Chapter 6: Tissues — Detailed Premium Notes

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1. Introduction to Tissues

What is a Tissue?

- A tissue is a group of similar cells that are organized to perform a specific function.
- In unicellular organisms like Amoeba or Paramecium, one cell performs all the life processes.
- In multicellular organisms (plants and animals), work is divided among different groups of cells. These groups are called tissues.

Importance of Tissues:

- They bring division of labour – each tissue does a special job.
- This makes the body more efficient and organized.
- For example:
  - In plants → some tissues transport water, some store food, some give support.
  - In animals → some tissues help in movement, some carry messages, some protect the body.

Broad Types of Tissues:

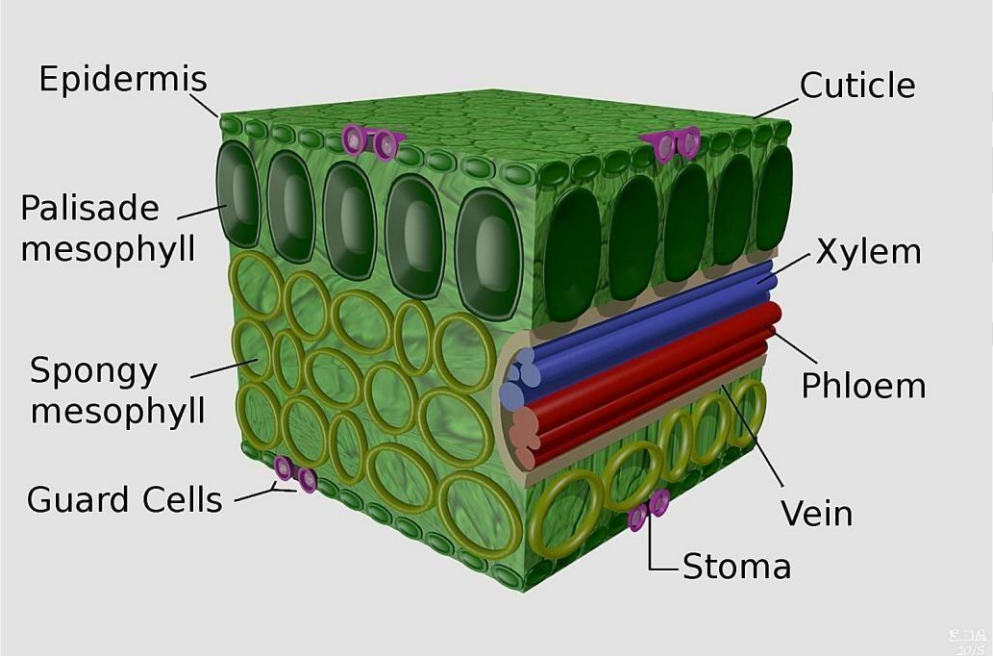
1. Plant Tissues
   - Help in growth, transport, storage, support, and protection.
   - Divided into:
     - Meristematic tissue → responsible for growth.
     - Permanent tissue → performs fixed functions like photosynthesis, transport, and storage.

2. Animal Tissues
   - Help in movement, protection, communication, and body coordination.
   - Major types:
     - Epithelial tissue → covers body surfaces.
     - Connective tissue → supports and connects body parts.
     - Muscular tissue → helps in movement.
     - Nervous tissue → carries messages.

In short:

- ***Tissues are groups of similar cells performing specific functions.***
- ***They make multicellular organisms organized and efficient.***
- ***Two main categories → Plant Tissues and Animal Tissues.***

A. Plant Tissues



What are Plant Tissues?

- ***A tissue is a group of similar cells performing a specific function.***
- ***In plants, tissues are organized systems that enable them to grow, stay upright, transport materials, and survive in different conditions.***
- ***Unlike animals, plants do not move, but they grow throughout life. Therefore, they need special tissues for continuous growth, transport, and support.***

◇ ***Why are Plant Tissues Needed?***

1. ***Continuous Growth*** 🌱
    - ***Plants keep increasing in length and thickness throughout their life.***
    - ***Some tissues must always remain active in cell division to support this growth.***

