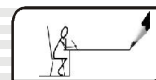
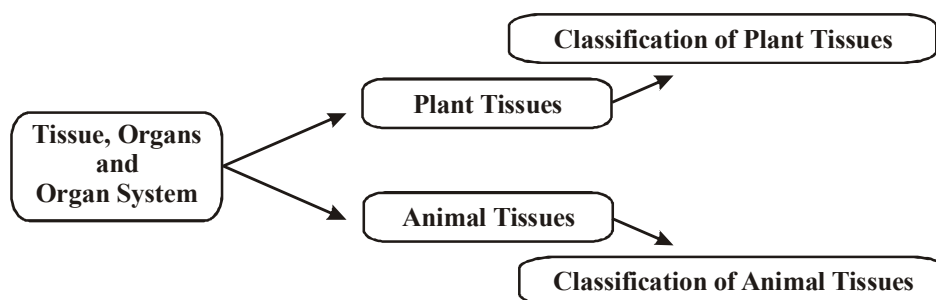


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TISSUES

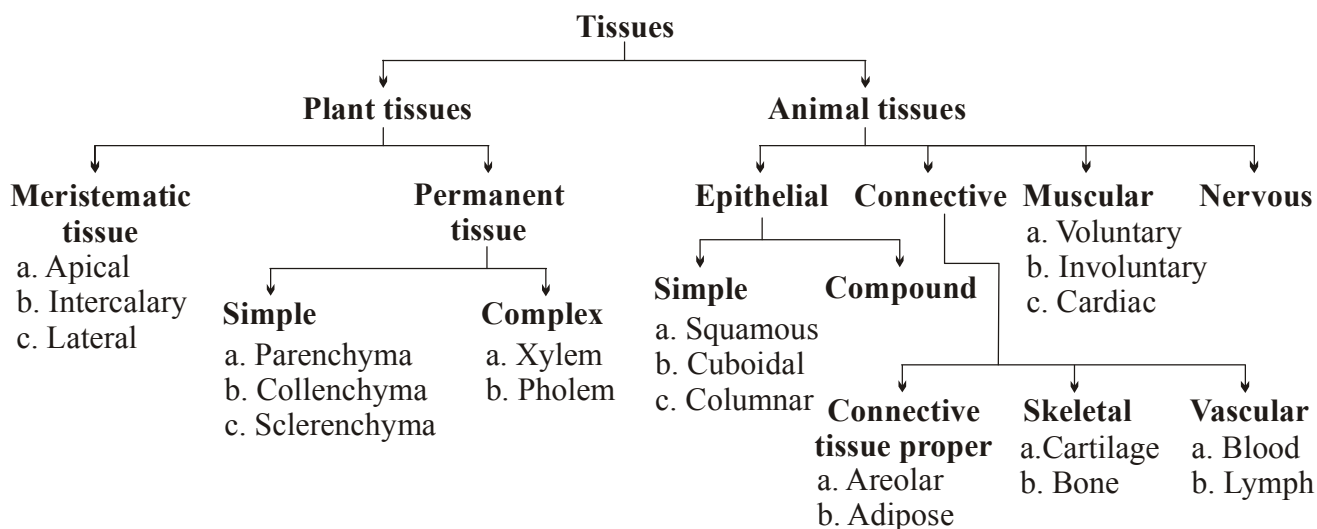


THEORY



INTRODUCTION

- Multicellularity is the most important characteristics of complex organism like humans, mango, penicillium etc.
- An organism is multicellular when it contain many cells.
- Cells have different structure, shape, size and origin. To group them we must have a fundamental knowledge of their functions also.
- **Group of cells that have common origin, similar structure and perform a definite function is called tissue.**



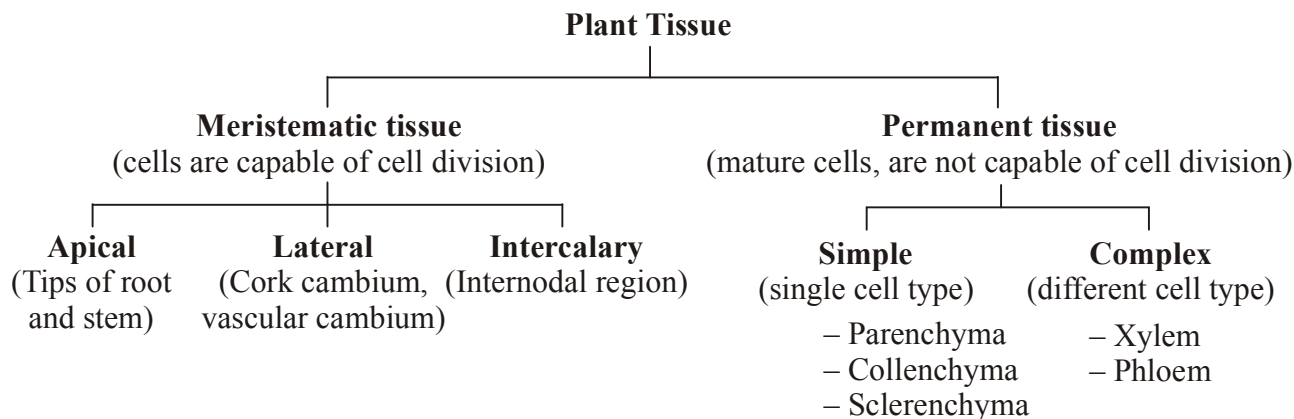
- Level of organisation : – Cell → Tissue → Organ → Organ system → Organism

- Founder of Histology (study of tissue) is **BICHAT**.
- All plant cells are totipotent in nature. Totipotency is the ability of cells to produce complete new organism of its own kind. In human beings, stem cells are totipotent.

Do you know:

The study of tissue is called histology. The term was coined by Meyer.

PLANT TISSUE :



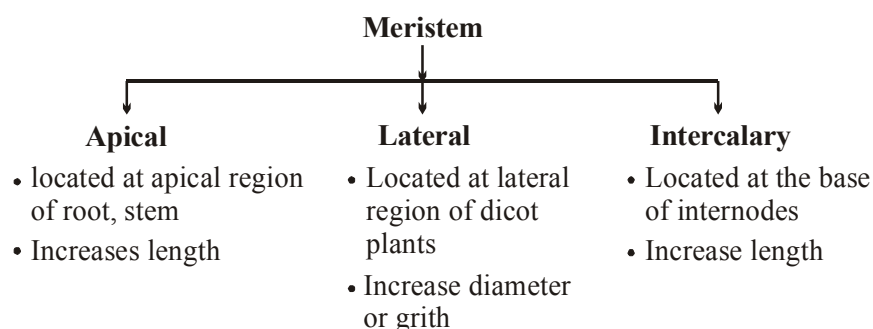
1. MERISTEMATIC TISSUE

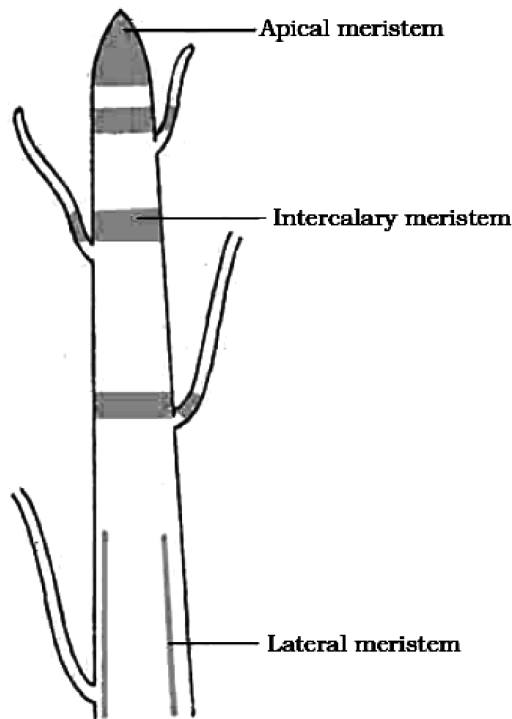
- Meristematic cells shows following characteristics.
 - (i) Spherical or polygonal.
 - (ii) less inter-cellular spaces are present or they are absent.
 - (iii) Protoplasm is dense, with large, prominent nucleus and small vacuoles (vesicles).
 - (iv) Cell wall is made up of thin cellulose.
 - (v) Metabolically active.
 - (vi) Divide through out plant life.
 - (vii) On the basis of origin meristem are of two types.

Do you know:

Meristems are region within plant body that is involved in formation of new Meristematic cells.

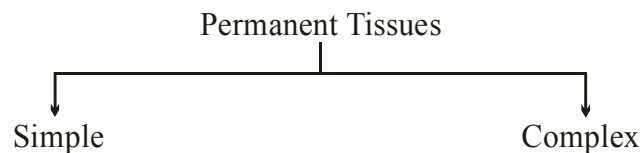
- On the basis of location meristem are of three types :





2. PERMANENT TISSUE :

- The permanent tissues are composed of those cells which have lost their capability to divide.
- May be living or dead at maturity.
- On the basis of composition these are of two types.



Do you know:

Differentiation is the process whereby cells take up a definite shape, size, structure and function.

A. Simple permanent tissues :

Homogenous masses of cells. Made up of only one type of cells.

These are of three types -

(i) Parenchyma –

- Living tissue.
- Cells are iso-diametric, oval or polygonal in shape with small nuclei.
- Loosely packed cells with inter cellular spaces.
- Cell wall is made up of thin cellulose.
- Cells are metabolically active having small nuclei.
- Provides support to plants and store food.
- In stems and roots, these cells stores nutrients and water.
- Found in cortex of roots, ground tissue of stem, mesophyll of leaves, pith, medullary rays, packing tissue in xylem and phloem.

- Modification of parenchyma :**

- (I) Chlorenchyma :**

Cells contain chlorophyll and perform photosynthesis.

- (II) Aerenchyma :**

Between cells large air cavities are present to give buoyancy to aquatic plants and help them to float.

- (III) Prosenchyma :**

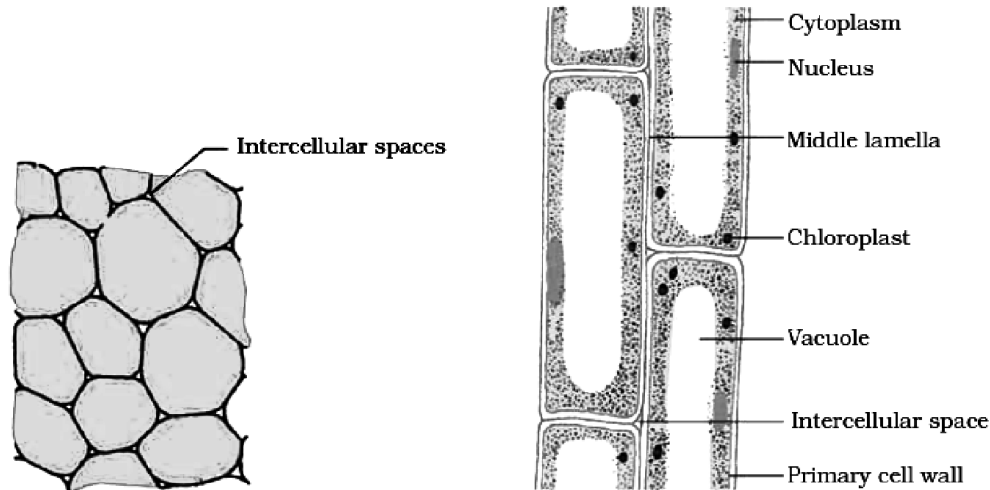
Cells have thick cellulose made cell wall.

Cell become long and taper at either end eg. in pericycle of some plants.

Provide mechanical support, found in some roots.

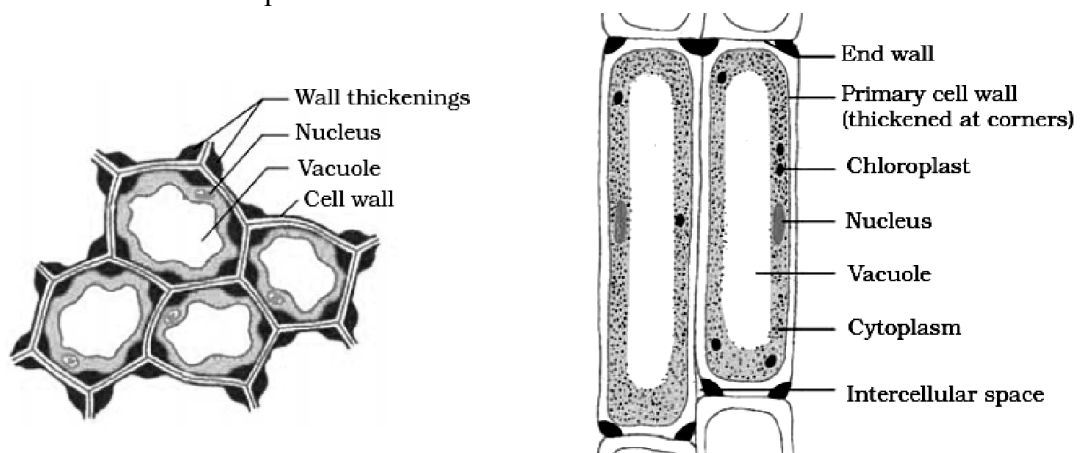
- (IV) Idioblast :**

Cells, which store waste materials like tannins, oils and calcium oxalate crystals.



