YAKEEN NEET 2.0

2026

STRUCTURAL ORGANISATION IN ANIMALS

ZOOLOGY

Revision-01

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Note Due to MULTICELLULARITY, division of Labour occurs.
(काम आपस में Divide हो जाता है।)

Animal Tissue

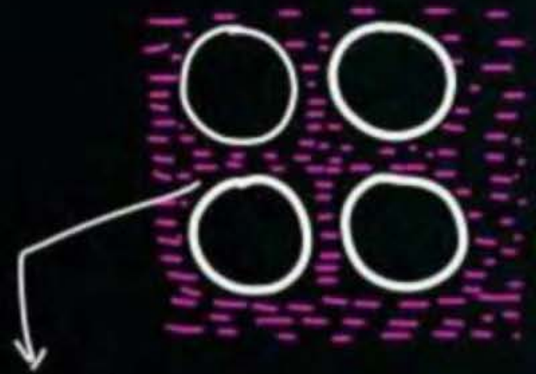
PROPERTY

→ Multicellular

→ Heterotrophs : Animals are dependent upon others for food.

→ Holozoic mode of Nutrition : We first ingest the complete food and then we Digest.

Tissues: Group of similar cells having some intercellular space between them (filled with intercellular substance/matrix) and performing a specific function.



outside cells
EXTRACELLULAR SPACE
OR
Space between cells: INTERCELLULAR SPACE
↳ filled with Matrix/intercellular substance
↳ made of Protein + Carbohydrates

A, B, C, D... → 'Cells'

words → 'Tissue'

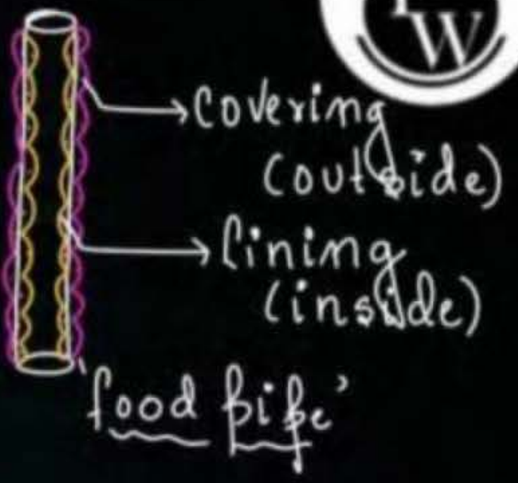
Sentences → 'Organs' → Stomach, Heart

Paragraph → 'Organ-system' → Stomach, Oesophagus, Large intestine, Small intestine

'Digestive system'

Basic Function

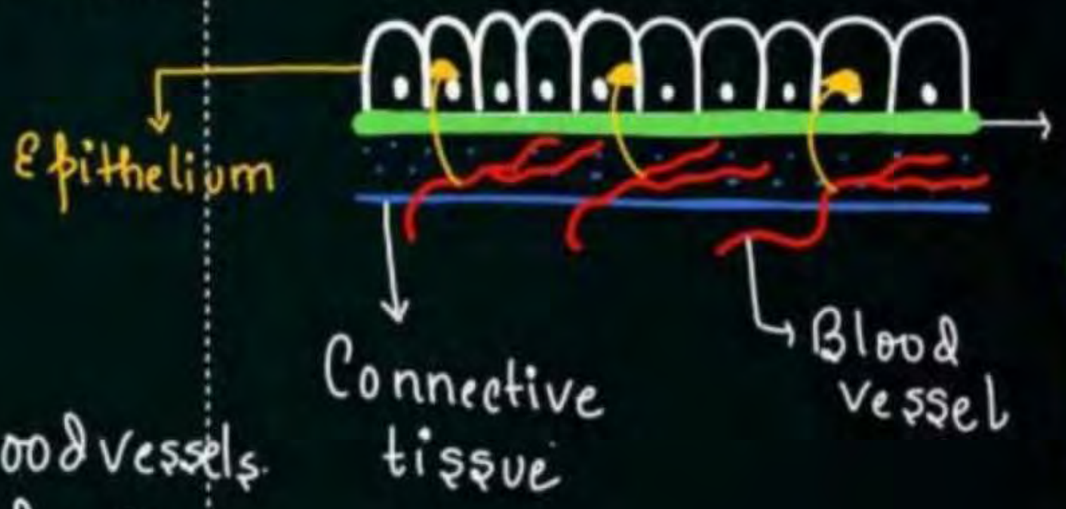
- i) Epithelial : Covering, Lining, Protection
- ii) Connective : Support and Linkage
  - Connects
- iii) Muscular : Locomotion and movement
- iv) Nervous tissue : Control and Coordination



Epithelium / Epithelial Tissue / Epithelia:

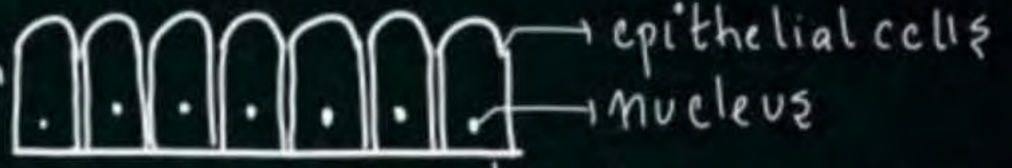
EPITHELIUM
upon to rest

- It always rests upon some other tissue.
- It is AVASCULAR
  - A: Absence
  - VASCULAR: Blood vessels
  - Epithelium doesnot have any Blood vessels.
- Connective tissue which is highly vascular is present Below Basement membrane. Nutrients and oxygen from Blood vessels of Connective tissue diffuses via Basement membrane to the epithelium

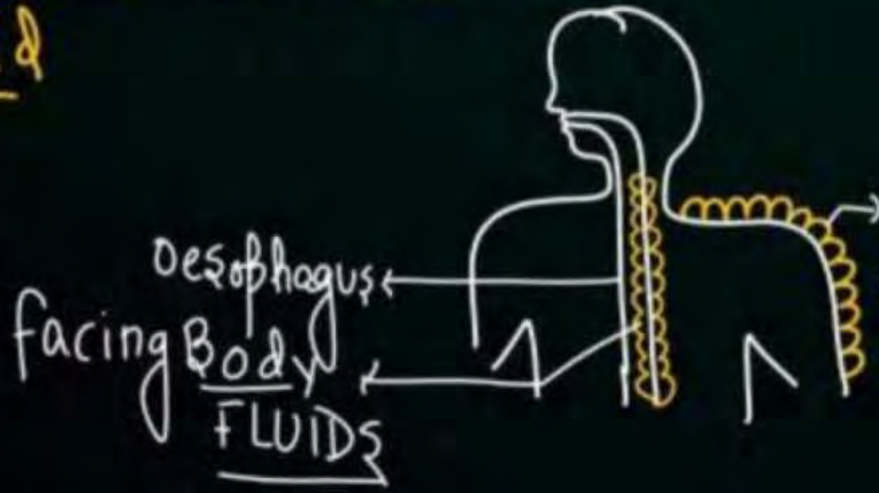


- High regeneration ability
  - regeneration → again formed

- Cells are 'COMPACTLY' (Close) packed with very less intercellular space which means LESS MATRIX.



- The CELLS of Epithelium either faces EXTERNAL environment or Body fluid
  - CELLS → apical surface of



Note: Diffusion: movement of particles from high concentration to Low concentration

'APICAL SURFACE' of cell may have modifications

(i) MICROVILLI / BRUSH-BORDERED EPITHELIUM

- When the plasma membrane of cells gets folded to form finger like projections called microvilli to increase the surface area for secretion and absorption.

eg: Small intestine

(ii) CILIATED EPITHELIUM

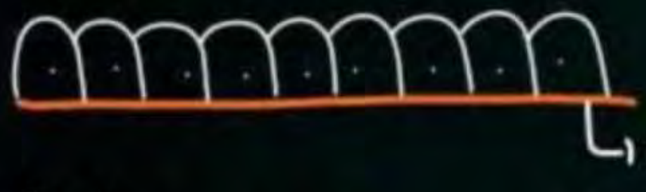
- 'Cilia' are hair like projection from apical surface usually present in hollow organs for movement of particles (unidirectional)

eg: fallopian tube.