2. ***Transport of Materials*** 💧 ○ ***Water and minerals absorbed by roots have to reach every leaf.*** ○ ***Food prepared in leaves (by photosynthesis) must be transported to storage organs and roots.***
    - ***This requires an efficient transport system.***
3. ***Support & Rigidity*** 🌳
    - ***Plants cannot move away from environmental stress (wind, rainfall, grazing animals).***
    - ***They need tissues that provide strength, flexibility, and protection.***
4. ***Protection & Survival*** 🌓
    - ***Outer tissues protect plants from drying out, mechanical injury, or infection.*** ○ ***Some tissues reduce water loss by forming protective layers.***

◇ ***General Characteristics of Plant Tissues***

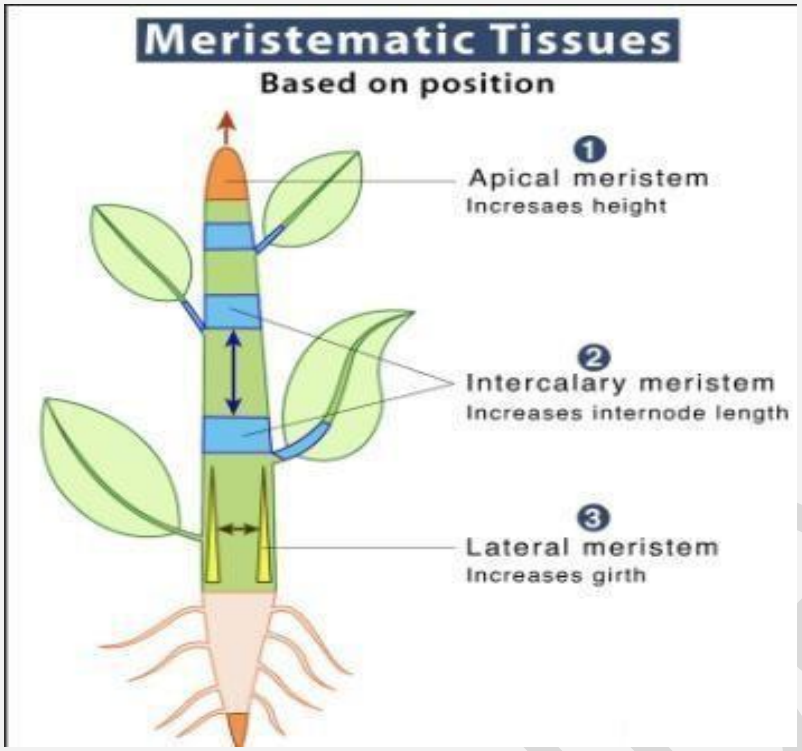
- ***Plant tissues are mostly rigid due to the presence of cell walls (made of cellulose).***
- ***Some tissues are living (active in function like photosynthesis or transport), while others are dead (for strength and support).***
- ***Unlike animals, where growth is limited, plants show indefinite growth due to the presence of special tissues.***
- ***Plant tissues work together just like departments of a factory → growth, storage, transport, and protection.***

◇ ***Broad Classification of Plant Tissues***

Plant tissues are mainly of two categories:

1. ***Meristematic tissues → responsible for continuous growth.***
2. ***Permanent tissues → formed from meristematic tissues; they perform specific functions like support, storage, transport, and protection.***

2.Meristematic Tissue



What is Meristematic Tissue?

- ***Meristematic tissue is a growth tissue in plants.***
- ***It is made up of actively dividing cells that continuously form new cells.***
- ***These new cells then develop (differentiate) into various other types of tissues.***
- ***Because of meristematic tissues, plants can grow in length, thickness, and form new structures throughout their life.***

◇ *Characteristics of Meristematic Cells*

- ***Cells are small, round, and closely packed (no intercellular spaces).***
- ***Cell wall is thin and made of cellulose.***
- ***Nucleus is large and prominent.***
- ***Cytoplasm is dense; vacuoles are either absent or very small.***
- ***Cells are metabolically active (always dividing).***

☞ ***These features make them perfectly suited for continuous growth.***

◇ *Importance of Meristematic Tissue*

1. ***Growth in length (roots and shoots).***
2. ***Increase in thickness of stems and roots.***
3. ***Healing of wounds in plants (as cells divide and fill damaged parts).***
4. ***Formation of new tissues and organs during the plant's life.***

◇ ***Types (Just a Glimpse)***

- ***Based on position, meristematic tissue is classified into:*** ○ ***Apical Meristem – tips of roots & shoots.*** ○ ***Intercalary Meristem – at internodes or leaf bases.*** ○ ***Lateral Meristem – on sides of stems & roots.***

3.Permanent Tissue

What are Permanent Tissues?

