HUMAN ANATOMY AND PHYSIOLOGY

UNIT 1 NOTES

INTRODUCTION TO HUMAN BODY

- LEVEL OF STRUCTURAL ORGANIZATION
- HOMEOSTASIS
- CELLULAR LEVEL OF ORGANISATION
- TISSUE LEVEL OF ORGANISATION

IMPERFECT PHARMACY

CONNECT WITH US ON :

@IMPERFECTPHARMACY

IMPERFECT PHARMACY

INTRODUCTION

The human body is a single structure but it made up of billions of smaller structure of 4 major kinds

Cell → Tissue → Organ → System

Definition Of HAP

It is simply the study of structure of indivisual body parts and how they works (function of those parts)
The study of human body involves two major principles :

- Anatomy
- Physiology

Anatomy

Anatomy is the branch of biological science deals with the study of structure of different body parts.

Subdivision Of Anatomy

- Cell Biology / Cytology (Study of cellular structure)
- Histology (Study of tissue structure)
- Gross Anatomy (Study of structures visible to naked eyes)
- Microscopic Anatomy (Study of very small structures)
- Systemic Anatomy (Study of specific body systems)
- Radiographic Anatomy (Study of structures with help of X-rays)
- Pathological Anatomy (Study of structural changes associate with disea

Physiology

It is the branch of biological science deals with the study of function and mechanism of different body parts.

Subdivision Of Physiology

- Respiratory Physiology (Study of function of lungs)
- Renal Physiology (Study of function of kidneys)
- Immunology (Study of function of defense mechanism)
- Neurophysiology (Study of function of nervous system)
- Pathophysiology (Study of functional changes linked with diseas
- Cardiovascular Physiology (Study of function of heart & blood vessels)
- Endocrinology (Study of harmones & body functions)

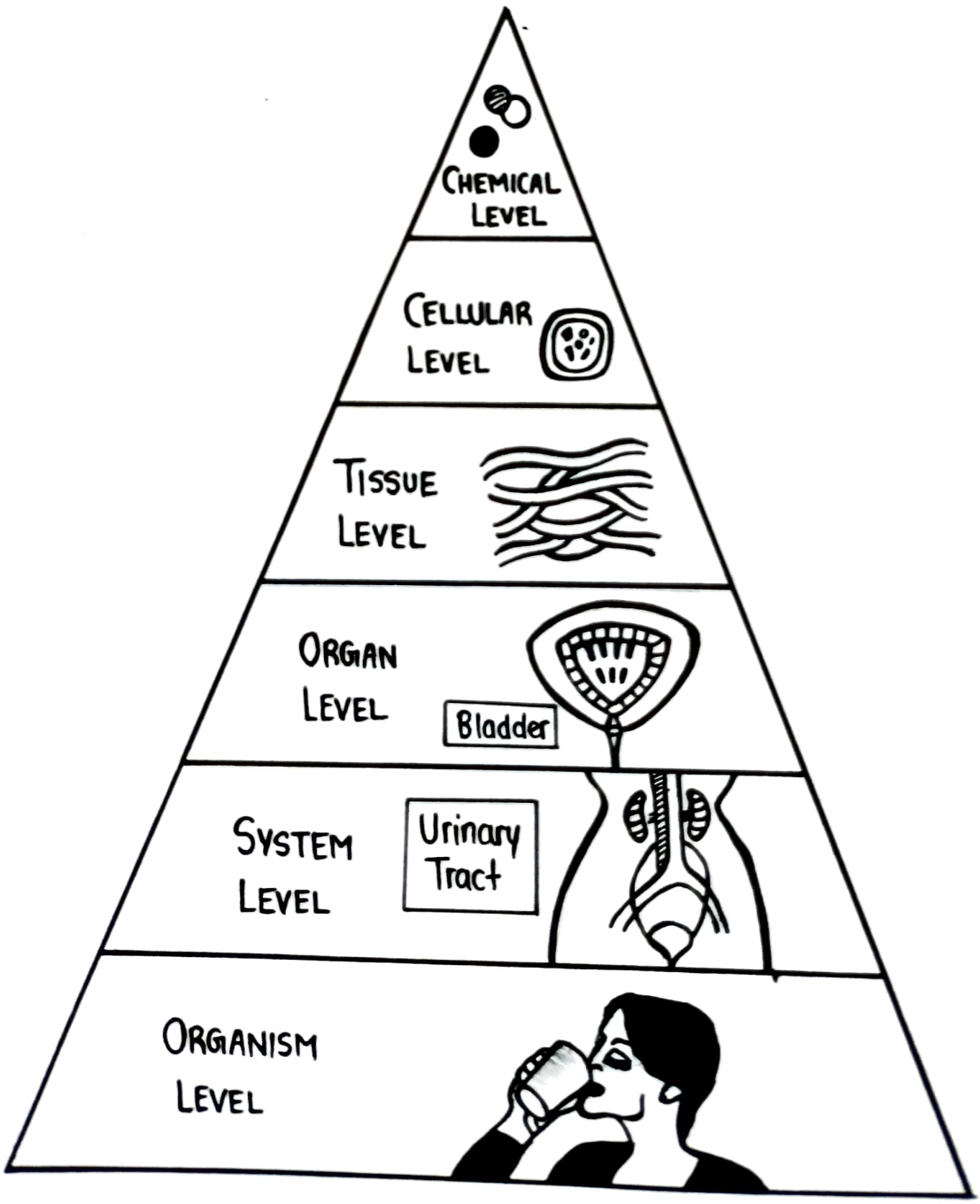
Scope Of HAP

- It is the base for understanding the anatomy & physiology of different body parts
- It helps in the study of human evolution and development.
- To understand pathology of disease and pathological changes.

LEVEL OF STRUCTURAL ORGANISATION

Living things consists of several level of structural organization that are associated with another in various ways.

- Chemical Level
- Cellular Level
- Tissue Level
- Organ Level
- System Level
- Organism Level



Chemical Level

- It is the lowest level of organization
- It includes atoms and molecules. i.e. nitrogen, phosphorus etc.

Cellular Level

- Atoms and molecules combines together to form cell
- It is the basic structural and functional unit of life

Tissue Level

- Structurally and functionally similar group of cells combines together to form tissue. Four basic types of tissue in the body are :

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

Organ Level

- Different kinds of tissue joined together to form a structure of body called organ.
- Some examples are heart, liver, lungs, brain, bladder.

System Level

- It is the level where different organs are joined together to form a body system
- Basically our body contains 11 systems given below :

① Integumentary System
② Skeletal System
③ Muscular System
④ Nervous System

⑤ Endocrine System
⑥ Circulatory System
⑦ Respiratory System
⑧ Digestive System
⑨ Reproductive System
⑩ Lymphatic System
⑪ Urinary System

Organism Level

- It is the highest level of organizational structure where all parts of body are functioning with one another to complete the total organism.

BASIC LIFE PROCESSES

The existence of life is mainly based on certain functions and process which are important for a living being to stay healthy and survive. and these basic essential activities that are performed by a living being are called 'Basic Life Processes'
They basically includes :

- Metabolism
- Respiration
- Reproduction
- Responsiveness
- Movement
- Growth

Metabolism

Metabolism refers to all the chemical process that takes place in our body. It is basically the process by which the body changes food and drinks into energy.
It is of two types

① Catabolism
② Anabolism

CATABOLISM	ANABOLISM
It is the breakdown of complex chemical substances into simpler components	It is building up of complex chemical substances from smaller, simpler components.

Respiration

Respiration is defined as process where living beings obtain energy (in the form of ATP) by taking oxygen and releasing carbon-di-oxide.

Reproduction

Reproduction is simply defined as 'reproduce'. Reproduction is the biological process by which organism give birth or give rise to a new organism.

Responsiveness

It is the ability of living being to respond to any changes in the external or internal environment.

Movement

It is the process of movement of whole body or individual organ, cell from one position to another.

Growth

Growth is defined as increase in mass and size of body or organs It occurs due to increase in number or size of the cell.

HOMEOSTASIS

It is made up of two words 'Homeo' and 'stasis'

Homeo	+	Stasis
(Same)		(State)

Homeostasis is defined as the ability of human body to maintain a constant internal environment by maintaining and balancing a pH, temperature, acid-base level etc.

The regulation / maintainance of the homeostasis is govern by the feedback systems of the body.

FEEDBACK SYSTEM

When there are some changes takes place in the internal environment of body then body's feedback system works to take it back into the normal / equillibrium condition.
A feedback system includes three basic components

- Receptor
- Control Centre
- Effector

Receptor

A receptor is a body structure that monitors / detects changes in the internal environment of body.

Control Centre

A control centre in the body is receive the input from the receptors and generates output in the form of nerve impulse, harmones or other chemical signals.

Effector

Effector is a body structure that receives output from the control centre and respond to the commands of control centre.

Types of Feedback Systems

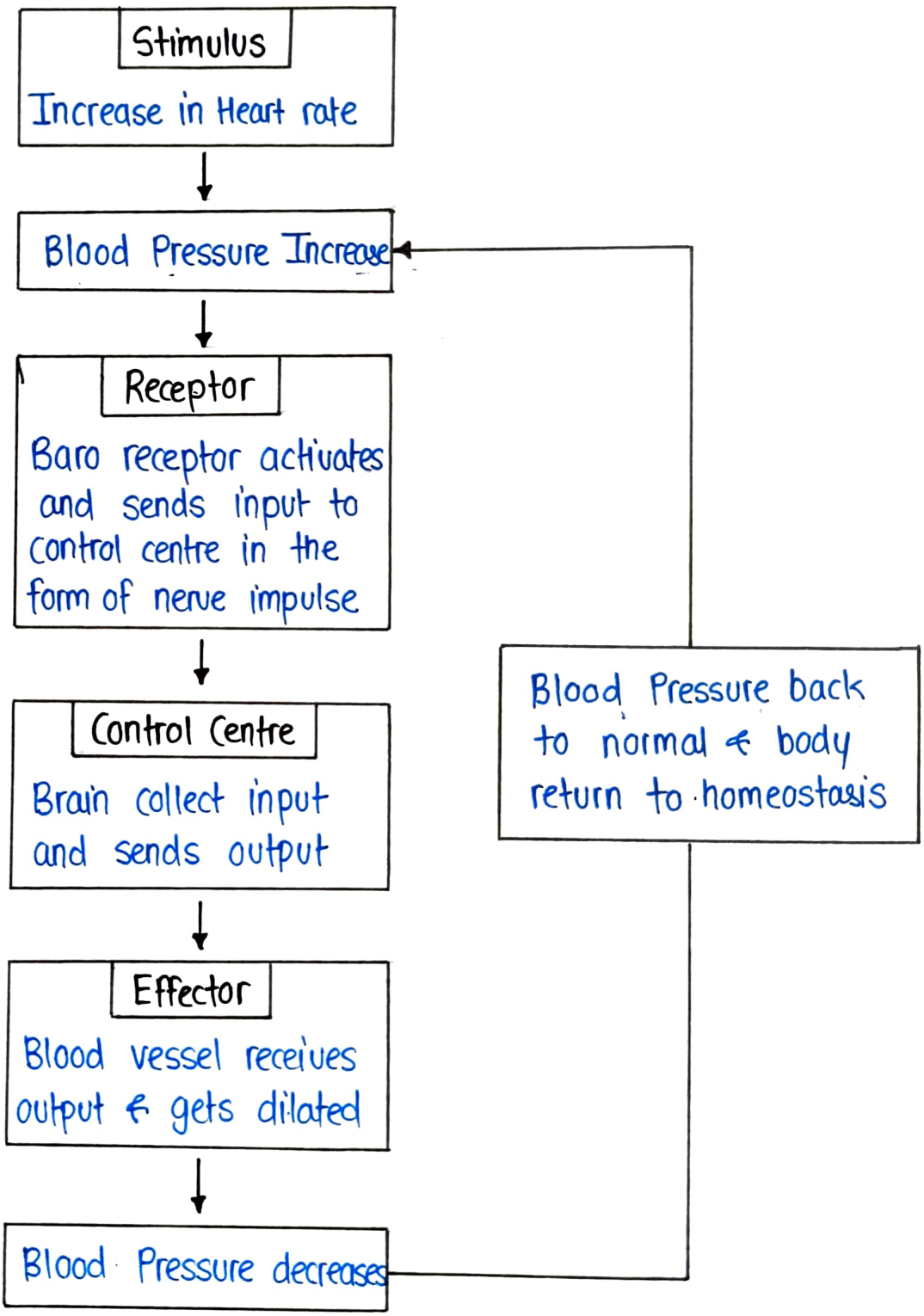
There are basically two types of feedback system