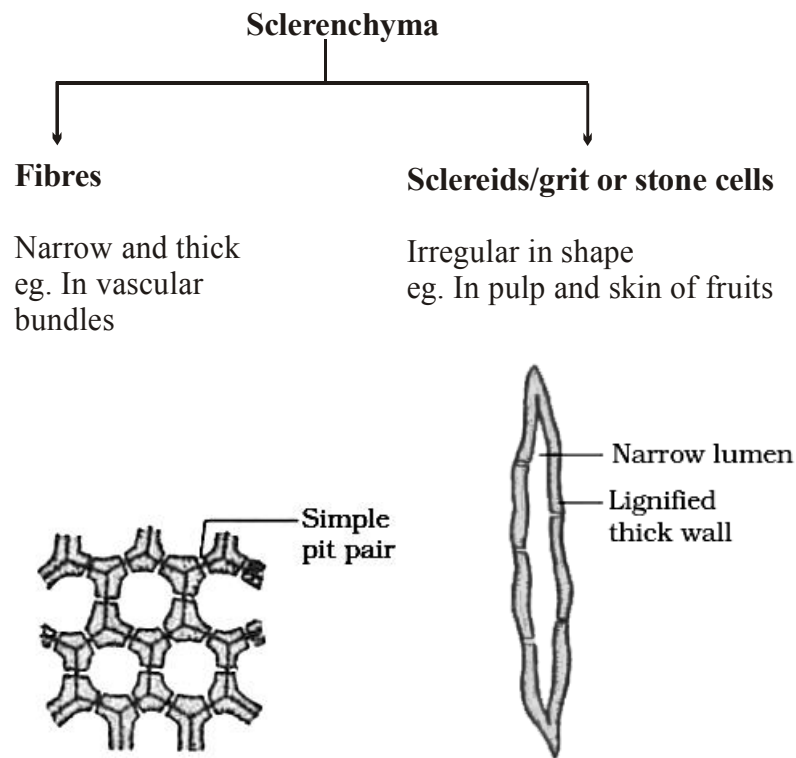
- (ii) Collenchyma :**

- Living elongated cells, cell wall has deposition of cellulose, pectin & hemi-cellulose.
- At the corner of cells irregular thickenings are present. So, inter-cellular spaces are absent or narrow.
- Allows easy bending of various parts of a plant like leaf, stem without breaking thus provide tensile strength to plant parts.
- Also provide mechanical support to plant.
- Found in leaf stalks below the epidermis, in hypodermis region of cortex, in mid rib of leaves, petioles of dicot plant.
- Absent in roots and monocot plants.



(iii) Sclerenchyma :

- Dead, long and narrow cells, with greatly thickened walls due to the deposition of lignin and cellulose.
- Make plant hard and stiff.
- Due to thick cell wall, there is no intercellular spaces between the cells.
- Pits are present over the cell wall.
- Provides strength and mechanical support to the plant parts.
- They are found in stem, root, veins of leaves, hard covering of seeds and nuts.
- Husk of a coconut is made up of sclerenchyma.
- Cells have lumen inside.
- These are of two types :

**Information :**

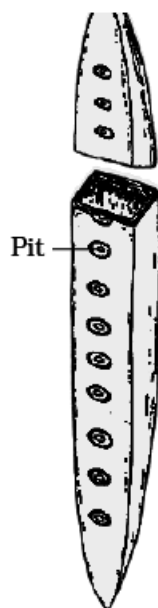
- Husk of coconut is made of sclerenchymatous tissue.

B. Complex permanent tissue :

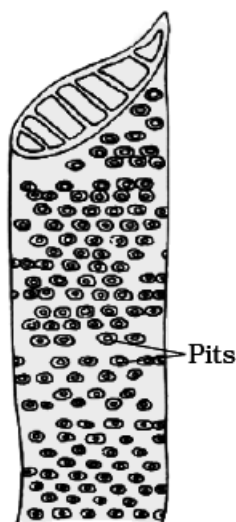
- Made up of more than one types of cells. All these cells co-ordinate to perform a common function.
 - Heterogeneous mass of the cells.
- These are of two types :

(i) Xylem or wood

- Consist of four type of cells, which are :
 - (a) Xylem tracheid
 - (b) Xylem vessel
 - (c) Xylem Parenchyma
 - (d) Xylem Fibres

(a) Xylem tracheid –

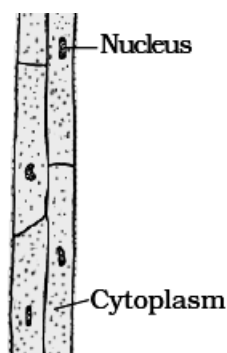
- Elongated, dead cells with tapering ends with narrow lumen.
- Cell wall with lignin deposition and pits.
- About 1 mm in length and made of up single cell.
- Main water conduction element in Pteridophytes and Gymnosperms.

(b) Xylem vessel –

- Made up of row of cells placed one above the other with out intervening walls absent due to dissolution.
- Long, dead, tube like structures with broad ends and wider lumen.
- Cell wall with lignin deposition and pits.
- Mainly found in Angiosperm.

Do you know:

Both tracheids and vessels help in vertical transport of water and minerals.

(c) Xylem Parenchyma –

- Living, parenchymatous cells with cellulose cell wall.
- Store food and helps in the sideways conduction of water and minerals.

(d) Xylem Fibres –

- Provide support.
- Elongated, dead sclerenchymatous with highly lignified cell wall & bear narrow lumen.
- Provide mechanical support.

Note : Secondary xylem is called wood.

(ii) Phloem -

- Also known as **bast** because phloem fibres of some plants like Jute, Flax and Hemp are used for binding purposes.
- Made up of four types of elements.

(a) Sieve tubes :

- Elongated, thin walled tube like cells with sieve plates at the ends.
- Living cells but nuclei absent
- Placed one above the other.
- Responsible for conduction of food from leaves to other parts of plants.

(b) Companion cells -

- Living, parenchymatous cells, associated with sieve tubes.
- Cell with thin cell wall, dense cytoplasm and prominent nucleus.
- Found only in Angiosperms.
- Its nucleus control metabolic functioning of sieve tubes.

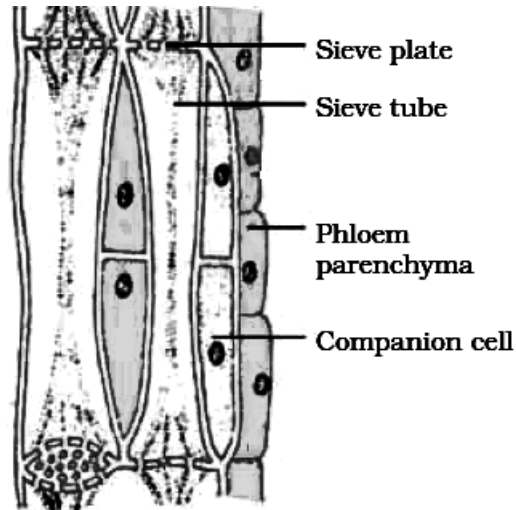
Note : Sieve tubes and Companion cells are called “the sisters cells”.

(c) Phloem Parenchyma -

- Living, Parenchymatous cells.
- Helps in storage of food.
- Absent in most of monocot and herbaceous dicots.

(d) Phloem Fibres -

- Dead, elongated, sclerenchymatous cells.
- Provide mechanical strength.
- Is the only dead phloem element.



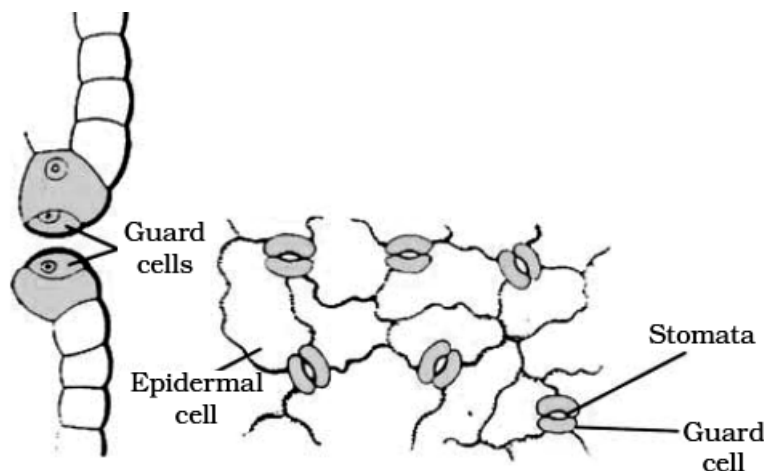
- Phloem helps in translocation of food in both direction i.e. upward and downward. It transports foods from leaves to various parts of the plant.

PLANT TISSUE SYSTEM

- Various tissues in plants forms tissue system, which are of three types -

(1) Epidermal tissue system**(2) Ground or fundamental tissue system****(3) Vascular or conductive tissue system****1. Epidermal Tissue System :**

- Outermost layer of cells.
- Epidermis makes outer covering of plant body.
- In xerophytes, epidermis remain covered by thick cuticle.
- In aerial parts of plant, epidermal cells secrete a waxy, water resistant layer on outer surface, which provide protection against loss of water, mechanical injury and invasion by parasitic fungi.
- In epidermis of leaf, small pores or stomata are present, enclosed by two kidney shaped guard cells in dicot plants, which regulate opening and closing of stomata. Epidermal cells surrounding guard cells are called **subsidiary cell**.



- Stomatal pore, guard cells and subsidiary cells together form **stomatal complex**.
- Stomata help in gaseous exchange and transpiration.

Cork or Phellem :

- In old plants, the epidermis of the stem is replaced by a strip of secondary meristem, and forms the several-layer thick cork or the bark of the tree.
- The cells of cork are dead and compactly arranged without intercellular spaces.
- Their cell wall contain suberin that makes cork cells impervious to gases and water.
- Cork is protective in function.

2. Ground or Fundamental tissue system -

- Forms major part of plant body, made up of mostly parenchyma cells.
- Forms cortex, endodermis, pith, medullary rays of plant body.

3. Vascular tissue system -

- Made up of xylem and phloem.
- Group of xylem and phloem is called **vascular bundle**.
- Helps in conduction of water and minerals and in translocation of food.
- If **cambium is present** between xylem and phloem, such then the vascular bundles are called **open**, found in dicot plants and responsible for secondary growth.
- If **cambium is absent** between xylem and phloem, then the vascular bundles are called **closed type**, found in monocot plants.

