

UNIT-1★ Introduction to human body :-• Definition :-

* Anatomy: The study of internal and external structure and the physical relationship between body parts.

* Physiology: The study of how living organisms perform their vital functions.

• Scope :-

* Human Anatomy and Physiology are the branches of biology that concerns with forms (structures) and functions of human body.

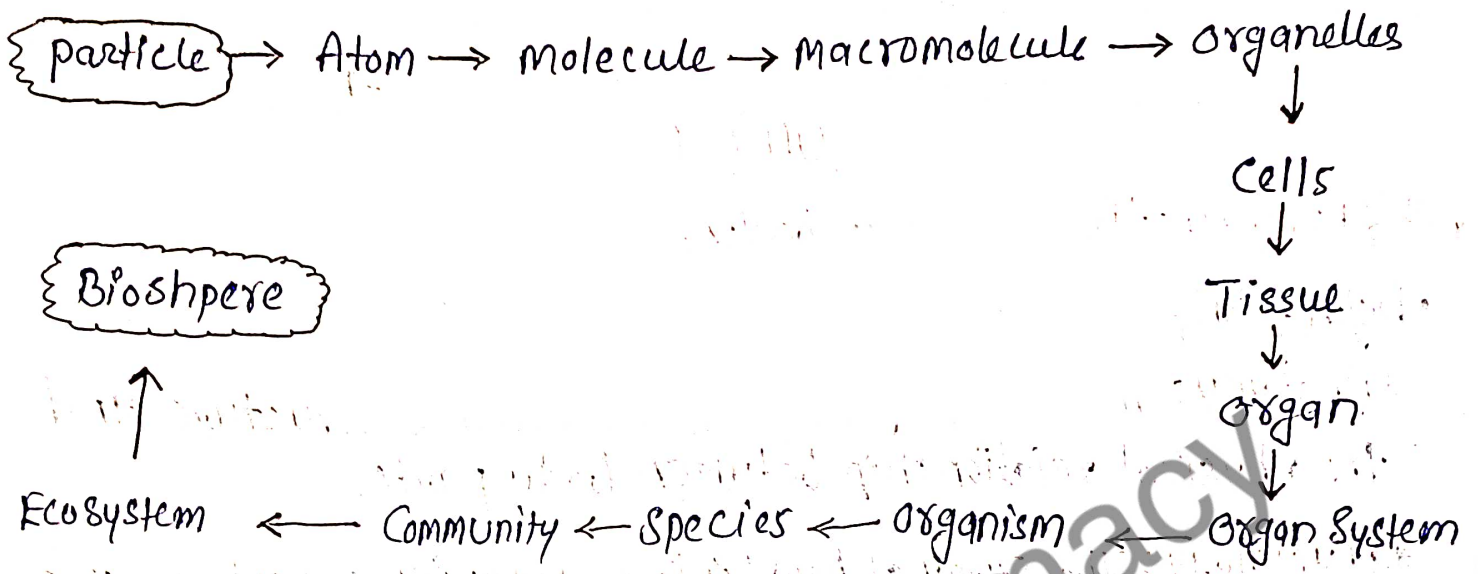
* Anatomy - Study of structure of whole body and individual parts (organ) and their correlation with each other.

* Branch of biomedical science dealing with normal structure, shape, size and location of various parts of the body.

* The study of the structure of the body and the physical relationships involved between the body system.

* Anatomy derived from Greek words: Ana means 'up' and tomy means 'cutting', and hence anatomy deals with study of structural components of body i.e. organ by mean. of surgical dissection.

★ Level of structural organization and body system:



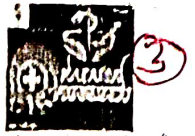
★ Body System :-

There are 10 organ system in the Human Body.

- Circulatory
- Respiratory
- Skeletal
- Muscular
- Digestive
- Excretory
- Reproductive
- Integumentary
- Nervous
- Endocrine

★ Basic Life Process:-

- **M**ovement : changing place or position
- **R**espiration: generating energy
- **S**ensitivity: being aware of the surrounding
- **G**rowth : an increase in size or number
- **R**eproduction: creating new individuals
- **E**xcretion : removal of waste products
- **N**utrition : obtaining food to build a body.
- **R**egulation : maintain homeostatisis



★ Homeostasis :-

- Literally means "Same state".
- Refers to the process of keeping the internal body environment in a steady state, when the external environment changed.
- Ability of organism to maintain a relative stable internal environment, involving continuous monitoring and regulating multiple parameters and coordinating the responses to minimize the ~~distribution~~ disturbance to organism.

Example :-

Would be the maintenance of body temperature and level of glucose in the ~~body~~ blood.

- Many variables are maintained by Homeostasis.

- * Temperature
- * Blood pH
- * Blood sugar
- * Water level
- * Blood pressure

or

How does the body maintain body temperature, blood calcium level, blood glucose level, or the right amount of water, blood pressure

* Basic Anatomical terminology :-

(4)

* Anatomical positions :-

1. Ventral (Front of the body)
2. Dorsal (Back side of body)
3. Lateral (Side of body)
4. Ventral (Anterior)
5. Dorsal (Posterior)

* Other positions of body :-

1. Median (In the mid 50% - 50%)
2. Medial (Side nearest to mid line)
3. Superior (Above any point refer to $\frac{\uparrow}{\downarrow}$)
4. Inferior (Below any point refer to $\frac{\uparrow}{\downarrow}$)
5. Palmar (Belonging to palm of Hand)
6. Plantar (Sole of foot)
7. Proximal (Near)
8. Distal (Far)

* Prefix related to organ, size, location :-

- | | |
|--------------------------------|-------------------------------|
| 1. Hepar / Hepatic (Liver) | 8. Myo (Muscles) |
| 2. Cardiac (Heart) | 9. Gastric (Stomach) |
| 3. Alveoli (Lungs) | 10. Neuro (Nervous) |
| 4. Bronchi (Lungs) | 11. Osteo (Bone) |
| 5. Angio (Vessels/artery) | 12. Pulmo (Lungs) |
| 6. Trachea (air pipe of lungs) | 13. Metro (Uterus) |
| 7. Bucca (Cheeks) | 14. Pseudo (false) (not Real) |

* Prefix related to location & positions :-

- | | |
|------------------|-------------------|
| 1. Infra (below) | 4. Intra (within) |
| 2. Supra (above) | 5. Post (after) |
| 3. Inter (btw) | 6. Pre (before) |
| | 7. Sub (under) |

* Other.