EPITHELIUM

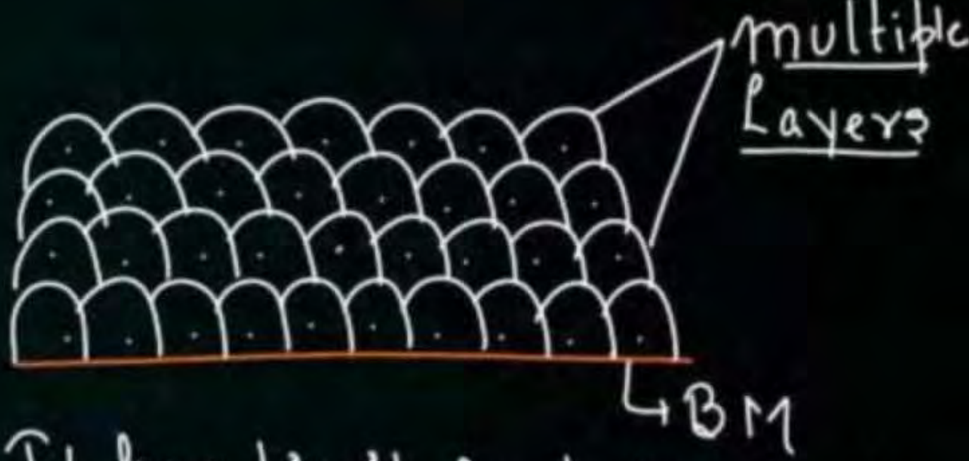
(A) SIMPLE EPITHELIUM

- Epithelium which is made up of single layer of cells



- It has major role in secretion, absorption, filteration, Diffusion etc.

(B) COMPOUND EPITHELIUM



- It has limited role in secretion and absorption but major role in PROTECTION and COVERING

ON THE BASIS OF STRUCTURAL MODIFICATION of cells,

Simple epithelium can be classified into:

(i) Simple Squamous epithelium

(ii) Simple Cuboidal epithelium

(iii) Simple Columnar Epithelium

1. **Simple Squamous Epithelium :**

- Cells are FLAT
- Nucleus is FLAT and Located in Centre
- Cells are with IRREGULAR BOUNDARIES
- Cells are so flat that it appears like TILES ON THE FLOOR, hence it is also known as 'PAVEMENT - EPITHELIUM'

Function : It plays a major role in FILTERATION & DIFFUSION

Fig: Side view (SQUAMOUS)

Fig: Top view (Squamous)

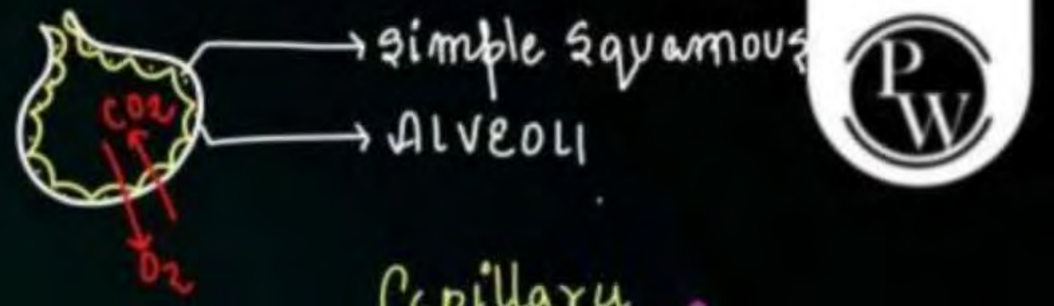
eg: • Alveoli in lungs (Diffusion of gases)

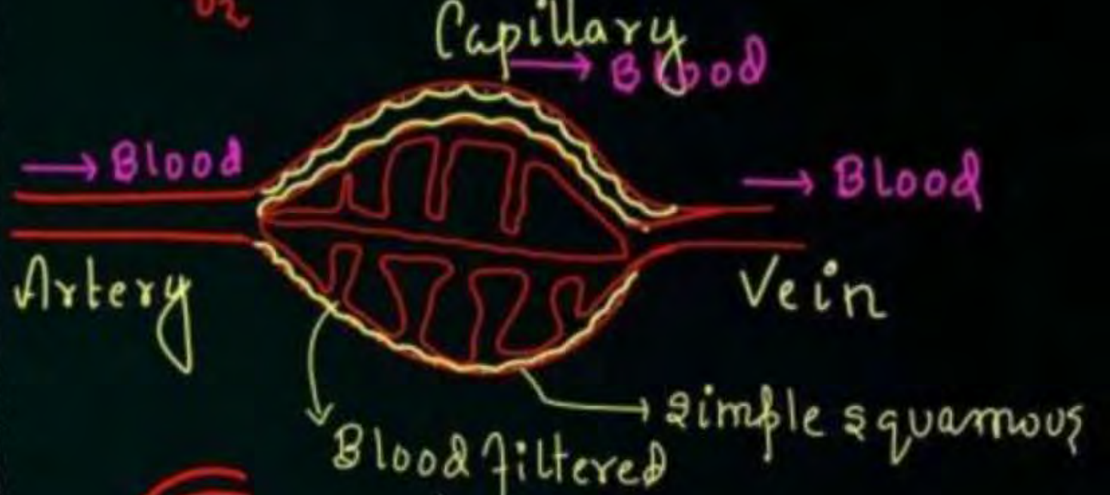
• Blood vessels → ARTERY
→ VEINS
→ CAPILLARY

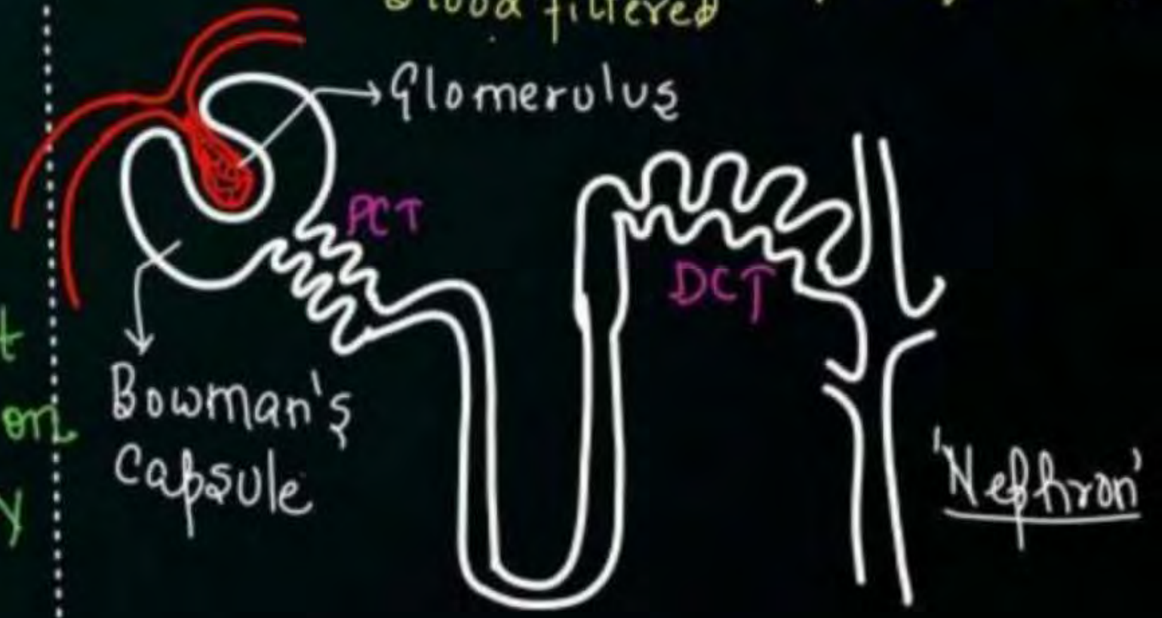
Note: Simple Squamous epithelium of Blood vessel is known as ENDOTHELIUM

• Glomerulus (Blood capillary)
• Bowman's capsule

] Present in Nephron of KIDNEY

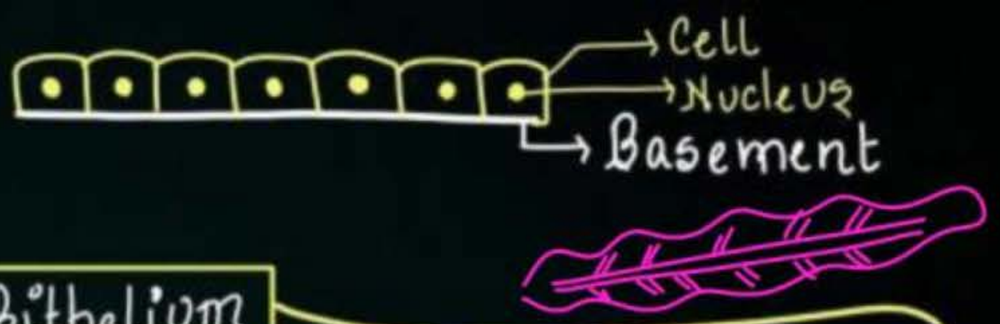






② Simple Cuboidal Epithelium:

- Cells are cubiodal
- Nucleus is ROUND and in the centre



Cuboidal Epithelium

(i) Simple Cuboidal epithelium

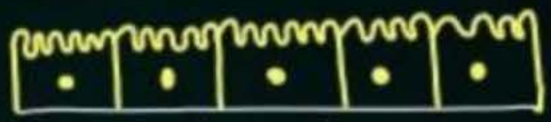
- Free surface of cell: No modification

Function: SECRETION & ABSORPTION

Examples: → DCT (Distal convoluted Tubules)
↳ Nephron
→ Thyroid follicles
→ Gonads → Testis
→ Ovary
→ Small ducts of GLANDS

