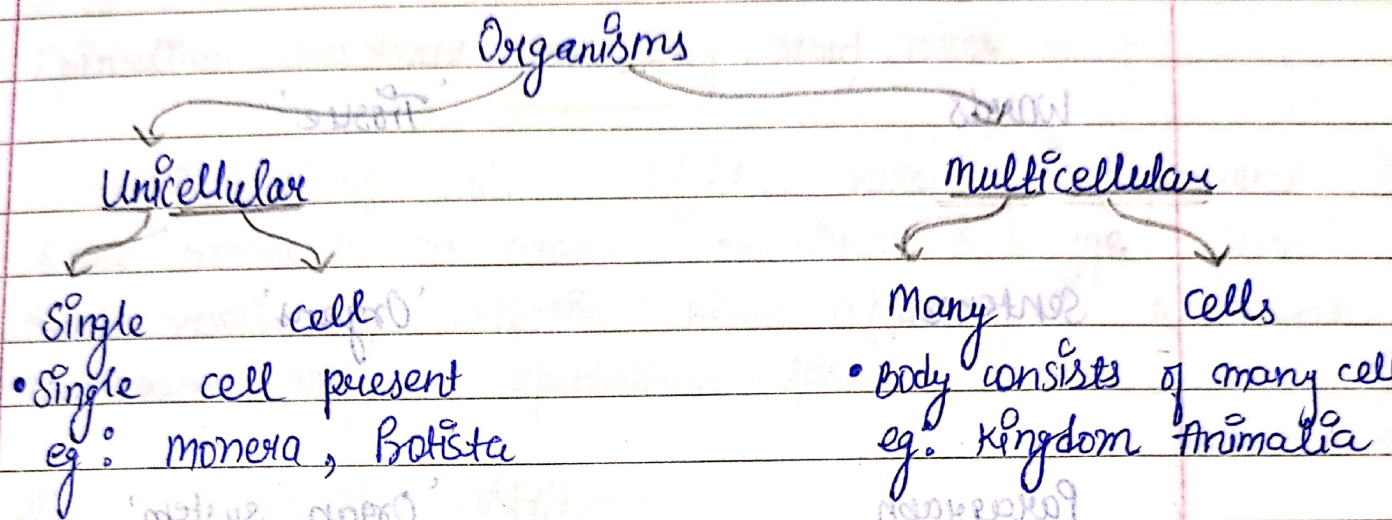


Structural Organisation in Animals

- Animal tissues
- Frog
- Cockroach

Animal Tissues :



Note: Due to multicellularity, division of labour occurs.
[काम आपस में divide हो जाता है]

Animal :

P → multicellular

R

O → Heterotrophs : Animals are dependent upon others for food

P

E

R

T

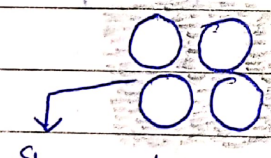
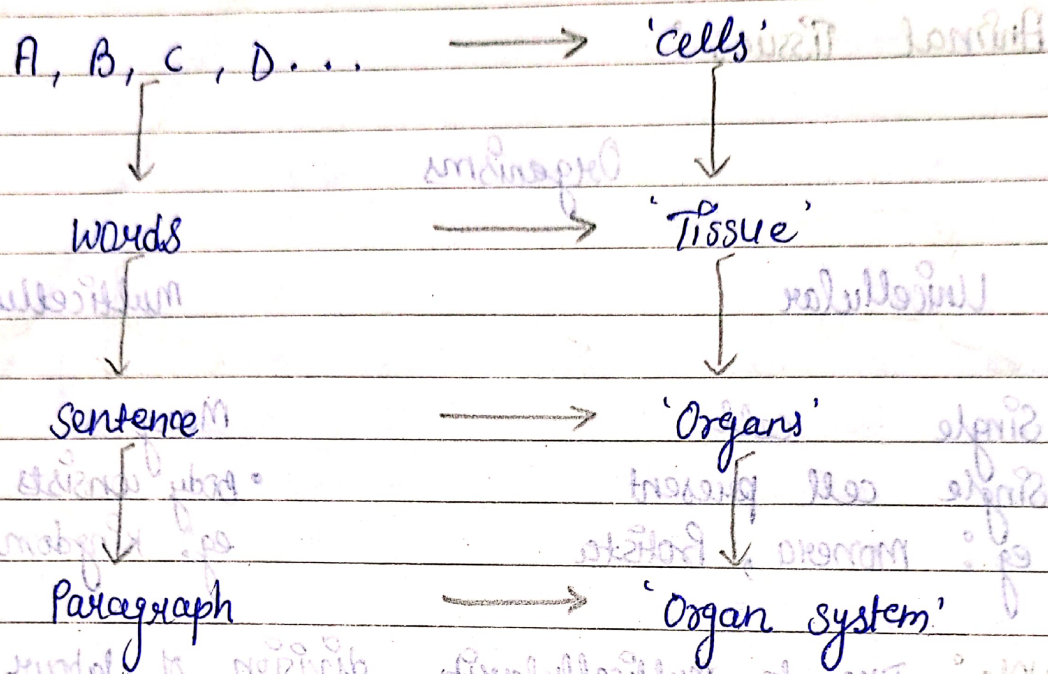
Y

