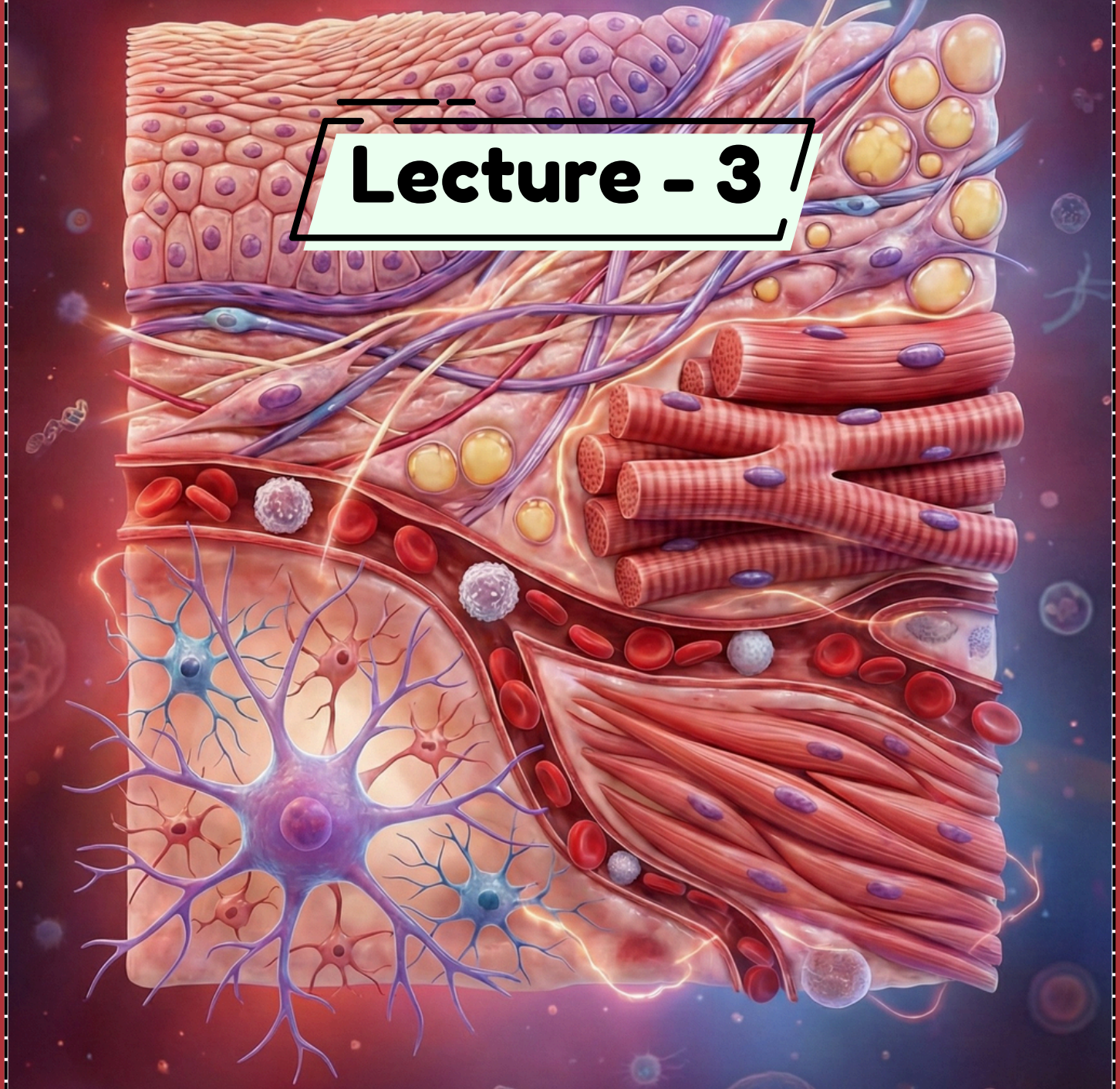
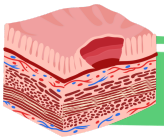
PARMAR SSC