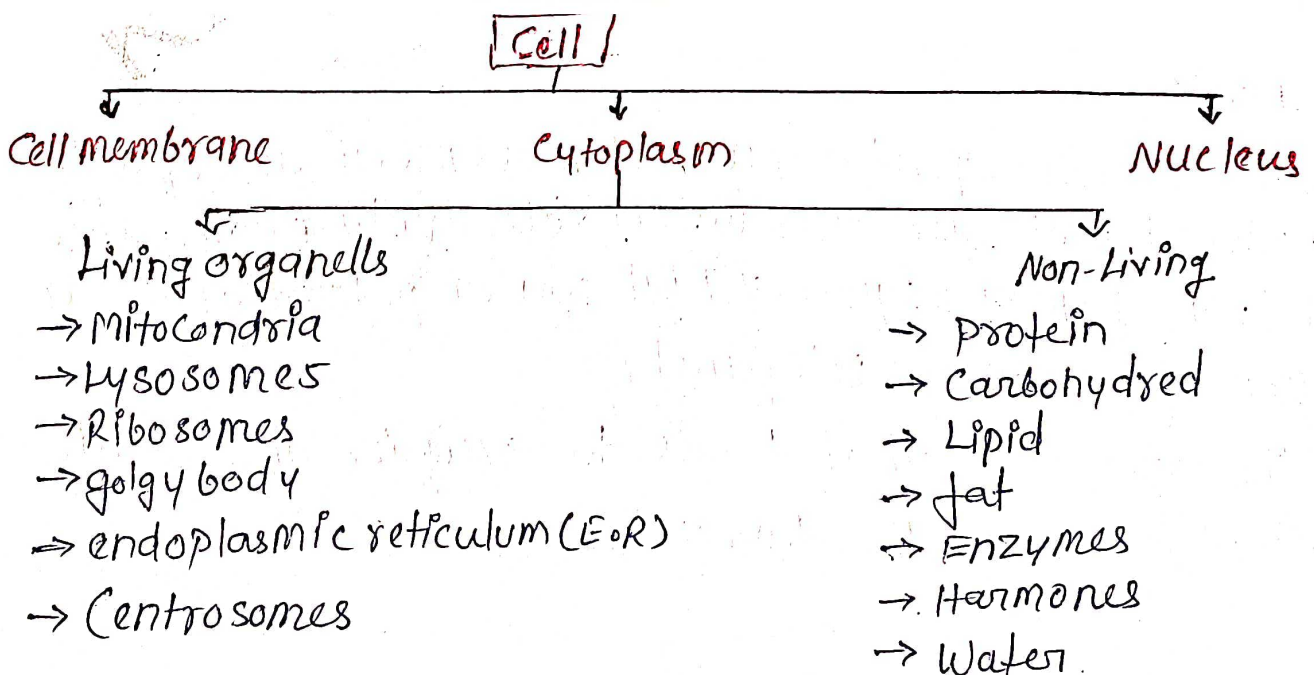
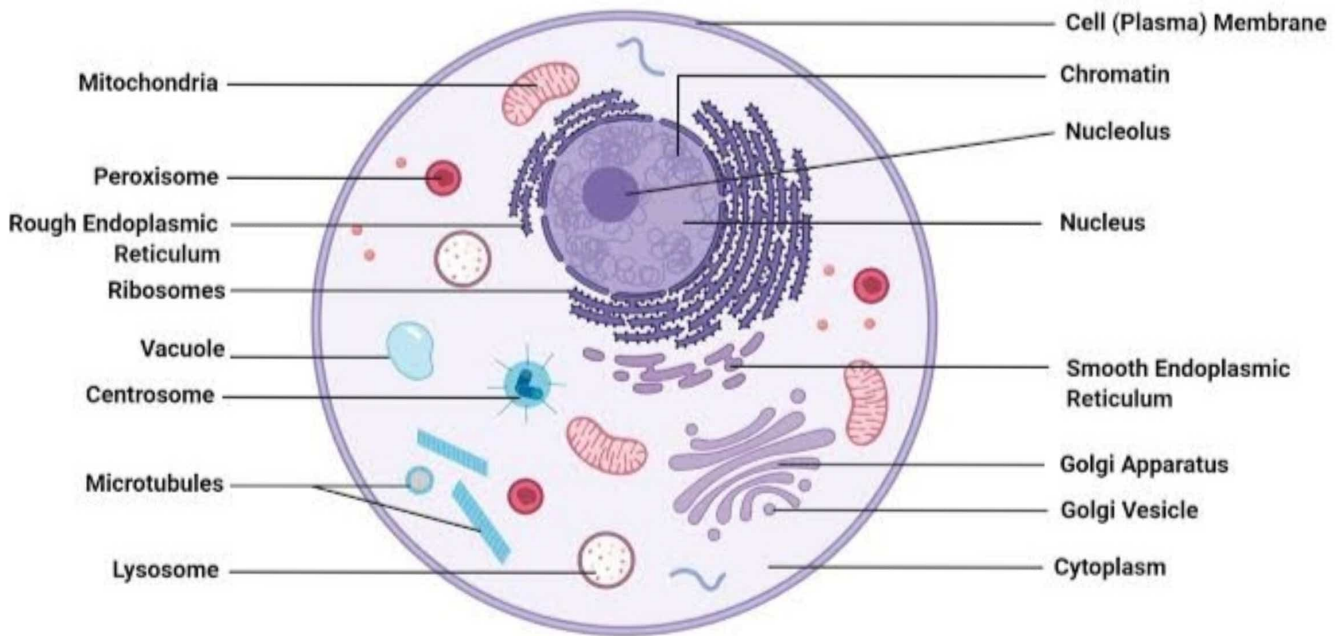
1. Iso (same)
2. Hypo (less)
3. Hyper (high/much)

Human anatomy & physiology

★ Cellular level of organization :-

★ Structure & function of cell :-

- A cell is the smallest structure and functional unit of the living body.
- Discovered by Robert Hooke (cell theory)
- All living organism made by cell and its components.