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

[Ingestive tissue & transport : digestive system (i)]

muscular tissue & movement : digestive system (ii)

Tissues : Group of similar cells having some inter-cellular space b/w them [filled with inter-cellular substance or matrix] and performing a specific function



Space b/w cells : Intercellular space

outside cell
Extracellular space
OR

Filled with matrix / intercellular substance
↳ made of protein + carbohydrate

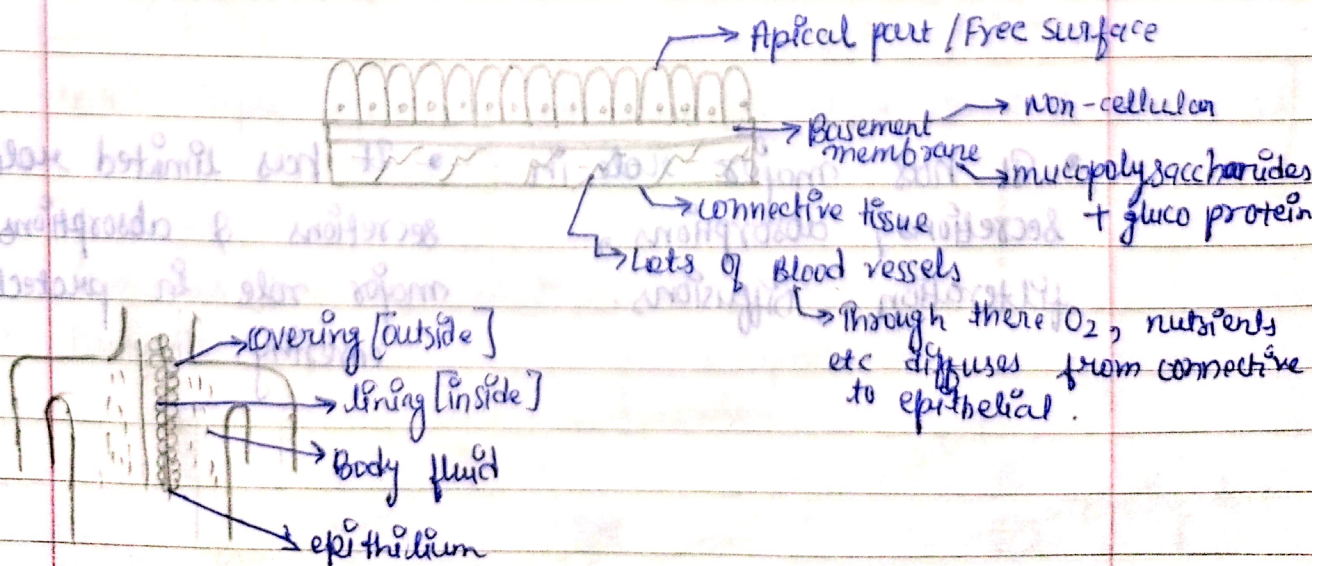
Tissues are broadly classified in types :

- (i) Epithelial Tissue : ^(outwards) Protection, ^(inwards) covering & lining
- (ii) connective Tissue : support & linkage [contact]
- (iii) muscular Tissue : locomotion & movement
- (iv) nervous Tissue : control & coordination

(1) EPITHELIUM / EPITHELIAL / EPITHELIA TISSUE :

upon to rest

- It always rest upon some other tissue
- It is AVASCULAR
absence Blood vessels
- Epithelium does not have any Blood vessels
- Connective tissue which is highly vascular is present below basement membrane. Nutrients & oxygen from Blood vessels of connective tissue diffuses via basement membrane to the epithelium tissue.
- High regeneration ability.
again formed.
- Cells are 'compactly' packed with very less intercellular space which means less matrix.
- The apical surface of cells of epithelium either faces external environment or body fluid.



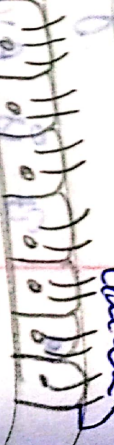
Apical surface of cell may have modification

microvilli / brush bordered epithelium



• When the plasma membrane of cells gets folded to form finger projections called microvilli to increase the surface area for secretions & absorptions.
eg: small intestine

Ciliated epithelium



• usually found in hollow organs.
• Cilia are hair like projections to move the particle in a specific direction.
eg: Fallopian tube

Types of epithelium

[Simple Epithelium]

• made up of single layer of cells.



[Compound Epithelium]

• made up of multi layer cells.



• It has major role in secretions, absorptions, filtration, diffusion.

• It has limited role in secretions & absorptions but major role in protection & covering.