ANIMAL TISSUE

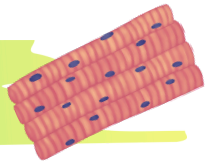
Lecture - 3



BY PARMAR SIR



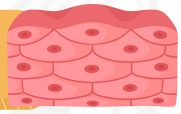
Introduction to Animal Tissues



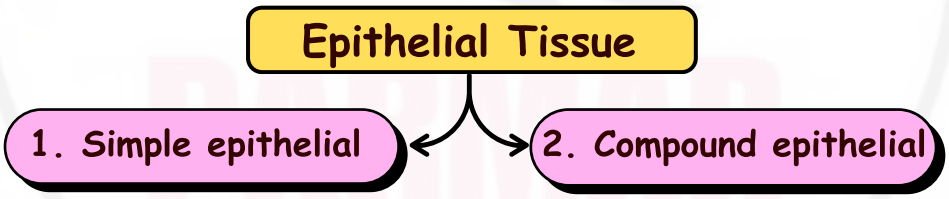
- Animal tissues are groups of similar cells with specific functions working together to form body structures.
- Animal tissues can be broadly classified into four main types:

1. Epithelial Tissue 
2. Muscular Tissue 
3. Connective Tissue 
4. Nervous Tissue 

1 Epithelial Tissue

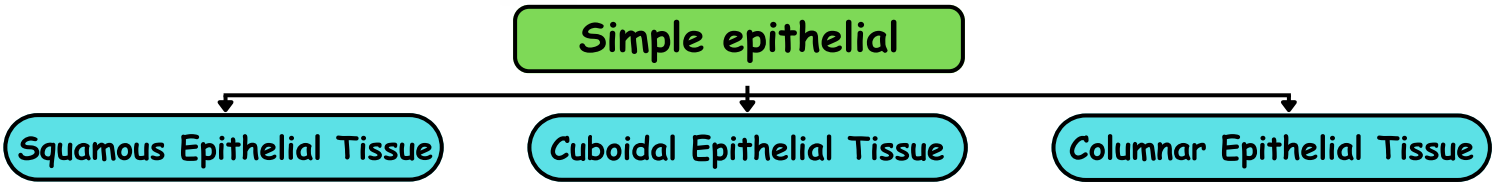


- **Occurrence:** Widespread throughout the body.
- **Characteristics:**
  - It acts as covering or protective tissue in animal body.
  - Cells form continuous sheet and are tightly packed with no intercellular spaces.
  - All epithelial tissues are separated by others through basement membrane.
- **Function:** It protects the body from injury or damage.



1 Simple epithelial

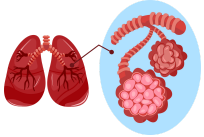
- **Occurrence:** Lining for body cavities, ducts, and tubes.
- **Structure:** It is composed of a single layer of cells.



1 Squamous Epithelial Tissue



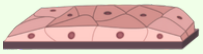
- **Occurrence:** Lines blood vessels, air sacs of the lungs (alveoli), and body cavities like the peritoneum.
- **Structure:** Cells are extremely thin and flat with irregular shape.



Squamous Epithelial Tissue

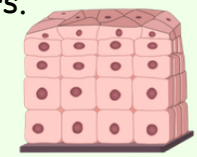
Simple Squamous Epithelial Tissue

- **Occurrence**: Mouth and oesophagus (food pipe).
- **Characteristics:**
  - They are single layer of cells, flattened with irregular boundaries.
  - They form delicate lining.



Stratified Squamous Epithelial Tissue

- **Occurrence:** Skin.
- **Characteristics:**
  - Cells are arranged in layers.
  - Prevents wear and tear.



2 Cuboidal Epithelial Tissue

- **Occurrence:** Salivary glands, sweat glands, thyroid glands, lining of kidney tubules.
- **Structure**: Cells have cube-like structure (height and width of the cells are equal).



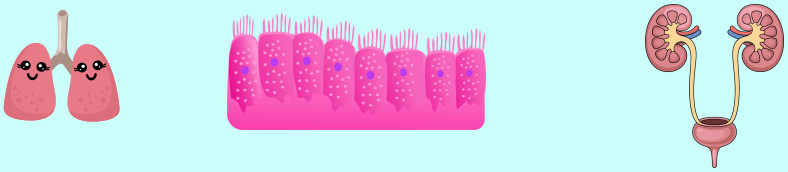
3 Columnar Epithelial Tissue

- **Occurrence:** Lining of intestine, stomach and gallbladder.
- **Structure**: The cells are pillar like, tall, and wide in appearance. Their nuclei is located at the base.



