

BIOLOGY

Chapter 6: Tissues



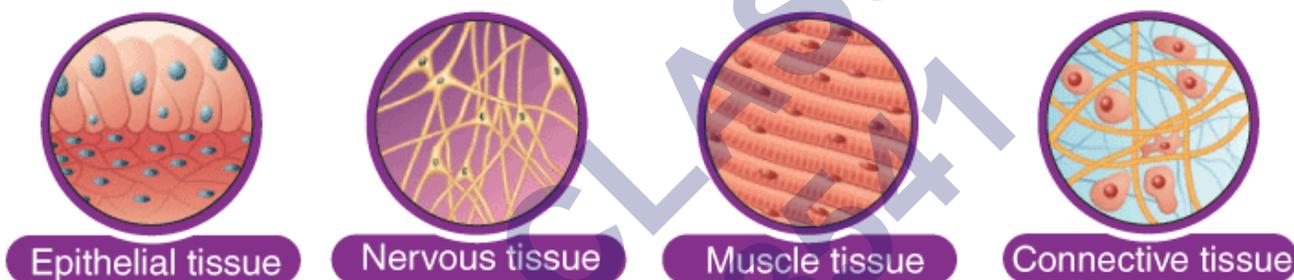
Tissues

Tissues are a group of cells that combine together to perform a particular function.

In simple terms, tissue can be defined as a group of cells with similar shape and function are termed as tissues. They form a cellular organizational level, intermediate between the cells and organ system. Organs are then created by combining the functional groups of tissues.

The study of tissue is known as histology and study of disease-related to tissue is known as histopathology. The standard tools for studying tissues is by embedding and sectioning using the paraffin block.

Types of Animal Tissues



Animal tissues are grouped into four types:

- Connective Tissue
- Muscle Tissue
- Nervous Tissue
- Epithelial Tissue

The collection of tissues are joined in structural units to serve a standard function of organs. The primary purpose of these four types of tissue differs depending on the type of organism.

For example, the origin of the cells comprising a particular tissue type also differs.

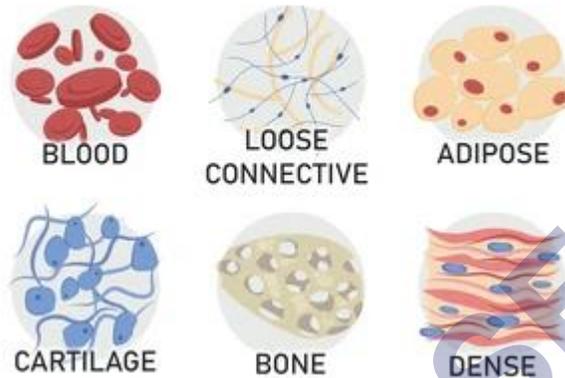
Lets say there are 4 types of tissue in human body
Connective, Muscle, Nervous, Epithelial



Remember it as: **COME YOU NEED**
 Easy, ain't it?

Connective Tissues

TYPES OF CONNECTIVE TISSUE



They are the group of tissues made up of cells separated by non-living material, called as an extracellular matrix. This tissue provides shape to the different organs and maintains their positions. For example, blood, bone, tendon, adipose, ligament and areolar tissues. There are three types of connective tissue:

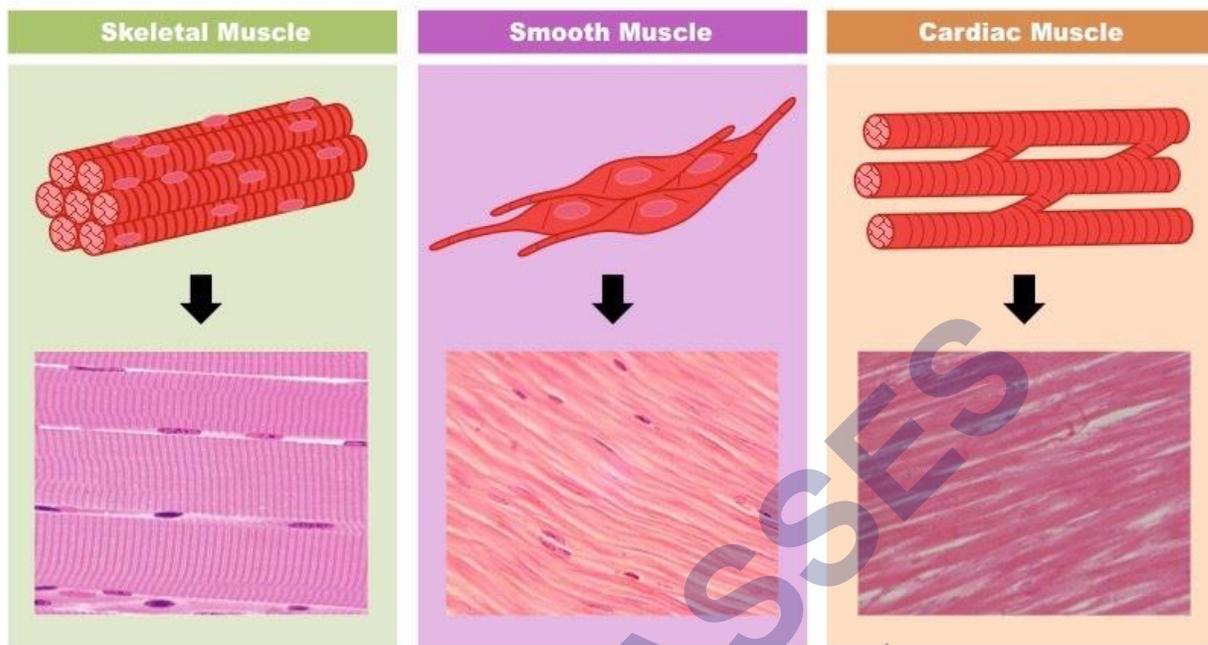
- Fluid Connective Tissue.
- Fibrous Conctive Tissue.
- Skeletal Connective Tissue.

Functions of Connective Tissue

The connective tissue functions by providing shape and maintains the position of different organs in the body. It functions as the primary supporting tissue of the body. Other important and the major functions of connective tissue in the body are:

- Insulating.
- Helps in binding the organs together and provides support.
- It protects against the invasions of pathogens by their phagocytic activity.
- Provides shape to the body, conserves body heat and also stores energy.
- It is involved in the transportation of water, nutrients, minerals, hormones, gases, wastes, and other substances within the body.

Muscle Tissue



They are involved in producing force and generating motion, either for the locomotion or for other body movements within internal organs. There are three types of muscle tissue:

- Skeletal Muscle – they are typically attached to bones
- Cardiac Muscle – found in the heart.
- Visceral or Smooth Muscle – they are found in the inner walls of organs.