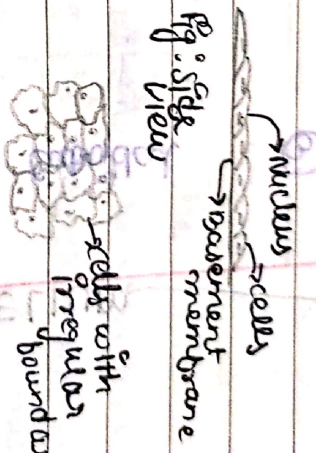
On the basis of structural modification of the cells:

Simple epithelium is classified into:

- (i) Squamous
- (ii) cuboidal
- (iii) columnar

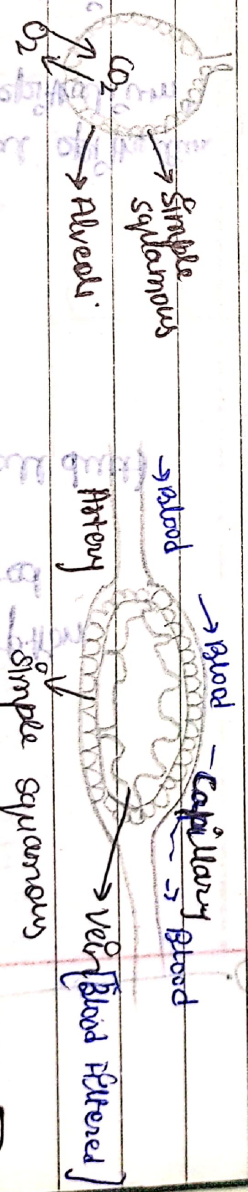
(I) SIMPLE EPITHELIAL:

- (a) simple squamous epithelium
 - cells are flat
 - nucleus flat and located in centre
 - cells are so flat that appears like 'flats' on the floor, hence it is also known as 'pavement epithelium'
 - cells are with 'IRREGULAR BOUNDARIES'



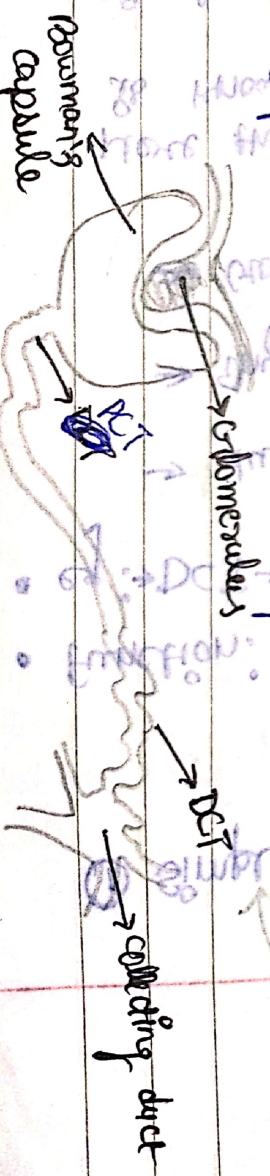
FUNCTION: It plays a major role in 'filtration & diffusion' eg: Alveoli in lungs. [diffusion of ^{gases} ~~alveoli~~]

- blood vessels (i) ARTERY (ii) VEINS (iii) CAPILLARY



NOTE: simple squamous epithelium of blood vessel is known as **ENDOTHELIUM**

- Malpighian (blood capillaries) present in kidney
- Bowman's capsule [nephron]



CUBOIDAL EPITHELIUM

① Simple Cuboidal



- Function: Secretion & Absorption
- eg: → DCT → Distal convoluted tubule
- duct of gland (small duct)
- Thyroid follicles
- Gonads → Testis & Ovary

Here the simple cuboidal epithelium is known as 'germinal epithelium'

Simple cuboidal is present in small duct of glands.

② * Brush-Bordered Cuboidal



- Function: Secretion & absorption
- eg: PCT → Proximal convoluted tubule of Nephron

③ Ciliated epithelium



- Function: movement
- eg: * Small bronchioles

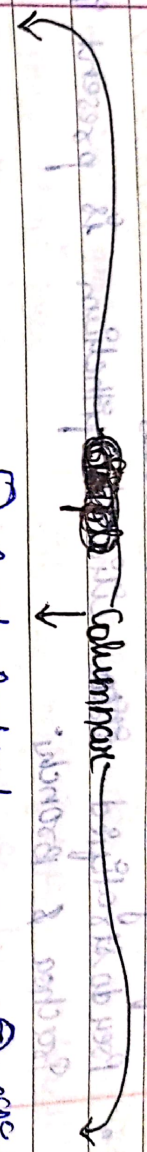
④ Simple Cuboidal epithelium

- Cells are cubical
- Nuclei are round & present in centre

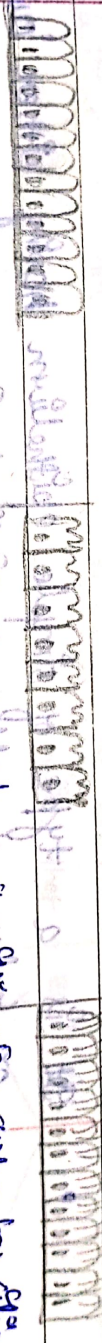


② ~~Simple~~ columnar epithelium

- Tall / elongated, slender cells
- Nucleus is oval & located at base



- ① Simple columnar epithelium
- ② Brush-bordered columnar
- ③ Ciliated columnar



- Free surface has no microvilli
- Function: secretion & absorption
- Free surface has microvilli
- Function: secretion & absorption