★ Transport across cell membrane :-

⑥

Transport are four type :-

- ① Active transport
- ② passive transport
- ③ facilitated diffusion
- ④ osmosis

① Active transport :-

Active transport is the movement of molecules across a cell membrane from a region of lower concentration to a region of higher conc. against the concentration gradient.

Note :- It required cellular energy

② Passive transport :-

It is a movement of ion and other atomic or molecular substance across cell membranes without need of energy input.

③ Facilitated diffusion :-

(also known as facilitated transport or passive-mediated transport) is the process of spontaneous passive transport of molecules or ions across a biological membrane.

④ Osmosis :-

Osmosis is the spontaneous net movement or diffusion of solvent molecules through a selectively permeable membrane from a region of high water potential to a region of low water potential,

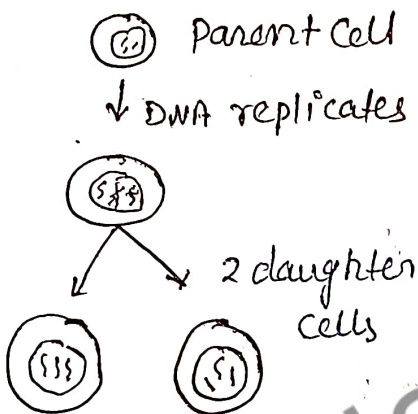
in the direction that tends to equalize the solute concentrations on the two sides.

Cell division

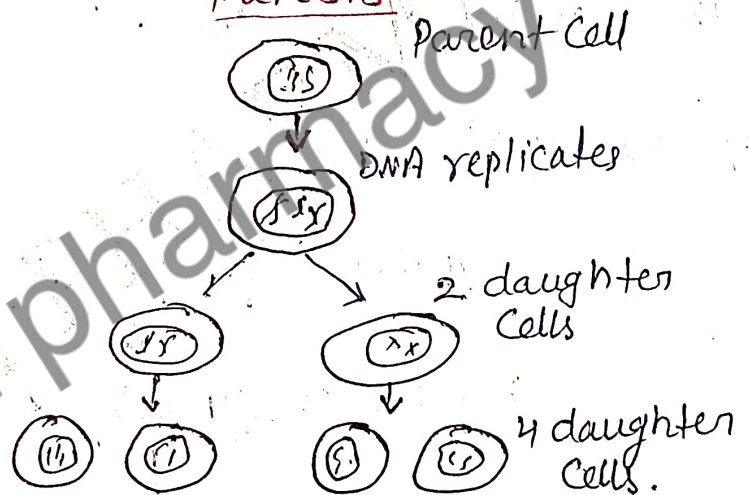
Cell division is the process by which a parent cell divides into two or more daughter cells. Cell division usually occurs as part of a larger cell cycle.

→ There are two types of cell division: ① mitosis
② meiosis

Mitosis



meiosis



General principles of cell communication

→ Cell-to-cell communication is absolutely essential for multicellular organisms and is also important for many unicellular organisms.

- Cells must communicate to coordinate their activities.

→ Biologists have discovered some universal mechanism of cellular regulation, involving the same small set of cell-signaling mechanisms.

→ Cell may receive a variety of signals, chemical signals, electromagnetic signals, and mechanical signals.

* Cell Signaling :-

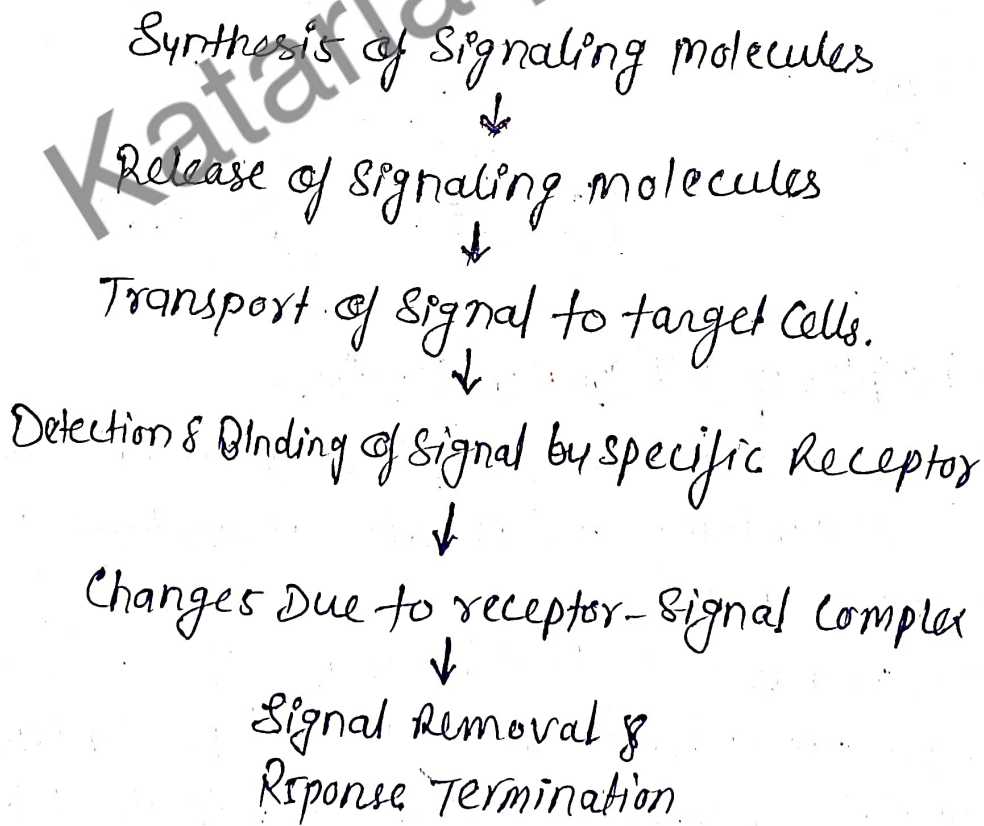
Cell Signalling is a part of a complex system of communication that governs basic cellular activities and coordinates cell actions.