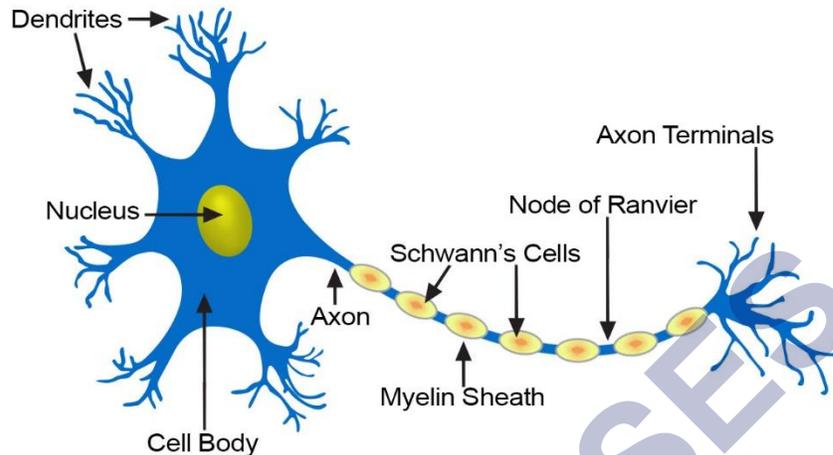
Functions of Muscle Tissue

Muscle tissues are associated with their movements including walking, running, lifting, chewing, picking and dropping objects, etc. The other major functions of muscle tissue in the body are:

- Helps in maintaining an erect position, or posture.
- Helps in the constriction of organs and blood vessels.
- Involved in both voluntary and involuntary movements.
- Involved in pumping blood and regulating the flow of blood in arteries.
- Controls respiration by automatically driving the movement of air both into and out of our body.

Nervous Tissue

Structure of a Typical Neuron



They are the main tissue components of the brain and spinal cord in the central nervous system. While, in the peripheral nervous system, the neural tissue forms the cranial nerves and spinal nerves.

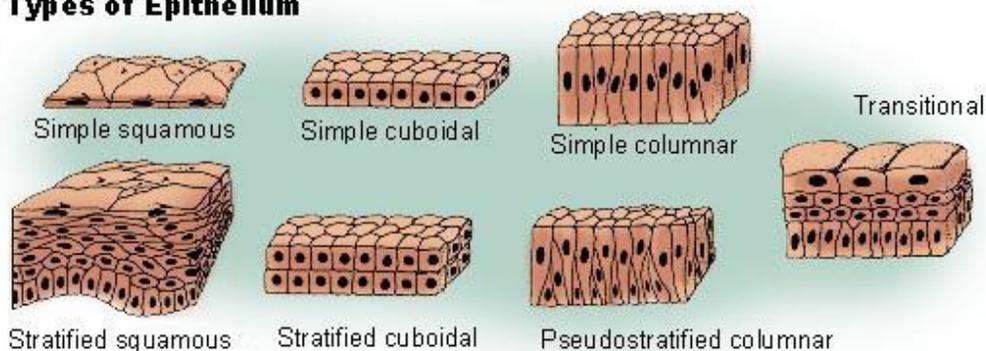
Functions of Nervous Tissue

The nervous tissue forms the communication network of the nervous system and is important for information processing. The other major functions of nervous tissue in the body are:

- Response to stimuli.
- Stimulates and transmits information within the body.
- Plays a major role in emotions, memory, and reasoning.
- Maintains stability and creates an awareness of the environment.
- Nervous tissue is involved in controlling and coordinating many metabolic activities.

Epithelial Tissue

Types of Epithelium



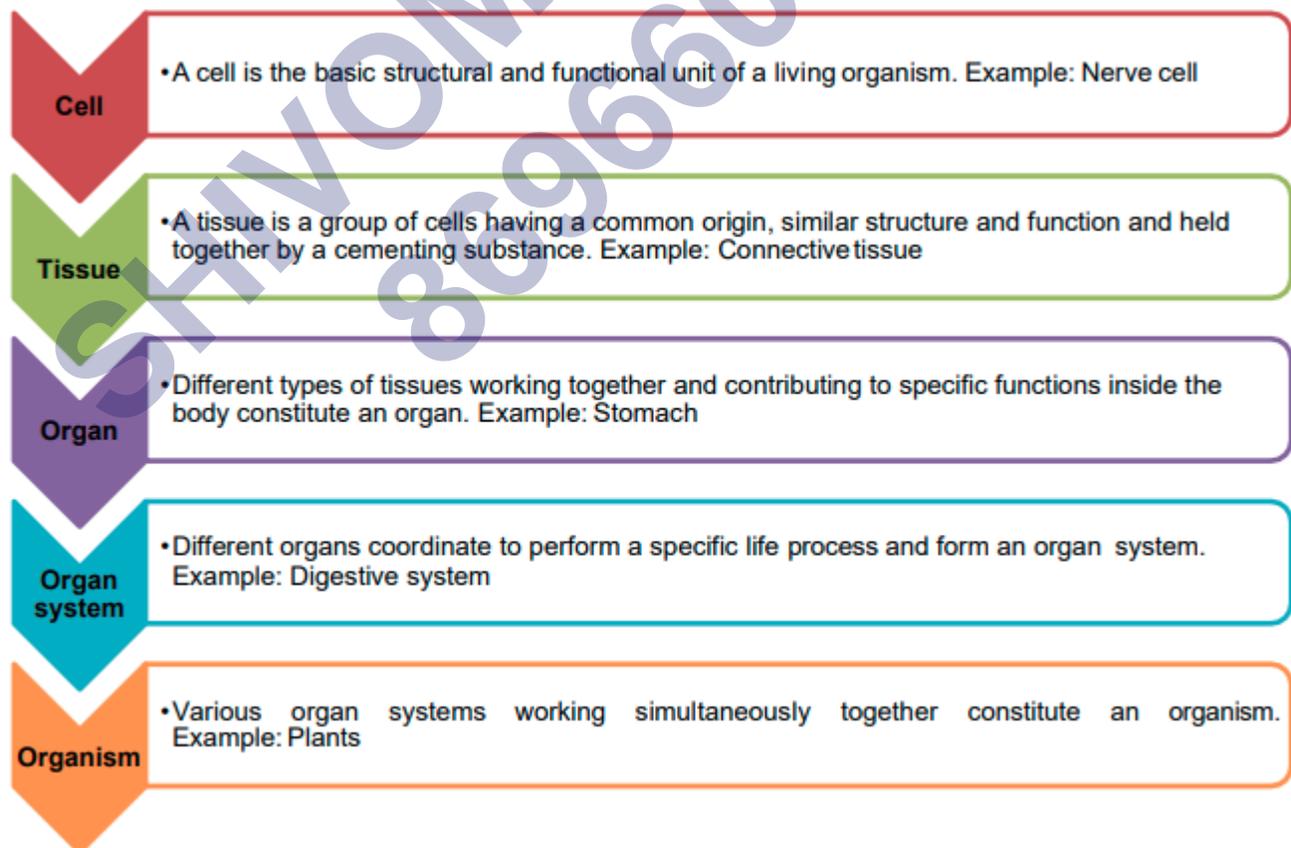
They are formed by cells which cover the external parts of the body organs and lines the organ surfaces such as the surface of the skin, the reproductive tract, the airways, and the inner lining of the digestive tract.