[Here, Simple Cubidal Epithelium is kl/a GERMINAL EPITHELIUM]

(ii) Brush bordered Cuboial



- Free surface has 'microvilli'

Function: SECRETION & ABSORPTION

Examples: PCT
Proximal convoluted Tubules

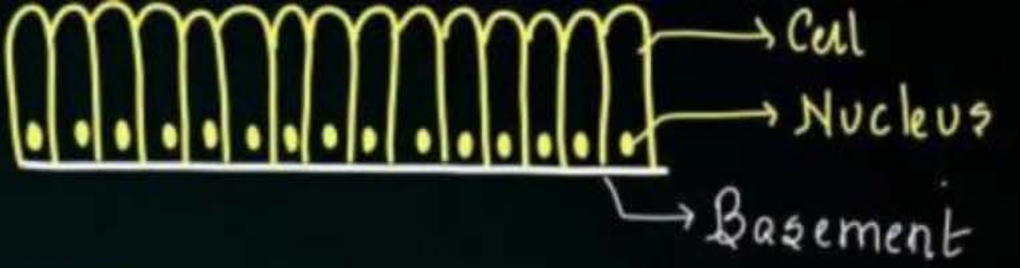
(iii) Ciliated Cuboidal epithelium

- Free surface has 'CILIA'

Function: Movement of particles.

eg: smaller bronchioles (mucus movement)

3. **Simple Columnar Epithelium** :



- Tall / Slender Cells
- NUCLEUS is OVAL & located at Base

Simple Columnar

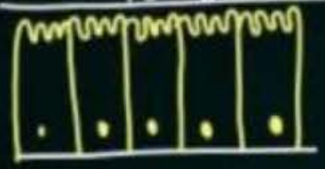
(i) **Simple Columnar**

- Free surface has no modification

Function : Secretion & absorption

eg: GI tract (Gastro-intestinal tract)
↓
'STOMACH'

(ii) **Brush bordered Columnar**



- Free surface has 'Microvilli'

Function: Secretion & Absorption

eg: GI tract
- ↳ Small intestine
- Goblet cells - Produce mucus

(iii) **Ciliated Columnar**

- Free surface has CILIA

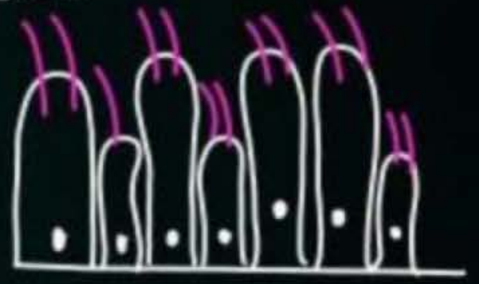
Function: movement of substances

eg: Large Bronchioles & Fallopian tube
↳ movement of ova

Note **Pseudostratified**: (Simple epithelium)

false multilayered

अतिरिक्त ज्ञान
- It is single layered but appears multilayered due to unequally sized columnar cells



- Pseudostratified Ciliated epithelium is present in TRACHEA & Bronchi.

GLANDULAR EPITHELIUM:

- It is a type of simple epithelium having either 'CUBOIDAL or COLUMNAR' cells specialised for secretions as it forms 'GLANDS'

Glands: Are the structures or organs that makes 'secretions'.

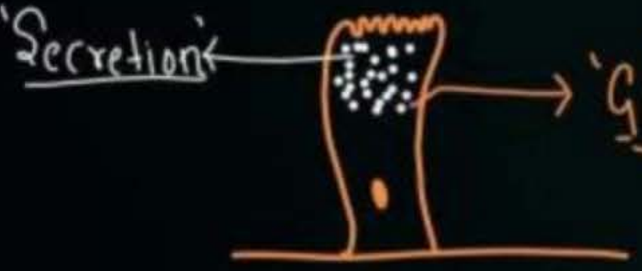
CLASSIFICATION of GLANDULAR EPITHELIUM:

(I) On the basis of no. of cells

(i) Unicellular gland

Single

- Single, isolated cell act as a gland & makes the secretion.



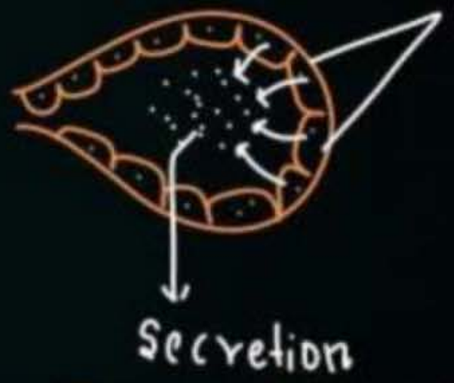
→ present in GI tract/ alimentary canal

→ Its secretion is a 'mucus'

(ii) Multicellular gland

many

- Many cells together act as a gland & makes the secretion



eg: Salivary gland, Sweat gland etc.

① On the Basis of Mode of Pouring their Secretion

(i) Endocrine gland

- DUCTLESS GLANDS

These glands pour their secretions directly into the blood stream without any duct.

eg: Hypothalamus, pituitary etc.

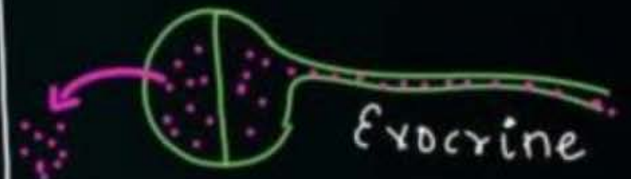
(ii) Exocrine gland

- Glands that pour their secretions like mucus, Saliva, tear, oil, milk, digestive enzymes etc with the help of a duct.

- Salivary gland, Goblet, tear gland, sweat gland, oil/Sebaceous gland, Mammary gland etc.

(iii) Heterocrine/Mixed/Composite

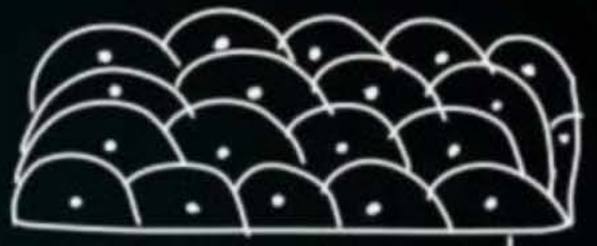
- Glands that has both Endocrine as well as exocrine part



Endocrine

eg: Pancreas

COMPOUND EPITHELIUM:



- Multilayer epithelium
- ★ It has less role in Secretion and absorption, mainly it gives support and Protection against chemical & mechanical stress.

Compound Epithelium

Transitional epithelium (Not in NCERT)

- Stretchable epithelium

eg: Urinary bladder

★★★ Stratified epithelium

(Non-stretchable)

- This is present in various surfaces.

DRY and moist

- Here 'Keratin' protein is deposited on epithelium to make it Dry and impermiable for water

eg: SKIN

- No keratin

eg: Buccal cavity, Oesophagus, Pharynx, Vagina, Pancreatic duct & SALIVARY DUCT

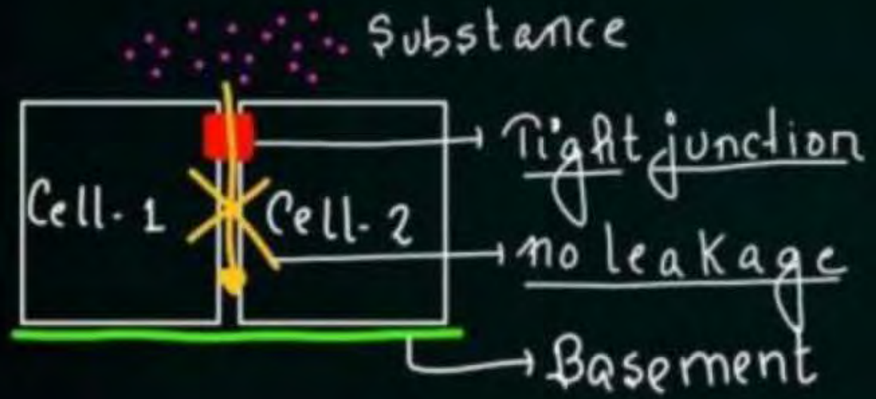
Cell Junctions : **Structural and functional** connection between cell.

- i) Tight junctions
- ii) Adhering junctions
- iii) Gap junctions

CELL JUNCTIONS:

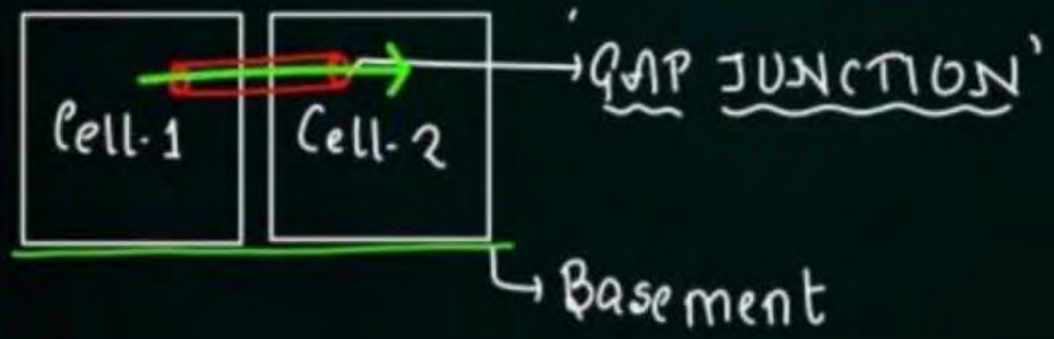
Structural & functional connection b/w Cells.