ANIMAL TISSUE :

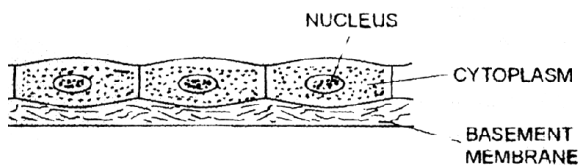
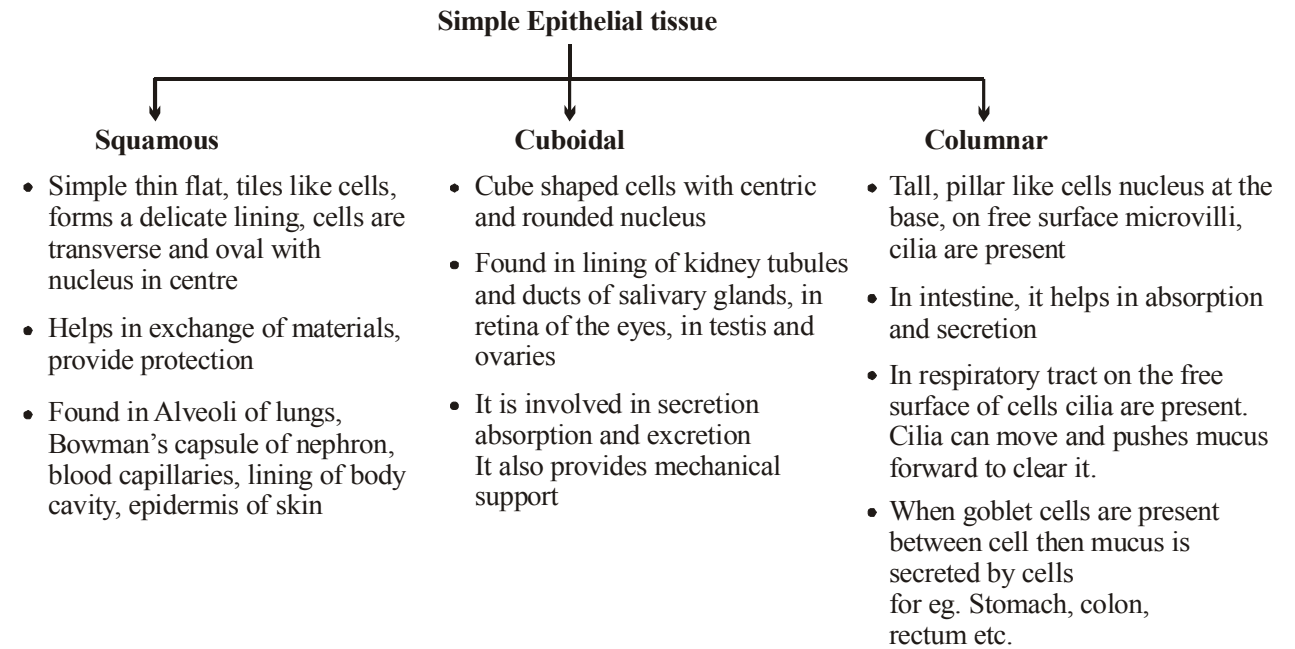
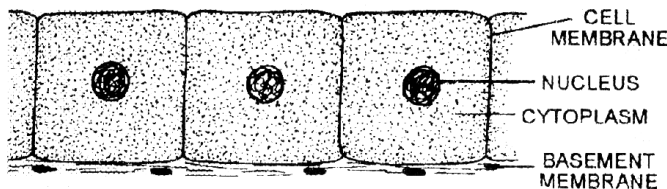
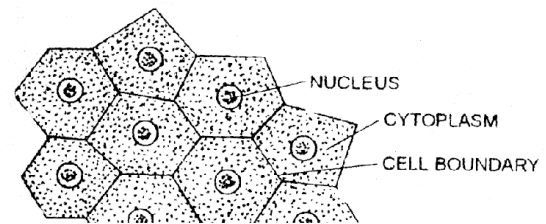
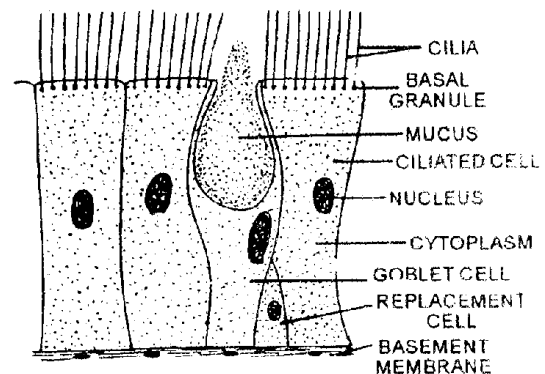
- Based upon the structure and functions, simple tissues in multicellular animals are categorized into four types. These are :
(1) Epithelial Tissue (2) Muscular Tissue (3) Connective Tissue (4) Nervous Tissue

1. Epithelial tissue :

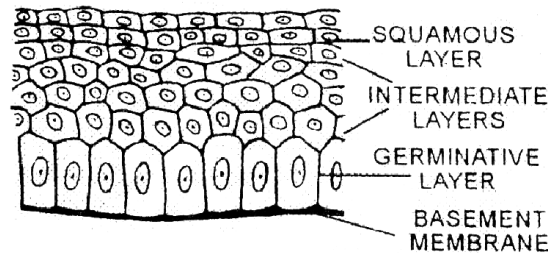
- Cells are tightly packed with no intercellular spaces and form a continuous sheet.
- Rest on extracellular fibrous basement membrane.
- Make outer covering or protective tissues in animal body.
- It regulates exchange of materials between body and the external environment and also between different parts of the body.

(a) Simple Epithelial Tissue :

- Single cell thick layer. On the basis of shape of cells, it is of different types :

**Squamous Epithelium****Cubodial Epithelium****Columar Epithelium****(b) Compound Epithelial Tissue :**

- It is multilayered thick structure.
- It is also called as **stratified epithelial tissue**.
- It is found in those regions of body where rapid wear and tear of cells is required.
- Skin is regarded as stratified squamous epithelial tissue as outer most layer of skin is squamous type.
- It is found in conjunctiva, female urethra, larynx, ureter, urinary bladder etc.
- It provides protection.

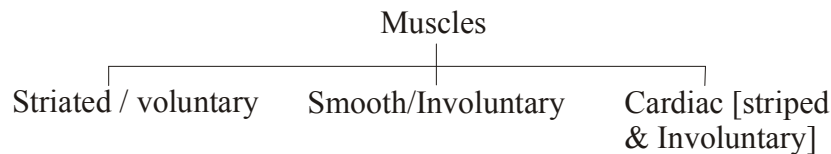


Stratified squamous epithelial tissue

2. Muscular Tissue :

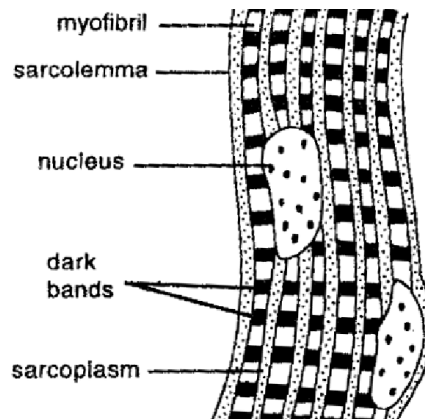
- Muscular tissue is distinguished from other tissues by its unique ability to contract and relax and thereby perform mechanical work. It is responsible for movement of body organs and location of body.
- Muscle cells are highly elongated and contractile and are called **Muscle fibres**.
- The contractility is due to the presence of contractile proteins (Actin & Myosin) in the muscle fibre.
- The plasma membrane of muscle cells is called **sarcolemma** and **endoplasmic reticulum** of muscle cell is called **sarcoplasmic reticulum**.

Type of muscular Tissue :



(a) Striated muscles / Skeletal muscle / Voluntary muscle :

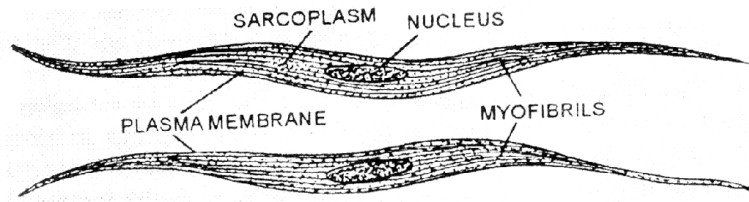
- They are also called as voluntary muscles because these are under the control of one's will.
- They are also found in tongue, limbs, neck, facial muscles etc.
- Muscle fibres or cells are multinucleated and unbranched.



(b) Smooth / Unstriated / Visceral / Involuntary Muscles :

- These are not under the will of organism, hence called as **Involuntary Muscles**.
- They are involuntary muscles also called **smooth muscles**.
- These are present in the walls of visceral tubular organs like alimentary canal, blood vessels, urinary bladder, urethra etc so are called as **Visceral Muscles**.
- These are also present in the dermis of skin, iris and ciliary muscles of eye.
- Sarcomeres is muscle cells. Sarcomeres are small and spindle shaped with tapering ends.
- It is covered by Sarcolemma. It is usually uninucleated and the nucleus is oval and centric.

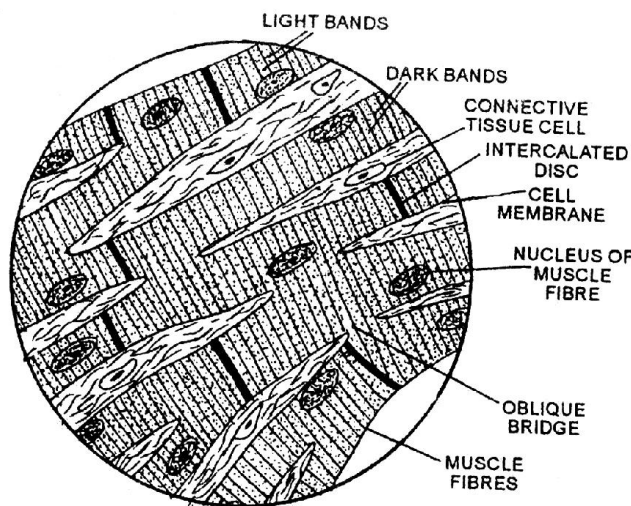
- These are not attached to skeletal structures, hence called as **Non-skeletal muscles**.
- These fibres contract slowly but for a long period without undergoing fatigue, hence called as **Non-fatigue muscles**.



Smooth Muscle Fibres

(c) Cardiac Muscles :

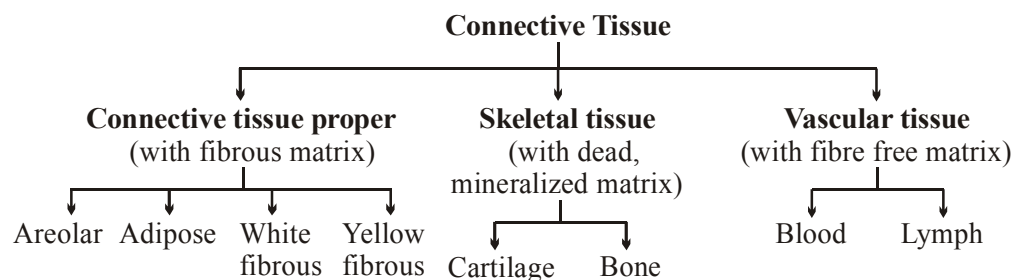
- These are found in the walls of heart.
- These are uninucleate, and branched.
- These are involuntary.
- Cardiac muscles are joined end to end by flat, dense, zig-zag junctions called **INTERCALATED DISC**.
- These muscles contract rapidly like skeletal muscles but do not get fatigued. So, these work efficiently throughout the life.



Cardiac Muscle Fibres

3. Connective Tissue :

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

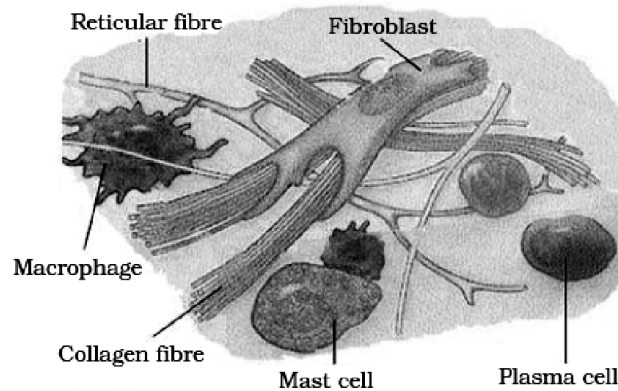
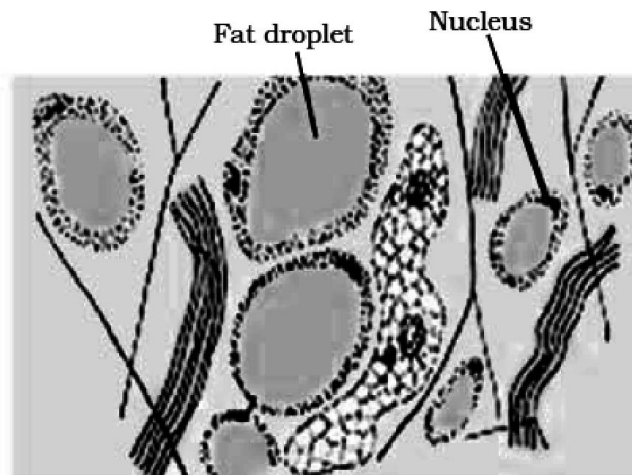


A. Connective tissue proper :

- It is most abundant type of connective tissue. It is of following types –

(i) Areolar Tissue :

- Most widely distributed tissue. Thus most abundant.
- Consist of transparent, jelly like, sticky matrix containing fibres, cells and mucin.
- Fibres are of two types i.e. **white and yellow fibres**. White fibres are made up of collagen protein.
- **Yellow fibres** are made up of elastin protein and provide elasticity to the tissue.
- Matrix contain several cells. Fibroblasts or fibrocytes are large, flat cells, which secrete matrix and fibres. Macrophages are large, amoeboid, phagocytic cells. Mast cells are small, oval, secrete heparin, histamine etc. which prevents blood clotting and involve in allergic reactions respectively.