→ The ability of cells to perceive and correctly respond to their microenvironment is the basis of development, tissue repair and immunity as well as normal tissue homeostasis.

Defination :-

Cell signaling is about communication between different groups of cells and tissues - how one group of cells informs another group of cells what to do.

STEPS IN cell signaling :-



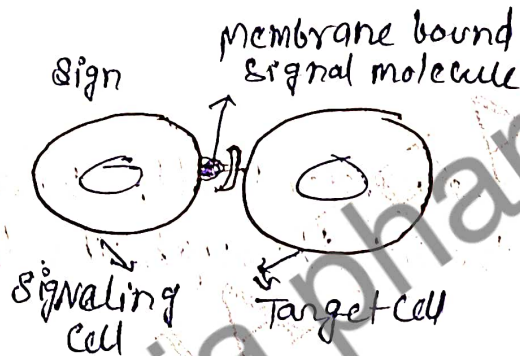
* Forms of intracellular signaling :-

- ① Contact-dependent
- ② paracrine

- ③ Synaptic
- ④ Endocrine

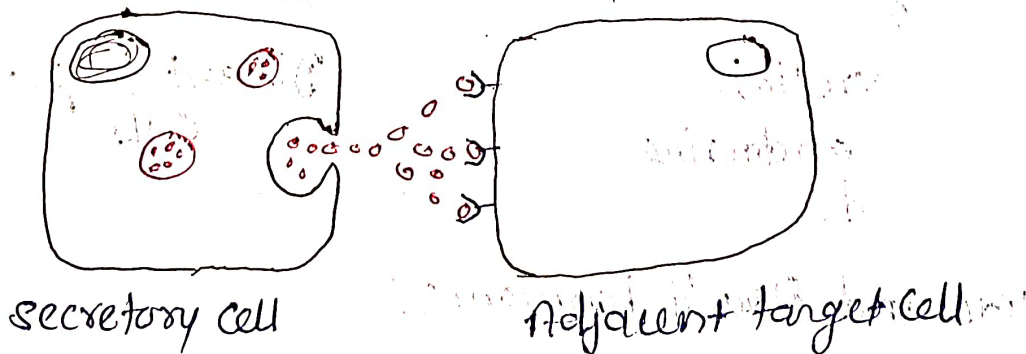
① Contact dependent :- (Juxtacrine)

→ Juxtacrine signals target adjacent (touching) cells.
 → These signals are transmitted along cell membranes via protein or lipid components integral to the membrane and are capable of affecting either the emitting cell or cells immediately adjacent.



② paracrine :-

paracrine signals target cell in the vicinity of the emitting cell. neurotransmitters represent an example.

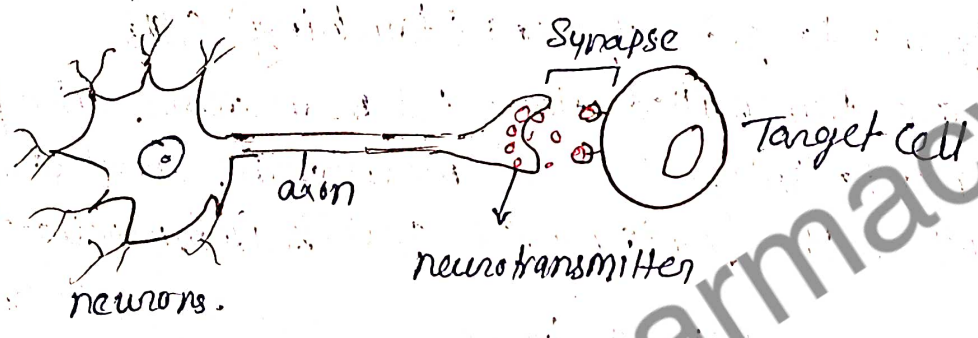


- Example :- nerve-nerve,
 - nerve-muscle cells
 - cytokines.

③ Synaptic :-

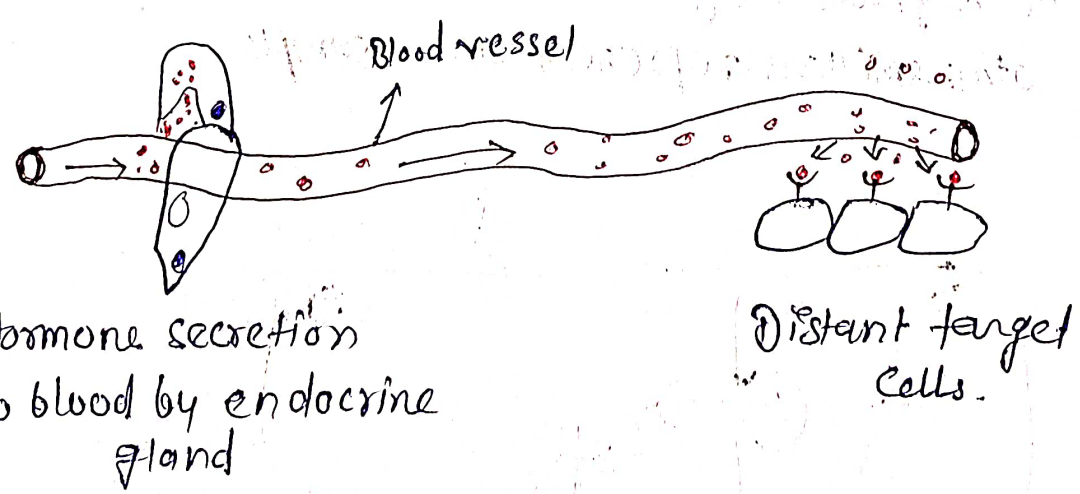
Synaptic signaling is similar to paracrine signaling but there is a special structure called the synapse b/w the cell originating and the cell receiving the signals.