① TIGHT JUNCTIONS: These junctions PREVENT LEAKAGE across the Cells.



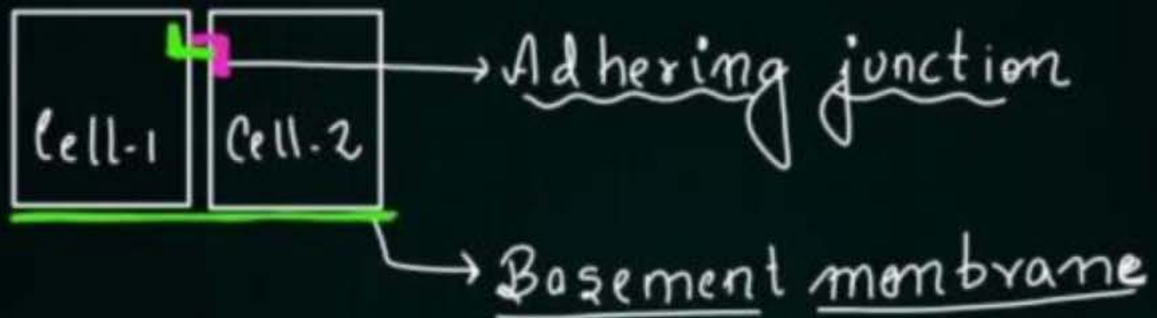
③ GAP JUNCTIONS: Junctions which helps in COMMUNICATING b/w cells by connecting the Cytoplasm of Cells & by transfer of ions, small molecules and sometimes even bigger molecules.

- It is also k/a "COMMUNICATING JUNCTION"



③ Adhering junction: Junctions which helps in CEMENTING b/w CELLS

↳ 'GLUING'



Note: These cell junctions are present in epithelium as well as other tissue.

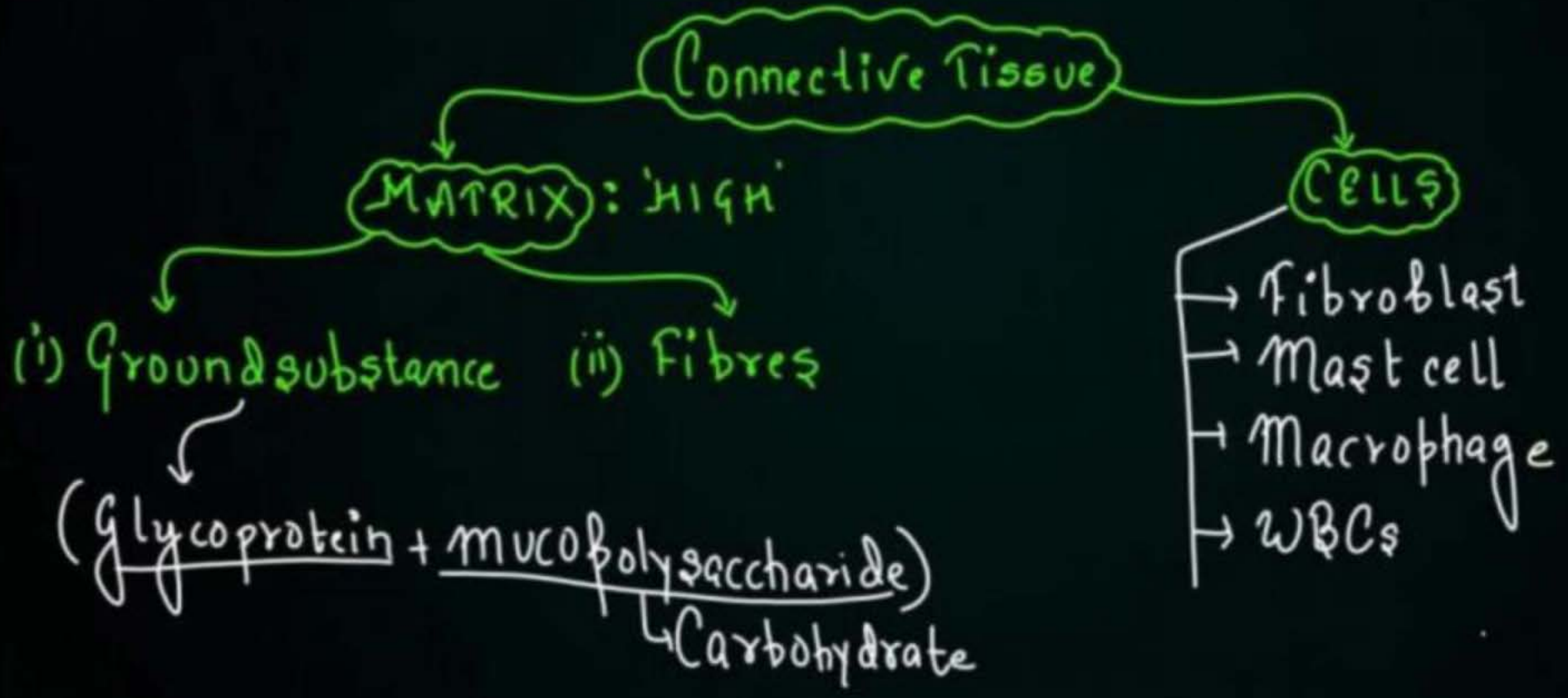
CONNECTIVE TISSUE:

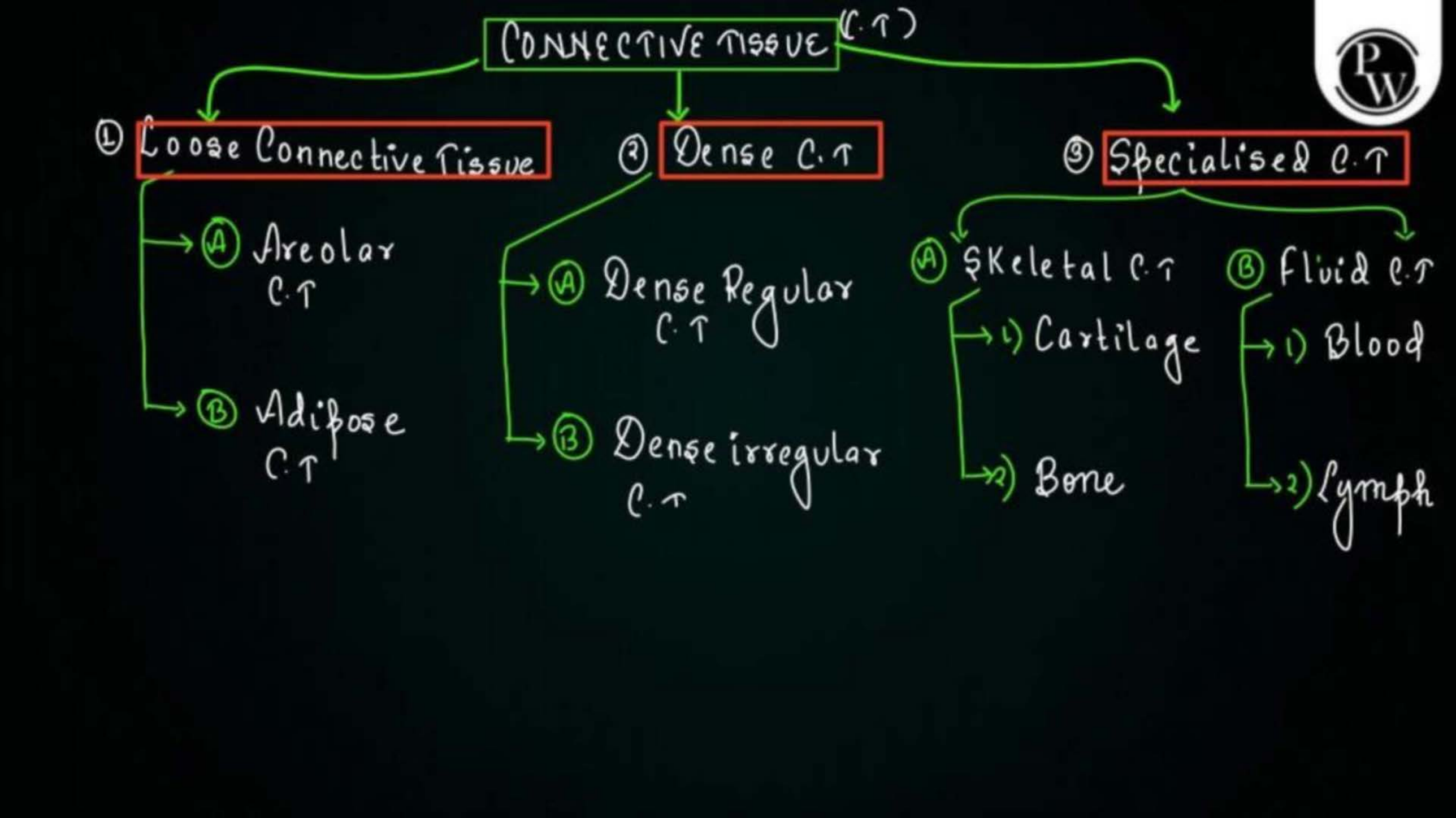
- Most ABUNDANT & widely distributed tissue.
- Provides Support & Linkage.