absorption

absorption

- eg: → GI tract
- ↳ Gastrointestinal tract

→ stomach

- eg: → GI tract
- ↳ small intestine

→ Goblet cells
→ produce mucus

- eg: → Fallopian tube
- ↳ large cilia

GI is the tract for passage of the digestive system that leads from mouth to the anus

brush bordered

also has microvilli

also has cilia

also has cilia

also has cilia

NOTE: Pseudostratified simple epithelium
 false multilayer

- eg: trachea, bronchiole, bronchus, bronchiole.
- It is single layered but appears multilayered due to unequal sized columnar cells.
- Pseudostratified ciliated epithelium is present in trachea & bronchi.

① Glands
 exocrine glandular epithelium;

It is a type of simple epithelium having either 'cuboidal' or 'columnar' cells specialised for secretion as it forms 'glands'.

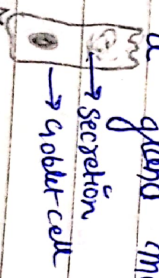
Islands: Are the structures or organs that makes

secretions: food, etc.

① Classification of glandular epithelium: (based on the basis of no. of cells)

① Unicellular gland

- Single isolated cell act as a gland makes the secretion



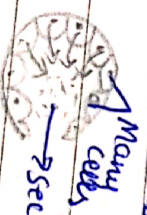
eg: Goblet cell

↳ secrete mucus

⇒ goblet cells are present in GI tract / alimentary canal

② Multicellular gland

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



eg: Salivary gland, sweat gland etc.

②

On the basis of Mode of
Releasing their secretion



① Endocrine

- Ductless glands
- These gland pour their secretion directly into the blood stream without any duct.

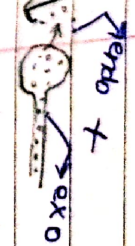
eg: Hypothalamus, pituitary, thyroid etc.



② Exocrine

- Pour their secretions with the help of duct
- mucus, earwax oil, digestive enzymes, milk, saliva, sweat etc, these are the secretion that gland pour with the help of duct.

eg: Salivary gland, sweat gland, oil / sebaceous gland & mammary gland etc.



③ Heterocrine / Mixed / Composite

- Islands that has both endocrine as well as exocrine part.

eg: Pancreas

```

graph TD
    A[Pancreas] --> B[Endocrine]
    A --> C[Exocrine]
    B --> D[Islets of Langerhans]
    D --> E[HORMONE]
    C --> F[Cell & acini]
    F --> G[Pancreatic juice]
    
```

①

Compound Epithelium :

- Multilayered
- Limited ROLE in secretion & absorption
- Major Role in : Protection



Barrier - Metastasis

COMPOUND EPITHELIUM

Transitional epithelium

• It is stretchable

• eg: Urinary Bladder

Stratified epithelium

• It is non stretchable

• This is present in various dry & moist surfaces

↓
DRY

↓
MOIST

• Here 'keratin' protein is deposited on epithelium to make it dry & impermeable for water.

eg: Skin

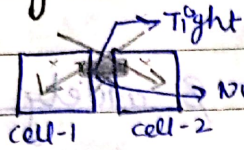
• No keratin
eg: Buccal cavity, Pharynx, oesophagus, vagina, duct of gland [large duct]
↓
Salivary gland, Pancreatic duct

* **CELL junctions**: It provide both structural & functional links b/w its individual cells.

Three types.

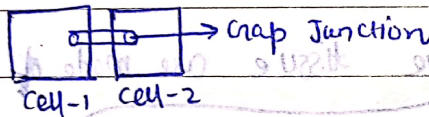
- Tight junctions
- Adhering junctions
- Gap junctions

* Tight Junctions



These junctions prevent leakage across the cells.

* Gap Junctions



Junctions which helps in communicating b/w cells by connecting the cytoplasm of cells & by transfer of ions, small molecules & some times even bigger molecules.

It is also known as 'communicating junction'.

* Adhering junctions



Adhering junction helps in cementing b/w cells.

NOTE: The cell junctions are present into epithelium as well as in other tissue but more in epithelium.

