

Kusugal Road, Hubballi

(ICSE Board)

Grade 9

Subject: Biology

Topic: Tissues

Exercise

1, Define tissue and histology. Who coined the term tissue?

Ans: **Tissue**

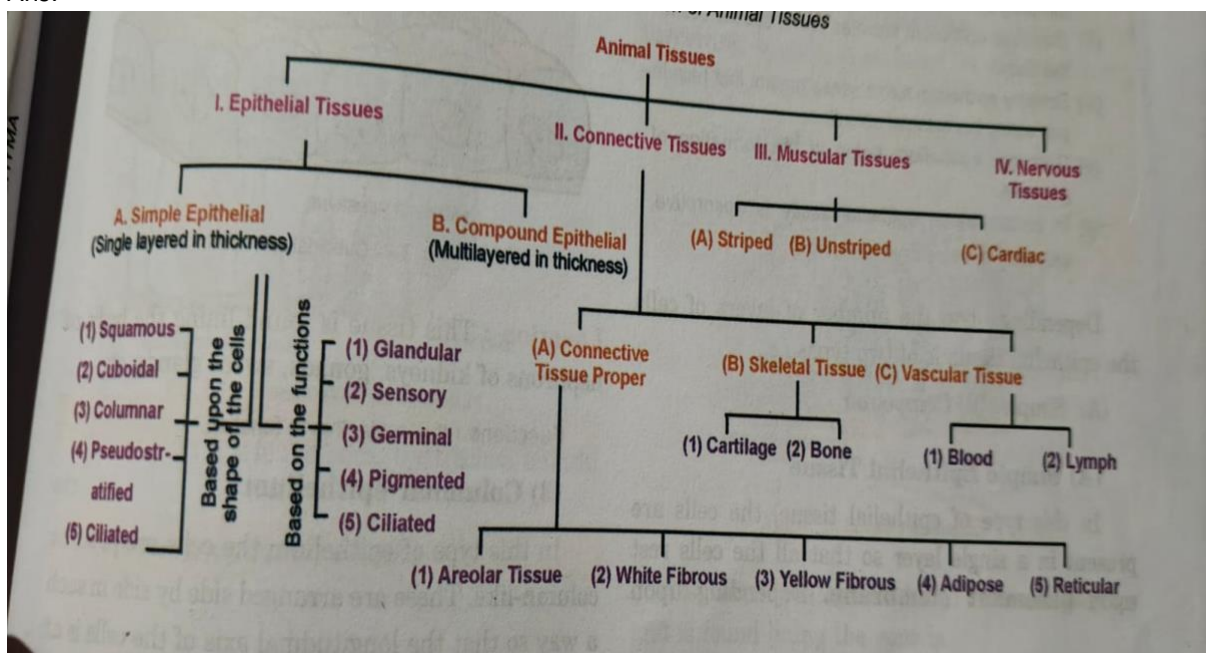
A **tissue** is a group of similar cells that work together to perform a specific function in an organism.

Histology is the branch of biology that studies tissues at the microscopic level. It involves examining the structure, organization, and function of tissues using microscopes and staining techniques.

The term "**tissue**" was coined by **Xavier Bichat**, a French anatomist and pathologist, in the late 18th century. He is known as the "Father of Histology,"

2. In the form of a flow chart show the classification of animal tissue

Ans:



3. Tabulate the difference between

Feature	Blood	Lymph
Definition	A fluid connective tissue that transports oxygen, nutrients, and waste.	A colorless fluid that transports white blood cells and removes waste from tissues.
Composition	Plasma, red blood cells (RBCs), white blood cells (WBCs), and platelets.	Plasma, WBCs, and lymphocytes; no RBCs or platelets.
Function	Transports oxygen, nutrients, and hormones; helps in immunity.	Helps in immunity and removes excess fluid from tissues.
Color	Red due to hemoglobin.	Colorless due to the absence of RBCs.
Circulation	Pumped by the heart through blood vessels.	Moved by body movements through lymphatic vessels.