Functions of Epithelial Tissue

- This tissue performs a wide variety of functions including:
- Play a major role in sensory reception, excretion, filtration and other metabolic activities.
- Provide mechanical strength and resistance to the underlying cells and tissue.
- It is involved in the movement of materials through the process of filtration, diffusion and secretion.
- Protects the internal organs against the invasions of pathogens, toxins, physical trauma, radiation, etc.

Epithelial tissues are also involved in secreting hormones, enzymes, mucus and other products from ducts and transporting it to the circulatory system.

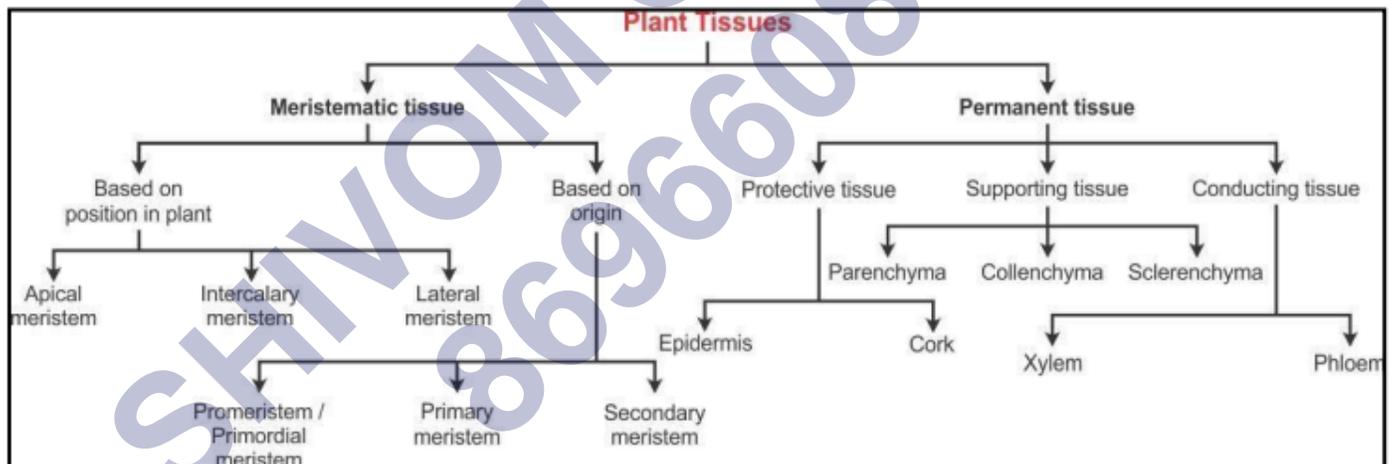
Levels of Organisation



Differences between Plant and Animal Tissues

| PLANT TISSUES | ANIMAL TISSUES |
|---|---|
| 1. Dead supportive tissues are more abundant as compared to living tissues. | 1. Living supportive tissues are more abundant as compared to dead tissues. |
| 2. Require less maintenance energy. | 2. Require more maintenance energy. |
| 3. Differentiation of meristematic and permanent tissues. | 3. No differentiation of meristematic and permanent tissues. |
| 4. Organization is simple. | 4. Organisation is relatively complex. |
| 5. Tissue organisation is meant for stationary habit of plants. | 5. Tissue organisation is meant for high mobility of animals. |

Classification of Plant Tissues

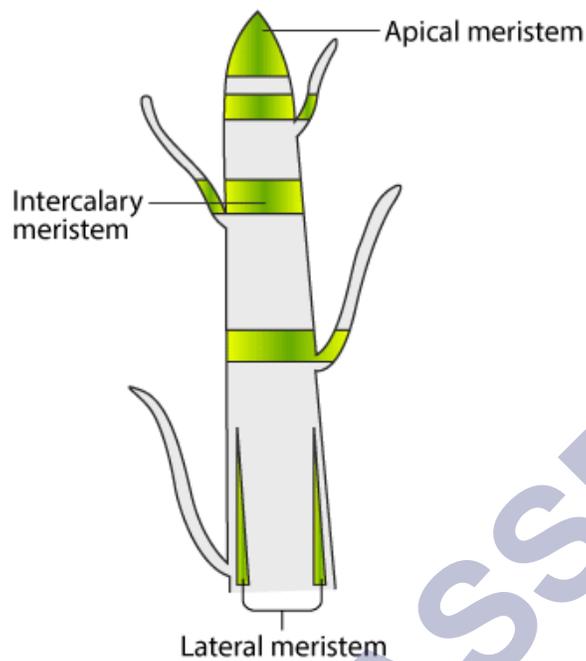


Meristematic Tissue

| Characteristics |
|--|
| • Cells are thin-walled and composed of cellulose. |

| Location |
|--|
| • Located at the tips of the roots and stems, and the base of the node, internode or leaf. |

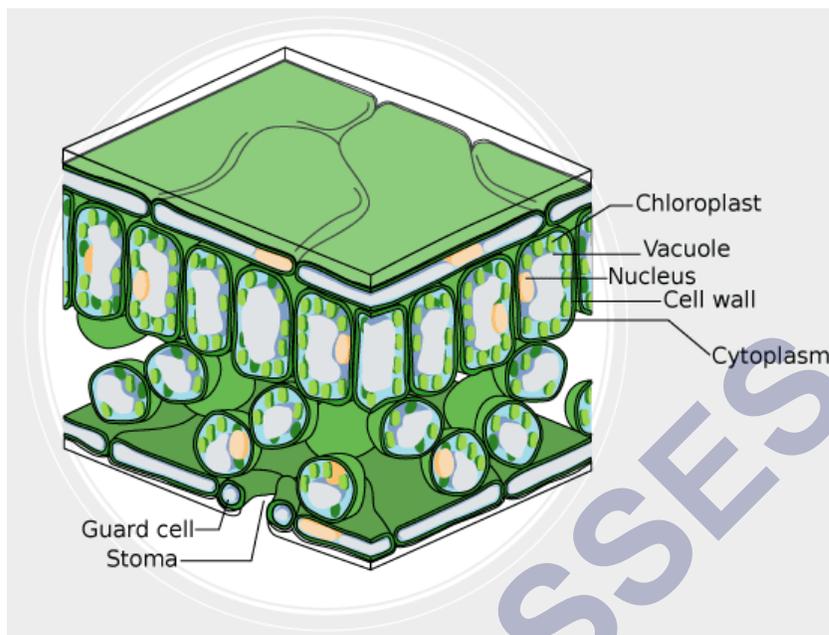
| Function |
|---|
| • The cells of meristematic tissue divide actively, which results in growth (increase in thickness and length) of plants. |



Types of Meristematic Tissues

| Type | Location | Function |
|------------------------------|--|--|
| Apical meristem | Located at the growing points of the stem, roots, branches and in growing young leaves near the tips of stems and axillary buds | Enables the root and stem to grow by increasing the length of plants |
| Intercalary meristem | Located at the internodes or stem regions between the places at which the leaves attach and at leaf bases | The cells are active and they continuously form several new cells |
| Lateral meristem/ Cambium | Present laterally (on the sides) on the roots and stem and is situated parallel to the longitudinal axis below the bark | The girth and width/diameter/thickness of the stem or root increases because of the lateral meristem |

Permanent Tissues



Permanent tissues are formed by the division of the meristematic tissue cells which have lost their ability to multiply.