Ciliated Epithelial Tissue

- **Occurrence**: Respiratory tract, urinary tubules or kidney.
- **Structure**: Cells are cuboidal/columnar in shape with hair-like projections on their free surface called "cilia", which facilitates movement (particularly movement of fluids).
- **Function**: Movement of mucus, urine, etc. through rhythmic beating of cilia.



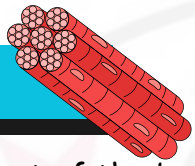
2 Muscular Tissue

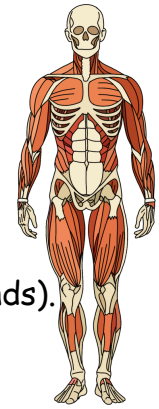
- **Structure**: It is composed of muscle cells or muscle fibres.
- Muscle fibres are elongated and large in size.
- Contractile proteins are present in the fibres (important for movement of body).
- **Function**: Contraction and relaxation, responsible for body movement.

Muscular Tissue

1. Skeletal muscle
2. Smooth muscle
3. Cardiac muscle

1 Skeletal Muscle





- **Occurrence**: Skeletal part of the body (containing bones).
- **Characteristics**:
  1. Muscle fibres are elongated, unbranched and cylindrical in shape.
  2. They are fast in nature.
  3. They are voluntary muscles.
  4. Each cell is multinucleated (many nuclei) with striations (alternate, dark and light bands).
  5. These cells are easily fatigue.
- **Function**: They help in body movement and maintaining posture

2 Smooth Muscle



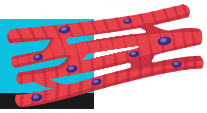




- **Occurrence**: In organs like intestine, uterus, blood vessels, stomach, bronchi, iris.
- **Characteristics**:
  1. The nucleus is located at the centre of each cell.
  2. Cells are non-striated, spindle shaped/fusiform which are held together by cell junction.
  3. Cells are unbranched, slow in growth and do not fatigue easily.
  4. They are involuntary muscles (not under our control).
- **Function**: Muscle peristalsis (a wave-like movement that propels food and other substances through the digestive tract).



3 Cardiac Muscle



- **Occurrence**: Heart.
- **Characteristics**:
  1. Cardiac muscle fibres are long, cylindrical in shape.
  2. Each fibre is uninucleated and branched.
  3. Striations are present.
  4. Cardiac muscles do not fatigue.
  5. They are involuntary muscles (not under our control).
  6. They help to pump and distribute blood to the body.
- **Functions**: They perform contraction and relaxation in wall of heart.

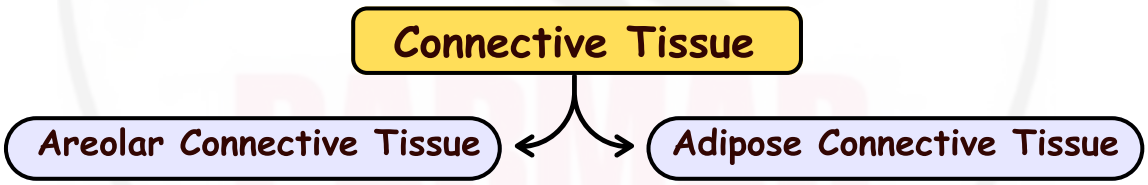


Summary

FEATURE	SKELETAL	SMOOTH	CARDIAC
Location	Bones	Intestine, Stomach, Iris	Heart
Striation	✓	✗	✓
Voluntary	✓	✗	✗
Branched	✗	✗	✓
Nucleated	Multinucleated	Uninucleate	Uninucleate

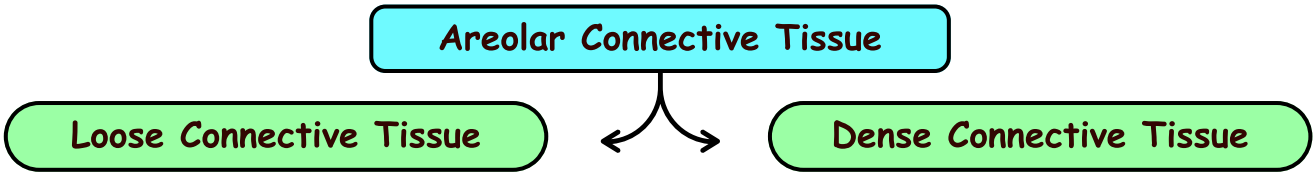
3 Connective Tissue

- **Occurrence**: Tendons, cartilage, adipose tissue, ligaments, dermis, etc.
- **Characteristics**: It connects various body parts.
- The cells are embedded in an intracellular matrix, this matrix may be jelly (cartilage), fluid (blood), dense or rigid (bone).
- It acts like a binding, supporting and packing material.
- It prevents organ from getting displaced by body movements



1 Areolar Connective Tissue

- It is a type of loose connective tissue that provides support, protection, and cushioning for various structures in the body.
- It's characterized by a loosely arranged network of fibers and cells within a semi-fluid matrix, making it flexible and adaptable.