① Positive Feedback System
② Negative Feedback System

NEGATIVE FEEDBACK SYSTEM

A negative feedback system responses to reverse / decrease the changes in internal environment.

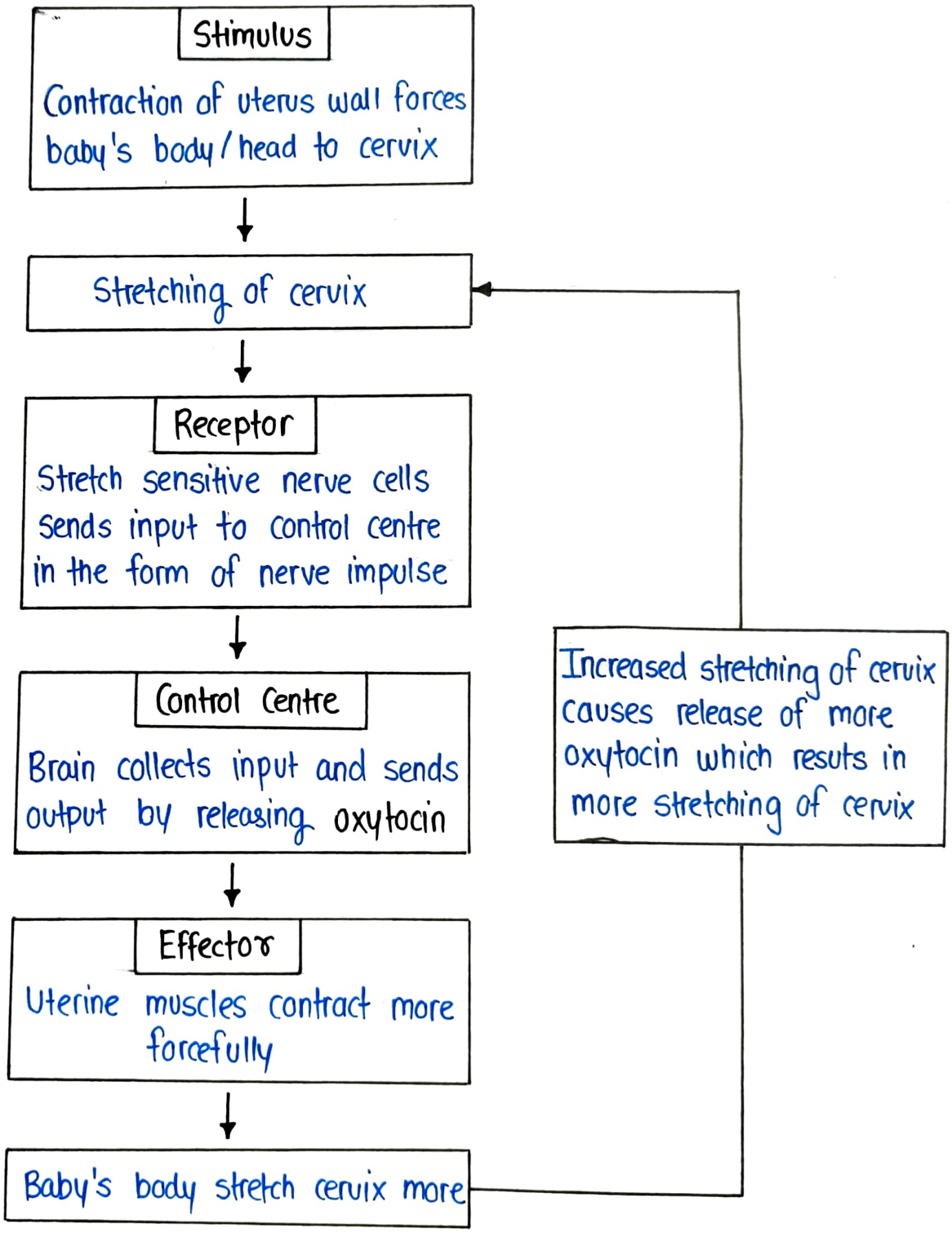
example : Regulation of blood pressure



POSITIVE FEEDBACK SYSTEM

A positive feedback system responses to increases the change in internal environment.

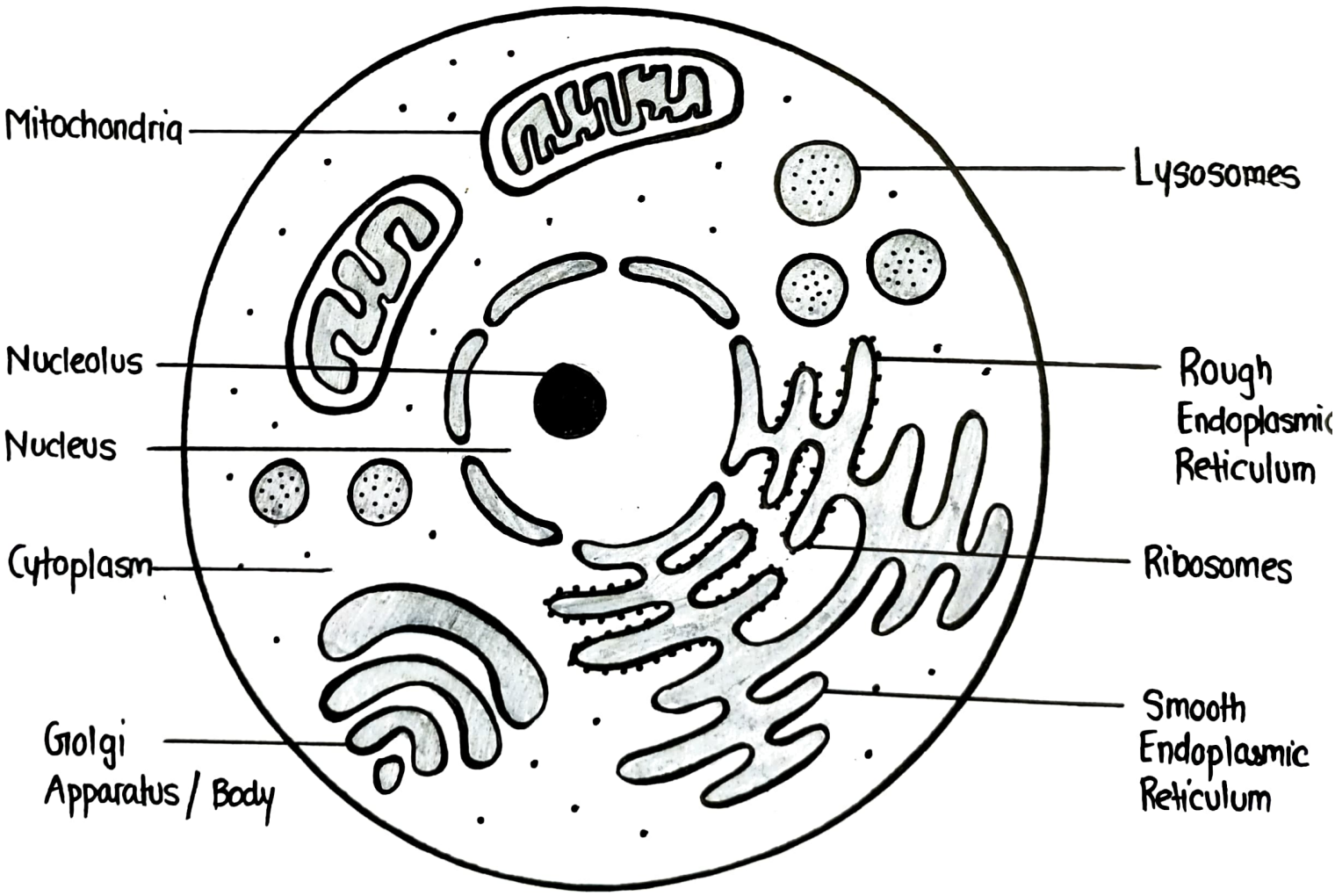
example : Normal Child Birth.



CELLULAR LEVEL OF ORGANISATION

Cell

- A cell is the basic structural and functional unit of eeh life.
- The cell was first discovered and named by Robert Hooke in 1665.
- The first living cell was discovered by 'Anton Van Leeuwenhoek'
- There are 200 different types of cells present in our body.
- Cell Biology or Cytology is the branch in which we study about cellular structure and function.