- ***Permanent tissues are formed when meristematic cells stop dividing and take a permanent shape, size, and function.***
- ***These tissues are specialized for specific functions such as support, storage, transport, and protection.***
- ***Unlike meristematic tissue, permanent tissue cells are mature and often lose the ability to divide.***

◇ ***Characteristics of Permanent Tissue:***

- ***Cells are well-differentiated (specialized).***
- ***They may be living or dead depending on the function.***
- ***Some have thin cell walls, others have thickened walls for support.***
- ***Cells are larger than meristematic cells and often contain vacuoles, chloroplasts, or stored food.***

◇ ***Importance of Permanent Tissue:***

1. ***Support & Strength*** 🌳 ***– Helps the plant remain upright.***
2. ***Storage*** 🫙 ***– Stores water, food, and nutrients.***
3. ***Transport*** 💧 ***– Moves water, minerals, and food throughout the plant.***
4. ***Protection*** 🛡️ ***– Prevents water loss and shields the plant from injury or infection.***

◇ ***Broad Classification (Overview)***

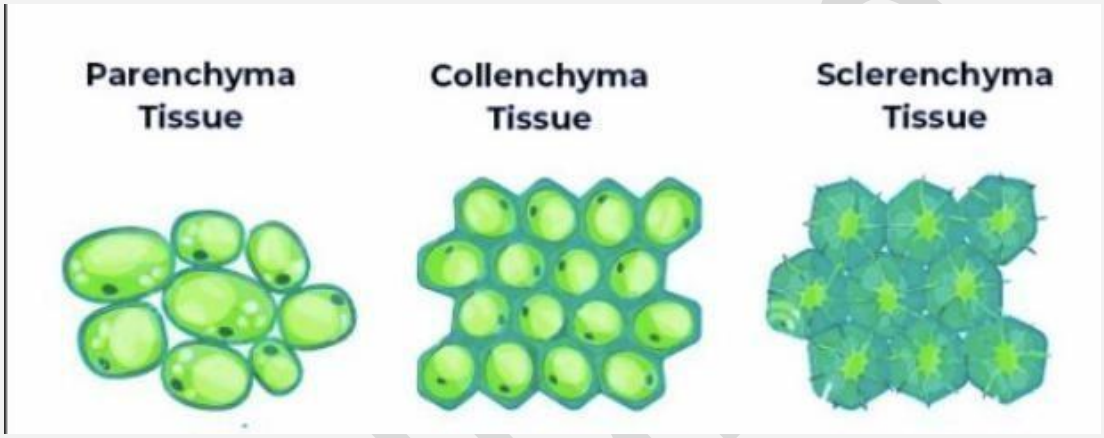
Permanent tissues are broadly divided into:

1. ***Simple Permanent Tissues – Made of similar cells performing one function.***
2. ***Complex Permanent Tissues – Made of different types of cells working together (like xylem & phloem).***

A) Simple Permanent Tissue

- ***Made of similar cells performing one function.***

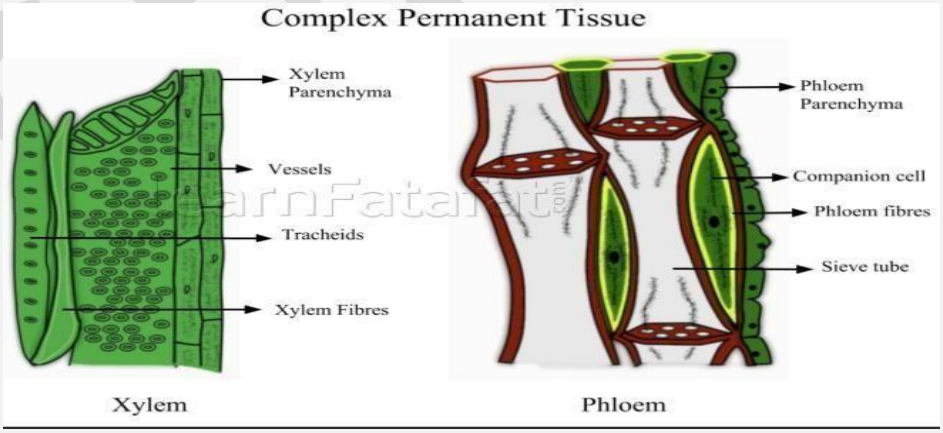
1. ***Parenchyma → Storage, photosynthesis, basic support.***
2. ***Collenchyma → Flexible support for young stems and leaves.***
3. ***Sclerenchyma → Hard, mechanical support (fibres & sclereids).***