→ Synaptic signaling only occurs between cells with synapse. For example b/w a neuron and the muscle that is controlled by neural activity.



④ Endocrine :-

Endocrine signals target cells distant cells. Endocrine cells produce hormones that travel through the blood to reach all parts of the body.



Ex. peptide and steroid hormones.

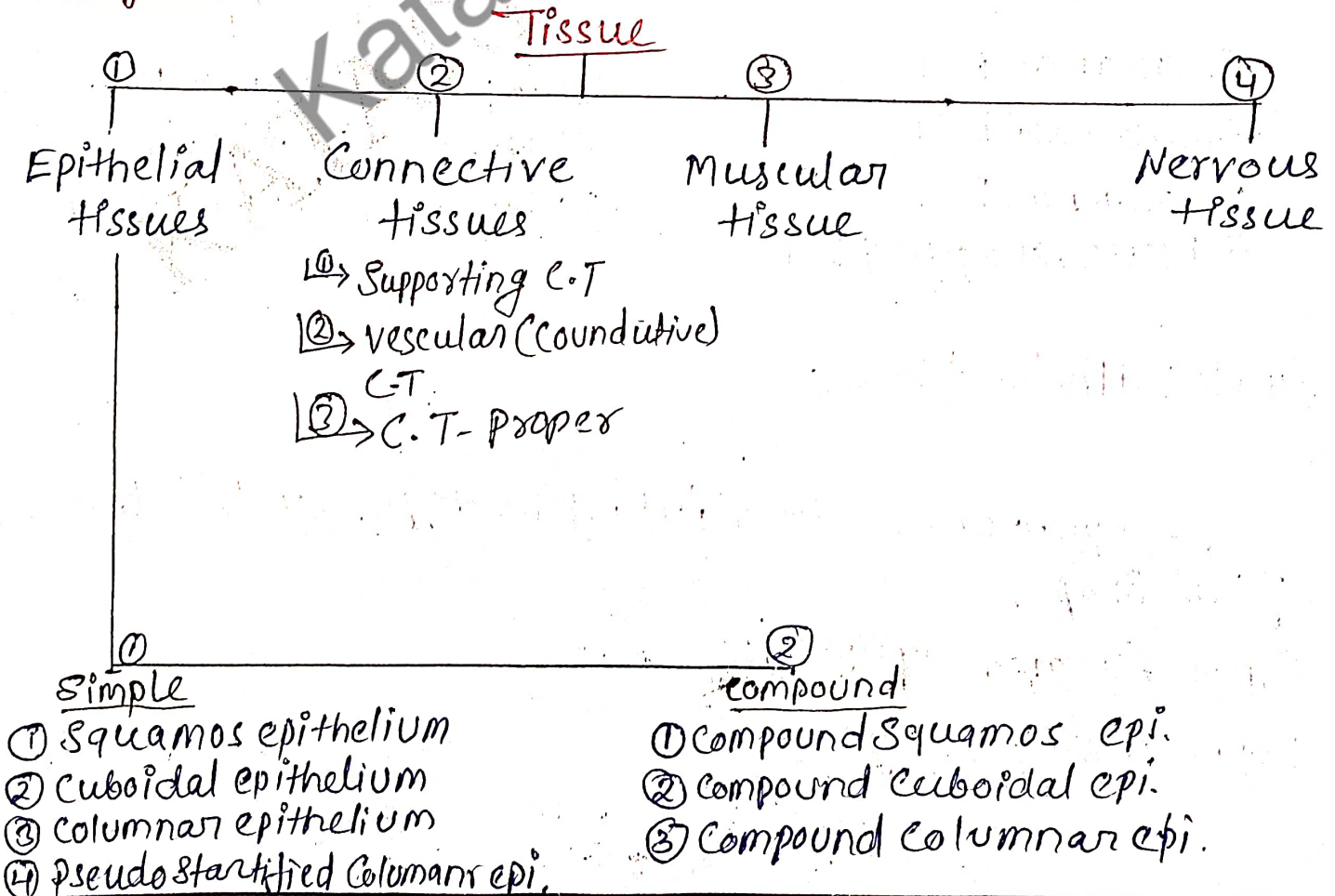


Human anatomy & physiology

★ Tissue level of organization :-

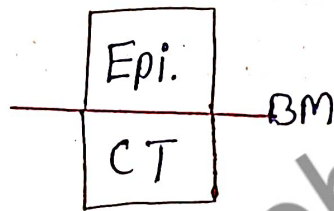
- A tissue is a group of cells
 - common embryonic origin
 - function together to carry out specialized activities.
- Hard (bone), semisolid (fat), or liquid (blood)
- Histology is the science that deals with the study of tissues
- pathologist specialized in laboratory studies of cells and tissue for diagnoses.
- Defination :- group of cell having similar origin, structure and function is called as tissue.

Type of tissue :-



① Epithelial tissue :- $\begin{cases} \text{UPON (Epi)} \\ \text{grow (Thilium)} \end{cases}$

- Epithelium tissue grow upon another tissue.
- protective and covering tissue.
- Intracellular space absent.
- Epithelium found in regular layer.
- First form of tissue play role in embryonic development.
- Persence of basment membran (BM) is difficult character of epithelium.