CELL STRUCTURE

Parts of Cell

A cell is basically divided into two major parts :

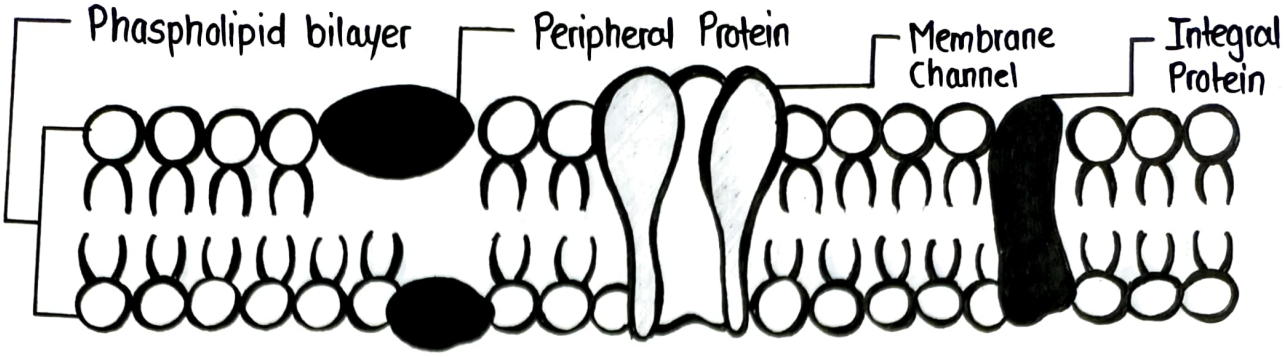
① Plasma Membrane

② Cell Organelles
- Cytoplasm
- Ribosomes
- Endoplasmic Reticulum
- Golgi Apparatus
- Mitochondria
- Lysosomes
- Nucleus

PLASMA MEMBRANE

- Plasma membrane also known as 'Cell Membrane' is a thin, flexible & elastic barrier or outer covering that separates the internal components of the cell from external environment
- It is a selectively permiable membrane that allows only few substances to pass through it.
- It is made up of :
  - Protein (60-80%)
  - Lipids (20-40%, in which 75% part is Phaspholipids)
  - Carbohydrates (1-2%)

- Plasma Membrane contain bilayer of 'Phaspholipids'
- The Phaspholipid molecules have two parts
  - Head (Hydrophilic)
  - Tail (Hydrophobic or Lipophilic)



PLASMA MEMBRANE

Functions of Plasma Membrane

- Protection of cells
- Act as a barrier to separate cell's internal environment from external organism.
- Give a specific shape to cell
- Regulate and control movement of substances
- Prevents movement of other substances that can be harmful for cell.

CELL ORGANELLES

Cytoplasm

- It is a gel like substance present in the whole cell from nucleus to plasma membrane.
- The fluid portion of cytoplasm in which other cell organelles (i.e. ribosome mitochondria etc) are suspended is called 'Cytosol' or 'Intracellular fluid'
- Cytosol contains water (75-90%), ions, amino acids, proteins, lipids different inorganic substances and salts.

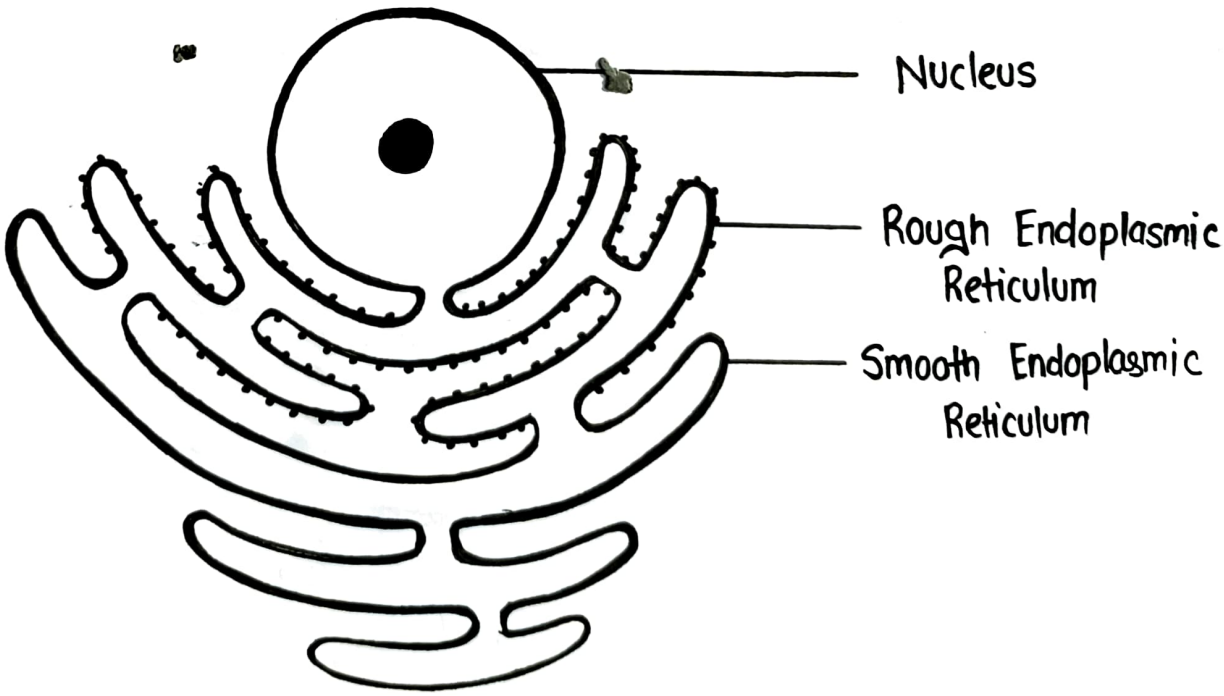
Ribosomes

- These are tiny granules composed of RNA & protein
- They synthesize proteins from amino acids using RNA and hence they are also known as 'Factory of Protein'
- They are of two types
  - Free Ribosomes : (Present freely in cytosol)
  - Membrane bound Ribosomes : (attached with endoplasmic reticulum)

Endoplasmic Reticulum

- Endoplasmic reticulum is a network of membrane attached with the nucleus, helps in the transportation of materials b/w cell organelles They are of two types

① Smooth E·R· (don't contain ribosome, synthesize fat & oils)
② Rough E·R· (contain ribosomes, synthesize protein)



ENDOPLASMIC RETICULUM

Golgi Apparatus / Golgi Body / Golgi Complex

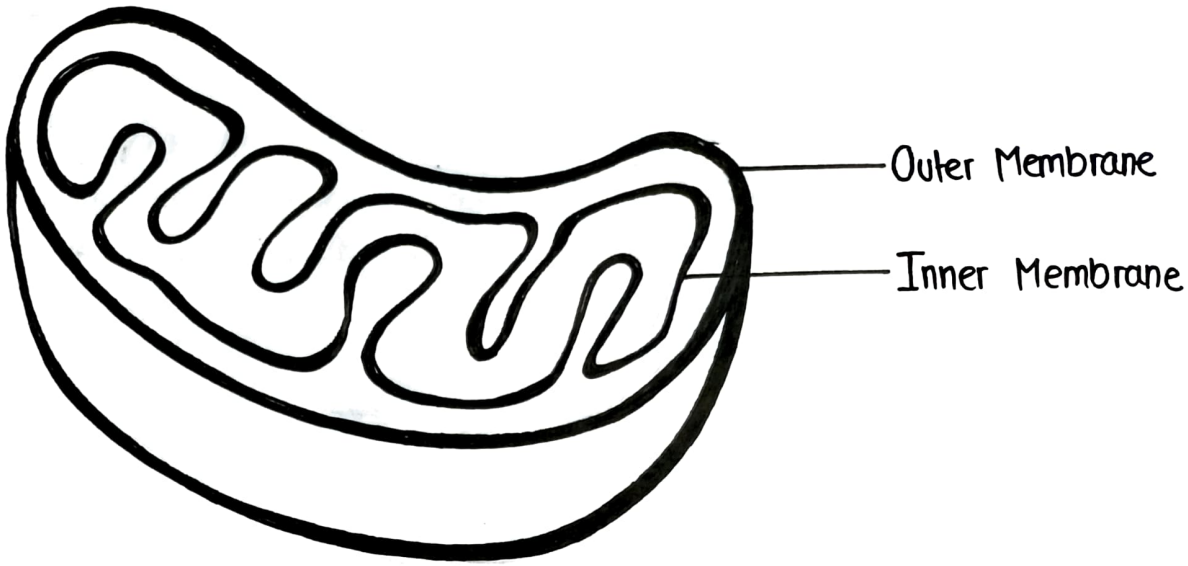
- It is present near the nucleus.
- It consist of 4 - 6 flattened sacs (bag like structure) called as 'Cisterns' placed upon each other.
- The protein move from endoplasmic reticulum to golgi apparatus
- Golgi apparatus stores, modifies and transport protein across cell

GOLGI BODY

Mitochondria

- It is also known as 'Power House of Cell'
- It consist of two membrane bound structure
  - Outter Membrane (Smooth)
  - Inner Membrane (Folded)

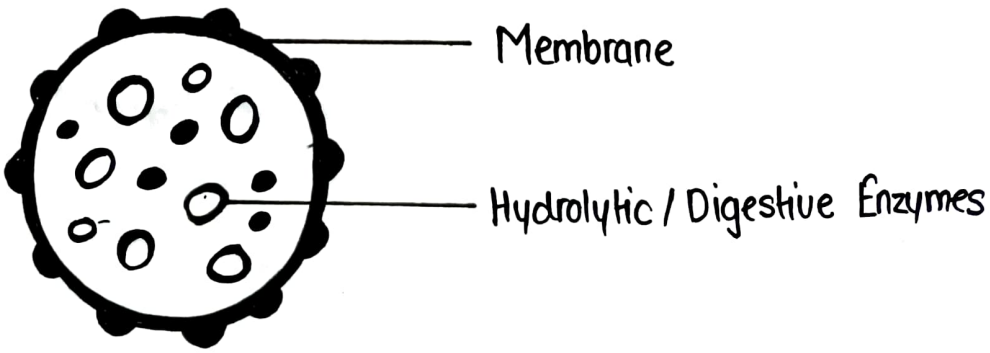
- They perform cellular respiration and during this process energy is released which is used to form 'ATP' and this ATP is utilized / used by cell for performing various activities.



MITOCHONDRIA

Lysosomes

- They are membrane bound structure filled with digestive enzymes.
- It helps to clean cell by digesting foreign materials and damaged cell organelles.
- It is also known as 'suicidal bags of cells' because when cell organelles get damaged, lysosomes get burst and digest the whole cell.



LYSOSOMES

Nucleus

- The nucleus is generally spherical or oval in shape and it is the largest structure of the cell.
- Nucleus controls all the activities done by the cell and that's why it is also known as 'Brain of the cell'
- It composed of two parts

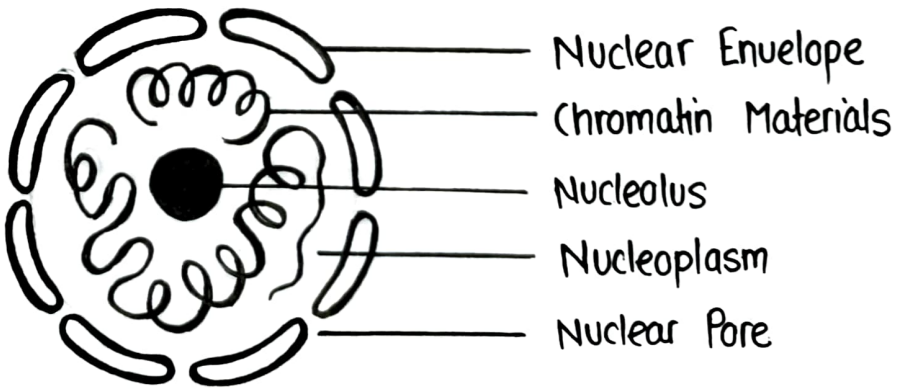
① Nuclear membrane / Nuclear envelope
② Nucleoplasm

Nuclear Membrane / Nuclear Envelope :

- It separates nucleus from cytoplasm
- It contains pores / space that permits transfer of material b/w cytoplasm and nucleoplasm.