1 Loose Connective Tissue

- **Occurrence**: Between skin and muscles, in space inside organs, in bone marrow.
- **Structure**: It is characterized by a loose, gel-like matrix consisting of cells, fibers, and a ground substance.

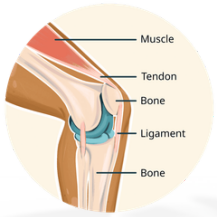
2 Dense Connective Tissue

- **Characteristics**: It has a high proportion of fibers, primarily collagen.

Dense Connective Tissue

Tendons

- It is a fibrous tissue with great strength and limited flexibility.
- It connects Muscle to Bones.



Ligaments

- It has considerable strength despite containing a small amount of matrix.
- It connects Bones to Bones.

2 Adipose Connective Tissue

- **Occurrence**: Below the skin (individuals with more body fat have more adipose tissue), in between internal organs.
- **Structure**: Cells are round, oval shaped. There is an aggregation of fat cells (adipocytes).
- **Functions**:

1. It prevents body from mechanical shock.
2. It acts as an insulator.

E.g. Camel hump.

Skeletal Connective Tissue

- Skeletal connective tissues are connective tissues with unique structures and functions beyond basic support and connection.

Skeletal Connective Tissue

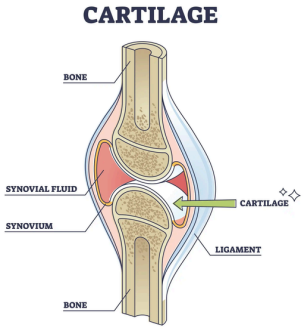
Cartilage | **Bones**

1 Cartilage

- **Occurrence**: Ear pinna, nose tip, trachea, larynx, bone surfaces at j
- **Characteristics**:

1. They are widely spaced out cells.
2. Matrix is gel-like and slightly elastic.
3. Cartilage is flexible in nature.

- **Function**: It supports and provides flexibility to the body.