Maggie + H_2O + Veg

{ Fibre, Ground, Cell }

Matrix




CONNECTIVE TISSUE (C.T)
① Loose Connective Tissue
② Dense C.T
③ Specialised C.T
(A) Areolar C.T
(B) Adipose C.T
(A) Dense Regular C.T
(B) Dense irregular C.T
(A) Skeletal C.T
1) Cartilage
2) Bone
(B) Fluid C.T
1) Blood
2) Lymph

① Loose C.T:

- Cells and fibres are loosely aggregated in the SEMI-FLUID MATRIX
- MATRIX ↑↑

② Areolar C.T:

Areolae → Space

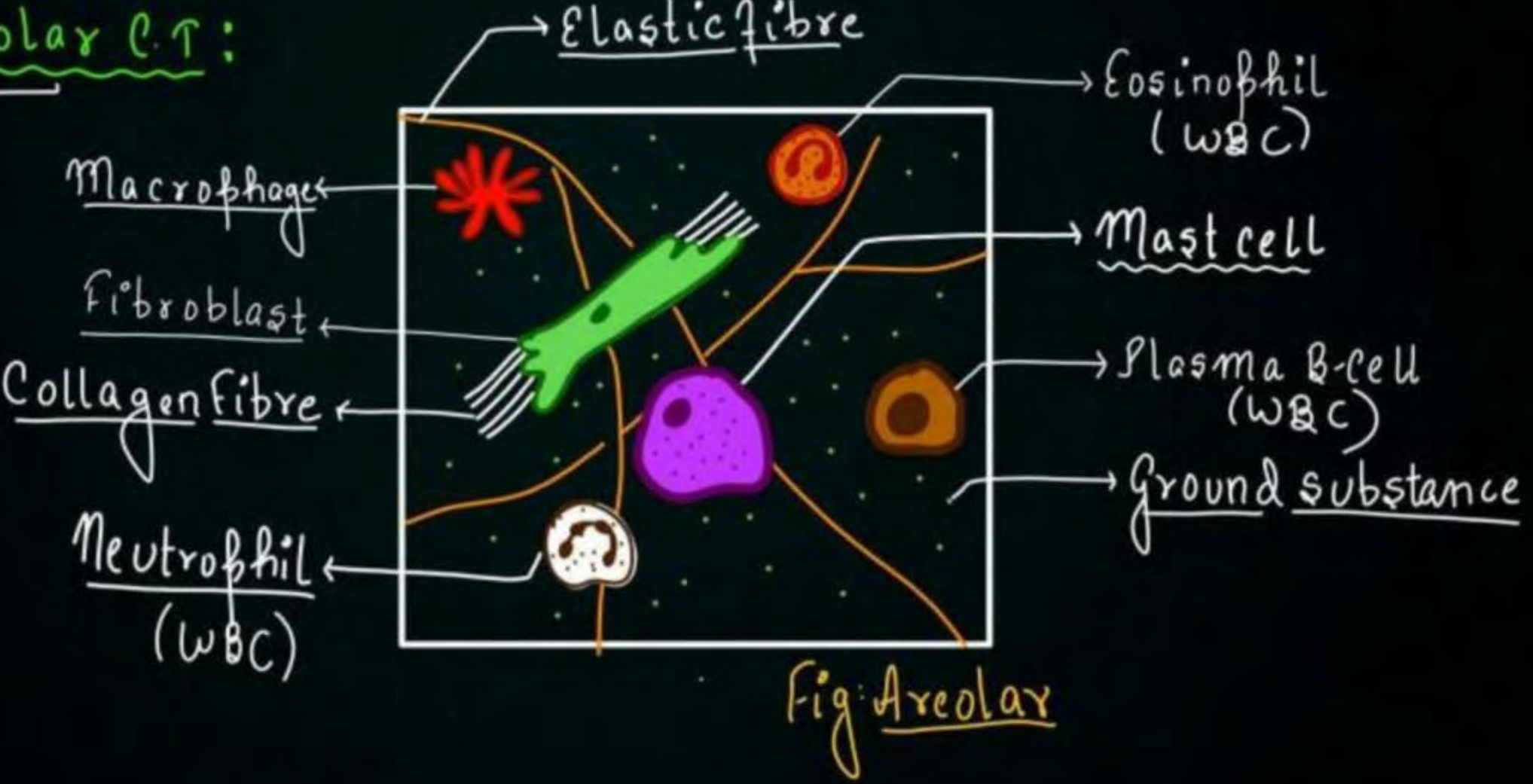


Fig: Areolar

FIBRES : These are of 2 types :

COLLAGEN	ELASTIC
• White in color, hence also k/a WHITE FIBRES	• Yellow in Color, hence also k/a YELLOW FIBRES
• Unbranched	• Branched
• Present in Bundles	• Present individually
• Provides Strength	• Provides elasticity.

Cells

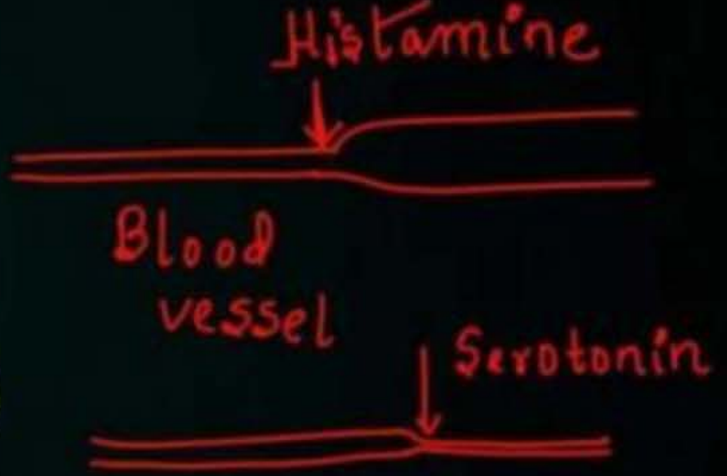
1. Fibroblast cell : Secretes the FIBRES and ground substance
2. Macrophage : 'PHAGOCYTIC CELL'
   ↳ It performs 'Phagocytosis'
   It engulfs (खा लेता है), the foreign substances and destroys it.
3. Eosinophil
4. Neutrophil
5. Plasma-B-cell

] Type of WBC

AREOLAR CONNECTIVE TISSUE:

Mast cell : Secretes → Histamine
→ Serotonin
→ Heparin

- Histamine: (It is a VASODILATOR)
  Blood vessel + Dilation
- Serotonin: (It is a VASOCONSTRICTOR)
  Blood vessel + constrictor
- Heparin: It is a natural anticoagulant (Prevent CLOT)
  opposite + Clot



Location & function of Areolar C.T :

Location: . It is located Beneath/ below the Skin.

Function: · Basically it connects the Skin with the underlying muscle.