Nucleoplasm :

- It is liquid ground substance covered by nuclear envelope
- It contains 'nucleolus' and 'chromatin Fibres / Materials'
- Nucleolus forms ribosomes & chromatin material forms centrosomes



NUCLEUS

TRANSFER OF MATERIALS ACROSS PLASMA MEMBRANE

Transfer of substances across the cell membrane is necessary to maintain the normal functioning and survival of the cell.
Substances move through the cell/plasma membrane by two major process :

① Passive transport process
② Active transport process

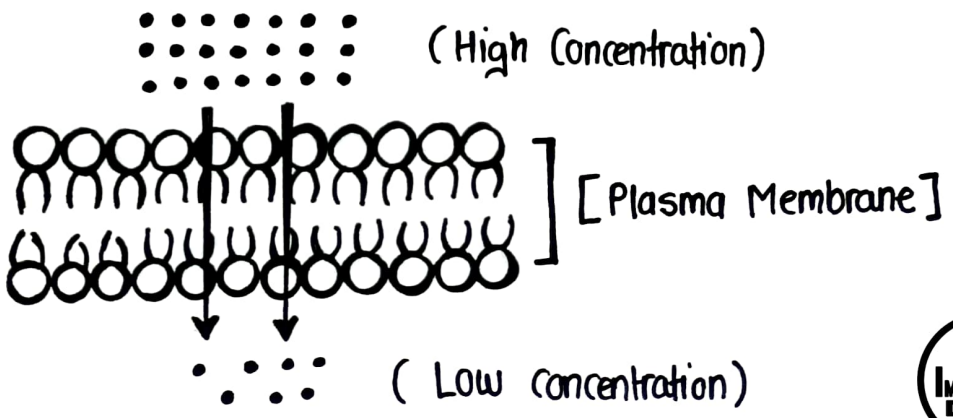
Passive Transport

In passive transport substances move across the cell membrane from the area of Higher Concentration to the area of Lower concentration.
In passive transport there is no energy ~~to~~ requirment to move substances across cell membrane.
It is of three types :

- Simple Diffusion
- Facilitated Diffusion
- Osmosis

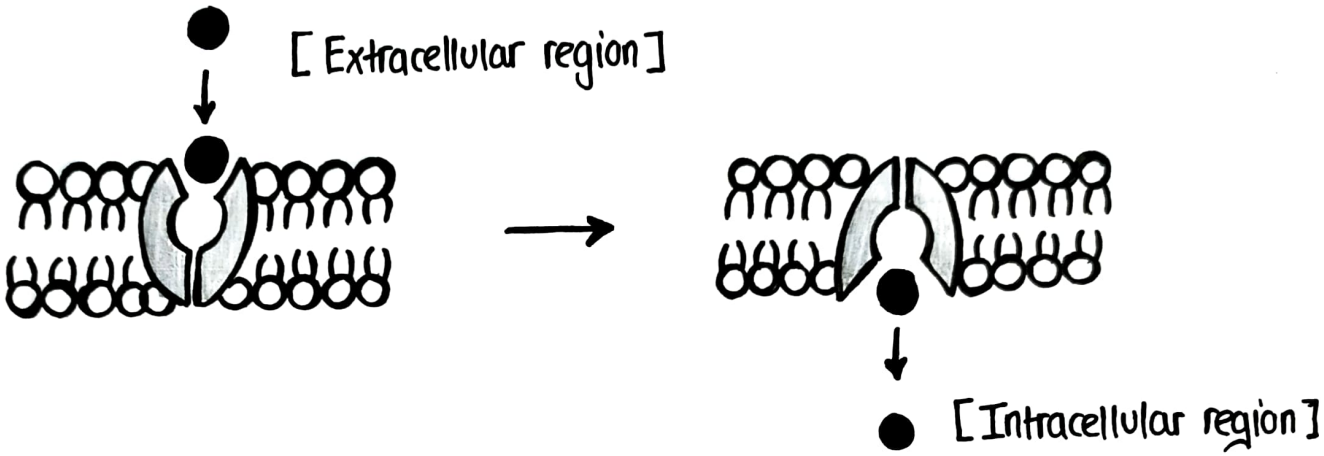
Simple Diffusion :-

In simple diffusion substances simply moves across cell membrane from the area of higher concentration to the area of lower concentration
It doesn't requires any carrier protein.



Facilitated Diffusion :-

It is also known as 'Carrier - mediated Diffusion'. In this molecules moves from high concentration to low concentration with the help of 'Carrier Proteins'. It includes movement of large molecules and glucose, vitamins etc.



Osmosis :-

Osmosis is simply defined as movement of solvent molecules across a semi-permiable membrane and here the solvent is basically 'water' hence osmosis can be defined as movement of water molecules across ~~sem~~ cell membrane / plasma membrane from higher concentration to lower concentration.

Active Transport

Active transport is defined as a process that involves the movement of molecules from a region of lower concentration to a region of higher concentration by using external energy.

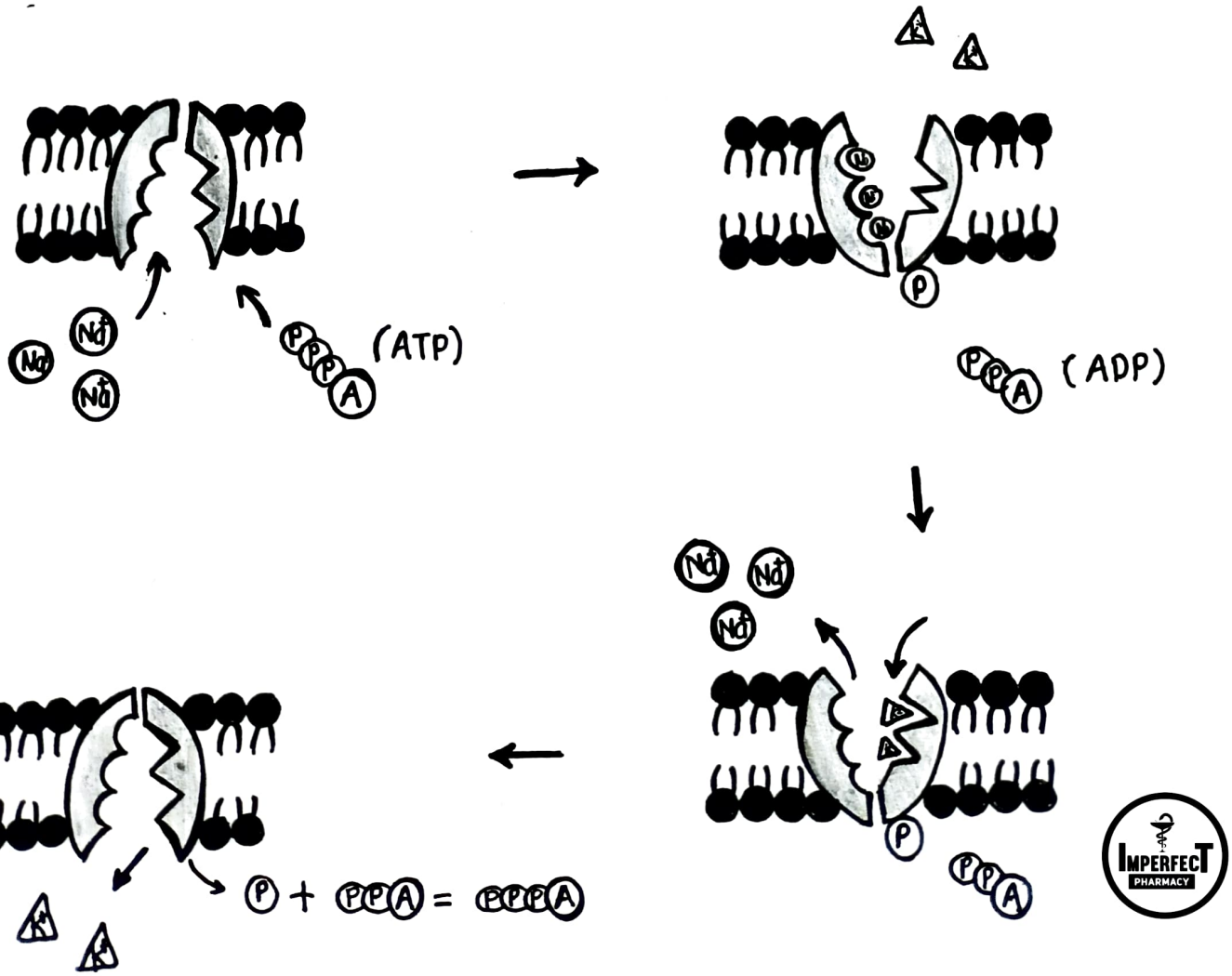
Energy is mainly obtained by the breakdown / hydrolysis of ATP

It is of two types

- Primary Active Transport
- Secondary Active Transport

Primary Active Transport

- In primary active transport the energy is utilized by the breakdown of ATP
- It requires carrier protein
- 40%. of the whole ATP uses in primary active transport
- <u>example</u> : sodium- potassium pump



Secondary Active Transport

In secondary active transport energy is used from electrochemical gradient that is generated by active transport
They are of two types

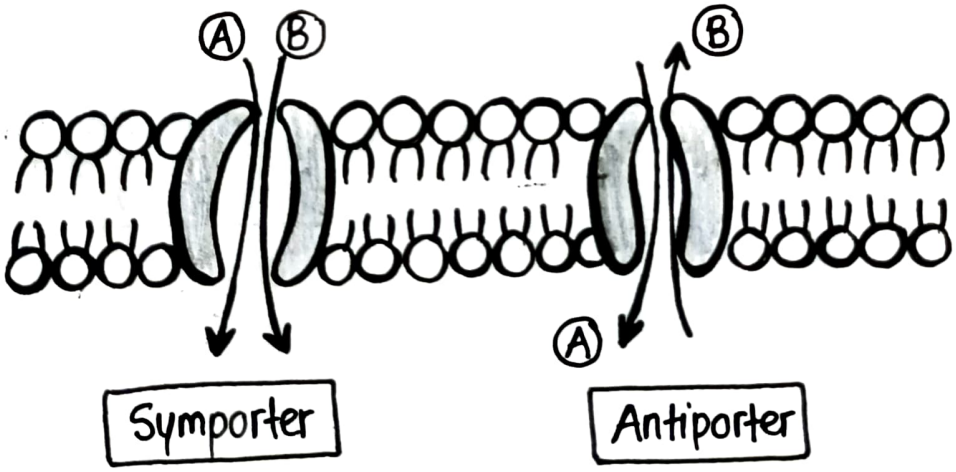
- Symporter
- Antiporter

Symporter :-

A symporter is an active transport protein that transport two different molecules across the cell membrane in the same direction

Antiporter :-

An antiporter is an active transport protein that transport two different molecules in opposite directions



CELL DIVISION

- Cell division is a process by which a parent cell divides into two daughter cells.
- It is also known as 'Cell Reproduction' or 'Cell Multiplication'
- The cell division takes place approximately in every 24 hours.
- There are basically two types of cell division

① Somatic Cell Division / Mitosis
② Reproductive Cell Division / Meiosis

Cell Cycle

During the division of cell, DNA replication and cell growth takes place The cell cycle is the sequence of events or changes that takes place during the division of cell into daughter cells.