Feature	Medullated Nerve Fibres	Non-Medullated Nerve Fibres
Definition	Nerve fibers with a myelin sheath.	Nerve fibers without a myelin sheath.
Appearance	White in color.	Grey in color.
Speed of Impulse	Faster due to saltatory conduction.	Slower conduction of impulses.
Location	Found in the brain, spinal cord, and peripheral nerves.	Found in autonomic nervous system and internal organs.

Feature	Meristematic Tissues	Permanent Tissues
Definition	Actively dividing cells responsible for growth.	Cells that have lost the ability to divide.
Function	Helps in growth and development.	Provides support, transport, and protection.
Location	Found at tips of roots and shoots, cambium.	Found in mature plant organs like stems, roots, and leaves.

Feature	Tendon	Ligament
Definition	Connects muscle to bone.	Connects bone to bone.
Composition	Made of collagen fibers.	Made of elastin fibers.
Flexibility	Less flexible.	More flexible.
Function	Provides strength and transmits force.	Provides support and stability to joints.

Feature	Tracheids	Vessels
Definition	Elongated, dead cells with tapering ends in xylem.	Tube-like structures in xylem for water conduction.
Structure	Narrow and long.	Wider and shorter.
Function	Conducts water with less efficiency.	Conducts water more efficiently.

Feature	Xylem	Phloem
Function	Transports water and minerals.	Transports food (sugars).
Composition	Made of tracheids, vessels, xylem fibers, and xylem parenchyma.	Made of sieve tubes, companion cells, phloem fibers, and phloem parenchyma.
Direction of Flow	Upward only.	Both upward and downward.
Living/Dead	Mostly dead cells.	Mostly living cells.

Feature	Collenchyma	Sclerenchyma
Definition	A type of plant tissue that provides flexible support.	A type of plant tissue that provides rigid support.
Cell Wall	Thickened at corners.	Uniformly thickened walls with lignin.
Flexibility	Provides flexibility.	Provides hardness and strength.

Feature	Bone	Cartilage
Definition	Hard connective tissue that forms the skeleton.	Soft connective tissue found in joints.
Composition	Made of osteocytes (bone cells) and calcium salts.	Made of chondrocytes (cartilage cells).
Hardness	Hard and rigid.	Soft and flexible.

Feature	Striped Muscle Fibres	Unstriated Muscle Fibres
Also Known As	Skeletal or voluntary muscles.	Smooth or involuntary muscles.
Appearance	Striated (striped) under a microscope.	Non-striated (smooth).
Control	Voluntary (controlled by the brain).	Involuntary (not under conscious control).
Location	Found in limbs, face, and body movement muscles.	Found in internal organs like the stomach and intestines.

4. Discuss the functions of

1. Xylem:

Transports water and minerals from roots to different parts of the plant.

Provides mechanical support to the plant.

Consists of tracheids, vessels, xylem fibers, and xylem parenchyma.

2. Phloem:

Transports food (mainly sucrose) from leaves to other parts of the plant.

Supports plant growth by distributing nutrients.

Consists of sieve tubes, companion cells, phloem fibers, and phloem parenchyma.

3. Meristem:

Responsible for plant growth by continuously dividing cells.

Helps in the formation of new tissues and organs.

Found in apical (tips), lateral (thickness), and intercalary (stem elongation) regions.

4. Ligaments:

Connect bones to other bones at joints.

Provide flexibility, strength, and stability to joints.

Prevent excessive movement to avoid dislocation.

5. Cardiac Muscle Fibers:

Make up the heart muscle and help in continuous contraction and relaxation.

Enable the pumping of blood throughout the body.

Work involuntarily, controlled by the autonomic nervous system.

6. Osteoblasts:

Bone-forming cells that produce new bone tissue.

Help in bone growth and repair by secreting collagen and minerals.

Play a crucial role in maintaining bone density and structure.

5. can you consider a cluster of eggs as a tissue? Why?