(2) CONNECTIVE TISSUE

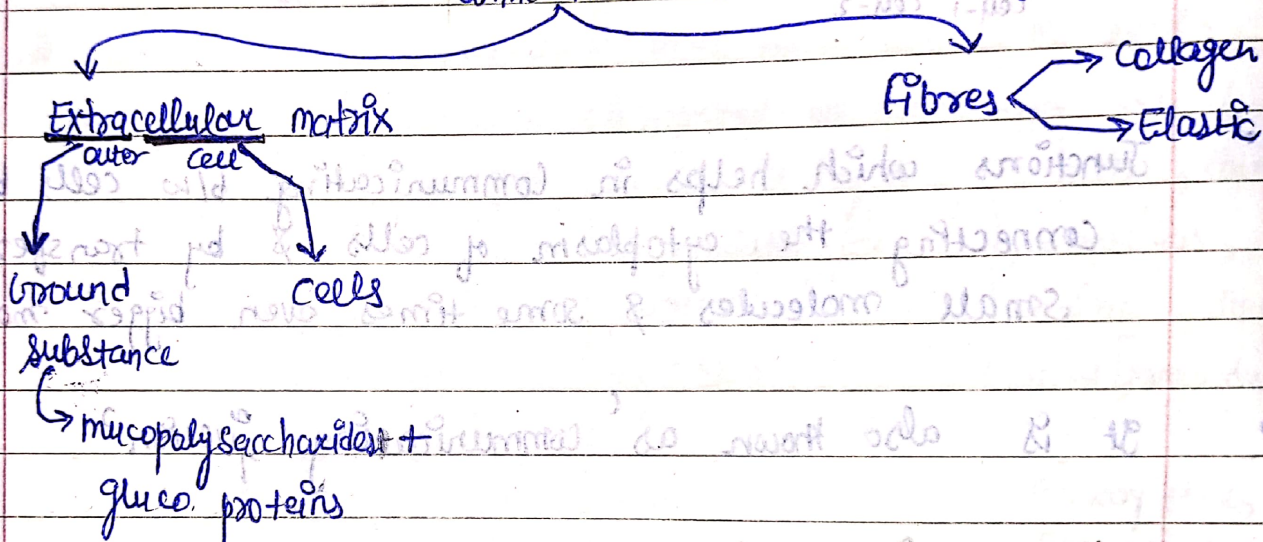
•

Connective tissues are most abundant & widely distributed in the body of complex animals.

•

They are named connective tissues because of their special function of linking & supporting other tissues/organs of the body.

Connective tissue are made of:



Classification of Connective Tissue

①

Loose C.T

cells & fibres are loosely aggregated in semifluid matrix.
matrix $\Rightarrow \uparrow \uparrow \uparrow$

$\rightarrow$ Areolar C.T

$\rightarrow$ Adipose C.T

② Dense C.T

cells & fibres are compactly packed in the matrix.
matrix $\Rightarrow \downarrow \downarrow$