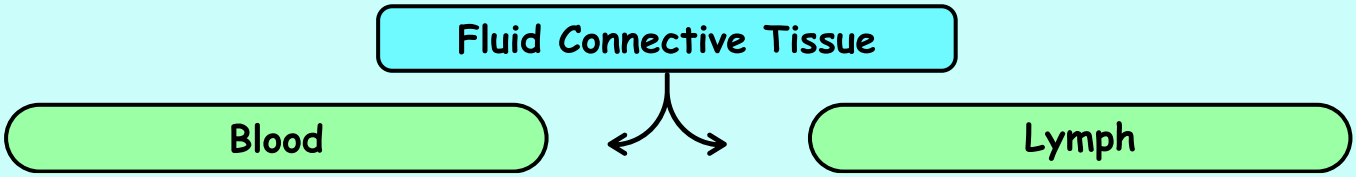


2 Bones

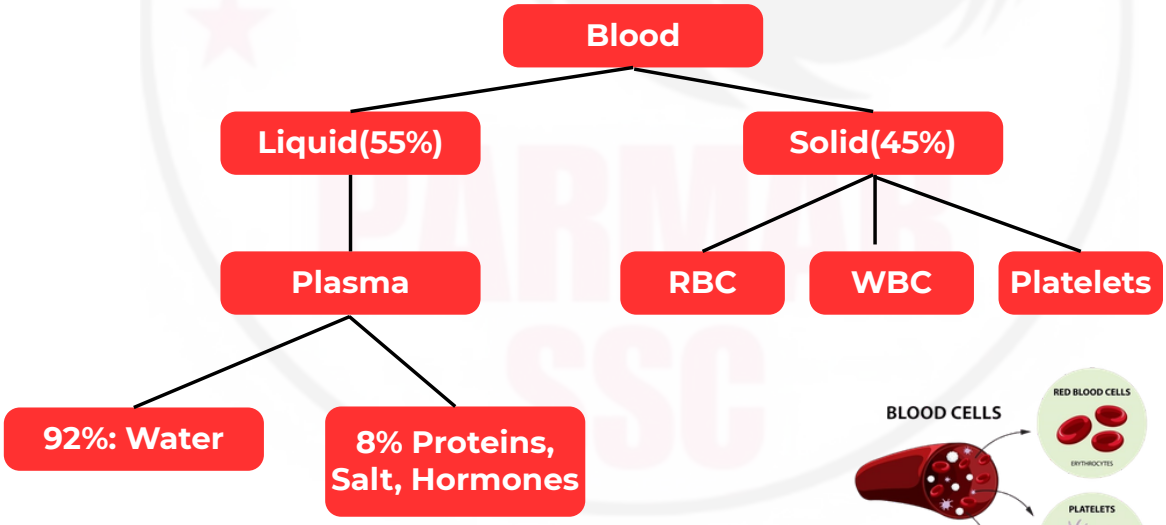
- **Characteristics:**
  - Bones are hard and rigid, strong, and non-flexible in nature.
  - Matrix of the bone is hard and composed of calcium and phosphorous compounds.
- **Functions:**
  - It forms a network of framework that supports the body.
  - It provides shape to body and protects the vital organs like brain, lungs, etc.

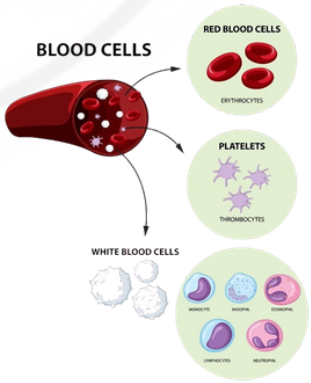
Fluid Connective Tissue

- It connects different part of the body and maintains continuity.



1 Blood





Liquid Part of Blood (Plasma):

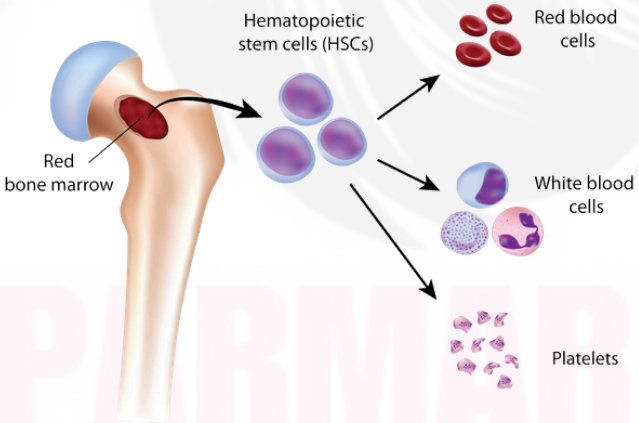
- It is yellow in color.
- It consists of 92% water and 8% proteins, salt and hormones.

Proteins	Function
Fibrinogen	Coagulant
Globulin	Provides defence
Albumin	To maintain osmotic balance

Most abundant protein in Blood Plasma.

- **Heparin** is a natural **anticoagulant** (carbohydrate) present in the blood.

When clotting proteins are removed from blood (Plasma), the clear liquid that remains after is called Serum.



Bone marrow is found within the sternum, hip bones, ribs, vertebrae, and the ends of long bones.

Solid Part of Blood:

RBC (Red Blood Cells)/Erythrocytes



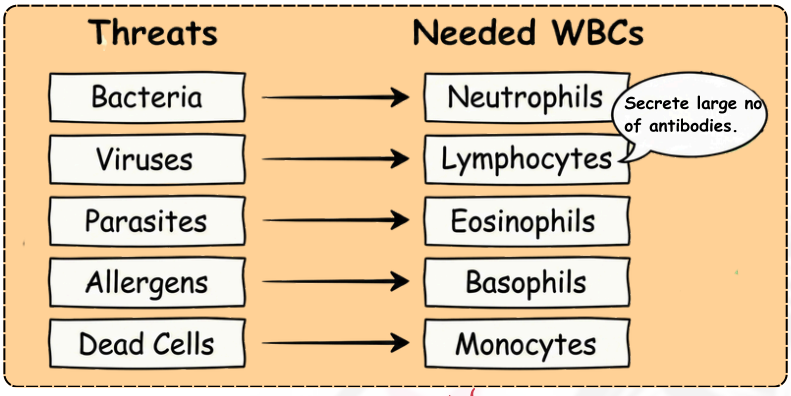
- **Normal range**: 4.5 to 5.5 million per cubic millimeter.
- **Color**: Red in color due to presence of heme (Fe). Heme has high affinity towards oxygen.
- **Shape**: Biconcave; disc-shaped.
- Lifespan and Formation: Bone marrow (at birth) having a lifespan of about 120 days.
- **Function**: It transports oxygen to whole body.
- Mature RBC's have no nucleus in them.
- **Graveyard of RBC**: Spleen.
- **Study of Blood**: Hematology.

