

◆ What is a Tissue?

📘 Definition:

A tissue is a group of cells that are similar in structure and work together to perform a specific function.

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◆ Importance of Tissues in Multicellular Organisms

- In unicellular organisms (e.g., Amoeba), one cell performs all life functions.
- In multicellular organisms (e.g., plants & humans), cells divide the work.
- Different types of cells perform different jobs efficiently.
- This is called division of labour.
- A group of similar cells located together for a specific job = tissue.

✅ Examples:

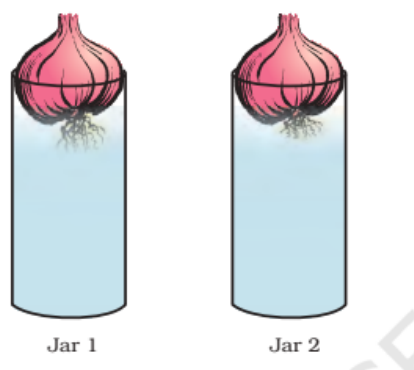
- Muscle cells → movement
 - Blood → transport
 - Phloem → food transport in plants
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🌱 6.2 Plant Tissues

◆ 6.2.1 Meristematic Tissue

📘 Definition:

Meristematic tissues are actively dividing cells present in specific growing regions of plants.



📷 Fig. 6.1 – Onion root growth experiment

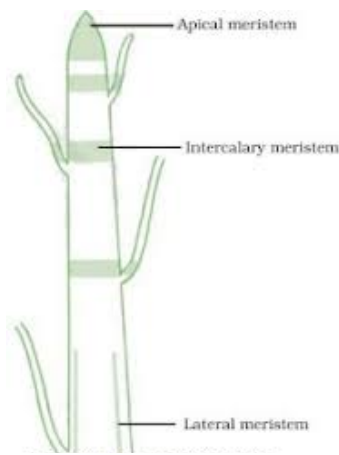


Fig. 6.2 – Location of meristem in plant

Activity 6.1:

Grow onions in water, cut root tips of one → observe growth difference → growth occurs at tips only

Types:

1. Apical Meristem → at tips of roots & shoots → increases length
2. Lateral Meristem → cambium → increases thickness
3. Intercalary Meristem → at base of leaves or internodes → helps in branch growth

Properties:

- Cells actively divide
- Thin cell wall, dense cytoplasm
- No vacuoles (as they're always dividing)

6.2.2 Permanent Tissue

Definition:

Formed when meristematic cells stop dividing and become specialised for a function. This process is called differentiation.

Types:

- A. Simple Permanent Tissue
- B. Complex Permanent Tissue

(A) Simple Permanent Tissue

Definition:

Made of one type of cells performing one function.

Types:

1. Parenchyma
 - Living, loosely packed cells
 - Thin walls, large spaces
 - Stores food

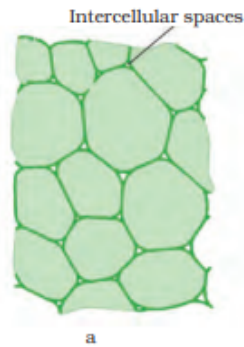


Fig. 6.4(a)

- Chlorenchyma → with chlorophyll (photosynthesis)
 - Aerenchyma → with air cavities (aquatic plants)
1. Collenchyma
 - Living, thickened corners
 - Support + flexibility (in stalks, climbers)

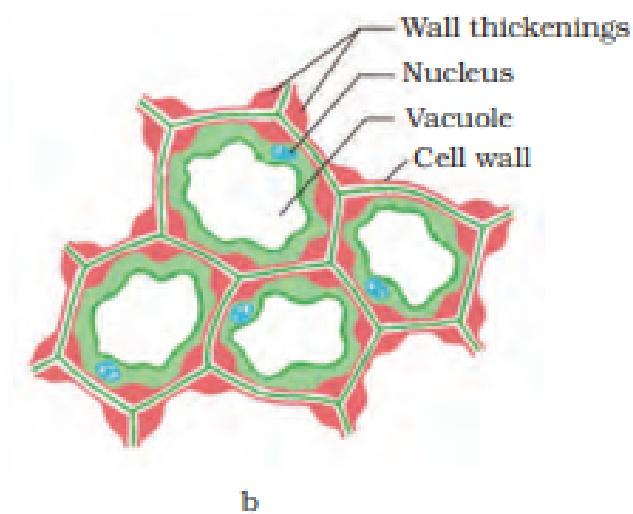


Fig. 6.4(b)