Dense Regular C.T

Dense Irregular C.T

③ Specialised C.T

Special function

Skeletal C.T

cartilage

Bone

Fluid C.T

Blood

Lymph

* Loose connective tissue

① Areolar C.T
↳ space

* cells

① macrophage: Phagocytosis

↳ engulf the ~~foreign~~ foreign particle & destroy

② Eosinophil

③ Neutrophil

④ Plasma B-cell: Produce Antibody

⑤ Fibroblast cell: secretes Fibre

⑥ * mast cell: secretes

Histamine → Vasodilator

Serotonin → Vasoconstrictor

Heparin [natural Anticoagulant] → opposite clot

Dilate Blood vessels

constrict Blood vessels

medicines that helps prevent blood clots

FIBRE

① Collagen Fibre

- white fibre
- Always exist in bundles
- Unbranched
- Provide strength

② Elastic Fibre

- Yellow Fibres
- Individual / Single
- Branched
- Elasticity

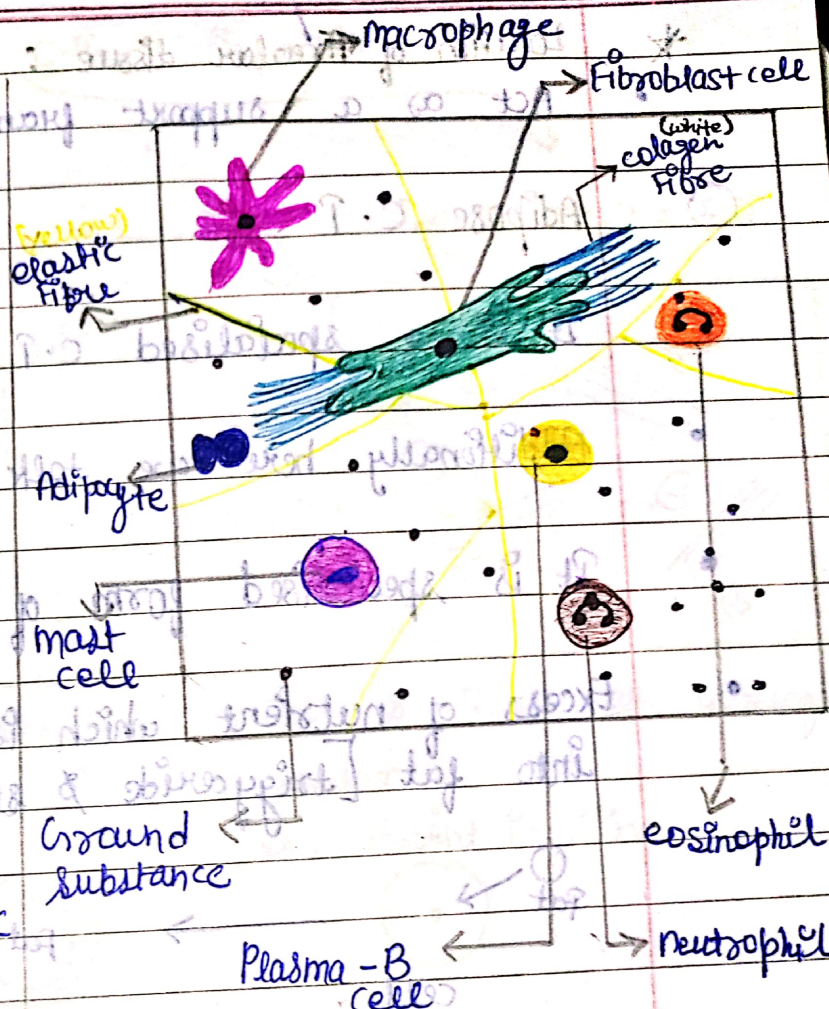


Fig: Areolar C.T

connects the SKIN with underlying muscles

* Location of Areolar tissue : Beneath the skin
Act as a support framework to epithelium

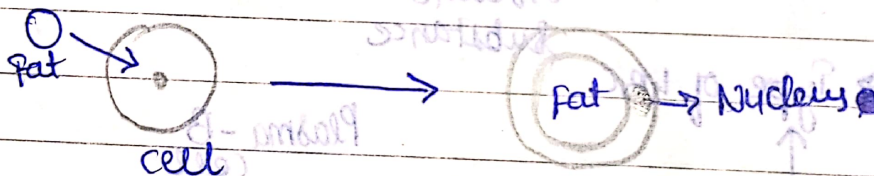
② Adipose C.T

It is a specialised C.T [as per NCERT summary]

Additionally here we talk about ADIPOCYTES

It is specialised form of Areolar.

Excess of nutrient which is not utilised gets converted into fat [triglyceride & stored in cell : ADIPOCYTE]



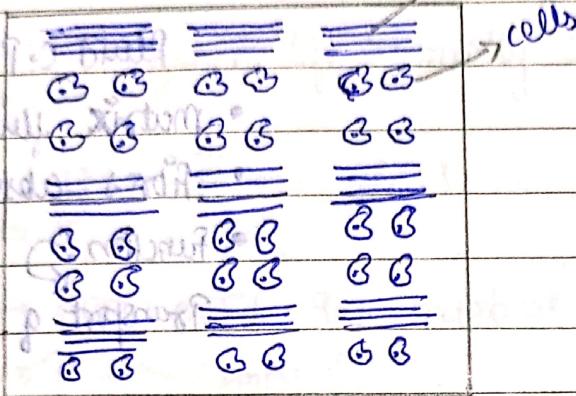
Location : Beneath the skin, around visceral organs