Types of Permanent Tissues

Protective Tissue

- It is found on the surface of the roots, stems and leaves.
- It consists of cells with thick walls.
- It provides protection against mechanical injury or invasion by parasitic fungi.

| Types of Protective Tissues | | | |
|-----------------------------|--|---|--|
| Type | Characteristics | Location | Function |
| Epidermis | Cells are elongated and flattened with no intercellular spaces between them. | Present in the outermost layer of leaves, flowers, stem and roots. | Protects the plant from desiccation and infection. |
| Cork | Cells are rectangular with vacuolated protoplasts. | It is the outermost layer formed after the epidermis undergoes certain changes. | Prevents desiccation, infection and mechanical injury. |

Supporting Tissue

- It provides support to the plant.

| Types of Supporting Tissues | | | |
|-----------------------------|-----------------|----------|----------|
| Type | Characteristics | Location | Function |

| | | | |
|--------------|--|--|---|
| Parenchyma | Consists of relatively non-specialised large, thin-walled living cells | Mainly present in the soft parts of the plant and outer cortical region of roots and stems | Provides temporary support and maintains the shape of the plant body |
| Collenchyma | Cells are living and elongated with cell walls irregularly thickened at the corners | Located in non-woody plants, leaf stalks and below the epidermis of the stems and veins of leaves | Provides mechanical support and elasticity to young dicotyledonous plants |
| Sclerenchyma | Consists of elongated, narrow and fibre-like cells. Cells are dead, pointed at both ends and thickened | Located in the stems around the vascular bundle, veins of leaves and hard covering of seeds and nuts | Provides strength and toughness to plant parts |

Conducting Tissue (Vascular Tissue)

- It is present in stems, roots and leaves.
- It provides a passage for water and dissolved materials to move up and down in the plant body.

Types of Conducting Tissues

| Type | Characteristics | Location | Function |
|-------|--|---------------------------------------|---|
| Xylem | Complex permanent tissue with thick-walled cells; most of the cells are dead | Present in the stem, roots and leaves | Provides upward movement of water and dissolved materials |

Components of Xylem

| | | | |
|-----------|---|---|--|
| Tracheids | Made of elongated cells with flat and tapering ends | - | Provide a network of hollow and connected cells for the transport of water |
|-----------|---|---|--|

| | | | |
|------------------|---|---|--|
| Xylem vessels | Tubular structures which consist of dead cells | - | Allow free flow of water and minerals from the roots to the leaves |
| Xylem parenchyma | Consists of living parenchyma cells associated with xylem | - | Stores food in the plant body |
| Xylem fibres | Separated by thin cross walls | - | Mainly support the plant |

Types of Conducting Tissues

| Type | Characteristics | Location | Function |
|--------|--------------------------|--|--|
| Phloem | Complex permanent tissue | Lies just beneath the bark of the tree | Provides a passage for the downward movement of food |

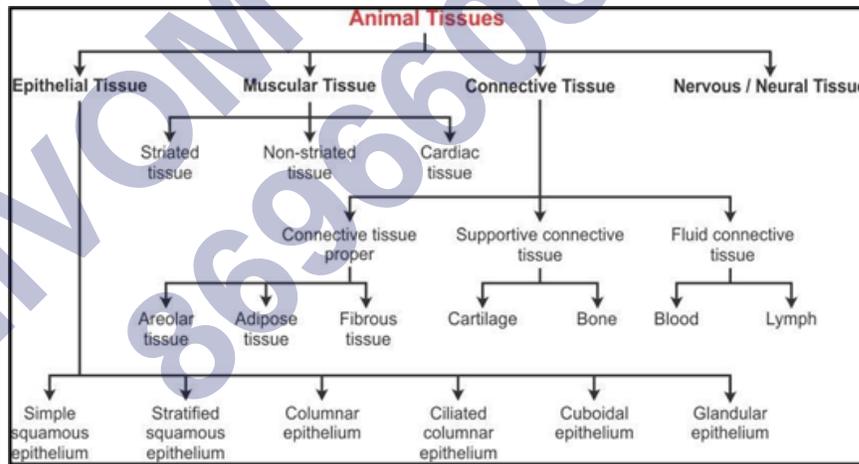
Components of Phloem

| | | | |
|-------------------|---|--------------------------------|--|
| Sieve tubes | Tubular cells with perforated walls and arranged end to end | - | Translocation of organic substances |
| Companion cells | Cells are living and keep their nuclei and other organelles throughout their life | - | Help to control the activity of sieve tube elements |
| Phloem fibres | Elongated, tapering and dead cells with thickened cell walls | Found particularly in the stem | Provide mechanical strength to plants |
| Phloem parenchyma | Cells are alive and filled with cytoplasm | - | Transports food from the leaves to the other non-green parts of the plants |

Differences between Meristematic and Permanent Tissues

| MERISTEMATIC TISSUE | PERMANENT TISSUE |
|---|--|
| 1. Simple tissue | 1. Simple, complex or specialised tissue |
| 2. Component cells are small, spherical or polygonal and undifferentiated | 2. Component cells are large, differentiated with different shapes |
| 3. Intercellular spaces are absent | 3. Intercellular spaces are present |
| 4. Cells grow and divide regularly | 4. Cells do not divide |
| 5. Metabolically active | 5. Metabolic rate is slow |
| 6. Provides growth to the plant | 6. Provides protection, support, conduction, photosynthesis, storage |

Classification of Animal Tissues



Epithelial Tissue

| Characteristics |
|------------------------------------|
| • Flat, cuboidal or columnar cells |

| Location |
|---------------------------------|
| • Covers the whole body surface |

| Function |
|---|
| • Protection, absorption, secretion, sensory perception |

Types of Epithelial Tissues

| Type | Characteristics | Location | Function |
|------|-----------------|----------|----------|
|------|-----------------|----------|----------|

| | | | |
|--------------------------------|---|--|--|
| Simple squamous epithelium | Cells are large, extremely thin and flat | Lining of blood vessels, lung alveoli, oesophagus, the lining of the mouth and cheek | Transport of substances through a selectively permeable membrane |
| Stratified squamous epithelium | Cells are arranged in a pattern of layers | Outer protective covering all over the body surface | Provides protection to underlying tissues |
| Columnar epithelium | Cells are tall and cylindrical-like pillars | Inner lining of the stomach and intestines | Absorption of nutrients from the digested food |
| Ciliated columnar epithelium | Cells possess fine hair-like cilia | Inner lining of the trachea, lungs, respiratory system and buccal chambers | In the respiratory tract, the movement of cilia pushes the mucus forward to clear it |
| Cuboidal epithelium | Cells are cube-shaped and are placed on a basement membrane | Lining of the kidney tubules as well as in the ducts of the salivary glands | Helps in the absorption of useful material from urine before it is passed out |
| Glandular epithelium | Epithelial tissue which folds inwards to form a multicellular gland | Present in the stomach, intestine and pancreas | Synthesis and secretion of substances at the epithelial surface |