1. Sclerenchyma
 - Dead, thick-walled (lignified)
 - No space, hard and stiff

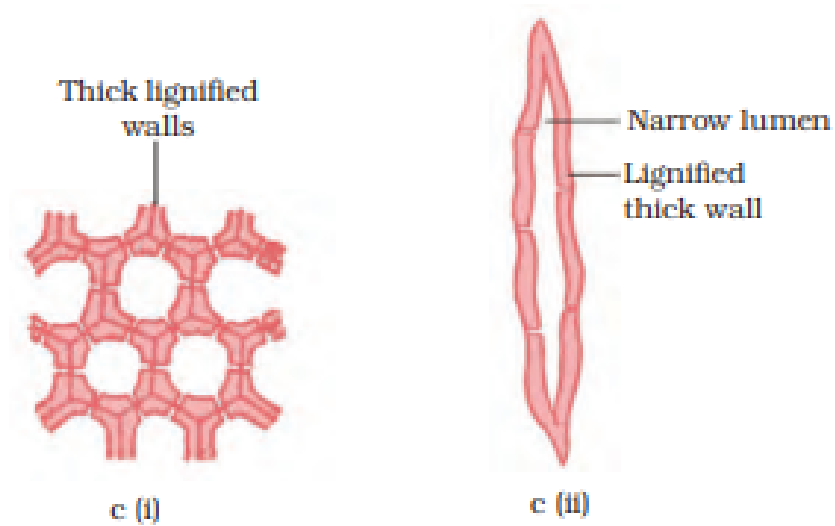


Fig. 6.4(c)

- Found in coconut husk, seed coat

Activity 6.2:

Observe stained plant stem slices under microscope → compare with Fig. 6.3

Epidermis (Protective Tissue):

- Outermost single layer
 - Protects plant parts
 - No spaces, flat cells
 - May secrete waxy coating (cutin)
- Fig. 6.5 – Guard cells and stomata

Activity 6.3:

Peel Rhoeo leaf → stain → observe epidermal cells and stomata under microscope

Special Features:

- Stomata → tiny pores for gas exchange & transpiration
- Root hairs → absorb water
- Cork → formed in old stems, dead cells, has suberin → waterproof

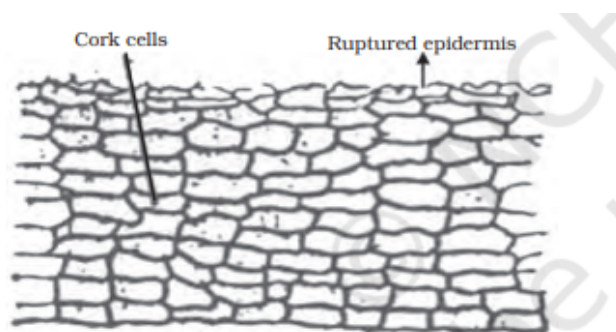


Fig. 6.6 – Cork structure

(B) Complex Permanent Tissue

Definition:

Made of more than one type of cells working together.

Types:

1. Xylem (water & mineral transport)

Components: tracheids, vessels, xylem fibres (dead), parenchyma (living)

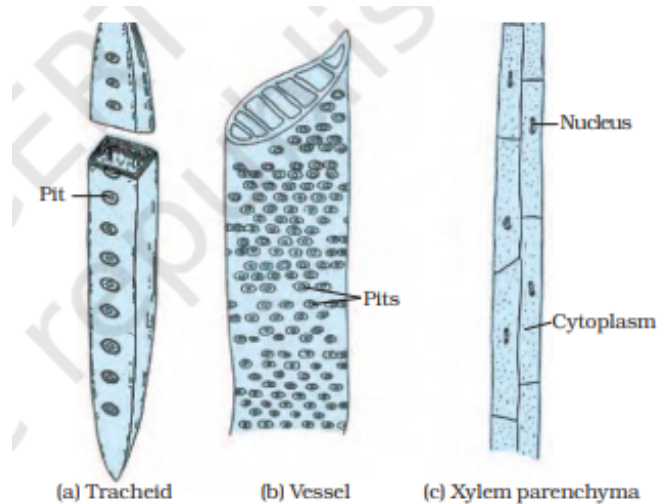


Fig. 6.7 (a, b, c)