**Fig: Areolar connective tissue****(ii) Adipose Tissue :****Fig: Adipose tissue**

- ▶ Fat storing connective tissue, matrix contain adipocytes cells, storing fat.
- ▶ Matrix contain fibres, cells etc.
- ▶ Primarily store food, below skin prevents heat loss from body and forms shock-absorbing cushion around kidneys and the eye balls.

Do you know:

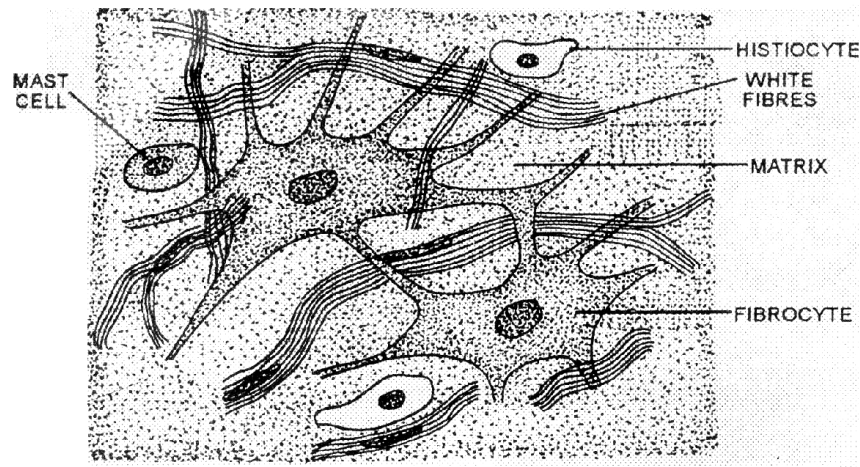
Animals living in cold areas have thick sub cutaneous fat, which prevents the heat loss.

The insulating fat body present in whale is called blubber.

Hump of camels is rich in adipose tissue.

(iii) White Fibrous Tissue :

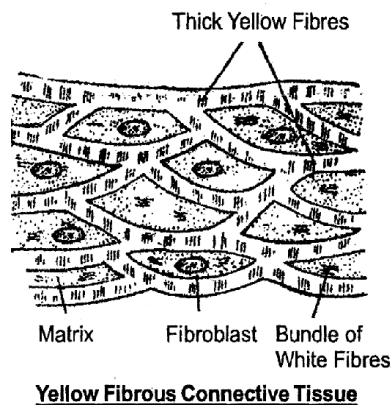
- Rich in white collagen fibres.
- For example tendons connect the muscles with the bones.

**Do you know:**

Sprain is caused by excessive pulling of ligaments.

(iv) Yellow Elastic Tissue :

- Contain loose network of yellow elastic fibres.
- For example ligaments that bind bone to bone.

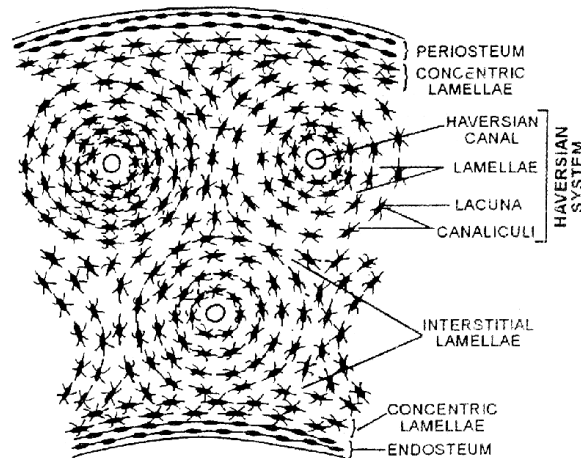
**B. Skeletal Tissue :**

- Have a tough matrix with protein, calcium and phosphorus salts.
- Forms a rigid frame work. Which supports the body, protects the vital organs, provide surface for attachment of muscles etc.
- These are of two types:

(i) Bones :

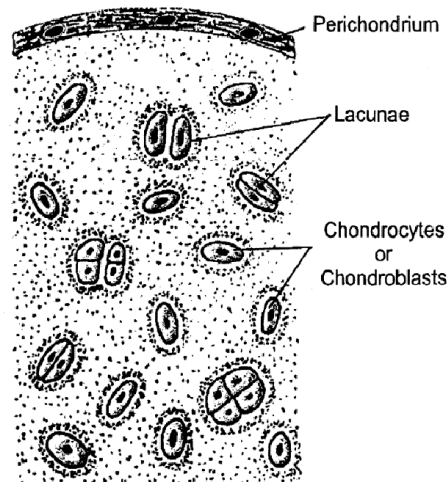
- Hardest tissue in the body with calcified matrix.
- Main constituent of the skeleton.
- Matrix is dense and hard, formed of a protein called **ossein**.
- Remain externally covered by periosteum.
- Matrix have longitudinal and transverse blood vessels i.e. Haversian and Volkmann's canals respectively.

- In matrix osteocyte cells are arranged in concentric rings or lamellae and forms Haversian system.
- In long bones, central bone marrow cavity is present, having soft fatty tissue called **Bone marrow**, which is of 2 types called red and yellow bone marrow.



(ii) Cartilage :

- It is elastic and strong but softer than bone.
- Matrix is like a homogenous mass, composed of flexible material i.e. the chondrin, having less amount of calcium salts.
- Cells are called as **chondrocytes**. Chondrocytes remain scattered in matrix.



Knowledge Enhancer :

Voluntary and involuntary muscles

There are two kinds of muscles.

(i) Voluntary muscles are those muscles, which function as per direction of conscious will. Brain can stop or start them. For examples, skeletal muscles that come into use when we walk.

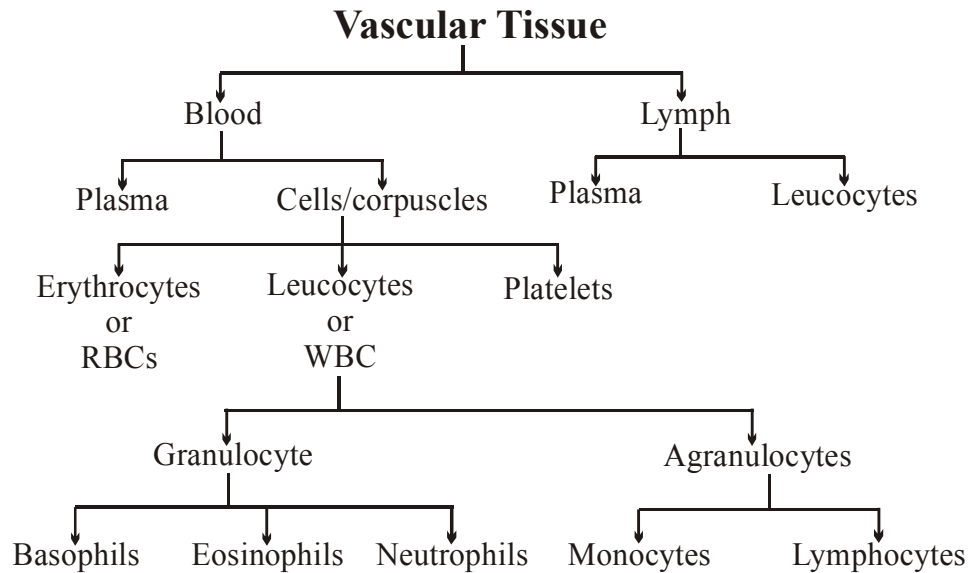
(ii) Involuntary muscles are those muscles, which function on their own, independent of conscious will. Brain cannot stop or start them. For examples, breathing in and out of air.

Do you know:

The muscles used to smile are called voluntary muscles. We can control smile to express how we are feeling.

C. Vascular or Fluid Tissue :

- It is of two types : (i) Blood (ii) Lymph

**(i) Blood :**

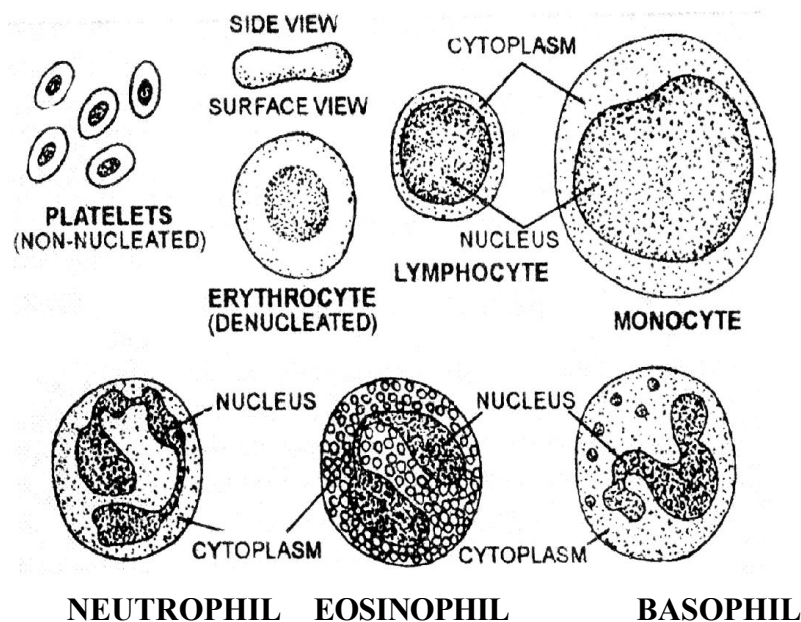
- Blood is a fluid connective tissue.
- Matrix of blood is called plasma.
- Consists of two components i.e. plasma and corpuscles.

(a) Plasma :

- Faint yellow, slightly alkaline, viscous fluid consisting of 90% H₂O, 1% inorganic salts, 7-8% proteins, 1-2% other materials, like food materials, gases, antibodies etc.
- Plasma proteins help in transport of materials, blood clotting, respond to foreign agents etc.

(b) Blood corpuscles or cells :

These are of three types

**RED BLOOD CORPUSCLES (RBCs) OR ERYTHROCYTES :**

- They are also called erythrocytes.
- Carry iron containing, oxygen carrying pigment **haemoglobin** that helps in transportation of oxygen.

- One molecule of haemoglobin carry four molecules of oxygen in the form of oxy-haemoglobin.
- In human body **life span is 120 days**.

WHITE BLOOD CORPUSCLES (WBCs) OR LEUCOCYTES :

- Rounded or irregular cells, can change their shape and are capable of showing amoeboid movement.
- Fewer than RBCs.
- These are of two types.:
- **Agranulocytes** : No granules in cytoplasm and have non lobed nucleus. Have 2 sub-types:
Monocytes : Largest WBCs
Lymphocytes : With large rounded nucleus, non-motile and non-phagocytic.
- **Granulocytes** : With granular cytoplasm and lobed nucleus. Have 3 sub-types :
Basophils : Large with S-shaped nucleus and secrete histamine and heparin.
Eosinophils : Large with bilobed nucleus, number increases during allergic conditions.
Neutrophils : Quite large with many lobed nucleus and phagocytic in nature.

PLATELETS (Thrombocytes):

- They are spindle shaped cells that helps in blood clotting.

(ii) Lymph :

- Consists of two parts - a clear, colourless fluid matrix called **plasma** and **WBCs** mainly **lymphocytes**.
- Lack RBCs and some blood proteins.

4. NERVOUS TISSUE :

- It is composed of specialised cells called **nerve cells or Neurons and Neuroglial cells**.
- (a) **Neuron** :
- Structural and functional unit of nervous system.
- A typical neuron has a large cell body called **CYTON** with two or more protoplasmic processes, the **dendrons**.
- One of the dendron is usually longer than the rest, called the **Axon**.
- Axon ends in a number of small branches on muscle fibres, gland cells or other neurons.
- '**Dendrons**' may branches into **dendrites**. Dendrons transmit nerve impulse to the cell body.
- The inter communicating junctions between two neurons (between the axon terminal of one neuron and the dendrites of another neuron) are called **SYNAPSES**. The impulses are transmitted across the synapse using chemicals called **Neuro-transmitters, for eg. Acetylcholine (Ach)**.
- The cell body contains a large nucleus and granular cytoplasm. These granules are called as **Nissl's granule**.
- The Axon is the nerve fibre of neuron, which transmits nerve impulse from cell body to dendrite of other neuron. The nerve fibre is usually covered by a cellular **Neurilemma**, which is the layer of **schwann cells**.
- Some nerve fibres have an additional myelin or medullary sheath.
- The myelinated nerve fibre show constriction at regular intervals called **nodes of Ranvier**.

- Some nerve fibres may be as long as one metre in length.
- The function of neuron is to transmit impulses.
- Nerve cells do not have centriole. So, these cells could not divide.

Knowledge Enhancer :**Synapse**

Synapse is a junction between two neurons. The terminal knobbed branch end of an axon are connected with dendrite branches of an adjacent neuron. This gap junction helps in transmission of impulse from one neuron to the next. The transmission of impulse is generally carried out with the help of a neurotransmitter chemical like acetylcholine.