Connective Tissue

Characteristics

- Consists of a matrix and the cells are embedded in it

Location

- Found in the deeper parts of the body, between the skin and muscles

Function

- Connects various organs and keeps them in place

Types of Connective Tissues

Connective Tissue Proper/Loose Connective Tissue

- It is composed of irregular cells scattered and embedded in a soft matrix and encompasses all internal organs and body cavities.
- It acts as a binding and supporting structure within the body.

| Types of Connective Tissues Proper | | | |
|------------------------------------|--|---|--|
| Type | Characteristics | Location | Function |
| Areolar tissue | Made of gelatinous matrix containing cells and irregularly arranged fibres | Found between the skin and muscles, around the blood vessels, nerves and in the bone marrow | Supports and strengthens the internal organs |
| Adipose tissue | Cells are filled with fat globules | Found beneath the skin, around the kidneys and other internal organs such as intestines | Insulates the body and prevents the loss of heat |
| Fibrous tissue | Mainly formed of fibre-forming cells, which form the tendons and ligaments | Found in the spaces between the bones and muscles | Tendons help to attach muscles to the bones. Ligaments serve to hold the structures together and keep them strong and stable |

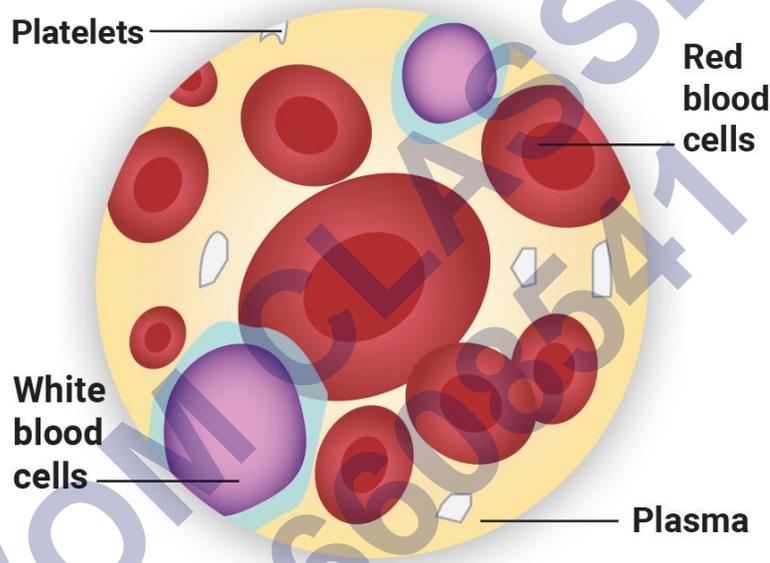
Supportive Connective Tissue/Dense Connective Tissue

- It is composed of fibres as its main matrix element and is found in bones and cartilages.
- It connects different tissues.

| Types of Supportive Connective Tissues | | | |
|--|---|--|---|
| Type | Characteristics | Location | Function |
| Cartilae | Non-porous, semi-transparent and elastic tissue | Present in the nose, external ear, trachea, larynx, ends of the long bones and between the | Smoothens the bone surface at joints, allowing smooth movement of these |

| | | | |
|------|---|---|--|
| | | vertebrae | joints |
| Bone | Hard, strong and non- flexible porous tissue which consists of living cells | Forms a rigid part of the skeletal system | Forms the supporting framework of the body Gives shape and rigidity to the body |

Fluid Connective Tissue



- It consists of liquid as the ground substance and is present throughout the body.
- It provides nutrition, helps in transport of nutrients and gets rid of waste matter.

| Types of Fluid Connective Tissues | | | |
|-----------------------------------|---|-----------------------------|---|
| Type | Characteristics | Location | Function |
| Blood | Red-coloured fluid matrix which consists of plasma and cells such as RBCs, WBCs and platelets | Present throughout the body | Connects different parts of the body and establishes continuity within the body |
| Lymph | Fluid surrounding the body cells which contains WBCs | Present throughout the body | Transports nutrients and provides protection against diseases |

Muscle Tissue

| Characteristics |
|--|
| • Consists of elongated, narrow, muscle cells called muscle fibres |

| Location |
|--------------------------------|
| • Mostly attached to the bones |

| Function |
|---|
| • Helps in contraction and relaxation of the body |

Types of Muscle Tissues

| Type | Characteristics | Location | Function |
|---|---|--|---|
| Striated/skeletal/striped/voluntary muscles | Muscle fibres are long, cylindrical, unbranched and multinucleate | Found attached to the bones | Help in voluntary muscle movement and locomotion |
| Non-striated/smooth/non-striped/involuntary muscles | Muscle fibres are smooth and without striations | Found in the uterus, digestive tract, urinary bladder, iris of the eye, bronchi of the lungs and other internal organs | Carry out movements which cannot be carried out by our conscious will |
| Cardiac/heart muscles | Muscle cells are short, cylindrical and have a single, centrally placed nucleus | Found only in the walls of the heart | Rhythmic contraction and relaxation of cardiac muscles help to pump and distribute the blood to various parts of the body |