Ans: No, a cluster of eggs cannot be considered a tissue. A tissue is a group of similar cells that work together to perform a specific function within an organism. In contrast, a cluster of eggs consists of individual reproductive cells (gametes) that do not function together as a unit. Instead, each egg is an independent cell with the potential to develop into an organism under the right conditions. Since they do not exhibit coordinated activity or specialization as tissues do, they do not qualify as a tissue.

6. Give four characteristics of each of the following

Epithelial Tissue (Animal Tissue)

1. Tightly Packed Cells – The cells are closely arranged with little or no space between them.

2. Covers and Protects – It forms the outer layer of the body and lines internal organs.

3. No Blood Vessels – It gets nutrients from nearby tissues since it does not have its own blood supply.

4. Can Regenerate – It heals quickly by growing new cells when damaged.

Connective Tissue (Animal Tissue)

1. Connects and Supports – It joins different parts of the body and provides support.
2. Has a Matrix – The cells are spread out in a substance called the extracellular matrix.
3. Can Be Hard or Soft – It includes both soft tissues (like fat) and hard tissues (like bone).
4. Contains Fibers – It has different types of protein fibers that provide strength and flexibility.

Meristematic Tissue (Plant Tissue)

1. Helps in Growth – It is responsible for plant growth by producing new cells.
2. Cells Keep Dividing – The cells do not stop dividing and make new tissues.
3. Small, Simple Cells – The cells have thin walls, a big nucleus, and no large vacuoles.
4. Found in Growing Areas – It is present in root tips, shoot tips, and stems where growth happens.
7. Differentiate between the meristematic and permanent tissues in plants.

Ans:

Feature	Meristematic Tissue	Permanent Tissue
Definition	Actively dividing cells that help in plant growth.	Mature cells that do not divide and perform specific functions.
Cell Shape	Small, rounded, or polygonal with thin walls.	Large, with varied shapes and thick or thin walls.
Function	Helps in growth by cell division.	Performs specialized functions like storage, support, and transport.
Types	Apical, lateral, and intercalary meristem.	Simple (parenchyma, collenchyma, sclerenchyma) and complex (xylem, phloem).
Cell Activity	Cells remain young and continuously divide.	Cells stop dividing and become specialized.
Location	Found in root tips, shoot tips, and between mature tissues.	Found throughout the plant in different organs.

8. Give a brief account of various types of cells found in connective tissue

Ans: 1. Fibroblasts – These are the most common cells in connective tissue. They produce collagen and other fibers that provide strength and support.

2. Macrophages – These are immune cells that help defend the body by engulfing and digesting harmful bacteria, dead cells, and other debris.

3. Mast Cells – These cells play a key role in the immune response by releasing histamine, which helps in inflammation and allergic reactions.

4. Adipocytes (Fat Cells) – These cells store fat and help in energy storage, insulation, and cushioning of organs.

5. Chondrocytes – These are found in cartilage and help maintain and produce the cartilage matrix.

6. Osteocytes – Found in bone tissue, these cells help maintain bone strength and structure.

7. Plasma Cells – These cells produce antibodies that help in immune defense against infections.

8. Leukocytes (White Blood Cells) – These cells help in fighting infections and are commonly found in loose connective tissue.

Each of these cell types plays an important role in maintaining the structure, defense, and function of connective tissues in the body.

9. Name the following

1. Tissue that forms the inner lining of our mouth -Epithelial tissue (specifically, squamous epithelium)

2. Tissue that connects muscles to bone in humans -Tendons

3. Tissue that transports food in plants -Phloem

4. Tissue that stores fat in our body -Adipose tissue

5. Connective tissue with a fluid matrix- Blood

6. Tissue present in the brain -Nervous tissue

10. Identify the type of tissue in the following

1. **Skin – Epithelial tissue** (specifically stratified squamous epithelium) and **connective tissue** (such as dermis with collagen fibers).

2, **Bark of tree – Protective tissue** (periderm, including cork or phellem).

3, **Bone – Connective tissue** (specifically, osseous tissue).