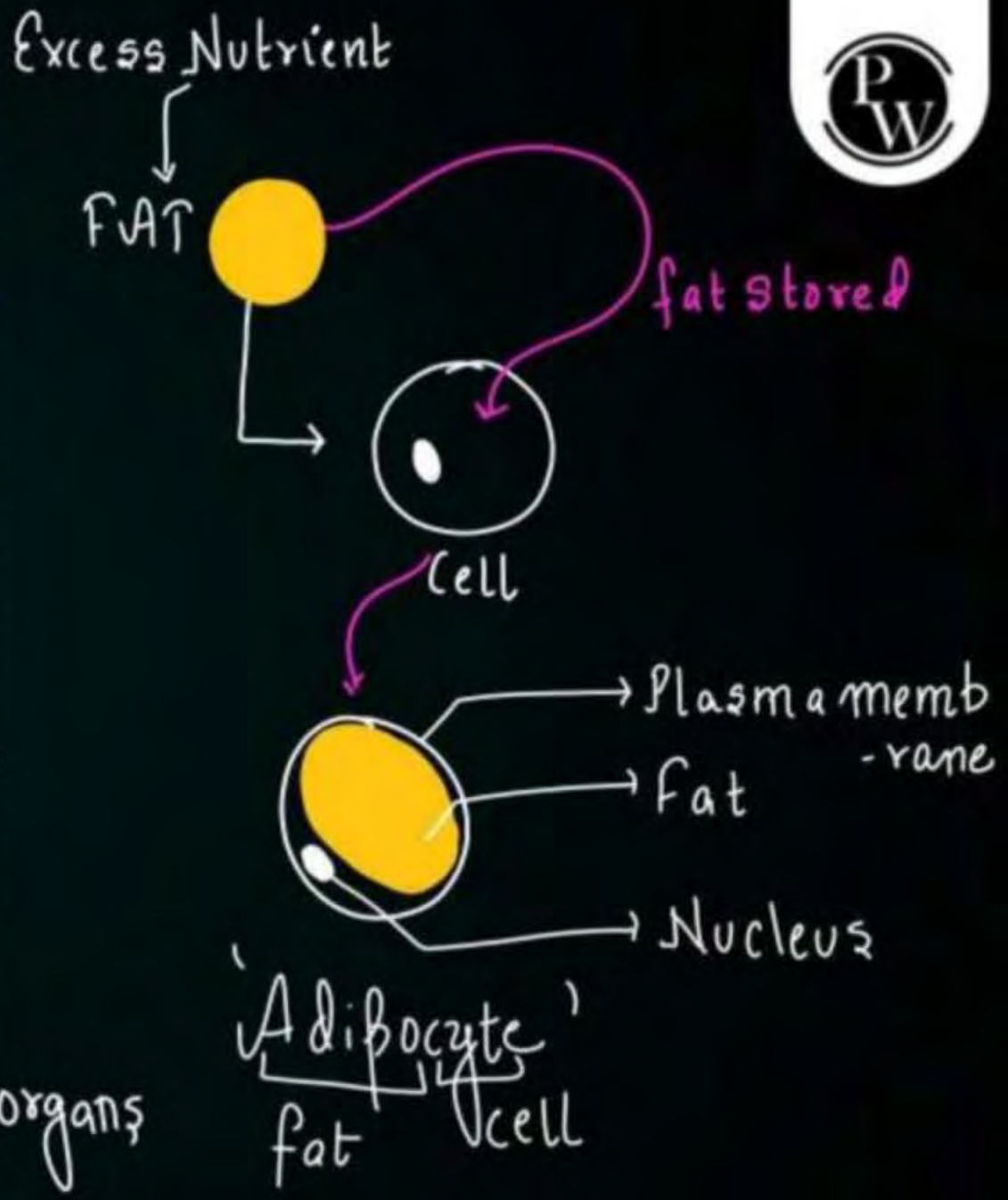
· It acts as a Basic framework for Epithelium.

(ii) Adipose C.T :

- It is a SPECIALISED form of Areolar C.T
- * Excess of Nutrients that are not used immediately are first converted into fat and stored with in cells k/a 'ADIPOCYTES'
- These Adipocytes when found in the 'Areolae' (space of areolar), it is Adipose C.T.

Location: Below the 'SKIN'

Function: Shock absorb, Cushion for Visceral organs



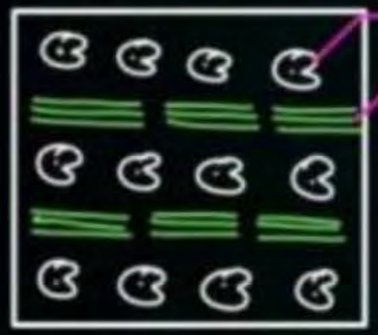
DENSE CONNECTIVE TISSUE:

- Fibres and Cells (Fibroblast) are densly/compactly packed in the Matrix
- Matrix : Less

Dense C.T

(i) Dense regular C.T → eg → Ligament, Tendons

(ii) Dense irregular C.T → eg: SKIN



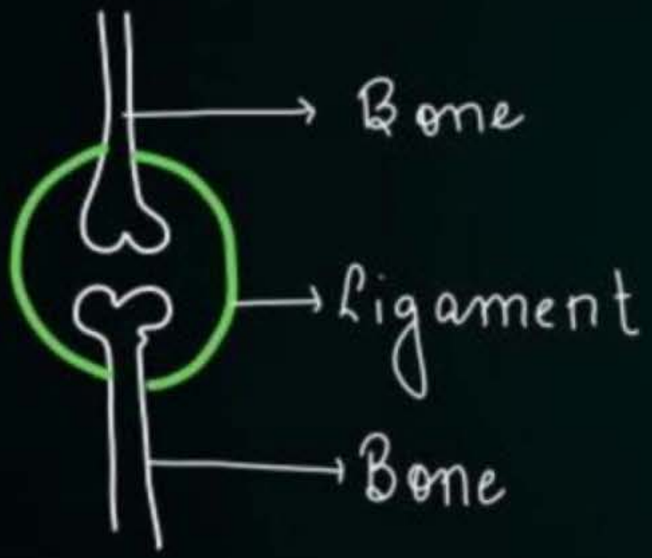
- Fibres & Fibroblasts are parallely arranged or Regular arrangement

- Fibres and fibroblast are randomly arranged.

Dense Regular C.T

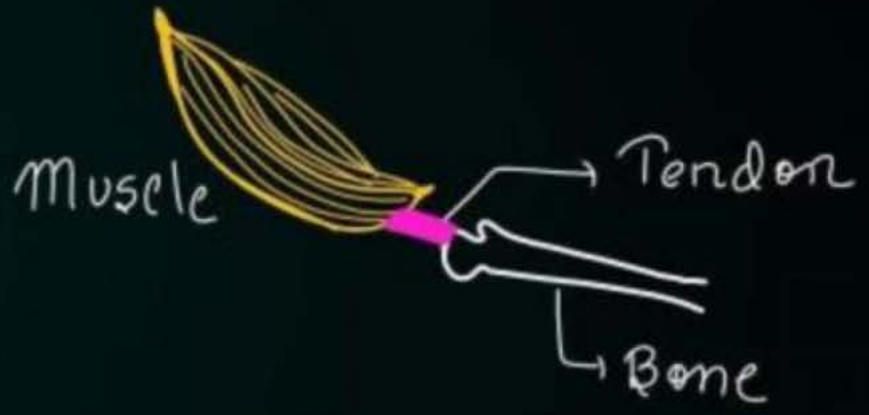
(i) Ligament

- Connects Bone to Bone



(ii) Tendons

- Connects muscles to Bone



SPECIALISED C.T:

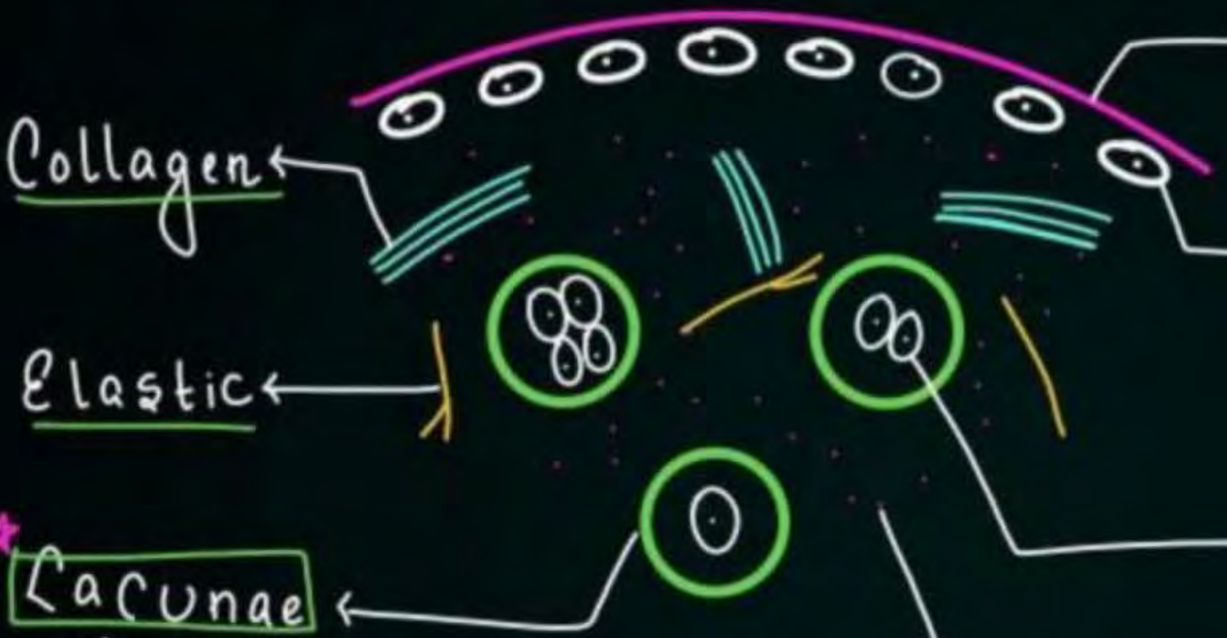
① SKELETAL C.T:

- Matrix SOLID
- The endoskeleton is made up of BONES & CARTILAGE: giving a major SUPPORT & framework of Body

ⓐ CARTILAGE:

★ Matrix is SOLID but SOFT and PLIABLE (resist compression)
(ज़ोर लगाने से नही टूटेगी)

Section of Cartilage:



Collagen

Elastic

Lacunae

Perichondrium around Cartilage
(Covering of Cartilage)

CHONDROBLAST
(immature Cartilage cells)

अतिरिक्त ध्यान

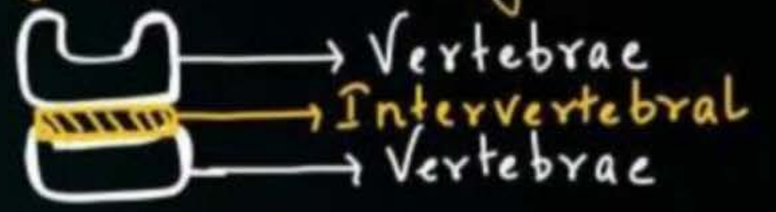
CHONDROCYTE
(mature Cartilage cell)

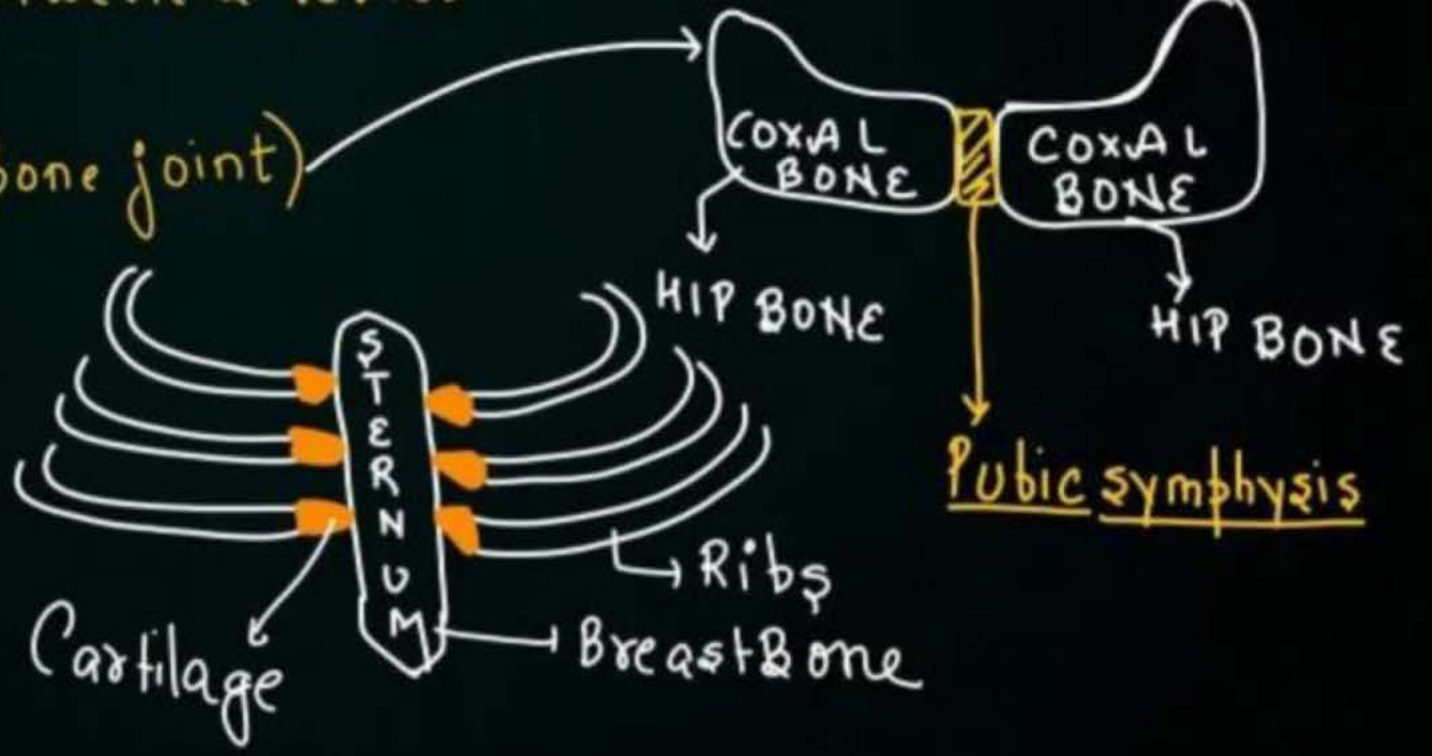
Matrix

- Fluid filled spaces within Matrix in which CHONDROCYTE are present: Can be 1 or multiple within one Lacunae

Examples of Cartilage:

- Most of the Vertebrate's Cartilage in embryonic stage is replaced by bones in Adults
- Tip of Nose
- External ear joints
- Intervertebral disc (between 2 Vertebrae)
- Pubic symphysis (hip bone joint)
- B/w Ribs & Sternum





BONE :

Matrix: SOLID, HARD, NON PLIABLE

Periosteum (Covering of Bone)

Osteoblast (immature Bone cell)

Collagen fibre

Lacunae: Fluid filled spaces in matrix

Osteocyte (mature Bone cell)

Lamellae: The matrix of Bone is present in the form of RINGS

Haversian Canal

Blood vessel, Nerves seen

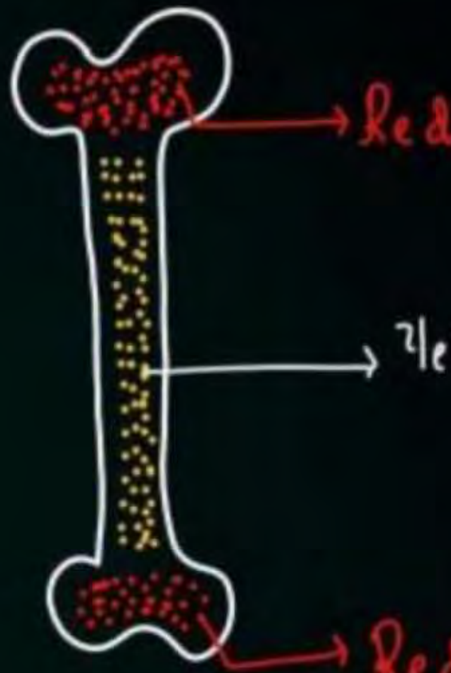
Name not in NCERT

Only 1 osteocyte within 1 Lacunae

Fig: Section of Bone

Bones

- Organic (10-30%) (Protein part)
- Inorganic Part (70-90%)
  - Bone has salts of Calcium:
    - Calcium phosphate (Max.)
    - Calcium carbonate
  - → HARDNESS of Bone.



- Responsible for Haematopoesis
  - Haemato → Blood cell
  - poesis → formation

NOTE:

- Bones are the major support framework of Body
- Bones protect softer tissue & organs.
- Some Bones (Long Bones of LIMB) are the site for Haemopoesis.

Eg of Bone:

- Limb bones (forelimb, hindlimb)
- SKULL
- Ribs
- Vertebral column.

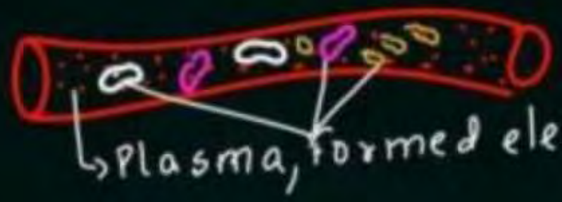
FLUID CONNECTIVE TISSUE:

- Matrix: FLUID & 'FIBRE-LESS'

Fluid Connective tissue

(i) BLOOD

- main circulating fluid



(ii) LYMPH

- It is formed by filterati
- on of Blood.

Blood

- Plasma
(Matrix: Liquid)

formed elements

Blood cells

Platelets

Red Blood cell
OR (RBC)
ERYTHROCYTES

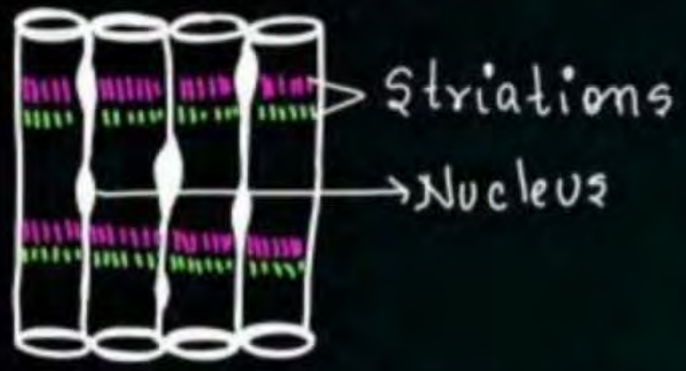
White Blood cells (WBC)
OR
LEUCOCYTES

- Blood helps in transportation of various substance like gases, hormones etc.