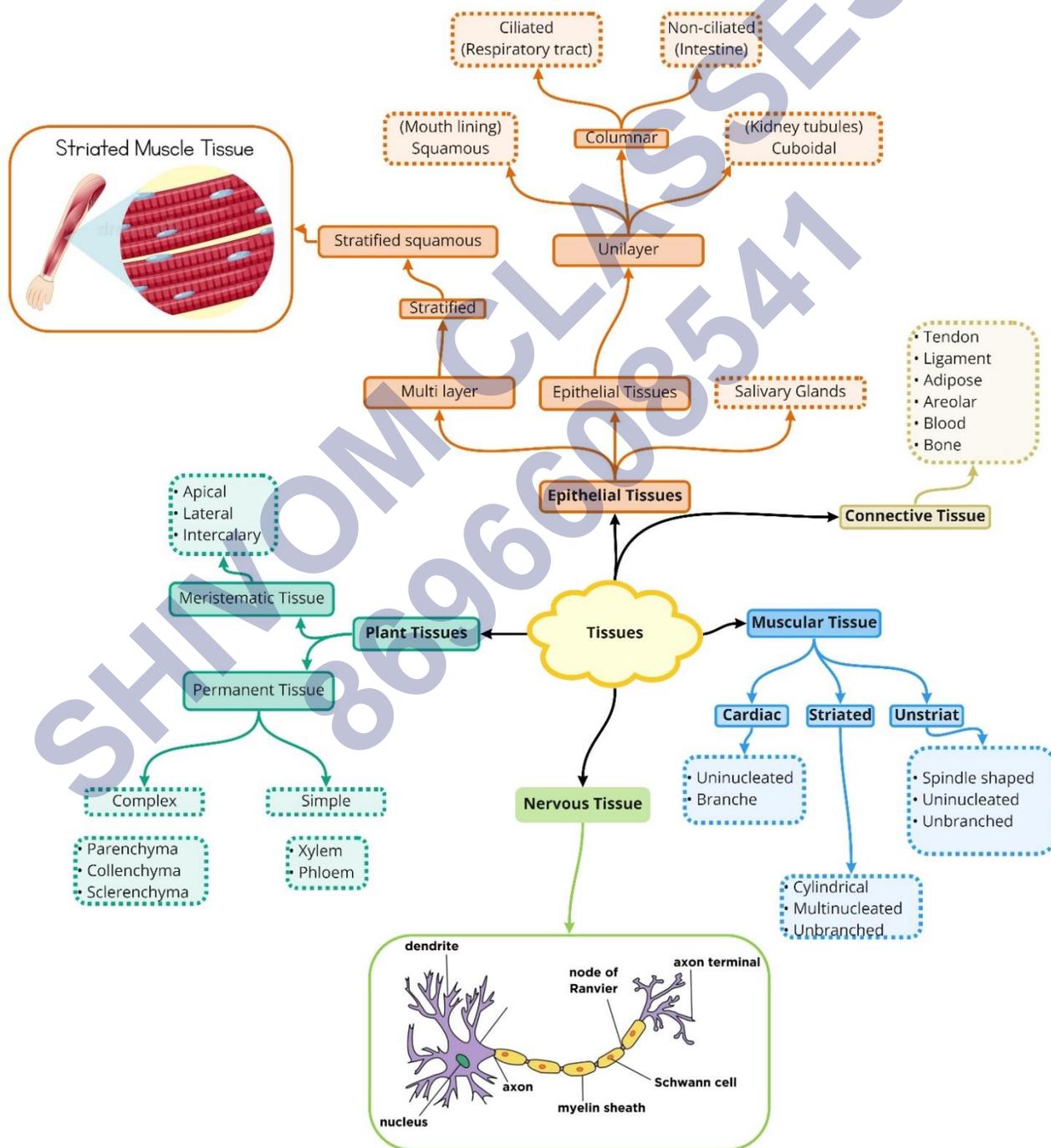
Differences between Smooth, Skeletal and Cardiac Muscles

| SMOOTH MUSCLE | SKELETAL MUSCLE | CARDIAC MUSCLE |
|----------------------|------------------------|---------------------|
| 1. Not striated | 1. Striated | 1. Striated |
| 2. Spindle-shaped | 2. Cylindrical | 2. Cylindrical |
| 3. Not branched | 3. Not branched | 3. Branched |
| 4. Nucleus - central | 4. Nuclei - peripheral | 4. Nuclei - central |

| | | |
|-----------------------------|-----------------------------|-------------------------|
| 5. No discs | 5. No discs | 5. Intercalated discs |
| 6. Involuntary | 6. Voluntary | 6. Involuntary |
| 7. Slow | 7. Fast | 7. Fast |
| 8. Contraction not inherent | 8. Contraction not inherent | 8. Contraction inherent |

Nervous/Neural Tissue

| Characteristics | Location | Function |
|--|---|---|
| <ul style="list-style-type: none"> • Made up of elongated cells called neurons • Each neuron consists of three parts—cell body, axon and dendrites | <ul style="list-style-type: none"> • Component of the nervous system and encompasses the brain, spinal cord and nerves | <ul style="list-style-type: none"> • Nerve cells mediate the transmission of messages from the brain to different parts of the body and vice versa |



Important Questions

➤ Multiple Choice Questions:

1. Which tissue is present at the growing tips of stem and roots ?

- (a) Permanent
- (b) Meristematic
- (c) Conductive
- (d) Complex

2. Blood is a type of:

- (a) connective tissue
- (b) muscular tissue
- (c) nervous tissue
- (d) epithelial tissue

3. Brain is composed of:

- (a) muscular tissue
- (b) connective tissue
- (c) nervous tissue
- (d) epithelial tissue

4. The heart of organisms is made up of:

- (a) muscular tissue
- (b) connective tissue
- (c) nervous tissue
- (d) epithelial tissue

5. Skin of hand is composed of:

- (a) muscular tissue
- (b) connective tissue
- (c) nervous tissue
- (d) epithelial tissue

6. Water and minerals are transported by:

- (a) phloem
- (b) xylem

- (c) xylem
(d) all of them
7. Stomata are found:
- (a) in the epidermis of leaf
(b) in xylem
(c) in phloem
(d) collenchyma
8. Which muscles act involuntarily?
- (i) Striated muscles
(ii) Smooth muscles
(iii) Cardiac muscles
(iv) Skeletal muscles
- (a) (i) and (ii)
(b) (ii) and (iii)
(c) (iii) and (iv)
(d) (i) and (iv)
9. Which is not a function of epidermis?
- (a) Protection from adverse condition
(b) Gaseous exchange
(c) Conduction of water
(d) Transpiration
10. Cartilage is not found in:
- (a) nose
(b) ear
(c) kidney
(d) larynx

➤ **Very Short Question:**

1. Name the tissues responsible for the movement of the body.
2. How does neuron look like?
3. Name the types of simple tissues.

4. Name the types of complex tissues.
5. Where is apical meristem found?
6. Which tissue make up the husk of coconut?
7. What are the constituents of phloem?
8. Define aerenchyma.
9. What is the utility of tissues in multicellular organisms?
10. Name the two types of tissues.

➤ Short Questions:

1. Give four differences between bone and cartilage.
2. Give the functions of bone.
3. Give the functions of cartilage.
4. What are the functions of areolar tissue?
5. Give difference between xylem and phloem.
6. What are fibres?
7. Name the tissues for the following:
 - (a) Stores fat in animal body.
 - (b) Divides and re-divides to grow in plants.
 - (c) Tissue that joins bone to bone.
 - (d) Covers the external surface of animal body.
8. What is stomata?

➤ Long Questions:

1. Write a note on plant tissues.
2. Show the types of animal tissues using flow chart.
3. What is connective tissue? Explain its types.

➤ Assertion Reason Questions:

1. For two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:
 - a. Both Assertion and Reason are correct, and reason is the correct explanation for assertion.

- b. Both Assertion and Reason are correct, and Reason is not the correct explanation for Assertion.
- c. Assertion is true but Reason is false.
- d. Both Assertion and Reason are false.

Assertion: Amoeba is the single cell animal in which single cell carries out all movement like intake of food, gaseous exchange and excretion.

Reason: Amoeba is not unicellular organism.