B) Complex Permanent Tissue

- ***Made of different types of cells working together.***

1. ***Xylem → Transport of water & minerals, also provides support.***
2. ***Phloem → Transport of food (sugars) to all parts of the plant.***



4.Protective Tissue

◇ ***What are Protective Tissues?***

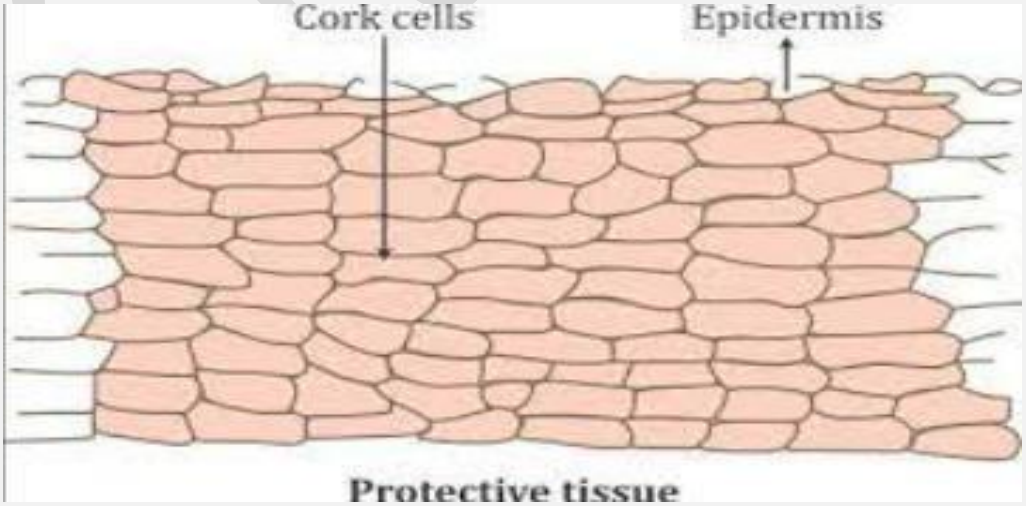
- ***Protective tissues are the outermost layer of cells in plants.***
- ***They cover and protect the plant from mechanical injury, water loss, and infections.***
- ***They act like a shield, keeping the plant safe from harsh environmental conditions.***

◇ ***Importance of Protective Tissues***

1. ***Prevents water loss – stops plants from drying out.***
2. ***Protects from injury – shields from wind, rain, and animals.***
3. ***Prevents infection – forms a barrier against fungi, bacteria, and other pathogens.***
4. ***Regulates gas exchange – some tissues like epidermis have stomata for breathing.***

◇ ***Types of Protective Tissues***

1. ***Epidermis*** ○ ***Found in young stems, leaves, and roots.***
   - ***Usually a single layer of living cells.*** ○ ***Often covered with a waxy layer called cuticle to prevent water loss.***
   - ***May contain stomata for gas exchange and trichomes (hair-like structures) for protection.***
2. ***Cork (Phellem)*** ○ ***Found in older stems and roots.*** ○ ***Made of dead cells with suberin (waterproof substance).*** ○ ***Forms thick outer bark, protecting the plant from water loss, mechanical injury, and infections.***



B. Animal Tissues

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5. Epithelial Tissue

- ***Covers body surfaces and lines cavities.***
- ***Cells are tightly packed with minimal intercellular substance.***
- ***Types:***
    - ***Squamous epithelium: Flat, thin cells; present in lungs, blood vessels; helps in diffusion.***
    - ***Cuboidal epithelium: Cube-shaped; lines kidney tubules, gland ducts; secretion and absorption.***
    - ***Columnar epithelium: Tall cells; lines digestive tract; absorption.***
    - ***Ciliated epithelium: Has hair-like structures (cilia); lines respiratory tract; moves mucus.***
    - ***Glandular epithelium: Specialized cells for secretion.***