4, **Lining of kidney tubule – Epithelial tissue** (simple cuboidal epithelium).

5, **Vascular bundle – Complex tissue** (consisting of xylem and phloem, which are specialized connective tissues in plants).

11. Where each of the listed tissues is found in the body:

1. Ciliated Epithelium – Found in the respiratory tract (trachea, bronchi), fallopian tubes, and parts of the spinal cord, where it helps in moving mucus and other substances.

2. Ligaments – Connect bones to other bones at joints, providing stability (e.g., knee, elbow, spine).

3. Neuroglia (possibly you meant "Neuroglia" instead of "Neurogallium") – Found in the nervous system, providing support and protection to neurons in the brain and spinal cord.
4. Unstriated Muscle Fibers (Smooth Muscle Fibers) – Found in involuntary muscles such as the walls of blood vessels, digestive tract, urinary bladder, and uterus.
5. Stratified Epithelium – Found in areas exposed to friction, such as the skin (keratinized), the lining of the mouth, esophagus, and vagina (non-keratinized).
6. Reticular Tissue – Found in lymphoid organs such as the spleen, lymph nodes, and bone marrow, where it supports immune cells.
7. Meristematic Tissue – This is plant-specific tissue, not found in the human body. It is responsible for plant growth and is located in root and shoot tips.
8. Fibrous Tissues – This term is unclear, but if you meant "Fibrous Tissues," they can be found in tendons and other connective structures.
9. Parenchyma – In plants, it is a fundamental tissue found in leaves, roots, and stems. In animals, it refers to the functional tissue of organs like the liver, kidneys, and lungs.
10. Tuboidal Epithelium (likely meant "Tuboidal Epithelium") – Found in glandular ducts, kidney tubules, and thyroid follicles.
11. Adipose Tissue – Found under the skin (subcutaneous layer), around organs like the kidneys, and in bone marrow, acting as an energy store and cushion.
12. Areolar Tissue – A loose connective tissue found under the skin, around blood vessels, nerves, and organs, providing support and elasticity.
13. Reticular Tissue – (Repeated from above) Found in lymphoid organs such as the spleen, lymph nodes, and bone marrow.
14. Nerve Cell (Neuron) – Found in the brain, spinal cord, and peripheral nerves, responsible for transmitting nerve impulses.

12. Give one word for the following

1. Tissue – Group of cells performing a specific function
2. Histology – Study of tissues
3. Ligament – Bundle of yellow fibers connecting bones
4. Meristem – Dividing cells at the tips of roots and stems
5. Voluntary – Activities under the control of organisms willpower

13. What type of tissue:

1. Parenchyma – Fills space inside a plant stem
2. Phloem – Supplies a plant with food
3. Blood (vascular tissue) – Transports oxygen to various body parts in humans
4. Muscle tissue – Brings about movements in humans
5. Connective tissue – Binds other tissues together
6. Xylem – Transports water and salts in plants
7. Bone (skeletal tissue) – Forms the supporting framework in the human body
8. Nervous tissue – Conducts messages from one part of the body to another

14. Describe various types of simple epithelial tissues

Epithelial tissues are classified based on the number of layers and the shape of the cells. Simple epithelial tissues consist of a single layer of cells and are specialized for functions like absorption, secretion, and filtration. There are four main types of simple epithelial tissues:

1. **Simple Squamous Epithelium**

- **Structure:** A single layer of flat, thin cells with centrally located nuclei.
- **Function:** Facilitates diffusion, filtration, and osmosis.
- **Location:** Found in the alveoli of lungs (for gas exchange), lining of blood vessels (endothelium), and the Bowman's capsule in kidneys.

2. **Simple Cuboidal Epithelium**

- **Structure:** A single layer of cube-shaped cells with centrally located, round nuclei.
- **Function:** Involved in secretion and absorption.
- **Location:** Found in kidney tubules, glands (such as thyroid and salivary glands), and ducts.