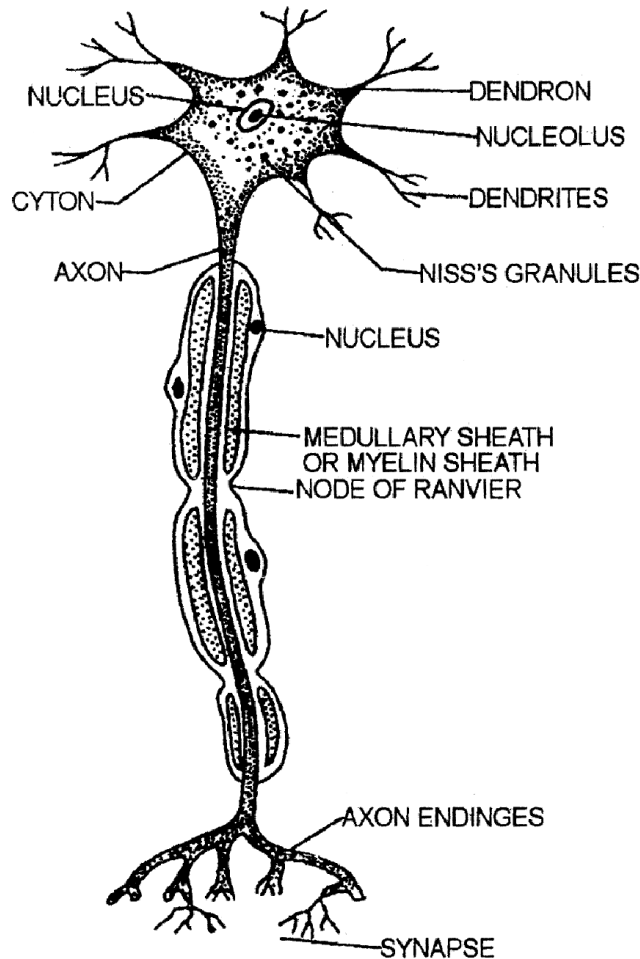


Figure : A Neuron

(b) Neuroglial cells :

- These are specialised cells found in brain and spinal cord act as supporting and packing cells.

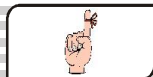
Do you know:

The left side of the human brain controls the right side of the body and the right side of the brain controls the left side of the body.

TRY YOURSELF :

1. Plant tissue can be divided into following groups :
 (A) 2 (B) 3 (C) 4 (D) None
2. The process by which Meristematic tissue changes into permanent tissue is called :
 (A) development (B) differentiation (C) division (D) all of the above
3. Cells capable of cell division are :
 (A) Mirror cell (B) Meristematic cell
 (C) Microscopic voltage cell (D) Permanent cell
4. Cork cambium is a :
 (A) Apical meristem (B) Lateral meristem
 (C) Intercalary meristem (D) Robert hooke
5. Sclerenchyma is a :
 (A) dead permanent complex tissue (B) living permanent simple tissue
 (C) dead permanent simple tissue (D) none of the above
6. Ability of a cell to give rise to all the various cell types :
 (A) Meristemate (B) Permanent (C) Differentiation (D) Totipotency
7. Cells are living or dead it depends upon :
 (A) Nucleus (B) Mitochondria (C) Protoplasm (D) All of the above
8. Aerenchyma is found in :
 (A) Mesophyte (B) Xerophyte (C) Hydrophyte (D) None of these
9. Which among them is not a type of parenchyma?
 (A) Chlorenchyma (B) Collenchyma (C) Aerenchyma (D) Both (A) and (B)
10. Cells found in pulp and skin of fruits :
 (A) Fibres (B) Grit cells (C) Epithelial cells (D) All of the above
11. Technical term for cork cambium is :
 (A) Phellem (B) Phellogen (C) Phelloderm (D) Phallic
12. Guard cell differ from other epidermal cell by :
 (A) Presence of chloroplast (B) Absence of vacuole
 (C) Presence of centriole (D) All of the above
13. Skin is a part of :
 (A) Connective tissue (B) Epithelial tissue (C) Muscular tissue (D) Nervous tissue
14. Blood is a :
 (A) Fluid epithelial tissue (B) Intracellular tissue
 (C) Plasma (D) Fluid connective tissue
15. Which among them is many layered?
 (A) Squamous (B) Cuboidal (C) Columnous (D) Stratified
16. Which among them is a mucous secretory cell?
 (A) Goblet (B) Myoblast (C) Neuron (D) None of these
17. Which among them is not a muscle cells?
 (A) Striated (B) Smooth (C) Cardiac (D) Hyaline
18. The cytoplasm of muscle fibre is called :
 (A) Neoplasm (B) Sarcoplasm (C) Glycogen (D) Myofibre
19. Shape of smooth muscle cell is :
 (A) Cylindrical (B) Barrel (C) Spindle (D) Oblong

20. An important protein of muscle is :
(A) Actin (B) Albumin (C) Both (A) and (B) (D) None of these
21. While holding a note book in your hand you are using :
(A) Voluntary muscle (B) Smooth muscle (C) Involuntary (D) Both (A) and (B)
22. Every connective tissue have :
(A) Matrix (B) Cells (C) Both (A) & (B) (D) Muscle
23. WBC are a part of :
(A) Epithelial protective tissue (B) Connective tissue
(C) Involuntary active muscle tissue (D) None of these
24. Tissue storing fat in our body :
(A) Fibroblast (B) Adipose (C) Mast (D) All of these
25. Ligament and Tendon are helpful :
(A) Articulation of bone and attachment of muscle
(B) Blood circulation
(C) Nerve impulse
(D) None of these
26. Platelet helps in :
(A) Movement of body (B) Joining of cranium
(C) Blood clotting (D) Transporation of gases
27. Bones are a type of :
(A) Cartilage (B) Ligament (C) Connective tissue (D) All of them
28. Structural and functional unit of nervous system is :
(A) Nephron (B) Neuron (C) Nephridia (D) None of these
29. The impulse are transmitted across the synapse using chemicals called :
(A) Insulin (B) Vasopressin (C) Acetylcholine (D) All of the above
30. Neuron not having myelin sheath make nerve impulse move :
(A) Faster than myelinated neuron (B) Slower than myelinated neuron
(C) Some time faster and other times slower (D) None of these
31. Part of neuron receiving stimulus is called :
(A) Axon (B) Soma (C) Dendrite (D) Node of Ranvier



POINTS TO REMEMBER

1. Tissue is a group of specialized cells with similar structure and performing a common function.
2. Tissues ensure division of labour in multi-cellular organisms.
3. The tissues present in plants and animals are different owing to variations in their body organization and mode of living.
4. Plants show two main types of tissues – meristematic tissues and permanent tissues.
5. Meristematic tissues may be apical, lateral or intercalary, depending on their location in the plant.
6. Permanent tissues are classified into simple and complex tissues. Simple tissue shows only one type of cells whereas complex tissue consists of more than one type of cells, functioning as a unit.
7. Three types of simple permanent tissues are parenchyma, collenchyma and sclerenchyma.
8. Parenchyma is a supporting and storing tissue, composed of unspecialized, thin-walled cells with large intercellular spaces.
9. Collenchyma cells are elongated, with irregularly thickened cell walls. It provides mechanical support and elasticity to the plant.
10. The main supporting tissue, sclerenchyma, consists of long and narrow cells with thick, lignified cell walls.
11. Parenchyma and collenchyma are living tissues whereas sclerenchyma is a dead tissue.
12. Epidermis is the outer protective covering of the plant and is usually layered by cuticle.
13. Stomatal pores, present in the epidermis, are essential for transpiration and gaseous exchange.
14. In older plants, many layered cork is seen, made up of dead and compactly arranged cells.
15. Xylem and phloem are important types of complex tissues in plants.
16. Xylem is composed of tracheids, vessels, xylem parenchyma and xylem fibres. It conducts water and minerals from roots to aerial parts of the plant.
17. Phloem consists of sieve tubes, companion cells, phloem fibres and phloem parenchyma. It transports food from leaves and storage organs to all other parts of the plant.
18. Animal tissues are grouped into 4 basic types – epithelial, connective, muscular and nervous tissue.
19. Epithelial tissues are the covering or protective tissues which act as a barrier between the various systems of the body. It rests on a basement membrane and is composed of tightly packed cells.
20. Based on the shape and function of its cells, epithelial tissue is subdivided further into squamous, cuboidal, columnar, ciliated and glandular.

| Epithelium type | Shape of cells | Function |
|-----------------|---|--|
| Squamous | Thin and flat | Protection |
| Cuboidal | Cubical | Absorption, secretion and mechanical support |
| Columnar | Elongated | Absorption and secretion |
| Ciliated | Cubical or columnar cells with cilia | Moving materials, like mucus, forward |
| Glandular | Glands formed from cuboidal or columnar cells | Secretion |

21. Connective tissue is the binding and supporting tissue of the animal body. Matrix forms the main bulk of this tissue, whereas the cells are loosely spaced and less in number.

22. Blood, bone, ligament, tendon, cartilage, areolar tissue and adipose tissue are important connective tissues present in our body.
23. Blood is a fluid connective tissue, composed of plasma and cells, and plays a significant role in the process of transportation.
24. Functions of protection, providing skeletal framework and anchoring are carried out by the strong and hard bone tissue.
25. Ligaments connect bones to bones whereas tendons connect bones to muscles.
26. Cartilage provides support and flexibility to the body parts.
27. Areolar tissue repairs the injured tissues and fills spaces within organs.
28. Adipose tissue serves as a fat reservoir and also carries out the function of insulation.
29. All movements in our body are brought about by the muscular tissue through the contraction and relaxation of their contractile proteins.
30. Depending on their structure and function, the muscles may be striated, smooth or cardiac muscles.
 Striated Smooth Cardiac Shape of cells Long, cylindrical, unbranched Spindle-shaped Cylindrical, branched
 Striations Present Absent Present Control Voluntary Involuntary Involuntary Number and position of nuclei Multinucleate and peripheral Uninucleate and central Uninucleate and central.

| | Striated | Smooth | Smooth |
|--------------------------------|-------------------------------|-------------------------|-------------------------|
| Shape of cells | Long, cylindrical, unbranched | Spindle-shaped | Cylindrical, branched |
| Striations | Present | Absent | Present |
| Control | Voluntary | Involuntary | Involuntary |
| Number and positions of nuclei | Multinucleated and peripheral | Uninucleate and central | Uninucleate and central |

31. Nervous tissue is present in the brain, spinal cord and nerves.
32. Neuron is made up of cell body, dendrites and axon.
33. Neurons are specialized to receive and conduct impulses rapidly.



TOP DEFINITIONS

1. **Tissues** – A group of specialized cells with similar structure, working together to perform a common function.
2. **Meristematic tissue** – Tissue made up of actively dividing cells, present in the growing areas of the plant body.
3. **Apical meristem** – Meristem present at the growing tips of stem and root that causes the stem and root to increase in length.
4. **Lateral meristem** – Meristem located on the lateral portion of the plant and responsible for increasing the girth of its stem and root.
5. **Intercalary meristem** – Meristem found between already differentiated tissues, in locations such as the base of leaves or internode.
6. **Permanent tissue** – A well-differentiated plant tissue derived from meristematic tissue, which has lost its ability to divide.
7. **Differentiation** – The process by which a cell attains a permanent shape, size and function.
8. **Simple permanent tissue** – A permanent tissue composed of only one cell type.
9. **Complex permanent tissue** – A permanent tissue composed of more than one type of cells which coordinate to perform a common function.
10. **Chlorenchyma** – Parenchyma whose cells contain chloroplasts and hence performs photosynthesis.
11. **Aerenchyma** – Parenchyma containing large air cavities, providing buoyancy to aquatic plants and allowing the circulation of gases.
12. **Xylem** – The complex tissue that conducts water and minerals in vascular plants and composed of tracheids, vessels, fibers, and parenchyma.
13. **Phloem** – The food-conducting tissue of vascular plants, consisting of sieve tubes, companion cells, fibers and parenchyma.
14. **Epidermis** – The outermost, protective layer of cells covering the surface of a plant.
15. **Stratified epithelium** – An epithelium composed of multiple layers of cells, with only the basal layer being in contact with the basement membrane.
16. **Ligament** – A fibrous connective tissue that connects (or binds) bones to bones.
17. **Tendon** – A fibrous connective tissue that connects bones to muscles.
18. **Voluntary muscles** – Muscles which can be controlled according to our will.
19. **Involuntary muscles** – Muscles which are not under the control of the will.
20. **Multinucleate cell** – Cell containing more than one nucleus.
21. **Uninucleate cell** – Cell containing only one nucleus.
22. **Neuron** – A cell of the nervous system specialized to conduct nerve impulses and made up of cell body, axon and dendrites.
23. **Impulse** – An electrical signal transmitted along a nerve fibre in response to a stimulus.

