

20/12/25

11-3 Tissues, Plant and Animal Tissues

Notes Notes:-

Tissue: Group of similar cells performing the same function and having a common origin.

Histology: The study of tissues.

Plant Tissue: ~~Meristematic~~ ~~Tissue~~ → Meristematic Tissue
→ Permanent Tissue

Meristematic Tissue: Actively dividing group of young cells. These are found in root tip & shoot tip.

- Characteristics: - living cells, compactly packed without intercellular spaces
- Without vacuole, cells are small, thin walled cuboidal in shape.
- Dense granular cytoplasm.
- Large, prominent and centrally located nucleus.
- Simple and undifferentiated cell.
- Don't store reserve food material.
- Divide indefinitely adding new cells to plant.
- Found at the tip of root and shoot.
- After maturation, new cells produced are transformed into permanent ~~cells~~ tissue.

Types of meristems: ~~Apical & Lateral~~ → Apical & Lateral. Based on their position in plant.

- Apical meristem:- Found in the growing tip of stem, root and their branches in the growing young and also on the tip of axillary buds.
Function:- It helps to increase the length of roots and stems.
- Lateral or Cambium meristem:-> It is located on the sides of root and stem.
-> It is responsible to increase the diameter of the plant roots and stem.
-> These are responsible for the growth in thickness by the addition of secondary tissue and this phenomenon is called secondary growth.
-> These are responsible for the growth in thickness from root tip to shoot tip in plants with the help of vascular cambium tissue.
-> Vascular cambium is responsible for increasing the diameter of stems and roots and for forming woody tissue.

Permanent Tissue (May be dead or living):-
-> These are the tissues that are completely grown and have lost the ability of division.
-> The meristematic tissues divide and differentiate to form the permanent tissues.

- Based on function, they are of 3 types: (a) Supporting (b) Conducting (c) Protective.
- (a) Supporting Tissue (Simple Permanent Tissue): These tissues

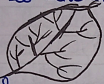
provide support and strength to the plants. They are of three types:- (i) Parenchyma (Living), (ii) Collenchyma (Living), (iii) Sclerenchyma (Non-Living).

- (i) Parenchyma Tissue (Living):- These are the tissues that help to provide support to the plants as well as to store food material.
-> The cells have thin wall and space in between.
-> Each cell has a large central vacuole, cytoplasm and a prominent nucleus.
Location:- Epidermis, Cortex, pith (Central region) of roots and stem and leaf of mesophyll. It is also found in xylem and phloem.
Function:- Stores food material in potato, sweet potato, etc.
• They secrete resins or gum in plant.
• Protect the internal tissue.
• In the leaves of green plants, parenchyma tissue contains chloroplast and is called chlorenchyma.
-> Helps in photosynthesis.
- (ii) Collenchyma Tissue (Living):- These are the tissues that provide flexibility in plants and allow them to bend without breakage.
-> They possess a large central vacuole, peripheral cytoplasm and a nucleus.
-> The cells are living and thickened at the corner due to cellulose.
Location:-> Beneath the epidermis in the stem & petiole

or leaf stalk of dicot plants.
 → Absent in monocot plants.
 Functions: → Provides elasticity to all the plant parts.
 → Supports parts of the plant by providing tensile strength and rigidity to the plants due to thickening of the walls.

(iii) Sclerenchyma Tissue (Non-living): These are the tissues
 (iii) Sclerenchyma Tissue (Non-living): → These are elongated narrow cells. → They lose their protoplasm when they get matured and become dead.
 → They have thick cell wall due to the deposition of lignin.

Sclerenchyma Tissue → Fibres
 → Sclerids



Location: stem and veins of leaves.

Function: • Mechanical strength to plant parts. • Protect the plant from environmental forces like strong winds. • Makes plant hard and stiff.

Note: • The husk of coconut is made of sclerenchyma tissue.
 • Shells of walnut and other nuts are made of sclerids.

due to their narrowness

(b) Conducting Tissue (Complex Permanent Tissue)

→ These are made up of more than one type of cell which work in close coordination to perform a common factor.