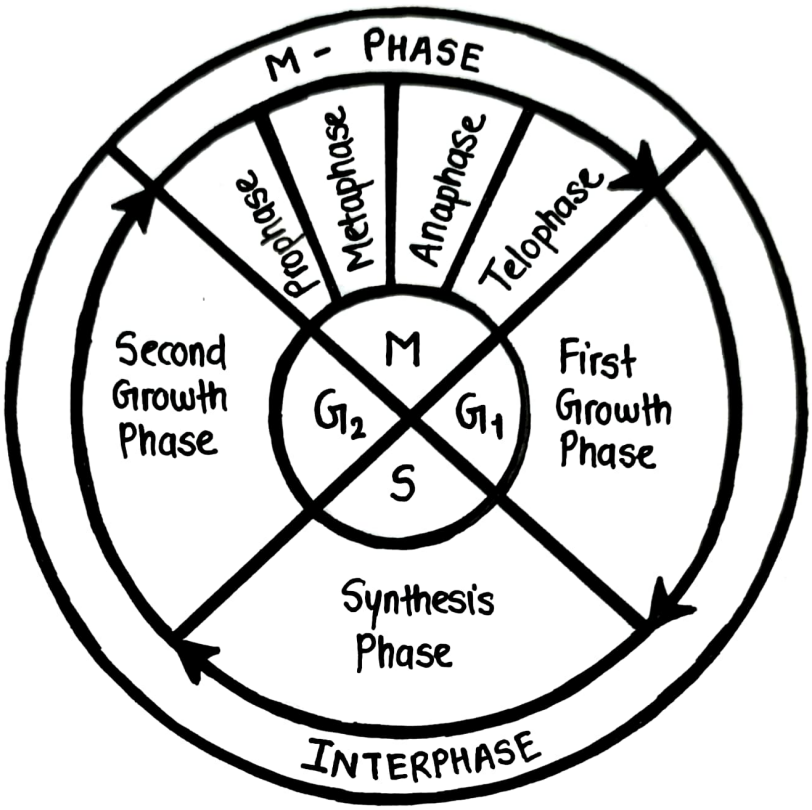
Need of Cell Division

- For growth of organism
- To replace old, dead and injured cell
- For gamete formation

Phases of Cell Division / Cell Cycle

A cell cycle or cell division involves two basic phases

- Interphase
- M- Phase



Interphase

- It is the longest phase of cell division and takes almost 23 hours means 95% time of the cell division
- It is basically the preparation phase of cell division
- It consist of three phases :

① G_1 Phase
② S Phase
③ G_2 Phase

G_1 Phase :

- It is simply known as 'First Growth Phase'
- In this phase cell is metabolically very active and replicate most of its cell organelles except DNA
- G_1 Phase last for 8-10 hours

S Phase :

- It is known as 'Synthesis Phase'
- It is the interval between G_1 and G_2 Phase
- During this phase cell makes an entire copy / replicate its DNA and centrosomes.
- S Phase lasts about for 8 hours

G_2 Phase :

- It is termed as 'Second Growth Phase'
- During this phase cell growth continues, enzymes and other proteins are synthesized.
- G_2 Phase lasts for 4-6 hours

M- Phase

- It is the final phase of cell division.
- It is also of two types

① Mitosis

② Meiosis

Mitosis / Somatic Cell Division

- Somatic cell division or Mitosis the type of cell division where the daughter cell produced are exactly similar to parent cell having same number of chromosomes as the parent cell
- Mitosis occurs in the whole body cells except germ cell and neuron cells.
- It is also known as 'Equational Division'.
- Mitosis occurs in two stages.

① karyokinesis
② Cytokinesis

karyokinesis

It is the process of 'nuclear division'
It occurs in 4 phases

- Prophase
- Metaphase
- Anaphase
- Telophase

Prophase :

- In early prophase, the chromatin fibre condensed and form chromosomes in which two sister chromatids attached together at centromere.
- The centrosomes that replicates in the S-Phase move towards opposite poles of the cell and started to form 'Mitotic spindle' or 'Spindle Fibre'
- In late prophase Nucleolus, Endoplasmic reticulum and other cell organelles started disappearing.

Metaphase :

- During metaphase 'nuclear envelope' is completely disintegrated.
- The spindle fibre of centrosome align the centromere of the sister chromatids at the centre of the cell.

Anaphase :

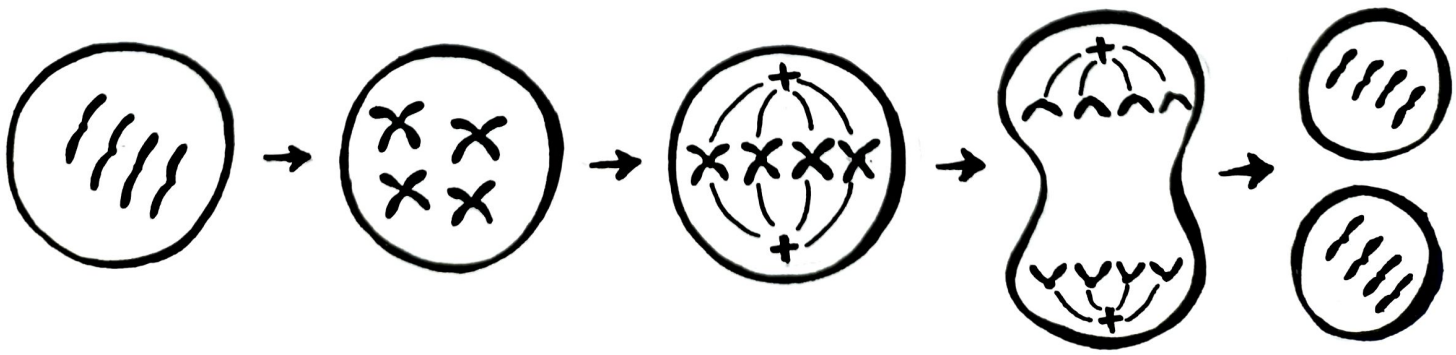
- In anaphase, the centromere splits and thus the two sister chromatids gets separated and move towards opposite pole of the cell.
- Once separated, the chromatids again termed as 'chromosomes'

Telophase :

- In this phase, the daughter chromosomes reach the opposite poles and spindle fibre gets disappear.
- Chromosomes again started converting into 'chromatin fibres'

Cytokinesis

- It is the division of cell's cytoplasm and organelles in newly form cells.
- Each new daughter cell now again enters into the 'Interphase Stage' and cell division continues.



Meiosis / Reproductive Cell Division

- Reproductive cell division or Meiosis is the type of cell division where the daughter cells receive only half chromosome of parental cell
- Meiosis occurs in germ cells / Sex cells / Reproductive cells found in male gonad (Testes) and female gonad (Ovary) to form Gametes (Sperm and Ovum).
- It is also known as 'Reductional Division'
- Meiosis occurs in two succesive stages :

① Meiosis - I
② Meiosis - II

Meiosis - I

It consist of four phases

① Prophase - I
② Metaphase - I
③ Anaphase - I
④ Telophase - I

Prophase - I

- In prophase - I firstly chromatin fibre condensed to form 'chromosomes' and these chromosomes exist in a pair called 'Homologous Chromosome Pair'
- In the last step of prophase - I there is an exchange of DNA (genetic material) between these paired chromosomes for genetic recombination.

Metaphase - I

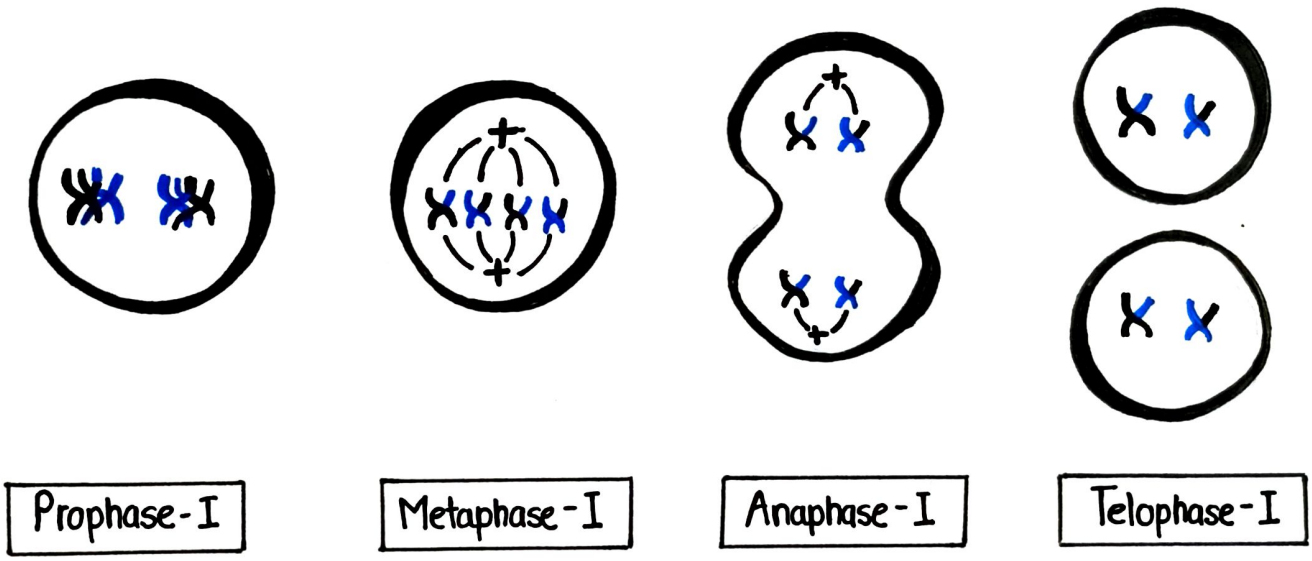
- In metaphase - I the spindle fibre of centrosome align the 'Homologous Chromosomes' at the centre of the cell.

Anaphase - I

- In anaphase - I the homologous chromosome gets separated and move towards opposite pole of the cell.

Telophase - I

- A nuclear membrane form around each homologous chromosome, the spindle fibre gets disappear and by the process of cytokinesis two new haploid cell forms



Meiosis - II

- The two new daughter cells that form in meiosis - I immediately enters into Meiosis - II.
- It also includes 4 stages

① Prophase - II
② Metaphase - II
③ Anaphase - II
④ Telophase - II

Prophase - II

In prophase - II nuclear membrane of newly form daughter cells again started disappearing and centrosome form mitotic spindle.