3. **Simple Columnar Epithelium**

- **Structure:** A single layer of tall, rectangular cells with nuclei near the base. It may have microvilli (for absorption) or cilia (for movement).
- **Function:** Absorption and secretion of mucus and enzymes.
- **Location:** Found in the lining of the digestive tract (stomach, intestines), uterus, and gallbladder.

4. **Pseudostratified Columnar Epithelium**

- **Structure:** Appears multilayered due to nuclei at different levels but is actually a single layer. Often has cilia and goblet cells.
- **Function:** Secretion and movement of mucus by ciliary action.
- **Location:** Found in the respiratory tract (trachea, bronchi) and parts of the male reproductive system.

Each of these types plays a crucial role in maintaining the body's functions by regulating exchange and protecting underlying tissues.

15. Describe briefly about the structure and functions of different types of tissues present in plants.

Ans: Plants have different types of tissues categorized into **meristematic** and **permanent tissues**, each serving specific functions:

1. Meristematic Tissue (Growth Tissue)

- **Structure:** Composed of small, undifferentiated, actively dividing cells with a thin cell wall and dense cytoplasm.
- **Function:** Responsible for growth and cell division.
- **Types:**
 - **Apical Meristem:** Found at root and shoot tips; promotes primary growth (length).
 - **Lateral Meristem:** Found in vascular and cork cambium; promotes secondary growth (thickness).
 - **Intercalary Meristem:** Present at nodes; helps in regrowth of plant parts.

2. Permanent Tissue (Matured Tissue)

Cells in permanent tissues are differentiated and do not divide. These are classified as **simple** and **complex tissues**.

a) Simple Permanent Tissue (Uniform Cells)

- **Parenchyma:**
 - Structure: Thin-walled, loosely packed, living cells.
 - Function: Storage, photosynthesis (chlorenchyma), buoyancy (aerenchyma).
- **Collenchyma:**
 - Structure: Elongated, living cells with unevenly thickened walls.
 - Function: Provides flexibility and mechanical support.
- **Sclerenchyma:**
 - Structure: Dead cells with thick, lignified walls.
 - Function: Provides strength and rigidity (e.g., fibers and sclereids).

b) Complex Permanent Tissue (Mixed Cells)

- **Xylem** (Water-Conducting Tissue):
 - Structure: Made up of tracheids, vessels, xylem fibers, and xylem parenchyma.
 - Function: Transports water and minerals from roots to shoots.
- **Phloem** (Food-Conducting Tissue):
 - Structure: Composed of sieve tubes, companion cells, phloem fibers, and phloem parenchyma.
 - Function: Transports sugars and nutrients from leaves to other parts.

Each of these tissues plays a crucial role in plant growth, support, transport, and survival.

16. Blood is the ‘river of life’. Justify the statement.

Ans: Blood is often referred to as the "**river of life**" because it plays a vital role in sustaining life by performing essential functions in the body. Here's how blood justifies this statement:

1. **Transportation of Oxygen and Nutrients**
 - Blood carries oxygen from the lungs to all body cells.
 - It transports nutrients absorbed from the digestive system to different organs.
2. **Removal of Waste Products**
 - Blood collects carbon dioxide from cells and transports it to the lungs for exhalation.
 - It carries metabolic waste to the kidneys for excretion.
3. **Regulation of Body Temperature**
 - Blood helps in heat distribution, ensuring the body maintains a stable temperature.
4. **Immunity and Protection**
 - White blood cells in the blood fight infections and diseases.
 - Platelets help in blood clotting to prevent excessive bleeding.
5. **Hormone Transport**
 - Blood carries hormones from glands to target organs, regulating body functions.
6. **Maintaining pH and Fluid Balance**
 - Blood helps in maintaining pH levels and proper fluid balance in the body.

Since blood continuously circulates and sustains life, it is rightfully called the "**river of life**."

17. Explain the structure and function of meristematic tissue with diagram

Ans: Meristematic tissue is a type of plant tissue that consists of undifferentiated cells capable of continuous division. These tissues are responsible for plant growth and are found in specific regions of the plant.