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6. Connective Tissue

- ***Connects, supports, protects organs.***
- ***Contains cells scattered in an extracellular matrix.***
- ***Types:***
    - ***Areolar tissue: Binds skin to muscles; holds organs in place.***
    - ***Adipose tissue: Stores fat; insulates body.***
    - ***Cartilage: Flexible connective tissue; found in nose, ear, joints.***
    - ***Bone: Hard connective tissue; supports body.***
    - ***Ligaments: Connect bone to bone; elastic.***
    - ***Tendons: Connect muscle to bone; inelastic.***

- ***Blood: Fluid connective tissue; transports gases, nutrients, and waste.***

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7. Muscular Tissue

- ***Specialized for contraction and movement.***
- ***Types:***
  - ***Skeletal muscle (striated): Voluntary control; attached to bones; cylindrical, multinucleated.***
  - ***Smooth muscle (unstriated): Involuntary; found in walls of internal organs; spindle-shaped, single nucleus.***
  - ***Cardiac muscle: Involuntary; found only in heart; branched cells with intercalated discs.***

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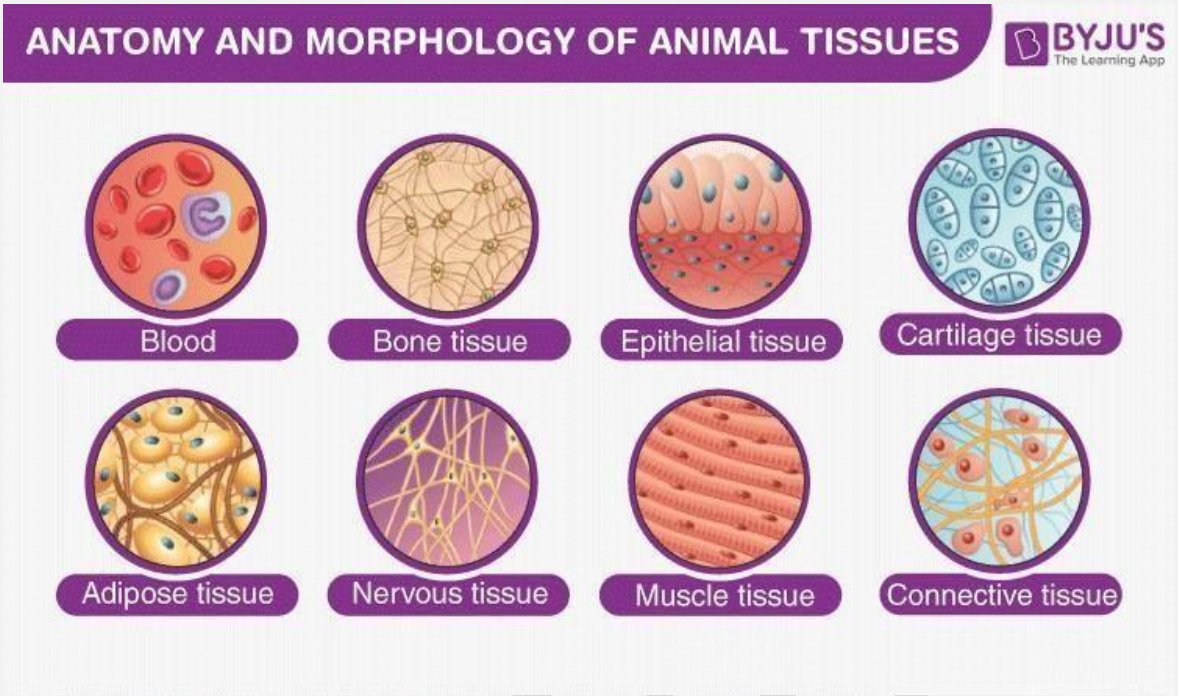
8. Nervous Tissue

- ***Made up of neurons which transmit electrical impulses.***
- ***Parts of neuron:***
  - ***Cell body: Contains nucleus.***
  - ***Dendrites: Receive signals.***
  - ***Axon: Transmits signals to other cells.***
- ***Controls and coordinates body functions.***


ANATOMY AND MORPHOLOGY OF ANIMAL TISSUES
BYJU'S
The Learning App
Blood
Bone tissue
Epithelial tissue
Cartilage tissue
Adipose tissue
Nervous tissue
Muscle tissue
Connective tissue