Metaphase - II

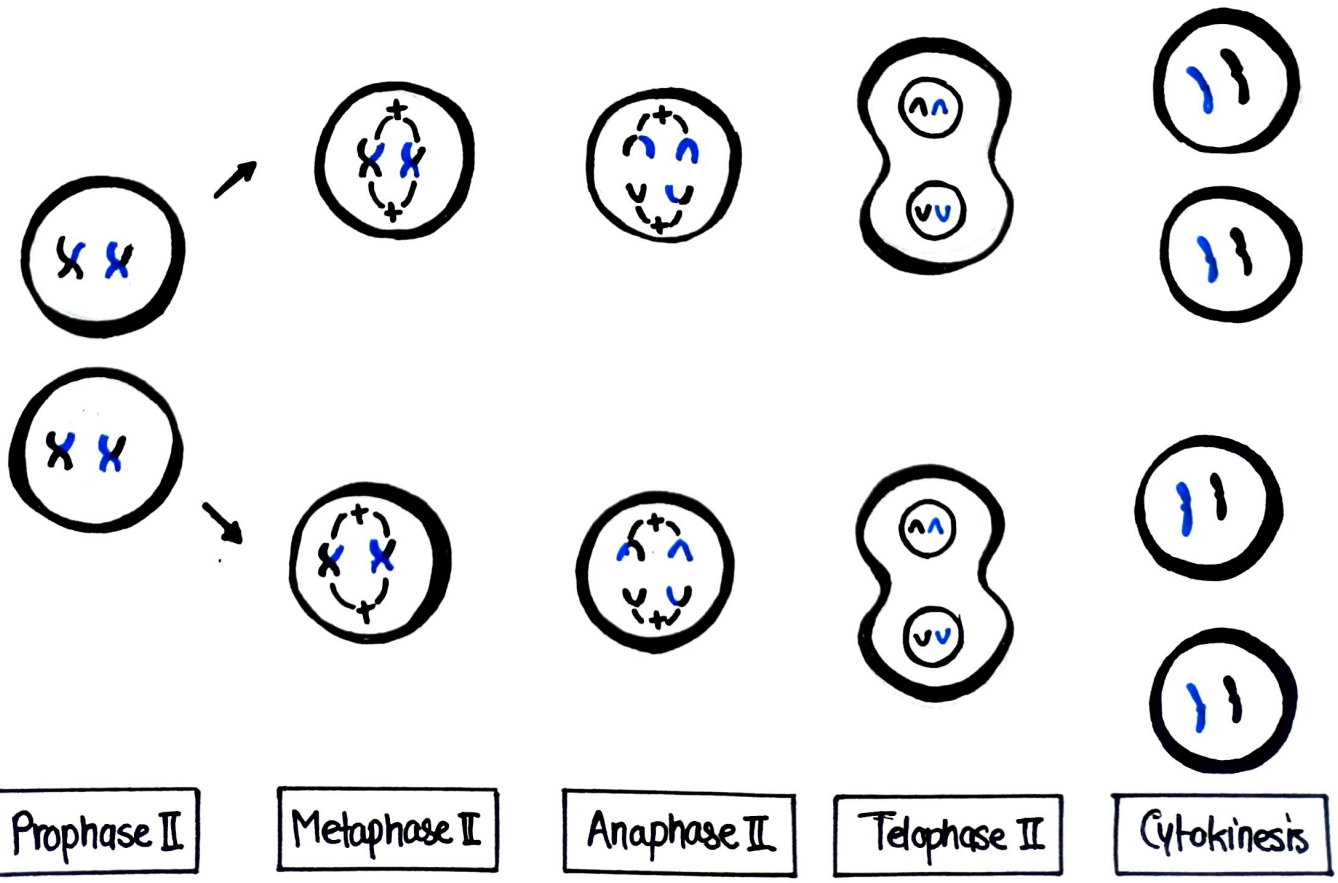
The spindle fibre of centrosome align the chromosomes (with sister chromatids) at the centre of the cell.

Anaphase - II

The centromere splits and sister chromatids separate and move towards opposite pole of the cell.

Telophase - II

The spindle fibre disappears and a new nuclear membrane forms around the separated chromatids and by the process of cytokinesis we get 4 new haploid cells.



CELL JUNCTIONS

- Cell Junction is simply the connection b/w two plasma membrane or two cells.
- It can be seen between two cells or b/w cell and basement membrane.
- It consist of multi-protein complexes that provides contact b/w two neighbouring cells.

Functions of Cell Junctions

- Helps in attachment of cells.
- Helps in transfer of ions/ substances
- To prevent the movement of unwanted substances
- Helps in cell communication.

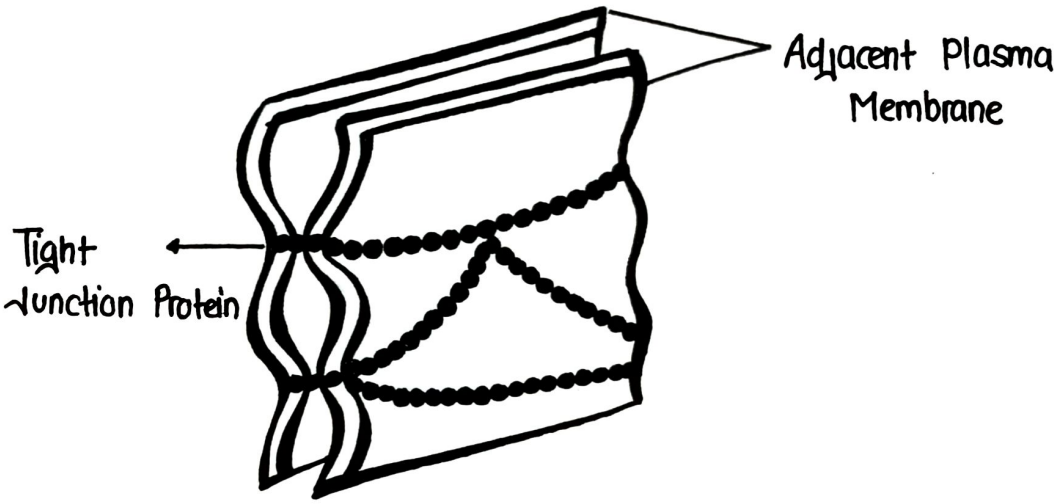
Types of Cell Junctions

There are five different types of cell junctions :

① Tight Junctions
② Adherens Junctions
③ Desmosomes
④ Hemi-desmosomes
⑤ Gap Junctions

Tight Junctions

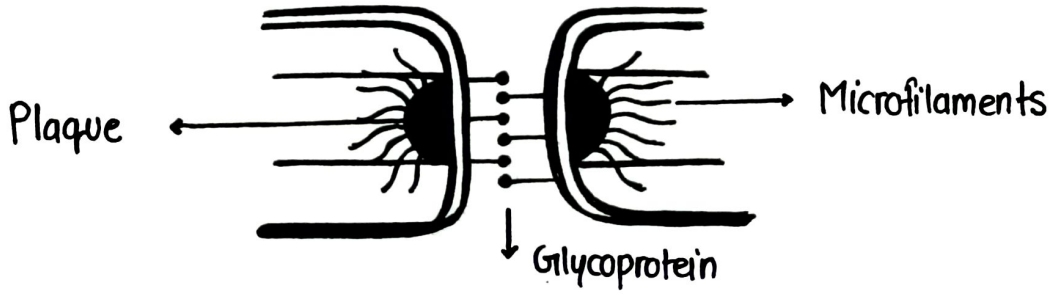
- Tight junctions act as a barrier that prevents the movement of unwanted ions / substances across cells.
- The cells of epithelial tissues that found in stomach, intestine and urinary bladder contain many tight junctions that prevents the leaking of components into blood.



TIGHT JUNCTIONS

Adherens Junctions

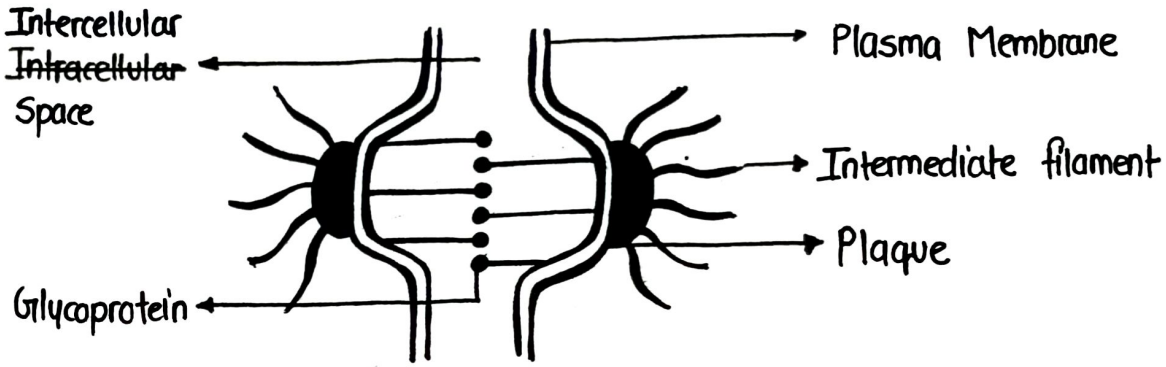
- These are also called belt desmosomes
- Adherens junction contain plaque (a dense layer of protein)
- The glycoprotein present in adherens junction helps to join the cells.



ADHERENS JUNCTIONS

Desmosomes

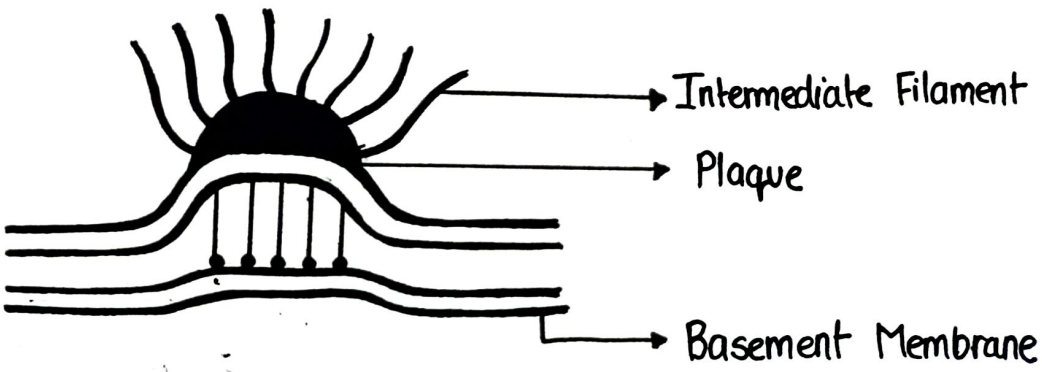
- These junctions keeps the neighbouring cells together.
- They contains Plaque and intermediate filament (made of keratin)
- The glycoprotein helps in attachment of cells.