Epithelium tissue

Simple

Compound

- ① Squamos E.T
- ② Cuboidal E.T
- ③ Columnar E.T
- ④ Pesudostartified E.T

- ① Compound Squamos E.T
- ② Compound Cuboidal E.T
- ③ Compound Columnar E.T

① Simple Epithelial tissue :-

- present only one layer.
- Simple Epithilum divided into four types on the base of Cell shape.

(a) Simple Squamos epithelium :-

- Found in single layer.



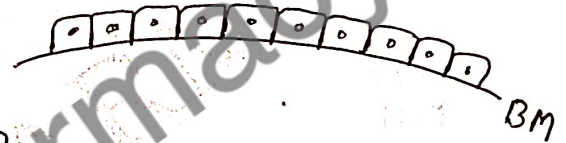
Human anatomy & physiology

- Presence of Basement membrane.
- Flate and Scale like structures.
- Function:- Covering and protection.

Ex.:- Bowman Capsule, Alveoli etc.

(b) Simple cuboidal Epithelium T:-

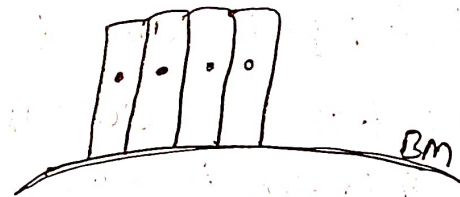
- cube like structure.
- presence of nucleus.
- found in single layer.
- Having same length and width.
- presence of Basement membrane.



Ex.:- Thyroid Gland, Iris (Eye) etc.

(c) Simple Columnar Epithelium T:-

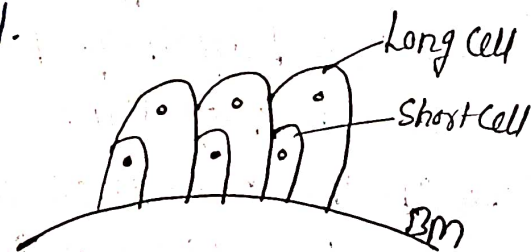
- Column like structure.
- presence of nucleus.
- presence of BM.
- Also like pillar structure.



Ex. Liver, bileduct etc.

(d) Pseudostratified Columnar epi. T:-

- Found in single layer
- Found two type of cell 'long' and small.
- presence of nucleus
- Because of two cell and two nucleus looks like but originally one cell.



Ex. male urethra

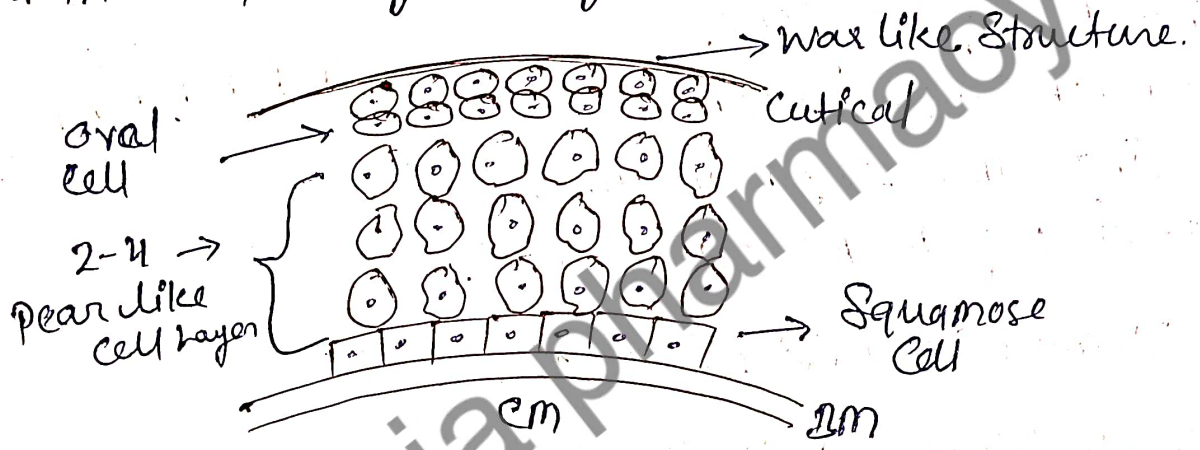
② Compound Epithelial tissue :-

- Made by many layer.
- on the base of exposal it is further divided into two part

- ① Transitional Epithelium
- ② Stratified Epithelium →
 - ① Squamose Stratified Epi-T.
 - ② Stratified Columnar epi-T
 - ③ Stratified Cuboidal Epi-T

① Transitional Epithelium T :-

- Expansion power.
- Found in one part of body of urinary.



→ Cutical made water proof -

② Stratified Epithelium T :-

→ on the basis of outermost layer, cell shape its further divided into three type.

(a) Squamose Stratified Epi-T :-

- outer most layer made by scale like / flate like cell.
- Inner most layer made by column like cells.
- 4 to 6 layer of polygonal cell.
- presence of B.M.
- On the presence of keratin protein this epithelium further divided into two part.

① keratinised stratified squamous epi. T.

Ex. Epidermis of skin

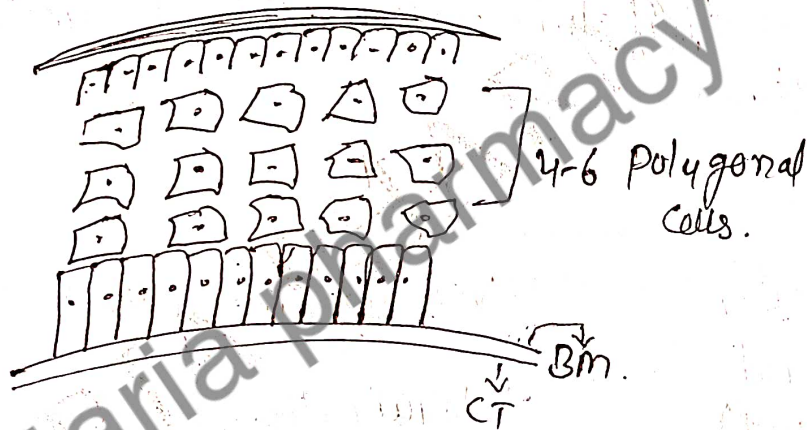
② non-keratinised stratified squamous epi. T.