→ These are called vascular bundle.

xylem phloem

- Xylem: It is a water conducting tissue.
- Xylem cells are thick-walled.
- They conduct water from root to other parts of plant.
- Xylem conducts water in one direction.
- * Old xylem tissue forms the wood and does not conduct water or mineral.

Xylem: → Xylem vessels (Dead)
 → Tracheids (Dead)
 → Xylem Fibres (Dead)
 → Xylem Parenchyma (Living)

Xylem Vessels & Tracheids: Are long, tube like structure with hard and thick cell walls. They help in the upward movement of water and minerals from roots to aerial parts of the plant.

Xylem Fibres: Are found in woody dicotyledonous plants. They provide mechanical strength to the plant body.

Xylem Parenchyma: Only living component of Xylem. They store food. Help in the conduction of water and minerals.

- Phloem: Food conducting tissue.
- Conduct food from leaves to different parts of plant in all direction.

Phloem: → Sieve tubes (Living)
 → Companion cells (Living)
 → Phloem Parenchyma (Living)
 → Phloem Fibres (Dead)

Sieve Tubes: - Are elongated tubular conducting channels placed end to end.

Companion cells: - lies close to sieve tubes and help them to conduct water.

Phloem Parenchyma: - Are Ordinary living Parenchyma cells that stored food.

Phloem Fibres: - They provide mechanical strength. The textile fibres of flax, hemp & jute are phloem fibres.

* Xylem and Phloem Together form Vascular bundle.

(c) Protective plant tissue: -

(i) Epidermis: -> It is the outermost protective tissue of plant. It consists of cells with thick walls.

Cutin: - An organic covering found on the outer walls of epidermis.

Function: - Prevents excessive ~~transpiration~~ transpiration the loss of water by transpiration.

* Wax present on the upper surface of floating leaves, protects them from getting wet.

(ii) Cork: - These are formed from older protective tissue present in the roots and stem.

Function: - It protects the inner tissue.
• Provides insulation from freezing temperatures.

Animal Tissue

• These are the tissues found in animal.
• They are of four types: (i) Epithelial tissue.

(ii) Muscular tissue.

(iii) Connective tissue.

(iv) Nervous tissue.

(i) Epithelial tissue (Epi - Upon; thalio - to grow): -

→ An epithelium is a tissue composed of one or more layer of thin, protective continuous sheet of cells covering the external surface of body & internal body organs.

• Location: - It lines the body cavity & cavities of internal body organs, blood vessels & duct (lining of internal surface of mouth, nose, outermost layer of skin, etc.)

• Shape: - Flat, cuboidal or columnar.

• Characteristics of epithelial tissue: -

(i) Cells are closely packed.

(ii) They form continuous sheets.

(iii) There is no space between the cells.

(iv) Blood vessels are absent.

• Functions of epithelial tissue: -

(i) They protect the underlying tissue from (i) injury; (ii) germs; (iii) harmful chemical; (iv) drying up.

(ii) Epithelial lining of intestine absorbs water & nutrients from digested food.

(iii) Epithelial lining of the seminiferous tubules produces spermatozoa (sperm). & in female it lined ovaries produces ova.

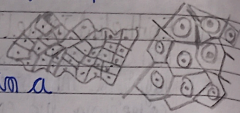
(iv) Epithelial lining of alveoli in lungs helps in the exchange of O_2 and CO_2 between blood & inhaled air.

(iv) Sensory epithelium receive sensory stimuli and convey impulse to CNS.

Types of epithelium: (i) Squamous epithelium, (ii) Cuboidal epithelium, (iii) Columnar epithelium, (iv) Ciliated epithelium, (v) Stratified epithelium.

(i) Squamous epithelium:-

→ Flattened, polygonal cells fitted together like tiles in a mosaic floor.

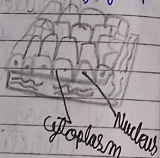


Location:- Lines the lymph vessels in Bowman's capsules, blood vessels, lining of mouth and nasal cavities and alveoli of lungs.