CONCEPT APPLICATION LEVEL - I [NCERT Questions]

Q.1 What is a tissue?

Ans. Tissue is a group of related cells that have a common origin and perform a common function.

Q.2 What is the utility of tissue in multicellular organisms?

Ans. The utility of tissue in multicellular organisms

- (i) Division of Labour. Tissues bring about division of labour in multicellular organisms. it increases efficiency.
- (ii) Higher Organisation. Tissues become organised to form organs and organ systems.
- (iii) Individual Cells. Work load of individual cells has decreased.
- (iv) Higher Survival. Because of division of labour, higher efficiency and organisation, the multicellular organisms have high survival.

Q.3 Name types of simple tissues.

Ans. Three – parenchyma, collenchyma and sclerenchyma. (Meristematic tissue is also a simple tissue).

Q.4 Where is apical meristem found?

Ans. Apical meristem occurs at root and stem tips.

Q.5 Which tissue makes up the husk of coconut?

Ans. Sclerenchyma.

Q.6 What are the constituents of phloem?

Ans. Sieve tubes, companion cells, phloem parenchyma and phloem fibres.

Q.7 Name the tissue responsible for movement of our body.

Ans. Muscular tissue.

Q.8 What does a neuron look-like?

Ans. A miniature tree with thin hair like parts arising from its ends.

Q.9 Give three features of cardiac muscles.

Ans. Features of cardiac muscles

- (i) **Cells/Fibres :** They are small, cylindrical, uninucleate striated with short lateral branches.
- (ii) **Intercalated Discs :** In the area of union between the two adjacent cardiac muscle fibres, zig-zag junctions called intercalated discs develop. The intercalated discs function as impulse boosters.
- (iii) **Rhythmic Contractions :** The muscles are involuntary and nonfatigued which continue to contract and relax tirelessly throughout life.

Q.10 What are the functions of areolar tissue?

Ans. The functions of areolar tissue are :

- (i) **Packing :** Areolar tissue provides packing material in various organs.
- (ii) **Binding :** It binds various structures with one another in such a way as to prevent their dislocation while allowing limited movement.

(iii) **Covering** : It provides covering over nerves, muscles and blood vessels.

(iv) **Repair** : The tissue provides materials for repair of injury.

(v) **Defence** : It has cells that feed on microbes, produce antibodies and other chemicals to combat them.

Q.11 Define the term tissue.

Ans. Tissue may be defined as a group or cluster of cells that are similar in structure and work together to achieve a particular function. Tissue as a cluster of cells performs a particular function at a definite place in the body. With in a tissue, cells are arranged or designed to give the highest possible efficiency of function. Blood, phloem and muscle are all examples of tissues.

Q.12 How many types of elements together make up the xylem tissue? Name them.

Ans. Xylem tissue are Complex tissues, which are made of more than one type of cells. Xylem tissue 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.

Q.13 How are simple tissues different from complex tissues in plants?

Ans. Differences between simple and complex tissues in Plants

| S.No. | Simple Tissue | Complex Tissue |
|-------|---|--|
| 1. | These are made up of only one type of cells, which look like each other. | These are made up of more than one type of cells. |
| 2. | All cells have common origin and structure. | The cells of complex tissues have different origin as well as structure. |
| 3. | They are called epidermis. | They are called vascular tissue . |
| 4. | Their main role is to store and provide structural support. Examples – Collenchyma, Parenchyma and sclerenchyma. | Their main function is transport of water, minerals, sugars and other metabolites. Examples – Xylem and phloem. |

Q.14 Differentiate between parenchyma, collenchyma and sclerenchyma on the basis of their cell wall.

Ans. Differences between parenchyma, collenchyma and sclerenchyma on the basis of their cell wall

| Parenchyma | Collenchyma | Sclerenchyma |
|--|---|--|
| The cell wall is thin and is made up of cellulose. | The cell wall is thick due to deposition of lignin. | The cell wall is thick at the corners due to deposition of pectin. |

Q.15 What are the functions of the stomata?

Ans. Stomata are small pores present in the epidermis of the leaf. Stomata are enclosed by two kidney-shaped cells called guard cells.

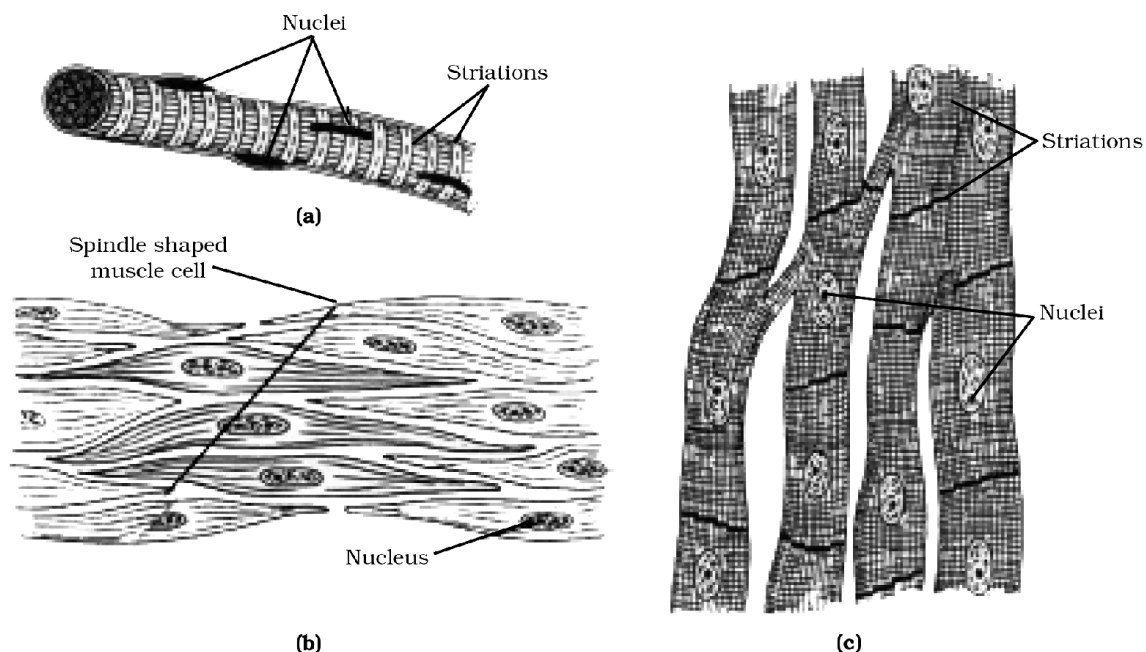
The main function of stomata are :

They are necessary for exchanging gases like CO₂ or O₂ with the atmosphere. Photosynthesis is not possible without them.

They are responsible for Transpiration in which water is lost in the form of water vapour from the plant surface. This ultimately helps in absorption of minerals by root tissues on account of build up root pressure.

Q.16 Diagrammatically show the difference between the three types of muscle fibres.

Ans.



Types of muscles fibres

(a) striated muscle, (b) smooth muscle, (c) cardiac muscle

Q.17 What is the specific function of the cardiac muscle?

Ans. The specific function of cardiac muscle to contract and relax rhythmically throughout life and to ensure the blood circulation through entire body. Heart muscle cells are cylindrical, branched and uninucleate.

Q.18 Differentiate between striated, unstriated and cardiac muscles on the basis of their structure and site/location in the body.

Ans. Differences Striated, Unstriated and Cardiac Muscles

| Striated Muscle | Unstriated Muscle | Cardiac Muscle |
|--|--|--|
| The fibres or cells are long and cylindrical. The fibres or cells are unbranched. | The cells are long, narrow, spindle-shaped. The fibres or cells are unbranched. | The cells are short, cylindrical and branched. At some places, they develop lateral outgrowths to form cross-connections. |
| Multiple nuclei are present on the periphery. | Single centrally located nucleus. | Cardiac cell are uninucleate and have a centrally located single nucleus. |
| Striations with light and dark band present. | Striations absent. | Striations present, but not as prominent as they are present in striated muscle. |
| They are present in Hand, feet and other skeletal muscles. | They are present in Walls of stomach, intestine, ureter and bronchi. | They are present in the heart. |

Q.19 Draw a labelled diagram of a neuron.

Ans.

Labelled Diagram of a Neuron

Q.20 Name the following.

- (a) Tissue that forms the inner lining of our mouth.
- (b) Tissue that connects muscle to bone in humans.
- (c) Tissue that transports food in plants.
- (d) Tissue that stores fat in our body.
- (e) Connective tissue with a fluid matrix.
- (f) Tissue present in the brain.

Ans.

- (a) Tissue that forms the inner lining of our mouth --- Squamous epithelium
- (b) Tissue that connects muscle to bone in humans - Tendon
- (c) Tissue that transports food in plants - Phloem
- (d) Tissue that stores fat in our body - Adipose tissue
- (e) Connective tissue with a fluid matrix - Blood
- (f) Tissue present in the brain - Nervous tissue

Q.21 Identify the type of tissue in the following: skin, bark of tree, bone, lining of kidney tubule, vascular bundle.

Ans.

| Given | Type of tissue |
|-------------------------|--------------------------------------|
| Skin | Squamous epithelium |
| Bark of tree | Cork or secondary epidermis (tissue) |
| Bone | Connective tissue |
| Lining of kidney tubule | Cuboidal epithelium |
| Vascular bundle | Conductive tissue (xylem and phloem) |

Q.22 Name the regions in which parenchyma tissue is present.

Ans. Parenchyma tissue are cluster of living cells . They consists of relatively unspecialised cells with thin cell walls. They are usually loosely packed and have large intercellular spaces. This tissue is mainly found in all soft parts of the plant such as stem, root, leaves, flowers, fruits. It is also found in the ground tissue of petioles, mesophyll of leaves as well as in vascular bundles.

Q.23 What is the role of epidermis in plants?

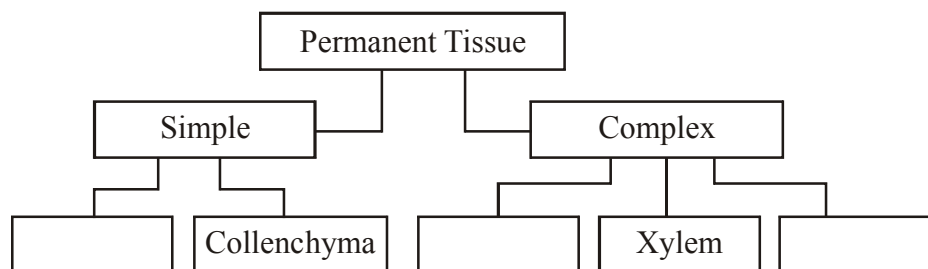
Ans. Role of epidermis in plants :

1. Protection of the underlying cells and tissues.
2. Prevention of water loss.
3. Prevention of mechanical injury and invasion by parasite fungi.
4. Absorption of water.
5. Exchange of gases and transpiration through stomata.

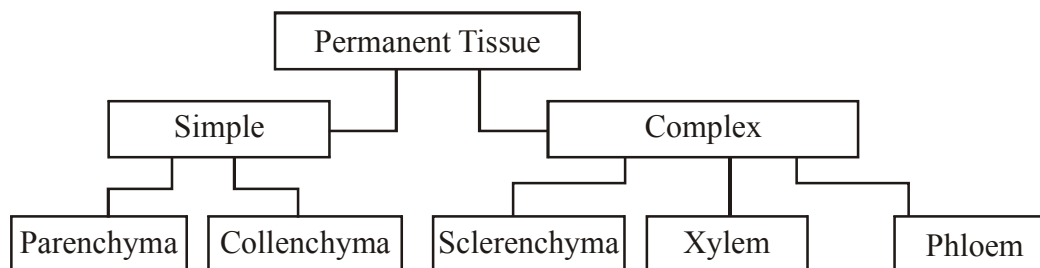
Q.24 How does the cork act as a protective tissue?

Ans. Cork is a multi layered structure of of epidermal. These cells are dead and compactly arranged without intercellular space. They also have a chemical called suberin in their walls which makes them impervious to water and gases.

Q.25 Complete the table :



Ans.