soft organs
lungs

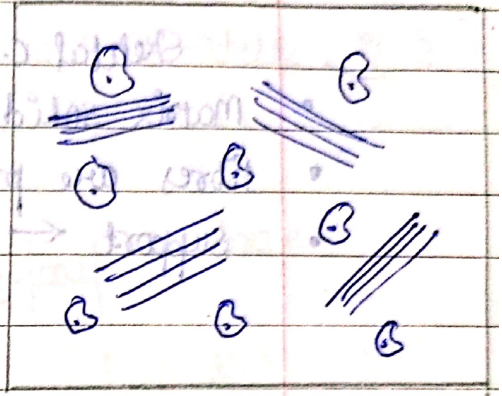
*

Dense C.T

Dense Regular C.T



Dense Irregular C.T



- Cells & Fibres are arranged parallelly

- Cells & Fibres are arranged randomly
- eg: Present in skin

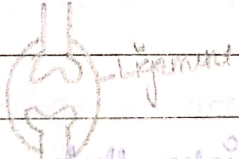
Dense Regular

Tendons

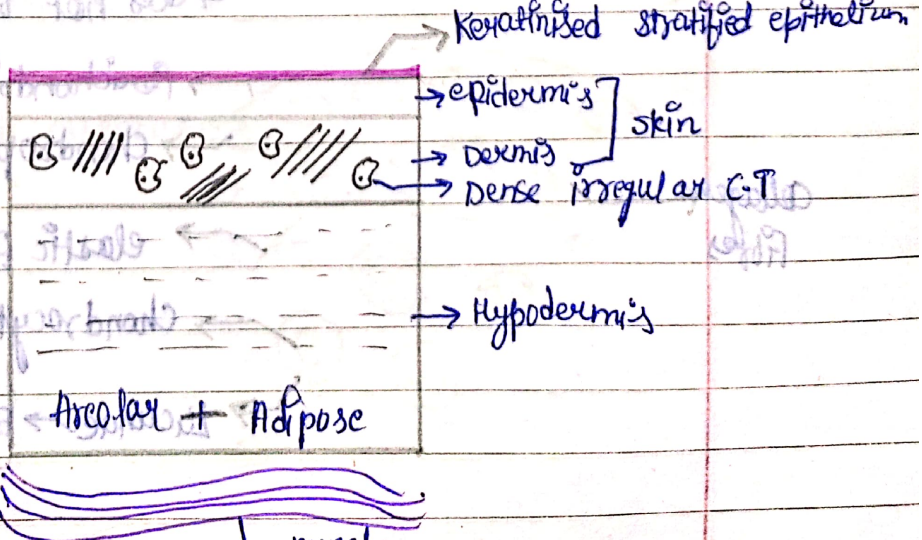
- Connects muscles to bone

Ligaments

- Connect bone to bone



NOTE:



*

Specialised Connective Tissue

Specialised C.T

Skeletal C.T

- Matrix solid
- Fibres are present
- Support ← Function

Fluid C.T

- matrix fluid
- Fibres absent

- Function: →

Transport of gases, nutrients

Blood

Lymph

Plasma

Blood Platelets

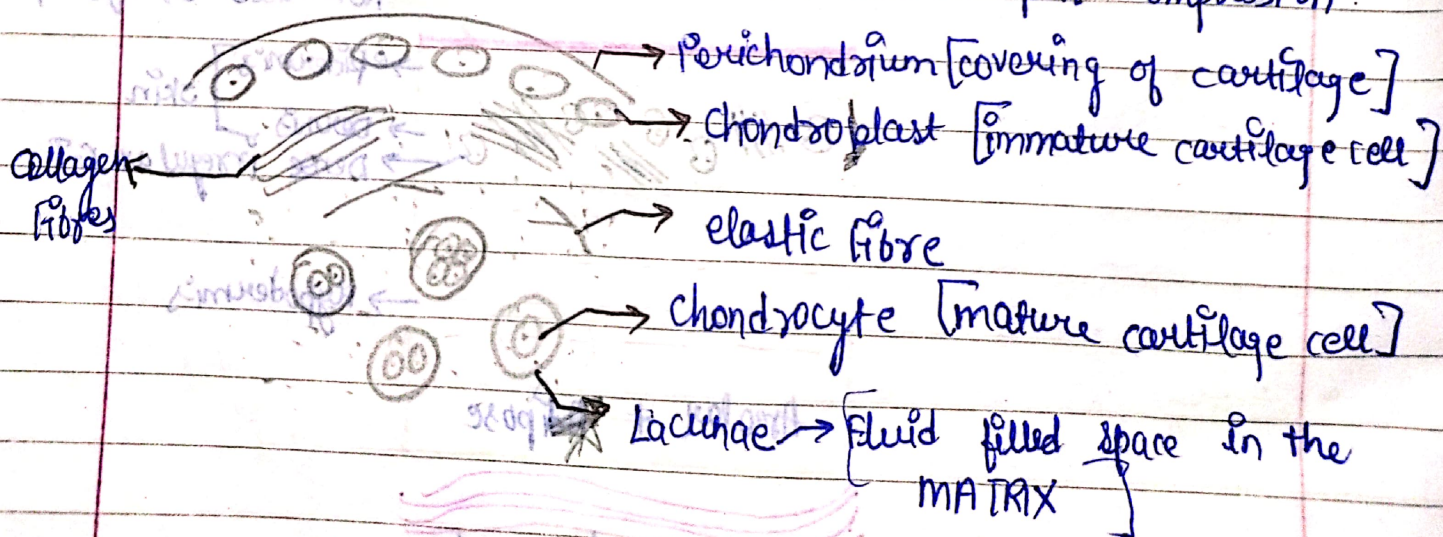
Blood cells

RBC

WBC

Skeletal C.T

- **CARTILAGE**: The intercellular material of cartilage is solid, soft and pliable and resists compression.
↳ does not break upon compression.



- In one lacunae, one or multiple chondrocyte can be present.

- Cartilage matrix $\begin{cases} \rightarrow \text{Chondroitin sulfate} \\ \rightarrow \text{Hyaluronic acid} \end{cases}$

- eg: Embryonic life: mostly cartilage $\rightarrow$ Later in adults, it is replaced by bones.