Structure of Meristematic Tissue

- **Cells are small and thin-walled** with a dense cytoplasm.
- **Nuclei are large** and prominent.
- **Vacuoles are either small or absent** because they do not store food.
- **Cells lack intercellular spaces**, making them tightly packed.

Function of Meristematic Tissue

- **Growth:** Responsible for primary and secondary growth.
- **Healing:** Helps in wound healing by forming new cells.
- **Formation of Permanent Tissue:** Matures into specialized cells.
- **Development of New Organs:** Helps in the formation of leaves, flowers, and branches.

18. Tabulate the difference between various types of striated, unstriated and cardiac muscles

Ans: Here's a tabular comparison of **striated (skeletal)**, **unstriated (smooth)**, and **cardiac muscles** based on their characteristics:

Feature	Striated (Skeletal) Muscle	Unstriated (Smooth) Muscle	Cardiac Muscle
Appearance	Striated (striped)	Non-striated (smooth)	Striated (striped)
Shape	Long, cylindrical	Spindle-shaped	Branched and cylindrical
Nuclei	Multinucleated (many nuclei per cell)	Uninucleated (single nucleus per cell)	Uninucleated (single nucleus per cell)
Control	Voluntary (under conscious control)	Involuntary (not under conscious control)	Involuntary (not under conscious control)
Location	Attached to bones	Walls of internal organs (stomach, intestines, blood vessels)	Walls of the heart
Contraction Speed	Rapid and powerful	Slow and sustained	Rhythmic and continuous
Fatigue	Fatigues quickly	Does not fatigue easily	Does not fatigue
Function	Enables body movement and locomotion	Controls involuntary actions like digestion and blood flow	Pumps blood throughout the body
Intercalated Discs	Absent	Absent	Present (for synchronized contractions)

19. What is fluid connective tissue? Where it is found in the body? Describe its functions

Ans: Fluid Connective Tissue

Fluid connective tissue is a type of connective tissue in which the extracellular matrix is liquid rather than solid or semi-solid. The two main types of fluid connective tissue in the human body are **blood** and **lymph**.

Types & Location

1. **Blood**

- Found in blood vessels (arteries, veins, and capillaries) and circulates throughout the body.

2. **Lymph**

- Found in lymphatic vessels and lymph nodes.
-

Functions

Blood

- **Transport:** Carries oxygen, nutrients, hormones, and waste products.
- **Protection:** Contains white blood cells that fight infections.
- **Regulation:** Maintains body temperature, pH balance, and osmotic balance.

Lymph

- **Immune Response:** Helps in defense against infections by transporting white blood cells.
- **Fluid Balance:** Collects excess fluid from tissues and returns it to the bloodstream.
- **Fat Absorption:** Helps absorb fats from the digestive system.

20. Describe various types of cells found in connective tissue

Ans: Connective tissue consists of various types of cells that perform different functions, including support, defense, and repair. Here are some key types of cells found in connective tissue:

1. Fibroblasts

- **Function:** Synthesize and maintain the extracellular matrix, including collagen and elastin fibers.
- **Appearance:** Spindle-shaped with elongated nuclei.
- **Location:** Found in most connective tissues, especially in loose and dense connective tissue.

2. Adipocytes (Fat Cells)

- **Function:** Store energy in the form of fat and provide insulation and cushioning.
- **Appearance:** Large, round cells filled with lipid droplets, with the nucleus pushed to the periphery.
- **Location:** Found in adipose tissue (white and brown fat).

3. Macrophages

- **Function:** Phagocytose pathogens, cellular debris, and dead cells; play a role in immune response.
- **Appearance:** Large, irregularly shaped cells with a prominent nucleus and cytoplasmic granules.
- **Location:** Found in loose connective tissue and organs such as the liver (Kupffer cells) and lungs (alveolar macrophages).