1. Phloem (food transport)

Components: sieve tubes, companion cells, phloem fibres, phloem parenchyma

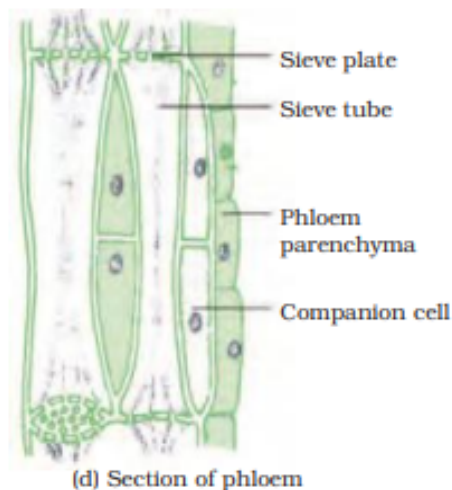


Fig. 6.7(d)

Together, xylem + phloem = vascular bundle



6.3 Animal Tissues

Types:

- Epithelial
- Connective
- Muscular
- Nervous

◆ 6.3.1 Epithelial Tissue

Definition:

Covers body surfaces and internal organs, forms a barrier between systems.

Characteristics:

- Tightly packed cells
- Little space
- Lies on basement membrane

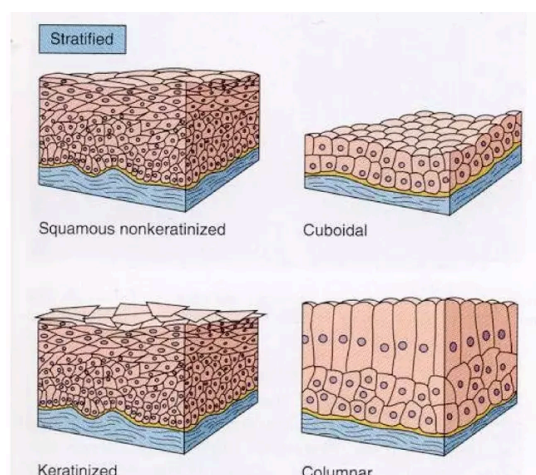


Fig. 6.9 – Epithelial tissue types

Types:

1. Squamous (flat, thin) – in alveoli, blood vessels
2. Stratified squamous – in skin, mouth (layered)
3. Columnar (tall, pillar-shaped) – intestine
4. Ciliated columnar – in respiratory tract (with hair-like cilia)
5. Cuboidal (cube-shaped) – in kidney tubules
6. Glandular – secretes enzymes, hormones

◆ 6.3.2 Connective Tissue

Definition:

Connects, supports, binds or separates other tissues/organs.

Key: Cells scattered in matrix (jelly/fluid/hard)

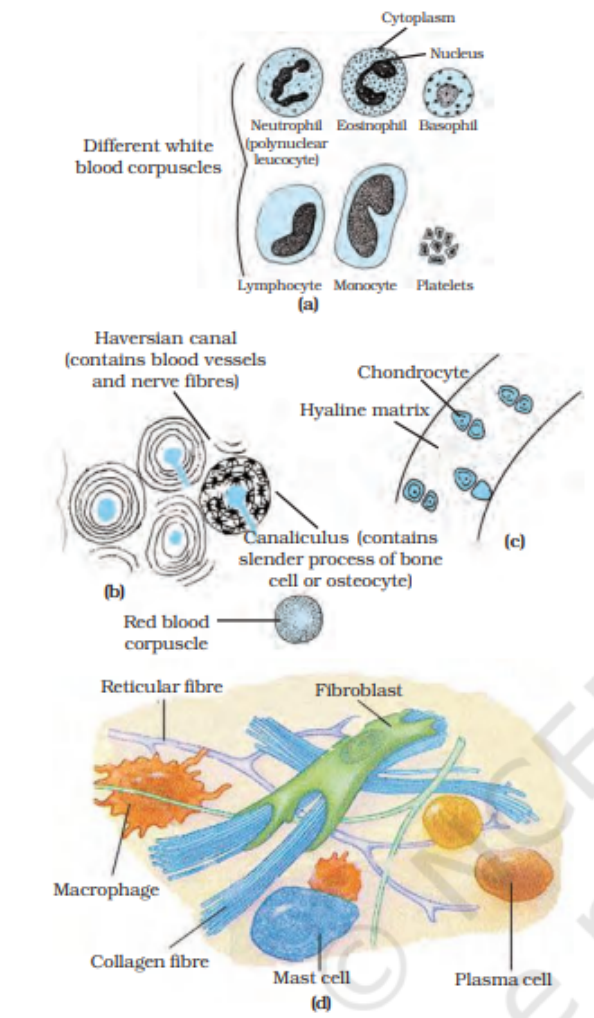


Fig. 6.10 – Types of connective tissues

Types:

1. Blood → fluid matrix (plasma), RBCs, WBCs, platelets
2. Bone → hard matrix (calcium + phosphorus)
3. Ligament → connects bone to bone (elastic)
4. Tendon → muscle to bone (strong)
5. Cartilage → smooth & flexible (in ear, nose)
6. Areolar → between skin & muscles, helps repair
7. Adipose → fat storage, insulation

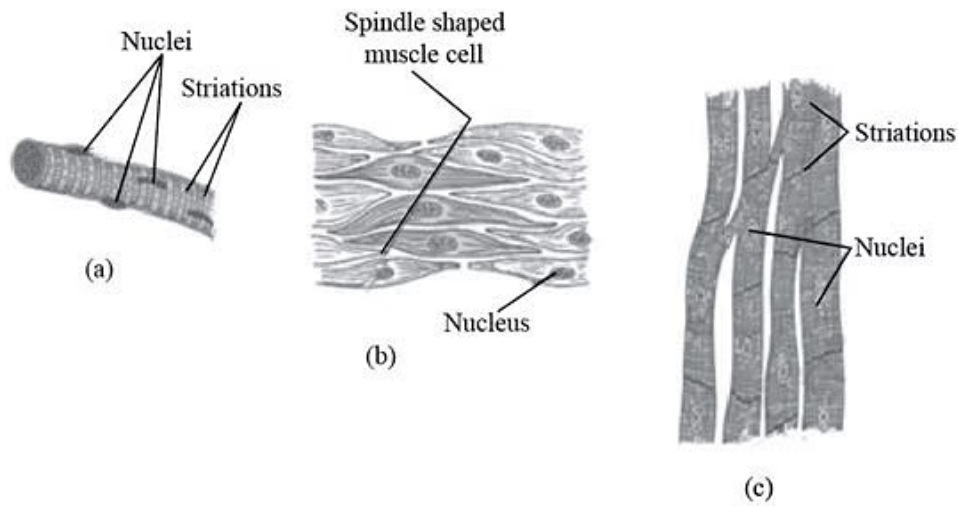
Activity 6.4: Observe blood under microscope

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6.3.3 Muscular Tissue

Definition:

Helps in movement, made of contractile protein fibres



Types of muscles fibres: (a) striated muscle, (b) smooth muscle, (c) cardiac muscle

Fig. 6.11 – Types of muscles

■ Types:

1. Striated / Skeletal
 - Voluntary, multinucleated, cylindrical, striped
 - Found in limbs
2. Smooth
 - Involuntary, spindle-shaped, single nucleus
 - In organs like intestine, bronchi
3. Cardiac
 - Involuntary, branched, rhythmic, single nucleus
 - Only in heart

Activity 6.5: Compare muscle types – shape, nuclei, location

Table 6.1 – Muscle fibre comparison

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◆ 6.3.4 Nervous Tissue

Definition:

Made of neurons, transmits signals rapidly

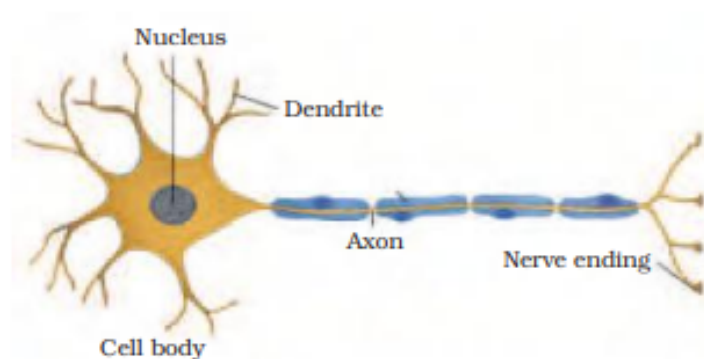



Fig. 6.12 – Neuron structure

Structure:

- Cell body → contains nucleus
- Dendrites → receive signals
- Axon → carries signal away
- Nerve = bundle of neurons

 Brain, spinal cord, nerves = all nervous tissue

✓ Function: Receive stimuli → send message → cause response

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Summary – What You Have Learnt

- Tissues = groups of similar cells
- Plant tissues = meristematic (dividing) + permanent (non-dividing)
- Simple (parenchyma, collenchyma, sclerenchyma)
- Complex (xylem, phloem)
- Animal tissues: epithelial, connective, muscular, nervous
- Each with specific role in body