$\rightarrow$ External ear joints

$\rightarrow$ Lips of nose

$\rightarrow$ ~~Intervertebral~~ Intervertebral disc

$\rightarrow$ Pubic symphysis

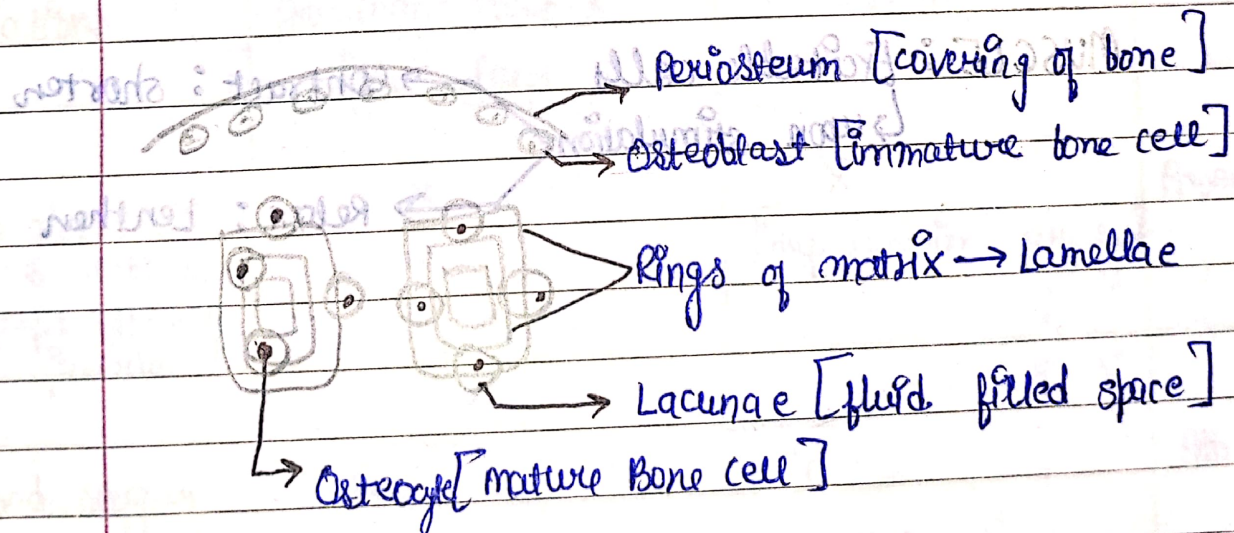
$\rightarrow$ Costal cartilage of Ribs

$\rightarrow$ Tracheal rings

$\rightarrow$ vertebrae

$\rightarrow$ costal

- BONES: matrix is solid, hard and non-pliable with in calci salts and collagen fibres which give bone its strength



- 1 lacunae $\rightarrow$ 1 osteocyte

- eg: Limb bones, Ribs

Vertebrae

Cranium

Bones

Organic part [10-30%] Inorganic part [70-90%]

Calcium salts
 → make bones hard
 CaCO_3 , Cal. Phosphate

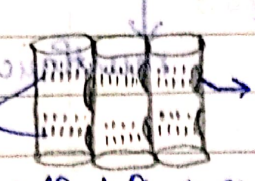
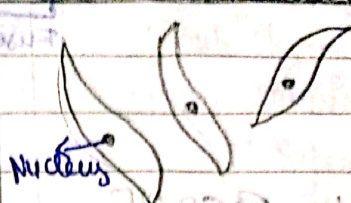
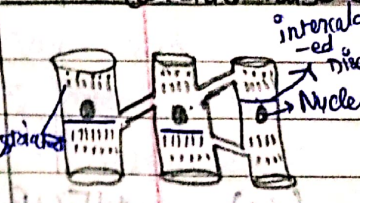
(3) MUSCULAR TISSUE

- Each muscle is made of many long, cylindrical fibres arranged in parallel arrays.
- These fibres are composed of numerous fine fibrils, called myofibrils.

MUSCLE: Excitable cells
 → upon stimulation

Contract: shorten
 Relax: Lengthen

TYPE OF MUSCLE

Characteristic	Skeletal muscle	Smooth muscle	Cardiac muscle
Muscle fibre	 Nucleus cylindrical muscle fibres striations / striped	 Nucleus Fusiform, spindle muscle fibre [tapered at both ends]	 intercalated disc Nucleus Cylindrical muscle fibres
Nucleus	Multinucleated, Peripheral	Uninucleated, central	Uninucleated, central
Branching	Unbranched	Unbranched	Branched
Nature	Voluntary	Involuntary	Involuntary
Striations	Prominent dark & light band	No striations	Faint striation (etch)
Intercalated disc ↳ it is combination of gap & adhering junction	X	X [Gap junction present]	Present
Blood supply	Rich	Low	Abundant
Contractions	Fast	slow	Fastest
Fatigue	Easily Fatigue	Slowly Fatigue	Never Fatigue
Examples	Facial muscles, Limb muscles	iris muscle, Ciliary muscle, Blood vessel, GI tract	Heart

NOTE: SKELETAL: SYNCYTIUM
Fused cell

multinucleated

(4) NEURAL TISSUE

Neural tissue

Neuron

Neuroglial cell

- Structural & functional unit of neural tissue
- Longest cell
- Excitable & conduction.

- It makes up more than 50% of neural tissue
- It support & packaging of neuron

• Schwann cell, Oligodendrocyte
eg:

secretes myelin sheath