4. Mast Cells

- **Function:** Involved in inflammatory and allergic responses by releasing histamine and other chemicals.
- **Appearance:** Large cells with cytoplasmic granules containing histamine and heparin.
- **Location:** Common in connective tissues near blood vessels and mucosal surfaces.

5. Plasma Cells

- **Function:** Produce antibodies as part of the immune response.

- **Appearance:** Oval-shaped cells with an eccentric nucleus and a perinuclear halo (clear area around the nucleus).
- **Location:** Found in lymphoid organs, the gastrointestinal tract, and areas of chronic inflammation.

6. Leukocytes (White Blood Cells)

- **Function:** Provide immune defense; includes neutrophils, lymphocytes, and eosinophils.
- **Appearance:** Varies by type; some have multilobed nuclei (neutrophils), while others have round nuclei (lymphocytes).
- **Location:** Circulate in the bloodstream but can migrate into connective tissue during immune responses.

7. Chondrocytes (in Cartilage Connective Tissue)

- **Function:** Maintain the cartilaginous extracellular matrix.
- **Appearance:** Rounded cells found in lacunae within cartilage.
- **Location:** Found in hyaline cartilage, fibrocartilage, and elastic cartilage.

8. Osteocytes (in Bone Connective Tissue)

- **Function:** Maintain bone tissue and regulate bone remodeling.
- **Appearance:** Star-shaped cells located in lacunae within the bone matrix.
- **Location:** Found in compact and spongy bone tissue.

9. Mesenchymal Stem Cells

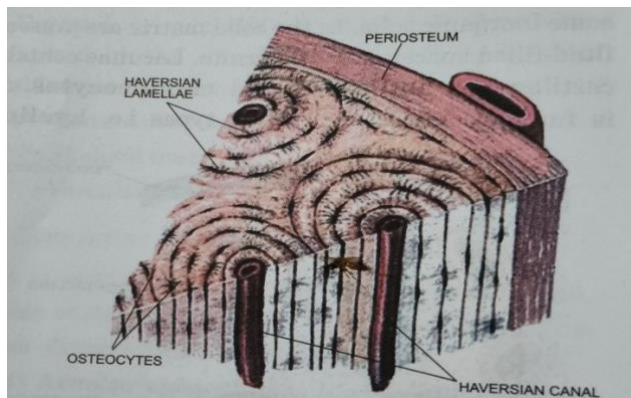
- **Function:** Serve as progenitor cells that can differentiate into fibroblasts, adipocytes, chondrocytes, and osteocytes.
- **Appearance:** Small, spindle-shaped cells.
- **Location:** Found in embryonic connective tissue and some adult tissues, including the bone marrow.

Each of these cells contributes to the function of connective tissue, whether by providing structural support, storing energy, or participating in immune responses.

21. Mark whether the following statements are true or false. Rewrite the false statements in correct form.

1. In monocot stems, intercalary meristem is located at the base of internode. -True
2. Intercellular spaces are present in collenchyma_ True
3. Phloem helps in the upward conduction of water and salts.- false because xylem conducts not phloem
4. Meristematic cells are totipotent.- True

5. Cambium has the apical meristem.- False because cambium is lateral meristem
6. Collagen fibers are inelastic in nature.-false because collagen fibres are elastic in nature, though they provide tensile strength
7. Ligaments attach muscles with the bones.- false because ligaments attaches bone to bone where as tendons attach muscles to bone.
8. Central body of nerve cells is called axon- False – The central body of nerve cells is called the cell body (soma), while the axon is a long projection..
9. Medulated nerve fibers form gray matter.- False – Medullated (myelinated) nerve fibers form white matter, while non-myelinated fibers form gray matter.
10. Adipose tissue prevents the loss of heat from the body.- True



1. Cavity present in bone: Medullary cavity
2. Tissue filled in its cavity: Bone marrow
3. Function of the tissue: Bone marrow produces blood cells (hematopoiesis).
4. Longitudinal canals in bone: Haversian canals
5. Transverse canals that connect to longitudinal canals: Volkmann's canals