Ex. Inner lining of cheeks.

(b) Stratified Columnar Epithelium tissue :-

→ Inner most layer is made by Column like

cell.



→ Above this layer 4 to 6 layer polygonal cell.

→ on the presence of cilia this layer divided into two types.

→ presence of Bm.

① Ciliated Columnar stratified Epi. T :-

Ex. Uterus, Buccal cavity

② Non-Ciliated Columnar stratified Epi. Tissue.

Ex. Male Urogeneter System.

(C) Stratified cuboidal Epithelium tissue :-

(16)

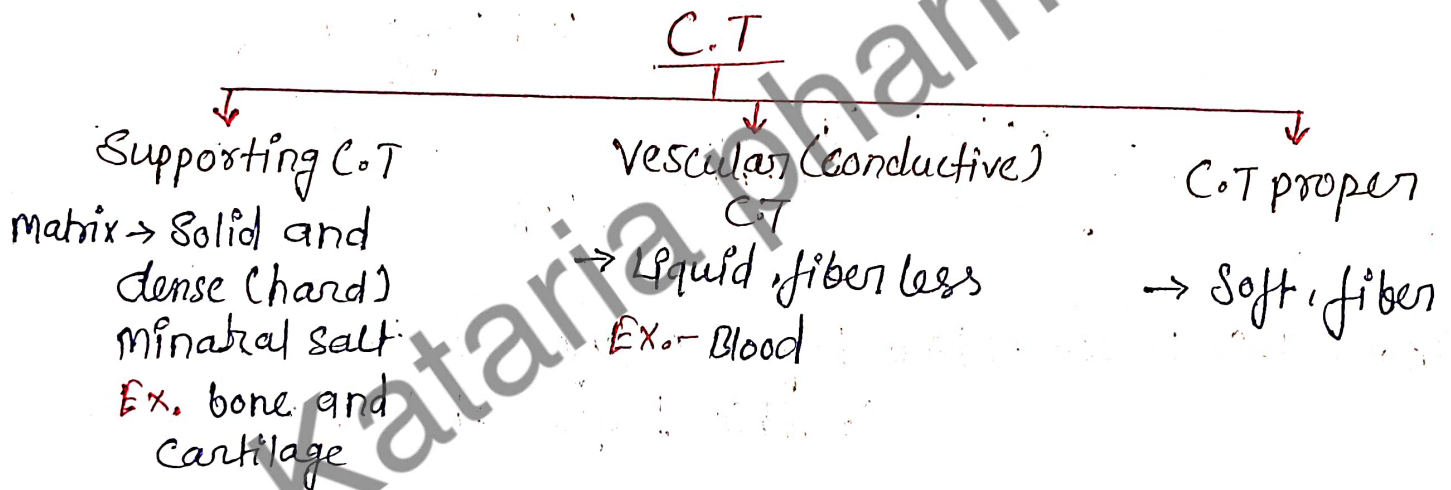
- Outer most layer is ~~made~~ made by cube like shape.
- Inner most layer made by Colume like ^{Cell.} Cell.
- 4 to 6 layer of polygonal cells.
- presence of Besment membran.

* Connective tissue :-

(2)

Defination :- connective tissues (CT) are group of tissue which connects or binds other tissue in the body.

→ on the basis of matrix nature this tissue divided into three part.



① Supporting C.T :-

The tissue that support and makes the framework of the body is called Supportive Connective tissue.

Types :- Supportive C.T is of two types:

1. Cartilage
2. Bone

→ Together bones and cartilage make up the skeleton.



Functions of Supportive C.T :-

- Support
- protection
- Storage of minerals (Calcium and phosphorus)
- Site for Hematopoiesis (red bone marrow)

2) Vesicular C.T :-

Blood is a fluid connective tissue that travels through tubular vessels.

- Blood consists of cells and cell fragments collectively called formed elements.
- These formed elements are erythrocyte, Leukocytes (WBC) and platelets.

Ex. Blood.

3) C.T Proper :-

Connective tissue proper consists of loose connective tissue and dense connective tissue (which is further subdivided into dense regular and dense irregular connective tissue.)

Composition of C.T.P :-

- 7 type Cells
- 3 type fiber.
- 1 type matrix.

① 7 type Cell :-

APP

Trick to remember - APL MFM

- A → Adipose Cell
- P → Plasma Cell
- L → Lymphocyte Cell
- M → Mast Cell
- F → Fibroblast Cell
- M → Macrophase Cell
- M → mesenchymal tissue Cell

① Adipose Cell :- (fatty tissue)

- oval shape cell.
- storage of fat.

Type



Monocellular
Ex. white fat
(young)



Multilocular
Ex. brown fat
(baby)

Fat globule

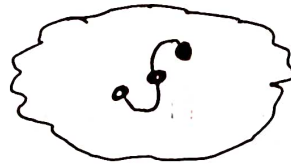
② Plasma Cell :-

- Smallest cell in the C.T.P.
- Less in numbers.
- Amoeba shape cell.
- CRT - wheel structure Nucleus.
- Main function of plasma - Formation of antibody.

③ Lymphocyte Cells :-

- Small in size few in number.
- maximum part of cell covered by nucleus.
- Amoeba shape
- Main function of lymphocyte cell :-
 - Formation of plasma cell and formation of antibody.