Function:- It provides protects the underlying parts from mechanical injury, germs and drying up.

(ii) Cuboidal epithelium:-

- Cuboidal cells.
- More or less like square shaped.
- Nuclei are round in shape.
- Nuclei lie at the centre of the cells.

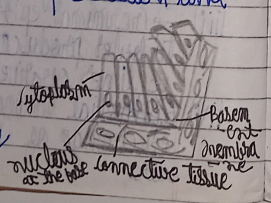


Location:- Kidney tubules, sweat glands & salivary gland.

Function:- It helps in excretion, secretion and absorption.

(iii) Columnar epithelium:-

- Pillar like appearance
- Cylindrical cells lie side by side.



- Cells are much taller than they are wide.
- Nucleus lie at the base of cell.

Location:- Inner lining of stomach & intestines.

Function:- Absorption and secretion.

Glandular epithelium:- → Large cells which secrete mucus.

→ This epithelium is also folded inward to form tubular hollow glands like sweat gland, tear gland and liver.

Location:- Mucous membrane of stomach, intestine and rectum.

Function:- Produce and secrete substances like hormones, protein etc.

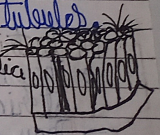
(iv) Ciliated epithelium:- They may be cuboidal or columnar. They have cilia at their free end which keeps lashing and moving the material entering the organs.

• Cuboidal ciliated epithelium:- Cuboidal in shape. Have cilia at free end.

Location:- Lines certain parts of urinary tubules.

• Columnar ciliated epithelium:- Columnar in shape. Cilia present at free surface.

Location:- Lines the trachea (wind pipe).



(v) Stratified epithelium:- Different epithelial tissue are present in several layer.

Location:- Found in skin and cornea.

Muscular Tissue

→ It consists of muscle fibres (long narrow cells).

→ Muscle fibres are held together by connective tissue.
→ Muscle fibres contract and relax to bring about movement of body.

- Types: (i) Striated muscles (Voluntary muscles)
- (ii) Unstriated muscles (Involuntary muscles)
- (iii) Cardiac muscles (Found only in Heart)

(i) Striated muscles (Voluntary muscles) (Skeletal muscles)
→ They are attached to bones hence are also known as skeletal muscles.
→ Their movement is under our will, hence they are also known as voluntary muscles.
→ They have striations (light and dark bands).
→ They are long, narrow, cylindrical, unbranched fibres with blunt end.
→ Cytoplasm contains myofibrils which shows alternating light and dark bands.
→ Each muscle fibre has many nuclei.
Location: Arms, legs, tongue, face, neck, etc.

(ii) Unstriated muscles (Involuntary muscles) (Smooth muscles)
→ They are called smooth muscles as they lack transverse striations.
→ They are involuntary in nature, i.e., not under our will.
→ Spindle shaped and arranged in bundle.
→ Each muscle fibre has one nucleus.
Location: Alimentary canal, urinary bladder, iris of eyes, blood vessels etc.

(iii) Cardiac muscles: → only in heart.

→ Involuntary, and works tirelessly.
→ Cylindrical, striated and short.
→ Branched muscle filaments are connected with dark junctions ~~intercalated~~ called intercalated disc.

Connective Tissue

→ Binding and supporting tissue.
→ Forms a sheath around the organ.
→ It has abundance of intercellular substance - matrix, connective tissue cells and fibres.
→ Cells are loosely packed.
→ Non living and also called packing tissue.
Functions: (i) Forms protective sheath around delicate organs like kidney, testes, spleen, etc.
(ii) Binds one another (muscles with skin, muscles with bones).
(iii) Forms a supporting framework of cartilage and bones.
Types of connective tissue: (i) Connective tissue proper, (ii) Supportive connective tissue, (iii) Fluid connective tissue.

- (i) Connective tissue proper: It helps in packing and binding the organs. It is of three types:-
- (a) Areolar (packing) connective tissue: Found beneath the epidermis.
Function: (i) Makes skin elastic to withstand stretching (ii) Binds the skin with muscles, attaches blood vessels and nerves to the surrounding tissue.
 - (b) Fibrous connective tissue: Consists of fibre forming cells - ligaments and ~~tendons~~ tendons.