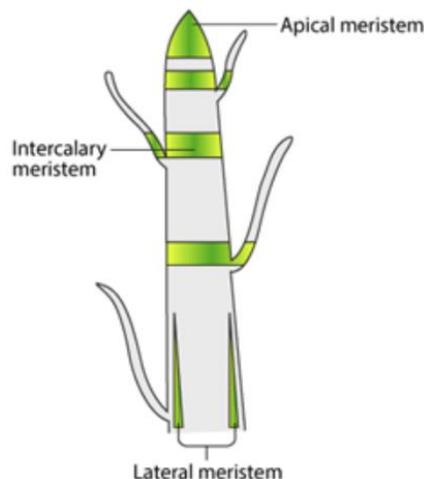
2. For two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:
- a. Both Assertion and Reason are correct, and reason is the correct explanation for assertion.
 - b. Both Assertion and Reason are correct, and Reason is not the correct explanation for Assertion.
 - c. Assertion is true but Reason is false.
 - d. Both Assertion and Reason are false.

Assertion: Amoeba is the single cell animal in which single cell carries

Reason: Amoeba is the single cell organism.

➤ Case Study Questions:

1. The growth of plants occurs only in certain specific regions. This is because the dividing tissue, also known as meristematic tissue, is located only at these points. Depending on the region where they are present, meristematic tissues are classified as apical, lateral and intercalary. New cells produced by meristem are initially like those of meristem itself, but as they grow and mature, their characteristics slowly change and they become differentiated as components of other tissues.



Apical meristem is present at the growing tips of stems and roots and increases the length of the stem and the root. The girth of the stem or root increases due to lateral meristem (cambium). Intercalary meristem seen in some plants is located near the node. Cells of meristematic tissue are very active, they have dense cytoplasm, thin cellulose walls and prominent nuclei. They lack vacuoles.

(i) Which meristem helps in increasing the girth of the plant?

- (a) Primary meristem
- (b) Apical meristem
- (c) Intercalary meristem
- (d) Lateral meristem

(ii) Lateral meristem is responsible for _____.

- (a) Growth of apical portion
- (b) Increase in the length
- (c) Increasing the girth of stem and root
- (d) Growth in parenchyma

(iii) The meristem present at the base of the internode is _____.

- (a) Lateral meristem
- (b) Intercalary Meristem
- (c) Apical Meristem
- (d) All of the above

(iv) What are the characteristic of Meristematic tissue?

(v) Enlist the type of meristematic tissue.

2. Meristematic tissue take up a specific role and lose the ability to divide. As a result, they form a permanent tissue. This process of taking up a permanent shape, size, and a function is called differentiation. Differentiation leads to the development of various types of permanent tissues.

Simple Permanent Tissue

Tissue made of one type of cells, which look like each other. Such tissues are called simple permanent tissue. Parenchyma is the most common simple permanent tissue. It consists of relatively unspecialised cells with thin cell walls. They are living cells. They are usually loosely arranged, thus large spaces between cells (intercellular spaces) are found in this tissue. This tissue generally stores food. In some situations, it contains chlorophyll and

performs photosynthesis, and then it is called chlorenchyma. In aquatic plants, large air cavities are present in parenchyma to help them float. Such a parenchyma type is called aerenchyma. Yet another type of permanent tissue is sclerenchyma. It is the tissue which makes the plant hard and stiff. We have seen the husk of a coconut. It is made of sclerenchymatous tissue. The cells of this tissue are dead. They are long and narrow as the walls are thickened due to lignin.

Complex 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. They are both conducting tissues and constitute a vascular bundle. Xylem fibres are mainly supportive in function. Phloem transports food from leaves to other parts of the plant. Except phloem fibres, other phloem cells are living cells.

(i) Tissue made of only one type of cell is termed as _____.

- (a) Simple permanent tissue
- (b) Complex permanent tissue
- (c) Simple Meristematic tissue
- (d) Complex Meristematic tissue

(ii) Xylem and phloem are examples of:

- (a) Meristematic tissue
- (b) Simple tissue
- (c) Protective tissue
- (d) Complex tissue

(iii) In aquatic plants, which type of parenchyma tissue is found?

- (a) Aerenchyma
- (b) Chlorenchyma
- (c) Sclerenchyma
- (d) Parenchyma

(iv) What is meant by Differentiation?

(v) Enlist the type of parenchyma tissue.

✓ Answer Key-

➤ Multiple Choice Answers:

1. (b) Meristematic

2. (a) connective tissue
3. (c) nervous tissue
4. (a) muscular tissue
5. (d) epithelial tissue
6. (c) xylem
7. (a) in the epidermis of leaf
8. (b) (ii) and (iii)
9. (c) Conduction of water
10. (c) kidney

➤ Very Short Answers:

1. Answer: Muscle tissue and nervous tissue
2. Answer: A neuron is the unit cell of nervous tissue. It is a thread-like structure with cell body and axon.
3. Answer: (a) Parenchyma (b) Collenchyma (c) Sclerenchyma
4. Answer: Xylem and phloem.
5. Answer: It is present at the growing tips of stem and root, it increases the length of the stem and roots.
6. Answer: Sclerenchyma.
7. Answer: Phloem constitutes the sieve tubes, companion cell, phloem parenchyma and phloem fibres.
8. Answer: When the cells have air-filled large cavities of parenchyma, it is called aerenchyma. Aerenchyma helps aquatic plants in floating.
9. Answer: It helps in growth, organisation of different organs and performing functions.
10. Answer: Plant tissues and animal tissues.

➤ Short Answer:

1. Answer:

| Bone | Cartilage |
|--|---|
| <ol style="list-style-type: none"> 1. Hard and non-flexible 2. Porous 3. Blood vessels present 4. Matrix made up of protein and mineral salts. | <ol style="list-style-type: none"> 1. Flexible not very hard 2. Non-porous 3. Blood vessels absent 4. Matrix made up of proteins. |

2. Answer: The functions of bone are:
- It provides shape to the body.
 - It provides skeletal support to the body.
 - It anchors the muscles.
 - It protects the vital body organs like brain, lungs, etc.
3. Answer:
- It provides support and flexibility to the body parts.
 - It smoothens surface at joints.
4. Answer: Functions are:
- It helps in repair of tissues after an injury.
 - It also helps in combating foreign toxins.
 - It fixes skin to underlying muscles.
5. Answer:

| Xylem | Phloem |
|--|--|
| <ol style="list-style-type: none"> It consists of mainly dead elements. It conducts water and minerals. It provides mechanical strength to the plant. | <ol style="list-style-type: none"> It consists of mainly living elements. It conducts food. It does not provide mechanical strength to the plant. |

6. Answer: Fibres consist of very long, narrow and thick cells. Example, jute fibre.
7. Answer:
- Adipose tissue
 - Meristematic tissue.
 - Ligament
 - Epithelial tissue.
8. Answer: Stomata are small pores present on the surface of a leaf which helps in the exchange of gases and in transpiration.