MUSCULAR TISSUE : (Mesodermal)

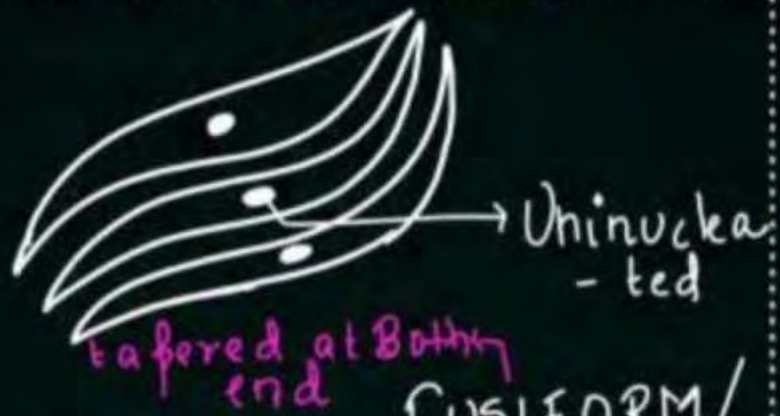
1. Excitable : upon giving stimulus, it shows Response
2. Extensible : The ability to lengthen (pull)
3. Elasticity : The ability to return to its orginal state
4. Contractile : The ability to shorten.

SKELETAL MUSCLE



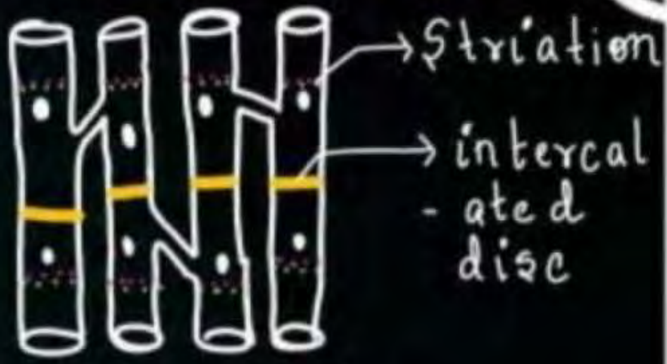
1. Muscle fibre: CYLINDRICAL
2. " " : UNBRANCHED
3. Nucleus: Multinucleated, perepheral position
4. Prominant Dark and Light Bands are seen: hence STRIATED MUSCLE (Striped)

SMOOTH MUSCLE



1. Muscle fibre: FUSIFORM/ SPINDLE
2. " " : UNBRANCHED
3. Nucleus: Centre, Uninucleated
4. No STRIATIONS

CARDIAC MUSCLE



1. Muscle fibre: CYLINDRICAL
2. BRANCHED muscle fibre
3. Nucleus: Uninucleated & Centre
4. Faint (हल्की) Striations : STRIATED MUSCLE

SKELETAL MUSCLE	SMOOTH MUSCLE	CARDIAC MUSCLE
5. Voluntary in Nature. We can conciously think and contract them.	5. Involuntary	5. Involuntary
6. High Blood Supply	6. Less Blood supply	6. Highest Blood supply.
7. Fast Contraction	7. Slow contraction	7. fastest contraction.
8. Easily fatigue (थकना)	8. Slow fatigue	8. Never fatigue (abundant Mitochondria)
9. No intercalated disc	9. No intercalated disc	9. Intercalated disc present.
eg: Biceps, tricept, facial muscle etc	eg: Blood vessel, Stomach, intestine, iris muscle (eye) etc	eg: Heart

Note: 1. Intercalated Disc: Combination of 'GAP + ADHERING JUNCTION

'Communication' Cementing

2. Smooth muscles may also have 'GAP JUNCTION'

3. Muscle are made up of Parallely arranged Muscle fibre (MUSCLE CELL), which further has unit called Myofibrils.

NEURAL TISSUE: (Nervous tissue)

(Ectodermal)

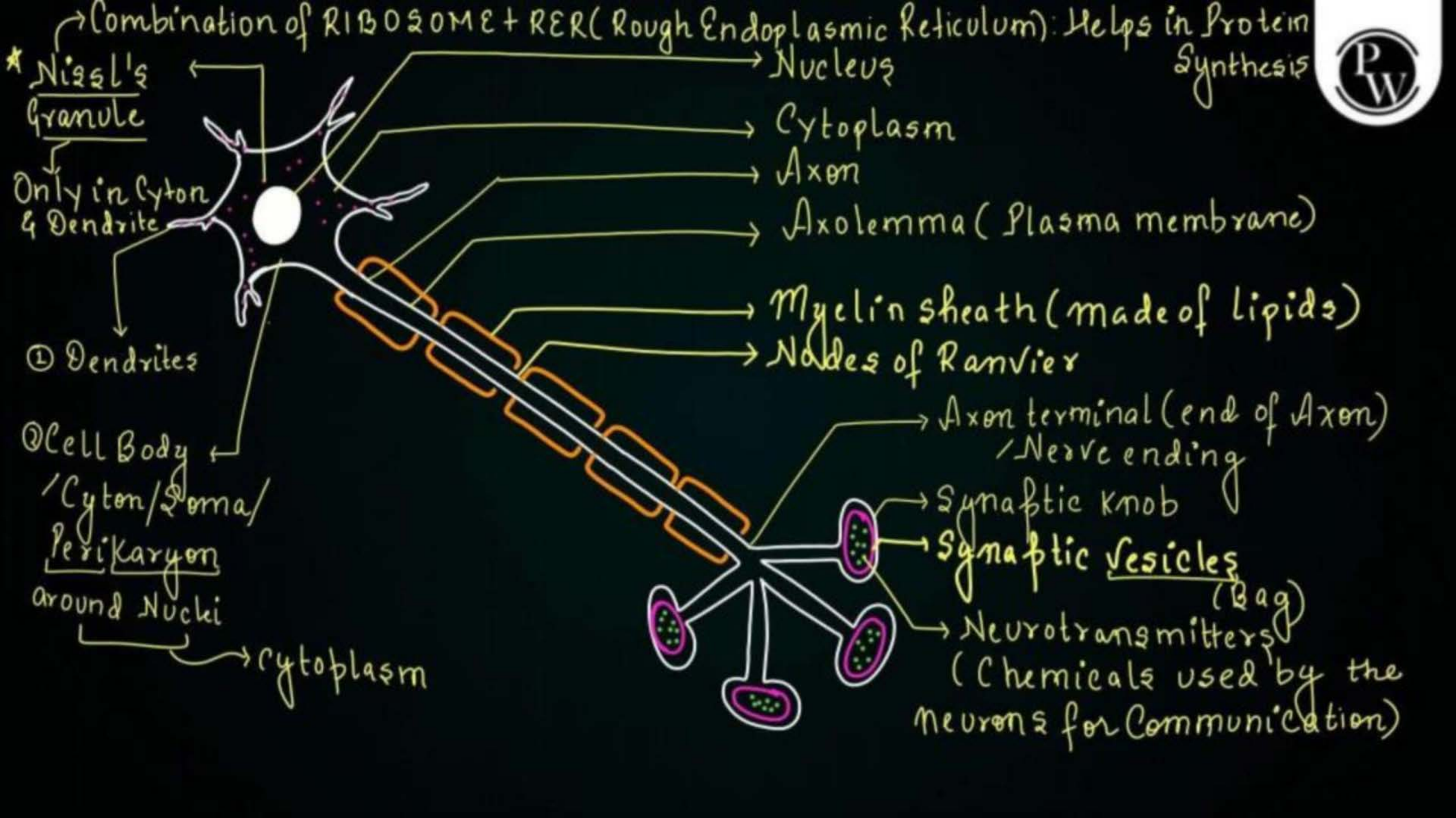
Neural tissue

Neuron

- Structural & functional unit of Neural tissue.
- EXCITABLE Cells
- Conduction seen
  - ↳ (the flow of current)

Neuroglial cell

- They make up more than 50% Volume of Neural tissue
- Non Excitable
- No Conduction
- They help in Support & Packaging of Neuron. (forms 'MYELIN')
- eg: Schwann cell, Oligodendrocyte


→Combination of RIBOSOME + RER (Rough Endoplasmic Reticulum): Helps in Protein Synthesis
* Nissl's Granule
Only in Cyton & Dendrite
Nucleus
Cytoplasm
Axon
Axolemma (Plasma membrane)
Myelin sheath (made of lipids)
Nodes of Ranvier
① Dendrites
② Cell Body /Cyton/Soma/ Perikaryon
around Nuclei
→ cytoplasm
Axon terminal (end of Axon) /Nerve ending
Synaptic knob
Synaptic Vesicles (Bag)
Neurotransmitters (Chemicals used by the neurons for Communication)

Note:

- Dendrites receives information ⟶ Pass to Cyton ⟶ Pass to Axon
- Myelin is a lipid enriched layer acting as an insulator but is DISCONTINUOUS & the gaps b/w them is K/a NODES of RANVIER

THANK YOU