DESMOSOMES

Hemidesmosomes

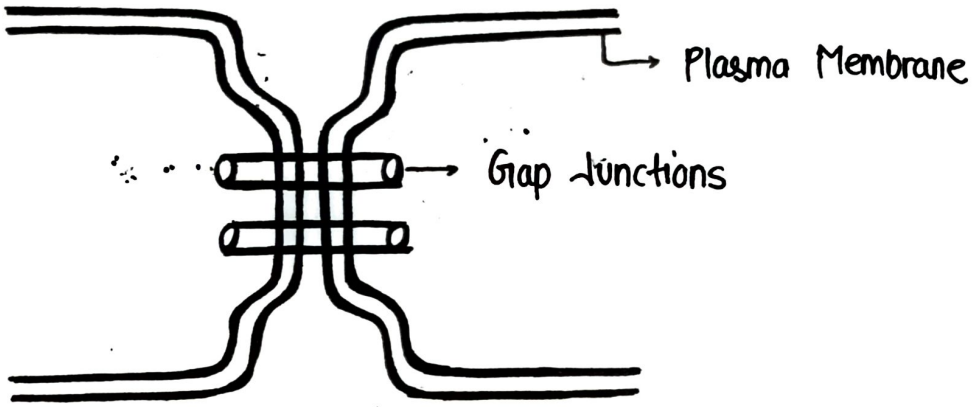
- Hemidesmosomes resemble like desmosomes but they do not attach with adjacent cells, they are basically attached with the basement membrane.



HEMIDESMOSOMES

Gap Junctions

- Gap junctions are specialized intercellular connection between cells which helps in the transfer of required ions / substances between two or more cells.
- A gap junction allows the communication of cells with one another.



GAP JUNCTIONS

CELL COMMUNICATION

- Cell communication is also known as 'Cell signalling'
- It is the ability of cell to receive and send signals from & to another cell.
- Cell communication is important for growth and development of cells. It is also important to maintain homeostasis.

- Communication between cells requires:

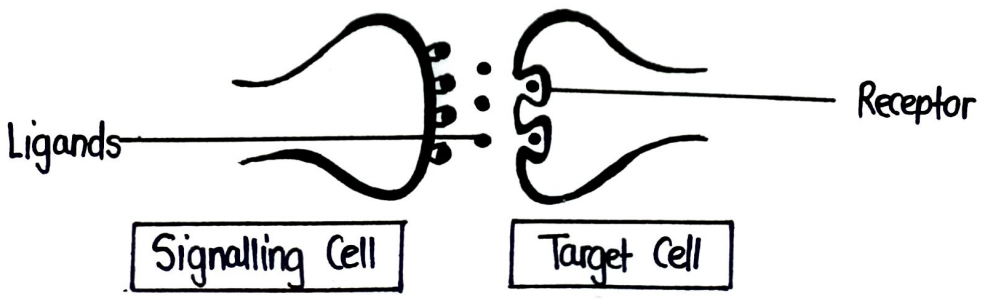
① Ligand : the signalling molecule
② Receptors : the site where receptor binds

Types of Cell Signalling

① Paracrine Signalling
② Autocrine Signalling
③ Endocrine Signalling
④ Direct Signalling

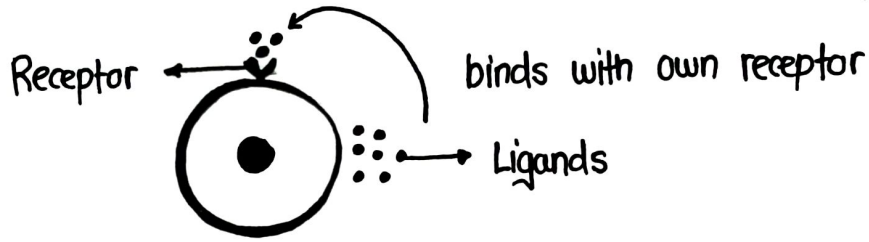
Paracrine Signalling :

- Paracrine & signalling is a form of cell signalling in which 'target cell' is very close to 'signalling cell' but not directly attached.
- It plays an important role in growth and development.



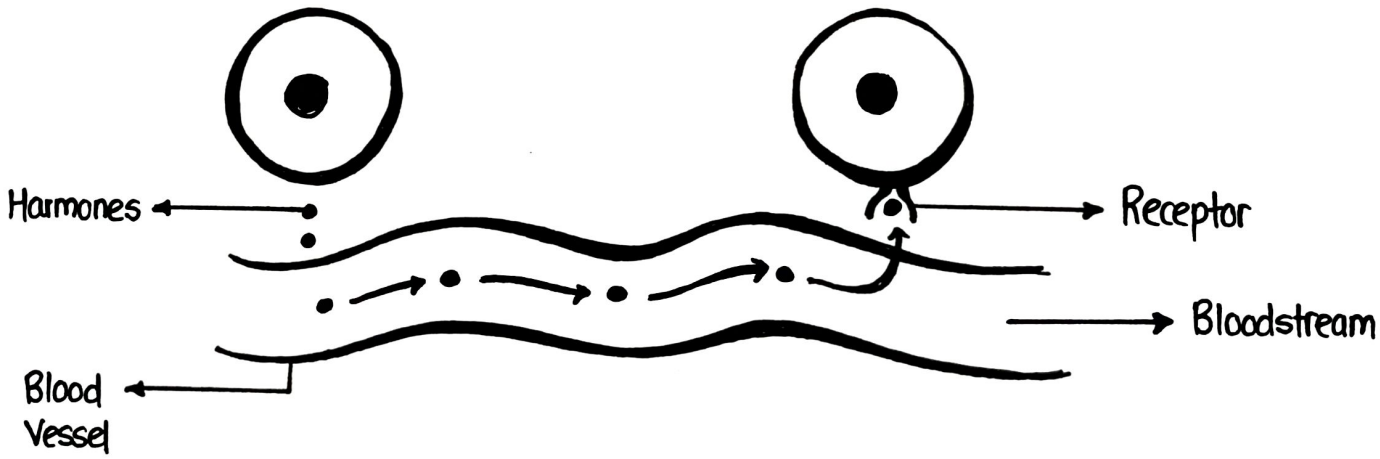
Autocrine Signalling

- In autocrine signalling, a cell signals to itself, releasing a ligand that binds to receptor on its own surface.
- Autocrine signalling plays a key role in 'metastasis'



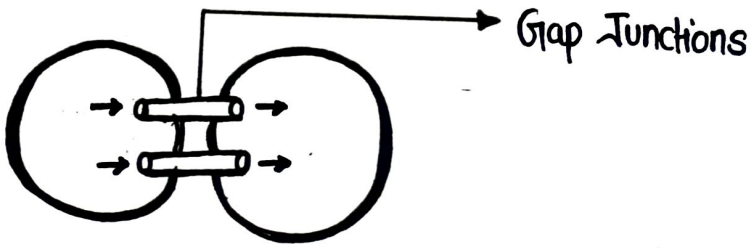
Endocrine Signalling

- When the target cell is too far from signalling cell, then cell releases its signals (ligands) into the 'bloodstream' and act on target cells and this type of signalling, called Endocrine signalling.
- In endocrine signalling, signals are in the form of harmones



Direct Signalling

- Direct signalling occur by transferring signal molecules across gap junction b/w neighbouring cells.



IMPERFECT PHARMACY

Tissue Level Of Organisation

Tissue

- Tissue is defined as group of cells having similar structure and functions.
- Histology is the branch of science that deals with the study of tissues.

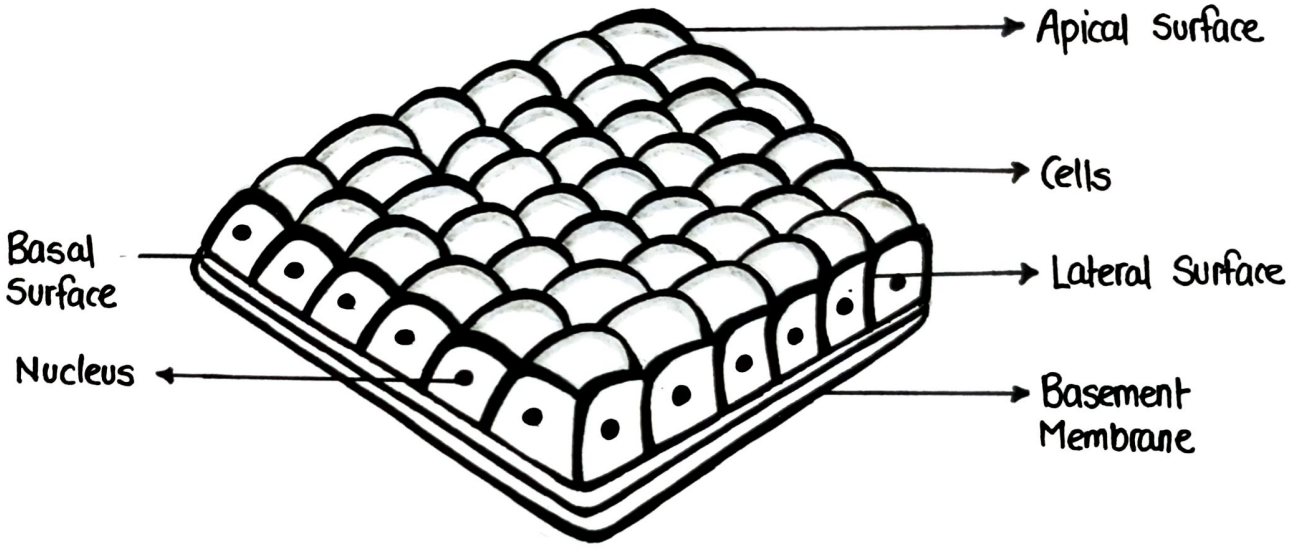
Types of Body Tissues :

According to structure and function body tissues can be classified into four basic categories :

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

EPITHELIAL TISSUE

- It is also known as 'Epithelium'
- It forms the outer covering of body and internal organs.
- In epithelial tissue cells are closely pack in the form of continuous sheet having no intercellular space.
- In epithelial tissue cells are connected with basement membrane by hemidesmosomes.



EPITHELIAL TISSUE

Functions of Epithelial Tissue :

- Protection (protects underlying tissue from injury and bacterial infection)
- Secretion (secretion of sweat from sweat glands)
- Absorbtion (Absorbtion of water and nutrients)
- Excretion (Elimination of waste products)

Types Of Epithelial Tissue

- Epithelial Tissue
  - Simple
    - Simple Cuboidal
    - Simple Squamous
    - Simple Columnar
  - Stratified
    - Stratified Cuboidal
    - Stratified Squamous
    - Stratified Columnar

Simple Epithelial Tissue

It is made up of single layer of cells and is divided into 3 sub categories :

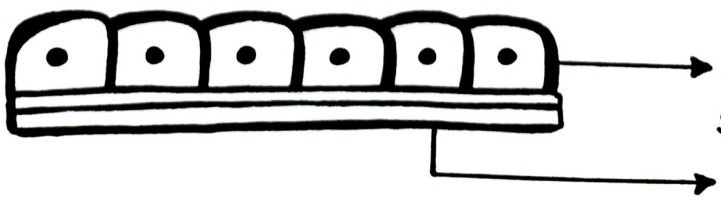
① Simple Cuboidal Epithelium
② Simple Squamous Epithelium
③ Simple Columnar Epithelium

Simple Cuboidal Epithelium :

It consist of single layer of cube shaped cells arranged on basement membrane.