4) Mast Cell :-



- Amoeboid shape
- S Shape nucleus.
- Much in number but small in size
- Functions :-
 - Histamin secretion (Vasodilator)
 - Secretion of Serotonine (Vasoconstrictor)
 - Heparin Secretion (Natural Anticoagulate)

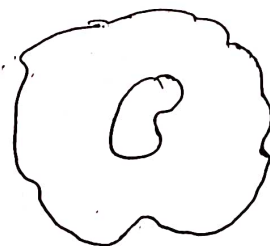
5) Fibroblast Cell :-

- Biggest Cell in the C.T.P.
- Found in large number.
- Oval like cell.
- It help in protein synthesis
- Nucleus present
- Functions :-
 - Secretion of matrix
 - Formation of fiber.

6) Macrophase Cell :-

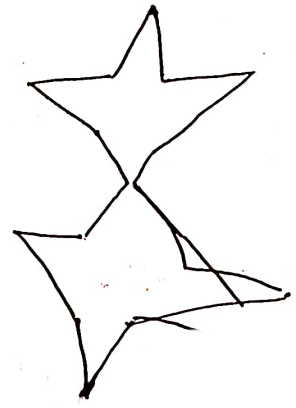
- Second Largest Cell of C.T.P.
- Amoeboid shape.
- kidney shape nucleus present.
- Phagocytic in nature.
- o This also called scavenger cells of body.

- Liver - Kuffer Cell
- Lungs - dust Cell
- blood - Monocyte cell
- Spleen - Reticular cell



① Mesenchymal Cell :-

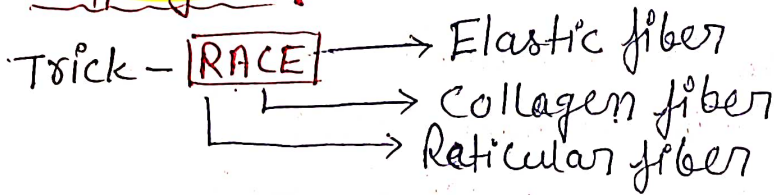
- Small in size, few in number.
- Bi-Star Shape.
- Completely undifferentiated cell of C.T.P.



Function :-

It can be changed in any type of six cell

② 3-type fiber :-



① Elastic fiber :-

- yellow in colour
- made by elastin protein
- Elastic in nature
- Branched shape
- found in single.

② Collagen fiber :-

- yellow white in colour
- made by collagen protein.
- Non-elastic in nature.
- un branch
- Rigid in nature and found in group.
- maximum protein found in body is collagen.

③ Reticular fiber :-

- Colourless fiber
- made by Reticular protein
- highly branched
- found in lymphoid organ or tissue

④ 1-type matrix :-

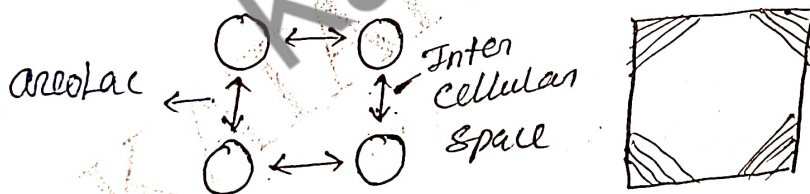
- M.P.S (mucopolysaccharides)
- cell are mostly covered by mucopolysaccharide matrix.

A Type of C.O.T. :-

- ① Areolar C.O.T
- ② Adipose C.O.T
- ③ White fiber C.O.T
- ④ Yellow fiber C.O.T
- ⑤ Reticular fiber C.O.T
- ⑥ mucoid C.O.T
- ⑦ pigment C.O.T

① Areolar C.O.T. :-

- Also called loose or spongy connective tissue.
- Widely spreading body.
- Maximum inter cellular space is found in this tissue.
- Collagen fiber group irregularly present.



- Only elastic fiber present
- There is no Reticular only elastic cell e.g. fibroblast, mast and macrophage
- presence of blood vessels and nerves.

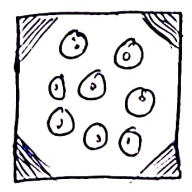
② Adipose C.O.T. :-

- modification of areolar tissue.
- fat globule are present in large amount.
- Two type globule are present.

- ① white fat globule
- ② brown fat globule

white fat globule

- Large and Singal fat globule
- Mt. Less in number (young)
- Ex. Hump of camel - blue whale



brownfat globule

- Small and many fat globule.
- Mt. Much in number (baby)
- Ex. New born baby Rat, Rodent, Squirrels.

③ White fiber C.T:

- White fiber (Collagen) is present larg quantity.
- Other Component present in less number.
- Elastic and Reticular fiber Completely absent.
- Fibroblast or mast Cell present in Larg number.
- This tissue found in two form.

- ① Cord
- ② sheet

Note :- muscles Connected by bone with Tendon
 Bone - bone Connected by Ligament



④ Yellow fibers C.T:

- yellow fibers (elastic fiber) is present in larg quantity.
- collagen fiber are also present.

Note :- Hardest Ligament of body → Ilio-femoral Ligament

- Ligament flava → present blw two vertebra
- Ex. Animals (Cow, buffelo, goat)

⑤ Reticular fiber C.T:

- This tissue also called Lymphoid tissue, present in lymph organs.
- Reticular fiber present in larg amount.
- Lymphocytic is present in much quantity.
- Ex. Lymph organs - Lymph node, Spleen

⑥ Mucoid C.T :-

- Also called embryonic tissue.
- Matrix present in maximum amount.
- Matrix jelly like. (soft matrix)
- Ex. umbilical cord, Comb of Cock.
- Few collagen fiber, fibroblast cell.

⑦ Pigment CoT (colour) :-

- modification of Areolar CoT.
- Gap is present in areolar CoT is filled by pigment cell.
- which provide to the tissue.
- pigment called chromatophore
- Eg. Iris, Choroid of eye
- Melanophore - melanine - black.

⑧ Nervous tissue :-

- Nervous tissue is found in the brain, spinal cord, and nerves. It is responsible for coordinating and controlling many body activities.