CONCEPT APPLICATION LEVEL - II

SECTION-A

Fill in the blanks :

1. Matrix of cartilage contains _____ and of bone _____ protein.
2. Cartilage cells are called _____ and bone cells _____.
3. A normal human adult has about _____ extracellular fluid.
4. Formation of RBC in liver, spleen and red bone marrow is called _____.
5. Striated muscle fibres in the sarcoplasm contains many _____ numerous _____ and glycogen granules for the supply of adequate _____.
6. Neuron receive impulses through _____ and pass them on to the next neuron through _____.
7. Permanent tissues are derived from _____ tissue.
8. Non vascular tissues like parenchyma, collenchyma and sclerenchyma are the examples of _____ tissues.
9. Vascular tissues, xylem and phloem are examples of _____ tissues.
10. Chlorenchyma tissues performs the function of _____.
11. Cork cambium is purely a _____.
12. Due to secondary growth on the surface of trees stem small pores are developed called _____.

SECTION-B

Multiple choice question with one correct answers :

1. The meristematic cells have :
(A) Thin walls (B) prominent nuclei (C) Absence of vacuoles (D) All of the above
2. Meristems helps in :
(A) Absorption of water (B) Absorption of minerals
(C) Transport of food (D) Growth of plants
3. The division in meristematic cells is :
(A) Mitotic (B) Amitotic (C) Meiotic (D) All of the above
4. The cells having the ability to divide are :
(A) Specialised (B) Glandular (C) Meristematic (D) Permanent
5. A nail inserted some years back at 1.5 mtr height on a tree trunk shall :
(A) remain where it was (B) move upwards
(C) move downwards (D) move laterally
6. Most metabolism of the plants is carried in tissue :
(A) Phloem (B) Meristem (C) Collenchyma (D) Parenchyma
7. Which tissue provides maximum mechanical strength to the plants :
(A) Parenchyma (B) Xylem (C) Phloem (D) Collenchyma

8. Xylem & Phloem belong to the group of :
(A) Simple tissue (B) Latex tissue (C) Complex tissue (D) None of these
9. Which constitutes the thickening in collenchyma :
(A) Suberin (B) Cutin (C) Pectin (D) Lignin
10. Vessels and Companion cells occur in :
(A) Angiosperm (B) Gymnosperm (C) Pteridophytes (D) Bryophytes
11. Which one is not a plant fibre :
(A) Coir (B) Flex (C) Hemp (D) Silk
12. Which of the following acts a middle man?
(A) W.B.C. (B) Plasma (C) Blood (D) Lymph
13. The main difference between bone and cartilage is of :
(A) Mineral distribution (B) Cell structure (C) Lymph vessels (D) Haversian system
14. Tendon is made up of :
(A) Yellow fibrous connective tissue (B) Adipose tissue
(C) Modified white fibrous tissue (D) Areolar tissue
15. Muscles get fatigued due to accumulation of :
(A) ATP (B) CO_2 (C) Lactic acid (D) Poly Molecule
16. Chemical ions responsible for muscle contraction are :
(A) Ca^{2+} and K^+ (B) Na^+ and K^+ (C) Na^+ and Ca^{2+} (D) Ca^{2+} and Mg^{2+} ion
17. Collagen is :
(A) Protein (B) Fat (C) Sugar (D) Starch
18. Sprain is due to pulling of :
(A) Muscles (B) Ligaments (C) Tendons (D) Nerves
19. Power of regeneration is poor in :
(A) Brain cells (B) Bone cell (C) Muscle cell (D) All of the above
20. Which one contain voluntary muscles?
(A) Heart (B) Hind limb (C) Liver (D) Lung

SECTION-C

PREVIOUS YEAR'S QUESTIONS

Very Short Answer Type Questions : (One Mark)

Q.1 Which one of the meristematic tissue is also called cambium ? What is its function? [SAI 2015]

Ans. (i) Lateral meristem. (ii) It increases the girth (thickness) of the stem or root.

- Q.2 State how the epithelium is usually separated from the underlying tissue. [SAI 2015]
Ans. The epithelium is separated from the underlying tissues by an extracellular fibrous basement membrane.
- Q.3 Write the name of most abundant muscular tissue found in our body. [SAI 2015]
Ans. Striated muscles or voluntary muscles or skeletal muscles.
- Q.4 Name the chemical substance which gets deposited in the walls of sclerenchyma. [SAI-2013,2014]
Ans. Lignin.
- Q.5 What is differentiation of meristematic tissues? [SAI-2012, 2014]
Ans. It is the process by which meristematic tissues take-up a permanent shape, size and function.
- Q.6 Name the tissue which forms subcutaneous layer. [SAI-2012, 2013, 2014]
Ans. Adipose tissue.

Short Answer Type Questions : (Two Marks)

- Q.7 Name the following :
(a) Tissue that occurs in specific regions of growth.
(b) Tissue present at the growing tips of stems and roots.
(c) Tissue at the base of the leaves or internodes on twigs.
(d) Basic packing tissue in the form of a few layers of cells. [SAI-2015]
Ans. (a) Meristematic tissue.
(b) Apical meristem.
(c) Intercalary meristem.
(d) Simple permanent tissue.
- Q.8 Determine the location of the following tissues: [SAI-2015]
(a) Unstriated muscle fibres (b) Cuboidal epithelium
(c) Adipose tissue (d) Striated muscle fibres
Ans. (a) In lining of alimentary canal, blood vessels, iris of eye, ureters and in the bronchi of lungs.
(b) They form the lining of kidney tubules and ducts of salivary glands.
(c) Adipose tissue is found below the skin and between internal organs.
(d) Mostly attached to bones.
- Q.9 Write one important functional difference between striated and smooth muscle tissues. [SAI-2012, 2013, 2014]
Ans. **Striated muscle tissue:** This tissue is responsible for voluntary actions like movement of limbs in our body.
Smooth muscle tissue : This tissue is responsible for involuntary actions like movement of food in alimentary canal in our body, also found in the iris of the eye, ureters and bronchi.
- Q.10 What are the functions of phloem ? [SAI-2012, 2013, 2014]
Ans. The functions of phloem are:
(i) It helps in the transportation of organic food to all parts of a plant.
(ii) Phloem parenchyma helps in the storage of food .
(iii) Phloem fibres provide mechanical support.

- Q.11 List two characteristics of cork cells which help them to function as protective tissue. [SAI-2012, 2013, 2014]
Ans. (i) Cells of cork are dead and compactly arranged without intercellular spaces.
(ii) They also have a chemical called suberin in their walls that makes them impervious to gases and water.
- Q.12 Give two characteristics of xylem elements. [SAI-2011, 2014]
Ans. (i) The cells have thick walls.
(ii) Mostly cells are dead.
- Q.13 What is the role of xylem parenchyma? [SAI-2014]
Ans. (i) It stores food.
(ii) It helps in the sideways conduction of water.
- Q.14 What is the unique feature of phloem elements as compared to xylem elements? [SAI-2014]
Ans. In phloem, except for phloem fibres, all other elements are living cells. In xylem, except for parenchyma, all other elements are dead cells.
- Q.15 Write two locations of the following animal tissues: [SAI-2012, 2013]
(i) Simple squamous epithelial cells.
(ii) Cuboidal epithelium
Ans. (i) Oesophagus, lining of mouth.
(ii) Lining of kidney tubules, ducts of salivary gland.

Short Answer Type Questions : (Three Marks)

- Q.16 Name two types of : (i) Fibres, (ii) Cells. [SAI-2015]
Found in areolar connective tissue. Where is this tissue located ?
Ans. (a) Areolar connective tissue consists of
(i) reticular fibre and collagen fibre and two types of cells :
(1) Mast cell and (2) Plasma cell.
(b) Areolar connective tissue is found between the skin and muscles, around blood vessels and nerves and in the bone marrow.
- Q.17 (a) Mention different types of blood cells. [SAI-2015]
(b) Which substances are transported by blood?
Ans. (a) (i) Red Blood Corpuscles (RBC)
(ii) White Blood Corpuscles (WBC)
(iii) Platelets
(b) Blood transports gases, digested food, hormones and waste materials to different parts of the body.
- Q.18 Name the tissue found in the following locations: [SAI-2015]
(a) Haversian canal, (b) Chondrocyte, (c) Eosinophils
Give one function of each of these.
Ans. (a) Connective tissue contains blood vessels and nerve fibres. They help to communicate with the cells and also give strength to bone tissues.
(b) Connective tissue in hyaline cartilage. They smoothens bone surfaces at joints and give flexibility to cartilage.
(c) Connective tissues (blood) are the kind of WBC and help the immune system in the body.

Q.19 Identify the tissue present in the following and give one specific feature of each:

- (i) leaf stalks below epidermis.
- (ii) In stem, around vascular bundles.
- (iii) At root and shoot tip.

[SAI-2013, 2014]

Ans. (i) Collenchyma, (ii) Sclerenchyma, (iii) Meristematic tissue (Apical meristem)

Features:

- Collenchyma allows easy bending in various parts of a plant.
- Sclerenchyma makes the plant hard and stiff.
- Meristematic tissue consists of actively dividing cells.

Q.20 What is epidermis ? What is its role ?

[SAI-2012, 2014]

Ans. Epidermis is a single layer of cells that covers all the parts of the plant externally.

Role:

(i) Protection - It protects against loss of water, mechanical injury and invasion by parasitic fungi.

(ii) Secretion - Epidermal cells on the aerial parts of the plant often secrete a waxy layer which further helps in protection from mechanical injury and water loss.

(iii) Absorption - Root hairs present on epidermis of root help in absorption of water and minerals from the soil.

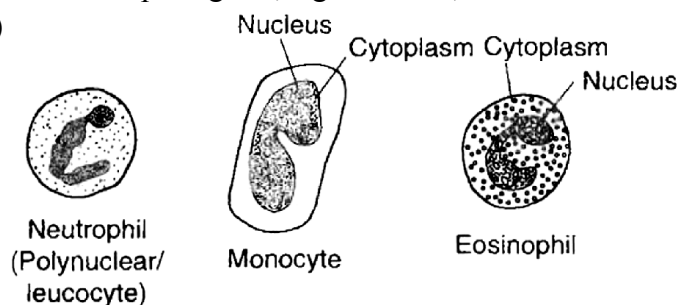
Q.21 (i) What are substances that are transported by blood ?

(ii) Draw any two types of white blood corpuscle.

[SAI-2014]

Ans. (i) Blood transports gases, digested food, hormones and waste materials to different parts of the body.

(ii)



Long Answer Type Questions : (Five Marks)

Q.22 Write four characteristic features of parenchyma tissue. How would you classify this tissue based upon its specialised functions ? What are these functions? [SAI-2015]

Ans. **Features:**

- (i) Parenchyma is generally found in all plants.
- (ii) Its cells are living.
- (iii) Intercellular spaces are present.
- (iv) The cell wall is thin and made-up of cellulose.
- (v) A large vacuole is present in the centre of the cell.
- (vi) Cells are generally rounded, oval or polygonal.

Classification of parenchyma tissues :

(i) Simple parenchyma or storage parenchyma, (ii) Chlorenchyma, (iii) Aerenchyma.

Functions:

- They provide support to plant and also store food.
- Some of them contain chlorophyll and perform photosynthesis.
- Some have large air cavities, which give buoyancy to the plant to help them float.
- The parenchyma of stems and roots also stores nutrients and water.

Q.23 List the characteristics of cork. How are they formed ? Mention their role.

[SAI-2010,12,14]

Ans. **Characteristics:**

- (a)
 - (i) Cells of cork are dead at maturity.
 - (ii) These cells are compactly arranged.
 - (iii) Cells do not possess intercellular spaces.
 - (iv) Cells possess a chemical substance suberin in their walls.
 - (v) They are several layers thick.
- (b) As plants grow older, a strip of secondary meristem replaces the epidermis of the stem. Cells cut on the outer side by this meristem are called cork.
- (c) They are protective in function for older stem / twigs / branches. They are impervious to gases and water.

SECTION-D

UNDERSTANDING BASED QUESTIONS

Q.1 Water hyacinth floats on water surface. Explain.

[SAI-2010, 13, 14]

Ans. Due to aerenchyma present in the swollen petiole.

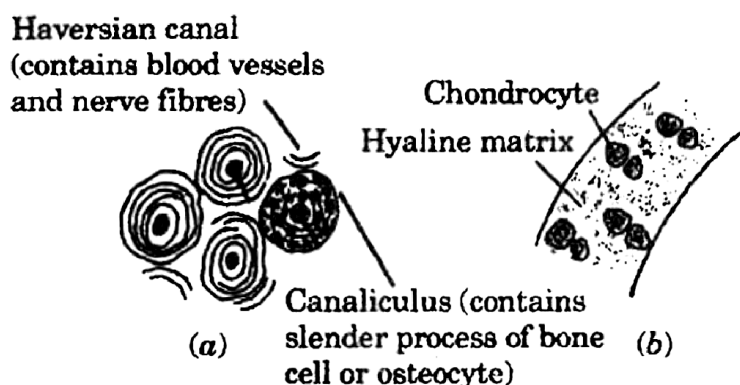
Q.2 Why are skeletal muscles known as striated muscles?