Hematopoiesis: The biological process of blood cell formation.
Polycythemia: A condition characterized by an abnormally high Red Blood Cell (RBC) count.

WBC (White Blood Cells)/Leukocytes



- **Normal range**: 5000-8000 per cubic millimeter.
- WBC's protects our body from infection (provides our body a defence mechanism).
- **Formed in**: Bone marrow having life span of 13-20 days.
- **Shape**: Round/Irregular in shape.
- **Types**: Monocytes, Lymphocytes, Neutrophils, Basophils, Eosinophils.



Abnormal production of WBCs leads to **leukemia**. It occurs when cancer develops in the **bone marrow**, which is called **blood cancer**.

Platelets/Thrombocytes



- **Normal range**: 1,50,000-3,50,000 per cubic millimeter of blood.
- **Shape**: Irregular shape.
- **Formed in**: Bone marrow having life span of 7-10 days.
- **Function**: They are essential for preventing and stopping bleeding by forming coagulation

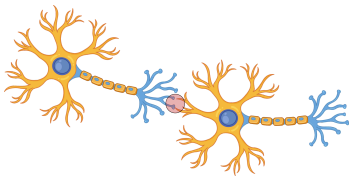
Low platelet count leads to thrombocytopenia (happens in case of dengue) and a very high platelet count leads to called thrombocytosis.

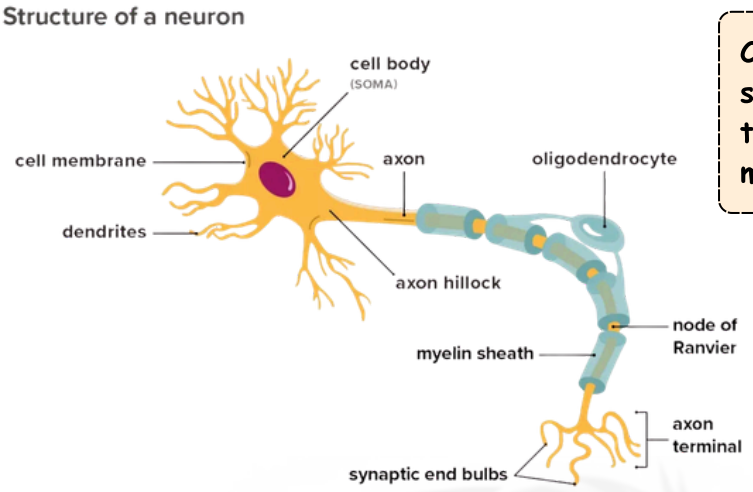
2 Lymph

- **Structure:**
  1. It is a colorless fluid.
  2. RBC and blood proteins are absent in lymph.
  3. Lymph is similar to blood plasma , contains proteins, salt, glucose, and water.
  4. It is slightly yellow in color.
- **Function:** Lymph plays a crucial role in maintaining bodily fluid balance and supporting the immune system.

4 Nervous Tissue

- Neural tissue (or nervous tissue) is a specialized tissue found in the nervous system.
- It is responsible for receiving stimuli, transmitting signals, and coordinating responses throughout the body.
- **Occurrence**: Found in Brain, Spinal cord, Nerves.





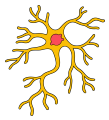
Camillo Golgi discovered the structure of the neuron using the "Black Reaction" (Golgi's method).

Anatomy of a Neuron

- A neuron is the basic structural and fundamental unit of the nervous system.
- It is specialized to transmit nerve impulses.
- Neuron is the longest cell in the human body.