Tendons - It connect muscles with bones. They are tough and inelastic. Their matrix contains unbranched wlike collagen fibres.

Ligaments - connect bone to bone. They are elastic due to the presence of yellow elastic fibres in matrix.

(c) Adipose (fat) tissue: It extends throughout the body. It is found under the skin but w/e in the internal organs. Act as a padding under the skin which acts as an insulation for retaining body heat.

(ii) Supportive connective tissue: - Cartilage and Bone:

Cartilage: - Non-porous. It protects over joints and bones. It has no nerve and blood vessels. Cartilage cells are called chondrocytes and are present in fluid-filled spaces called lacunae. It acts as a shock absorber throughout the body. At the end of the bones, it reduces friction and prevents them from rubbing together.

Location: Larynx, trachea, nasal septum, in betw/eeen ribs and ster num.

Bone: - Rigid and hard porous tissue. Bone cells are osteocytes. They are star shaped. Bone has a good blood vessels and nerves. It consists of inorganic salts and living cells.

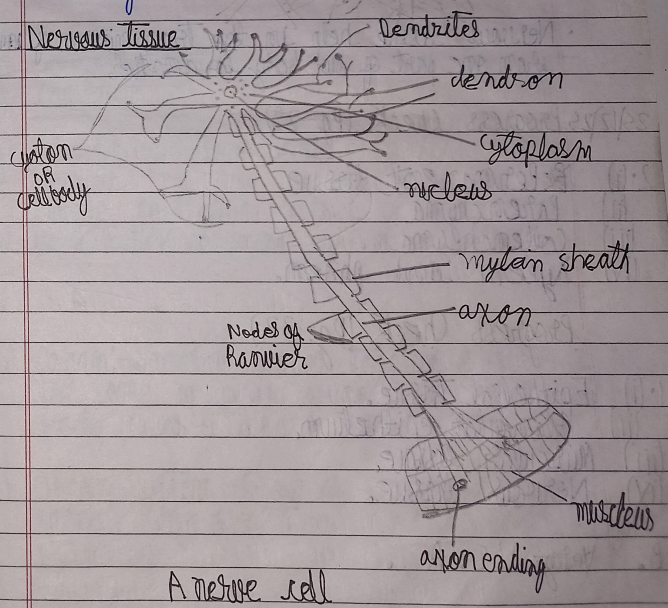
(iii) Fluid Connective Tissue: - Blood and Lymph:

Blood: - Red fluid flows in our body inside blood vessels. Contains plasma and blood corpuscles.

Plasma is a straw-coloured fluid which contains 85% - 90% water and 5-10% of RBCs, WBCs and platelets. WBCs, RBCs and platelets are the three blood corpuscles found in blood. RBCs contain haemoglobin that imparts red colour to blood.

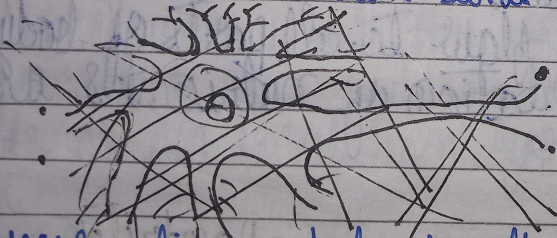
Lymph: Colourless fluid/transparent light yellow fluid that flows in lymph vessel. It is similar to blood plasma except that it contains very little protein and lacks RBCs. It contains WBCs. It is found in the intercellular spaces, hence it is also called tissue fluid.

Blood and lymph flow to all parts of body and help in the transportation of nutrients and immunity.



A nerve cell

- Nervous tissue consists of neurons.
- Neuron is a structural and fundamental unit of the nervous system.
- Neuron
 - Cell body (Nucleus & cytoplasm)
 - Axon (Extension of dendrites)
 - Dendrons and Dendrites



• Nervous tissue help in the transmission of impulses from one part of our body to another.