[SAI-2010,11,13,14]

Ans. Since skeletal muscles have light and dark bands so they are also known as striated muscles.

Q.3 Identify the two types of tissues in the given figure each of the two.

[SAI-2015]



Ans. (a) Compact bone, (b) Hyaline cartilage

Q.4 Differentiate between aerenchyma and chlorenchyma.

[SAI-2012, 2014]

Ans. Aerenchyma is present in aquatic plants. It has large air cavities which give buoyancy to the plants. Chlorenchyma is present in green parts of all plants. It has chlorophyll which helps in photosynthesis.

Q.5 Explain the significance of the following:

- (a) Hair like structures on epidermal cells.
- (b) Numerous layers of epidermis in cactus.
- (c) Presence of a chemical suberin in cork cells.

[SAI-2015]

Ans. (a) Function of epidermal cells in roots is water absorption. Hair like parts greatly increase the total absorptive surface area.

(b) Plants living in very dry habitats have thick epidermis and entire surface of the plants have this outer covering of epidermis. It protects them from loss of water, mechanical injury and parasitic invasion.

(c) Suberin makes the cork cells impervious to gas and water.

- Q.6 (a) State the feature of cardiac muscles which makes it unique.
 (b) The tissue is under control of will. What is this type of tissue called ? Name it.
 (c) What are ligaments ? What do you expect to feel if they are over stretched? [SAI-2015]

Ans. (a) The cardiac muscles (muscles of heart) are cylindrical branched and uninucleate. They are involuntary muscles. They show rhythmic contraction and relaxation throughout life. They never show fatigue.
 (b) These are called striated muscular tissues. These muscles are attached with bones and involved voluntary movements of body. They are called voluntary muscles also.
 (c) Ligaments are type of connective tissues. These tissues are very elastic. If these tissues are over stretched it causes fatigue and may also get teared.

Q.7 Complete the following table :

| Example | Tissue | Type of tissue | Cell (Living / Dead) | Main function |
|--|--------|----------------|-------------------------|---------------|
| (i) Husk of coconut | | | | |
| (ii) In leaf, stalk, below the epidermis | | | | |

Ans.

| Example | Tissue | Type of tissue | Cell (Living / Dead) | Main function |
|--|------------------|----------------|-------------------------|--|
| (i) Husk of coconut | Simple permanent | Sclerenchyma | Dead | Provides strength to plant |
| (ii) In leaf, stalk, below the epidermis | Simple permanent | Collenchyma | Living | Allow bending without breaking and mechanical strength |

CONCEPT APPLICATION LEVEL - III

SECTION – A

1. Fibres of striped muscles are :
(A) Oval (B) Spindle-Shaped (C) Cylindrical (D) Oblong
2. Striped muscle fibres are :
(A) Multinucleate (B) Uninucleate (C) Binucleate (D) Anucleate
3. In a striped muscle fibre, the nuclei lie :
(A) Centrally (B) Peripherally (C) Polar (D) Diffused
4. Striped muscle fibres possess :
(A) Longitudinal Striations (B) Oblique striations
(C) Transverse striations (D) No striations
5. Striations appear in striped muscles due to :
(A) Presence of alternate light and dark bands (B) Dispersion of pigments
(C) Presence of intercalated discs (D) Occurrence of actin strands
6. A characteristics of striped strands :
(A) Rapid contraction (B) Forceful contraction
(C) Fatigued after some time (D) All the above
7. Striped muscle is specialised to :
(A) Elongate (B) Contract (C) Relax (D) Both B and C
8. Striped muscle works :
(A) Automatically or involuntarily (B) Under control of will or voluntarily
(C) Under control of reflex system (D) All the above
9. Nucleated part of nerve cell is called :
(A) Axon (B) Dendrites (C) Cyton (D) None of the above
10. Cell body of a nerve cell contains :
(A) Nucleus (B) Cytoplasm
(C) Nissl granules and neurofibrils (D) All the above
11. Dendrites occur over :
(A) Muscle fibre (B) Nerve cell (C) Spinal cord (D) Brain
12. Nerve cells are also called :
(A) Neurons (B) Neurites (C) Neurines (D) Neurofibrils

13. Dendrites are :
(A) Long unbranched processes (B) Long branched processes
(C) Short branched processes (D) Short unbranched processes
14. Along fibre like process coming out of the cyton of a nerve cell is :
(A) Axon (B) Dendron (C) Neurolemma (D) Neurofibrils
15. Buttons are :
(A) Terminal sharp ends of dendrons (B) Terminal swollen ends of dendrons
(C) Terminal pointed ends of axon branches (D) Terminal knob-like swollen ends of axon branches
16. Nerve fibre is :
(A) A thin nerve (B) Fibre formed by many axons
(C) Fibre formed by ensheathing of axon (D) Fibre formed by ensheathing of a dendrite
17. Medullated nerve fibre is axon covered by :
(A) Neurolemma (B) Meduallary sheath
(C) Both neurolemma and medullary sheath (D) None of the above
18. Nodes of Ranvier are areas where :
(A) Joints occur between adjacent axons
(B) Axon terminals form synapses with dendrite tips
(C) Dendrites of one nerve cell are attached to dendrites of an adjacent one
(D) Non medullated areas of a medullated nerve fibre
19. Impulse is brought to a nerve cell through a :
(A) Dendrite (B) Neurofibril (C) Axon (D) Nissl granules
20. A nerve cell transmits its impulse to another through its :
(A) Dendrite (B) Axon (C) Cyton (D) All the above

SECTION-B

PRACTICAL BASED QUESTIONS

1. Cells are stained to :
(A) Nourish the cell (B) Highlight the cell organelles
(C) Make the cell turgid (D) Help in cell multiplication
2. Which is the most commonly used instrument for viewing slides in the laboratory?
(A) Simple Microscope (B) Compound Microscope
(C) Dissecting Microscope (D) Electron Microscope
3. Gita prepared a temporary mount of human cheek cells. She first observed it under low power and then under high power of the microscope. Under high power, she must have observed :
(A) more cells in brighter field of view. (B) more cells in diarker field of view.
(C) fewer cells in brighter field of view. (D) fewer cells in darker field of view.

4. Magnifying power of a microscope is calculated by :
(A) Multiplying the power of objective lens and eye-piece.
(B) Multiplying the power of objective lens with distance between the objective lens and the specimen.
(C) Adding up the powers of objective lens and eye-piece.
(D) Subtracting the power of objective lens from that of the eye-piece.
5. Glycerine is used to prepare a temporary mount of a tissue due to the following reasons :
(A) to colour the specimen
(B) to avoid drying up of the specimen quickly
(C) to avoid entry of air bubbles
(D) none of the above
6. Which of the following is the correct sequence for preparing a mount of onion peel?
(A) (i) Take out onion peel. (ii) Keep the peel on a slide.
(iii) Add a drop of glycerine on it. (iv) Add few drops of safranin stain.
(v) Cover it up with a coverslip.
(B) (i) Take out onion peel. (ii) Keep the peel in water in a petridish.
(iii) Add few drops of safranin stain and transfer to a slide.
(iv) Add a drops of glycerine. (v) Cover it up with a coverslip.
(C) (i) Take out onion peel. (ii) Keep it on a slide and add safranin stain.
(iii) Transfer it to water in a petridish. (iv) Remove water and add glycerine.
(v) Cover it up with a coverslip.
(D) (i) Take out onion peel. (ii) Cover it up with a coverslip.
(iii) On a petridish, add water to clean. (iv) Add a drops of glycerine.
(v) Add few drops of safranin stain.
7. Nihal prepared a mount of human cheek cell by staining it with methylene blue. But he did not see mitochondria in the cell because :
(A) Human cheek cells do not have mitochondria.
(B) They are too small to be seen under compound microscope.
(C) Mitochondria to do not get stained with methylene blue.
(D) None of the above

SECTION-C

Assertion & Reason :

Instructions: In the following questions as Assertion (A) is given followed by a Reason (R). Mark your responses from the following options.

- (A) Both Assertion and Reason are true and Reason is the correct explanation of 'Assertion'.
(B) Both Assertion and Reason are true and Reason is not the correct explanation of 'Assertion'.
(C) Assertion is true but Reason is false.
(D) Assertion is false but Reason is true.

1. **Assertion :** Every living organism is not multicellular.
Reason : Few multicellular organisms do not have tissue.
2. **Assertion :** Node of Ranvier occur in myelinated nerve fibre.
Reason : Myelin sheath is discontinuous.

SECTION-D

Match the following (one to one) :

Column-I and **column-II** contains **four** entries each. Entries of column-I are to be matched with some entries of column-II. Only One entries of column-I may have the matching with the same entries of column-II and one entry of column-II Only one matching with entries of column-I

- | | | | |
|----|---------------------|-----|-------------------------|
| 1. | Column I | | Column II |
| | (A) Pith | (P) | Secondary meristem |
| | (B) Cork cambium | (Q) | Parenchyma |
| | (C) Cambium | (R) | Primary meristem |
| | (D) Pits | (S) | Xylem vessels |
| 2. | Column I | | Column II |
| | (A) Node of Ranvier | (P) | Tear Gland |
| | (B) Exocrine gland | (Q) | Phagocytosis |
| | (C) Macrophage | (R) | Myelinated nerve fibres |
| | (D) Dendrite | (S) | Nerve impulse |

Match the following (one to many) :

Column-I and **column-II** contains **four** entries each. Entries of column-I are to be matched with some entries of column-II. One or more than one entries of column-I may have the matching with the same entries of column-II and one entry of column-II may have one or more than one matching with entries of column-I.

- | | | | |
|----|-----------------|-----|-------------------|
| 3. | Column I | | Column II |
| | (A) Bone | (P) | Connective tissue |
| | (B) Cartilage | (Q) | Matrix present |
| | (C) Ligament | (R) | Femur |
| | (D) Blood | (S) | Plasma |

SECTION-E

Comprehension :

If you germinate a kidney bean seed in a petridish, then the reserve food material present in plant part undergo oxidation to release energy. This energy is used in cell division and hence sprouting take place. The two small plant part comes out of the seed are plumule and radicle respectively.

- Plumule helps in formation of :
 (A) Fruit (B) Seed (C) Flower (D) None of these
- Root that help in anchorage are specialized structure of :
 (A) Plumule (B) Radicle (C) Embryo (D) None of these
- Height of the plant above the soil increases due to meristematic tissue present in :
 (A) Root tip (B) Shoot tip (C) Both (B) & (C) (D) None of these

ANSWER KEY

Try yourself :

- | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| 1. A | 2. B | 3. B | 4. B | 5. C | 6. D | 7. C |
| 8. C | 9. B | 10. B | 11. B | 12. A | 13. B | 14. D |
| 15. D | 16. A | 17. D | 18. B | 19. C | 20. A | 21. A |
| 22. C | 23. B | 24. B | 25. A | 26. C | 27. C | 28. B |
| 29. C | 30. B | 31. C | | | | |

CONCEPT APPLICATION LEVEL - II

SECTION-A

- | | | |
|------------------------|---------------------------------|---------------|
| 1. Chondrin, Ossein | 2. Chondrioblasts, Osteocytes | 3. 1.5 litres |
| 4. Erythropoiesis | 5. Nuclei, Mitochondria, energy | |
| 6. Dendrons, Axons | 7. Meristematic | 8. Simple |
| 9. Complex | 10. Photosynthesis | |
| 11. Secondary meristem | 12. Lenticles | |

SECTION-B

- | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| 1. D | 2. D | 3. A | 4. C | 5. A | 6. D | 7. B |
| 8. C | 9. C | 10. A | 11. D | 12. D | 13. D | 14. C |
| 15. C | 16. D | 17. A | 18. B | 19. A | 20. B | |

CONCEPT APPLICATION LEVEL - III

SECTION - A

- | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|
| 1. C | 2. A | 3. B | 4. C | 5. A | 6. D | 7. D |
| 8. B | 9. C | 10. D | 11. B | 12. A | 13. C | 14. A |
| 15. D | 16. C | 17. C | 18. D | 19. A | 20. B | |

SECTION-B

- | | | | | | | |
|------|------|------|------|------|------|------|
| 1. B | 2. B | 3. D | 4. B | 5. B | 6. B | 7. C |
|------|------|------|------|------|------|------|

SECTION-C

- | | |
|------|------|
| 1. B | 2. B |
|------|------|

SECTION-D

1. (A)-(Q), (B)-(P), (C)-(R), (D)-(S)
2. (A)-(R), (B)-(P), (C)-(Q), (D)-(S)
3. (A)-(P,Q,R), (B)-(P,Q), (C)-(P,Q), (D)-(P,Q,S)

SECTION-E

- | | | |
|------|------|------|
| 1. D | 2. B | 3. B |
|------|------|------|