Parts of Neurons

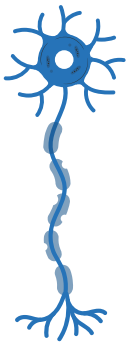
Cell Body (Soma) →
- It contains the nucleus and cytoplasm and controls the activities of the neuron.



Dendrites →
- Short, branched extensions from the cell body that receives signals from other neurons or sensory cells. It carries impulses toward the cell body



Axon →
- It carries nerve impulses away from the cell body to other neurons or effectors (muscles/glands).



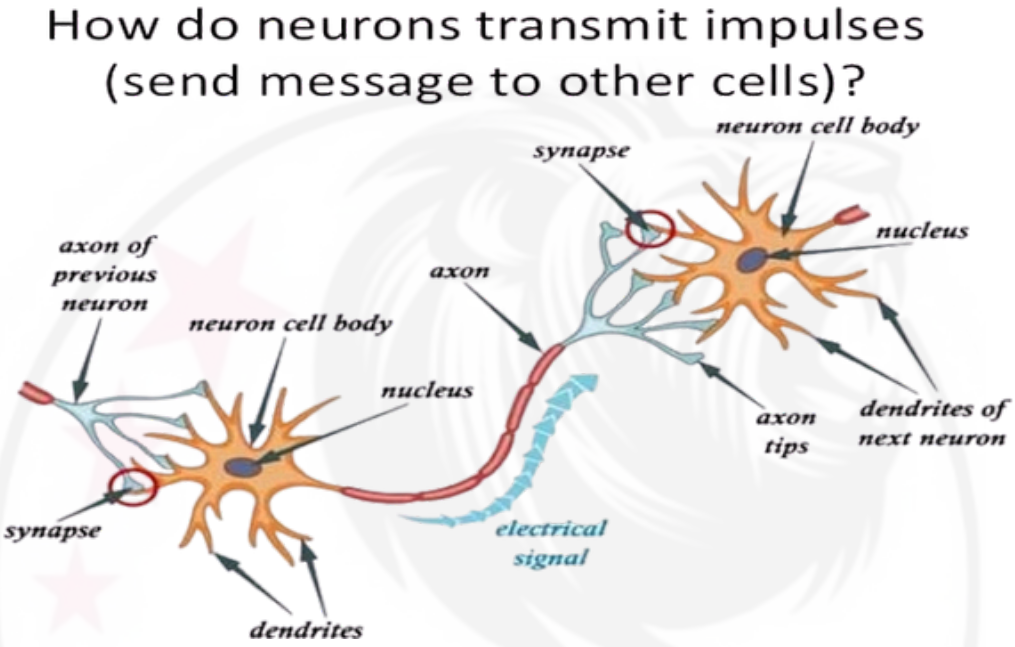
Myelin Sheath →
- A fatty layer that covers the axon that insulates the axon and speeds up signal transmission.

Schwann Cells →
- They are glial cells that form the Myelin Sheath on Axons outside the brain.

Axon Terminals (Synaptic knobs): →
- The end branches of the axon that contain neurotransmitters. It helps transmit signals to the next neuron or effector cell across a synapse.

Transmission of Neuron Impulses

- A stimulus is received by the dendrites.
- An electrical impulse travels through the cell body and axon.
- At the axon terminals, the impulse triggers the release of neurotransmitters.
- Neurotransmitters cross the synapse and pass the signal to the next neuron or effector (like a muscle or gland).
- This leads to a response.





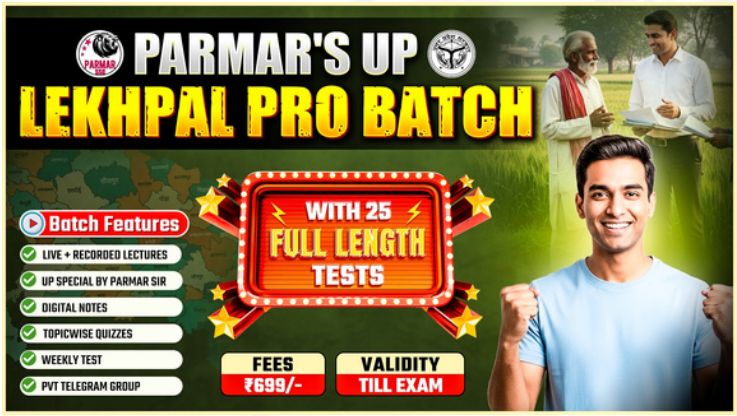


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