➤ Long Answer:

1. Answer: Plant tissues consist of two main types of tissue.

Meristematic tissue
 The cells in this tissue divide very fast and helps in the growth of plants. Cells are round, oval, polygonal, no intercellular spaces. Present at tips of root, shoot, at nodes and at the sides of the stem.

and

Permanent tissue
 The cells of meristematic tissue stops dividing, matures and forms permanent tissue. There are two types of permanent tissues.

Simple tissue
 All cells are same in structure and perform same function. Types of simple tissue are parenchyma, collenchyma and sclerenchyma.

Complex tissue
 It consists of group of different types of cells to perform same function. Types of complex tissue are xylem and phloem.

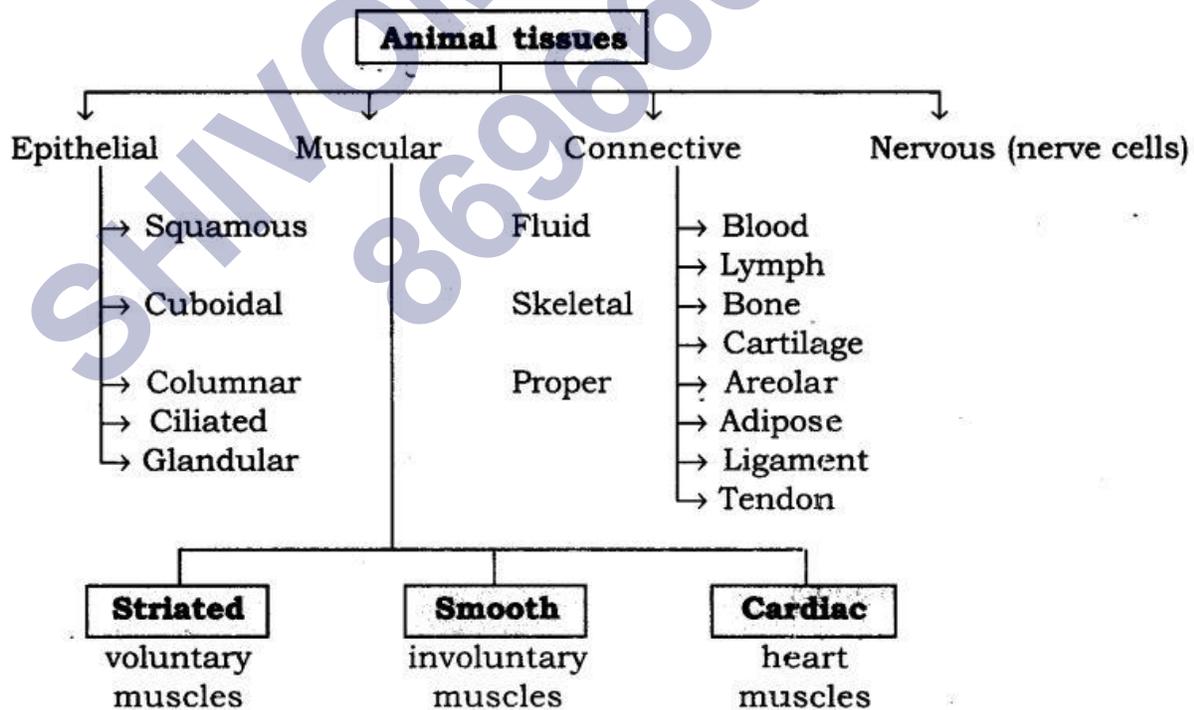
Parenchyma: Present in soft parts of the plant.

Collenchyma: Provides mechanical support to plant present in stalks. Sclerenchyma: They provide strength and flexibility to the plants.

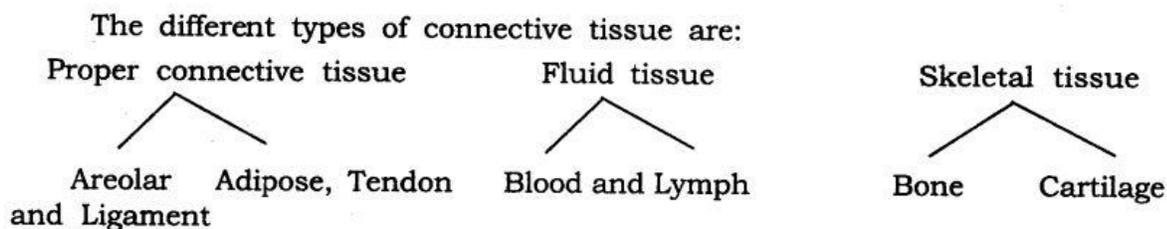
Xylem: Conduct water in plants from root to shoot. Consists of tracheids, vessels, xylem parenchyma and xylem fibres.

Phloem: Conduct food to all parts of plant. Consist of sieve tubes, companion cell, phloem parenchyma and phloem fibres.

2. Answer:



3. Answer: The connective tissue consists of different types of cells, all of them perform same function.



Areolar connective tissue: It is found between the skin and muscles, around blood vessels and nerves and in the bone marrow.

Areolar tissue fills the space inside the organs. It supports internal organs and helps in repair of tissues.

Adipose tissue: Adipose tissue stores fat, found below the skin and between internal organs. The cells of this tissue are filled with fat globules. It acts as insulator due to fat storage.

Blood: It has a fluid called plasma, in plasma are present red blood cells, white blood cells and platelets. Blood flows all over the body and helps in the transport of gases, digested food, hormones and waste material to different parts of the body.

Lymph: Lymph carries digested fat and lot of white blood cells in the plasma. **Bone:** It forms the framework that supports the body. It supports the different parts of our body. It is strong and non-flexible tissue.

Cartilage: It is present in nose, ear, trachea and larynx. It smoothens bone surfaces at joints.

Tendon: It connects bone and muscles. These tissues are fibrous, flexible and with lot of strength.

Ligament: It connects bone to 'bone. It is elastic, has lot of strength.

➤ Assertion Reason Answer:

1. (c) Assertion is true but Reason is false.
2. (b) Both Assertion and Reason are correct, and reason is not the correct explanation for assertion.

➤ Case Study Answers:

1.

- (i) (d) Lateral meristem
- (ii) (c) Increasing the girth of stem and root
- (iii) (b) Intercalary Meristem
- (iv) Characteristic of Meristematic tissue

- Meristematic tissue are very active type of tissue.

- They have dense cytoplasm.
- The wall of Meristematic cells are thin cellulosic walls and prominent nuclei.
- They lack vacuoles.

(v) There are three types of meristematic tissue

- Apical Meristem
- Intercalary Meristem
- Lateral meristem

2.

(i) A

(ii) D

(iii) A

(iv) Meristematic tissue lose the ability to divide. As a result, they form a permanent tissue. This process of taking up a permanent shape, size, and a function is termed as differentiation.

(v) There are three type of parenchyma tissue

- Aerenchyma
- Chlorenchyma
- Sclerenchyma