalated
- disc.
- In these muscles rhythmic contraction and relaxation occurs throughout
- the life.

NERVOUS TISSUE

Nervous tissue is a highly specialised tissue due to which the animals are able to perceive and respond to any change in the environment. The fundamental unit of nervous tissue is called nerve cell or neuron.

STRUCTURE OF NEURON:



Each neuron consists of three parts:

i) **Cyton or cell body or perikaryon :** It is star shaped having a single nucleus in the centre.

ii) **Dendrons :** The dendrons are short processes arising from the cyton and further branching into thin dendrites. They carry impulse towards the cell body.

iii) **Axon :** It is a single , long , cylindrical process arising from cyton which branch terminally.