Location : Lining of kidney tubules, pancreas, Covering of ovaries

Function : Secretion, Transporation (glands), Filtration (kidney)

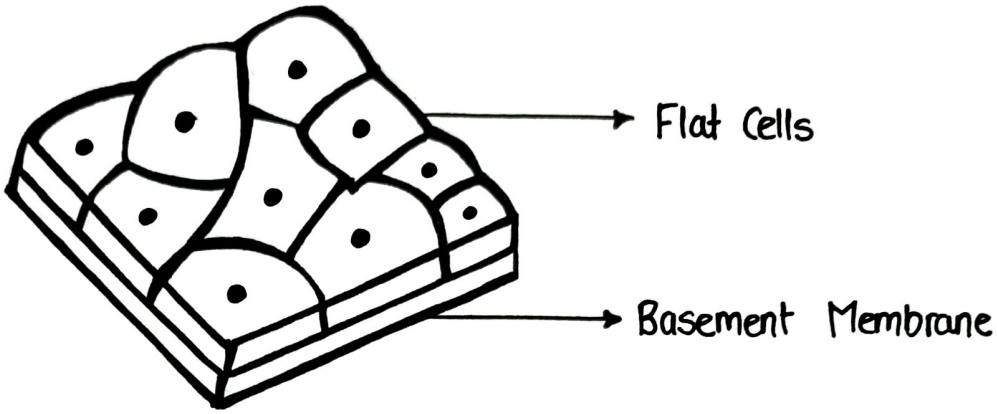


Simple Squamous Epithelium :

It consist of single layer of flat cells arranged on basement membrane.

Location : Lining of heart, blood vessels, air sacs of lungs.

Function : Absorbtion and Filteration

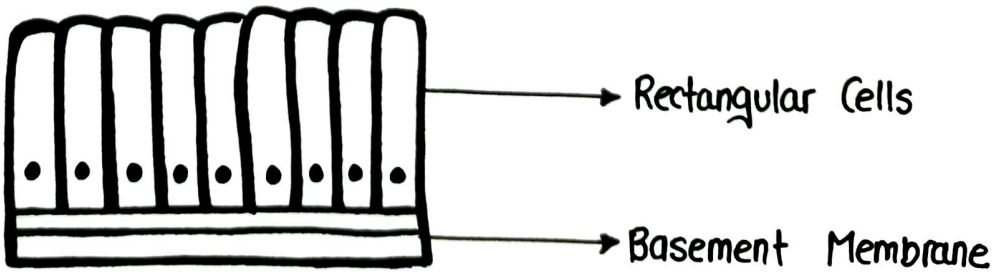


Simple Columnar Epithelium :

It consist of single layer of rectangular shaped cells arranged on basement membrane.

Location : Lining of entire digestive tract, reproductive system, eyes, ears

Function : Absorbtion, Protection, Secretion



Stratified Epithelial Tissue

It is made up of multiple layer of cells and further divided into 3 sub categories :

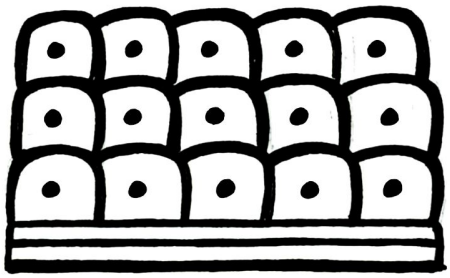
① Stratified Cuboidal Epithelium
② Stratified Squamous Epithelium
③ Stratified Columnar Epithelium

Stratified Cuboidal Epithelium :

It is made up of two or more layer of cube shaped cells attached on basement membrane.

Location : Lining of sweat glands, male urethera, uretus and anus

Function : Protection, Secretion, Absorbtion

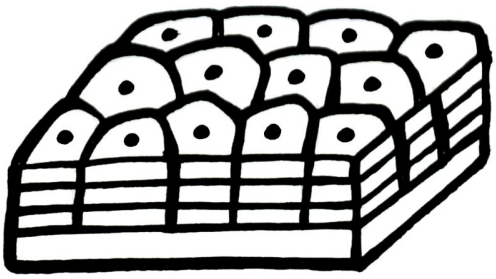


Stratified Squamous Epithelium :

It is made up of multiple layer of flattened cells.

Location : Skin, Mouth, Throat and Vagina

Function : Protection, keratin makes skin waterproof

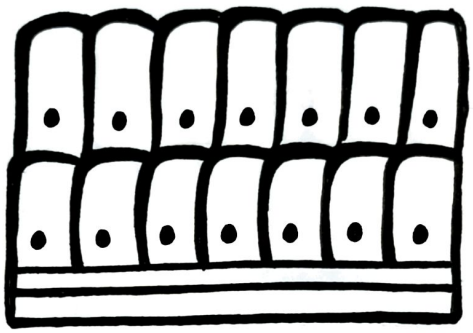


Stratified Columnar Epithelium

It is made up of several layer of rectangular shaped cells.

Location : Mucous membrane , Lining of eyelids

Function : Protection and Secretion



CONNECTIVE TISSUE

- Connective tissue as the name says it connects, support and binds different tissues and organs of the body.
- It is the most abundant and widely distributed tissue system in the body
- In connective tissue cells are loosely packed having a huge intercellular space.

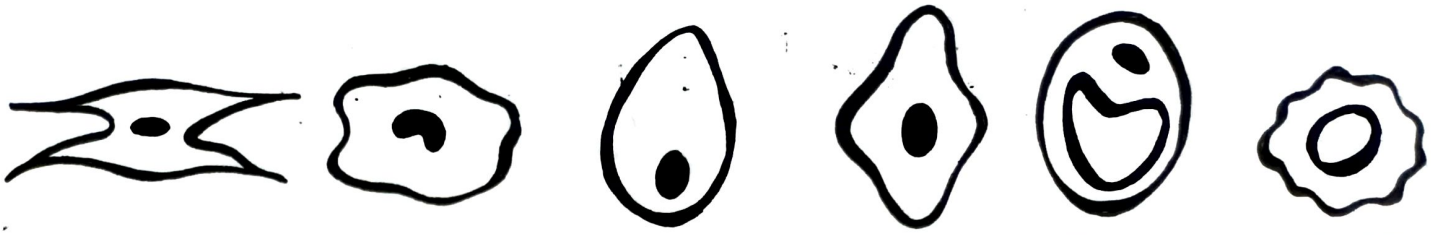
Composition of Connective Tissue

A connective tissue is composed of following three components

- Cells
- Fibres
- Ground substances

Cells

Fibroblast	Macrophages	Plasma Cells	Mast Cells	Adipocytes	WBC
They are the most common-ly found cell inearly in all connective tissue	Developed from mono--cytes, it destroys bacteria	Developed from B-lymphocytes and it sec--retes antibody	It releases histamine that dilates blood vessel	Also known as Fat cells and it stores fat	Also known as Leukocytes It protects body from infection



Fibroblast | Macrophages | Plasma Cells | Mast Cells | Adipocytes | WBC

Fibres

Collagen Fibres	Elastic Fibres	Reticular Fibres
• Made of collagen type I	Made of elastin	Made of collagen type-III
• Non-branched	Branched	Branched
• Very strong	Elastic Nature	Coating of glycoprotein
• Thick compared to other two fibres	Thin compare to collagen fibre	Thinnest
• Provide strength	Provide elasticity	Provide support

Ground Substances

- It is amorphous gel-like substance in which cells & fibres are suspended.
- It primarily composed of, water, hyluronic acid, glycoproteins, sulfate etc.

Functions of Connective Tissue

- It connects different body tissues
- Provides strength and protection to different body organs.
- Provides structural framework to body.
- Transportation and fat storage.

Types Of Connective Tissue

- Connective Tissue
  - Loose C.T.
    - Areolar Tissue
    - Adipose Tissue
    - Reticular Tissue
  - Dense C.T.
    - Dense Regular
    - Dense Irregular
  - Specialised C.T.
    - Cartilage
    - Bones
    - Blood

Loose Connective Tissue

Loose connective tissues are present all over the body. In loose connective tissue fibres and cells are loosely arranged in semi-fluid matrix. It has large proportion of ground substances.
It is further classified into 3 categories :

① Areoral connective tissue
② Adipose connective tissue
③ Reticular connective tissue

Areoral Connective Tissue :

It consist of collagen fibre, elastic fibre, reticular fibre and several kinds of cells such as fibroblasts, macrophages, plasma cells, adipocytes etc.

Location : Below the skin and between muscles

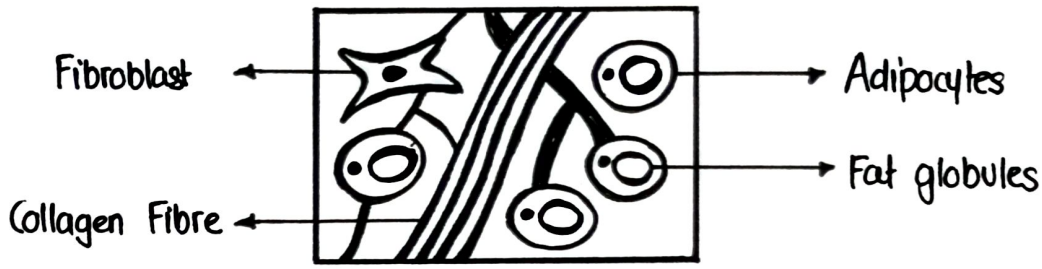
Function : Gives strength, elasticity and support tissue

Adipose Connective Tissue :

It mainly consist of adipocytes and few number of fibroblast cells

Location : Deep layer of skin , around heart and kidney

Function : Prevent heat loss , protects organ

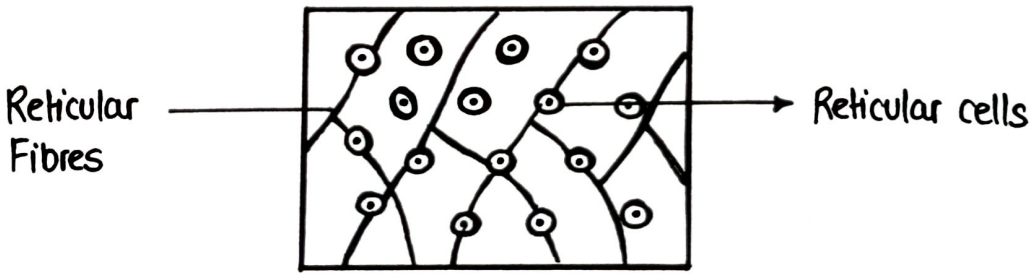


Reticular Connective Tissue :

It mainly consist of reticular fibres and reticular cells

Location : Liver, red bone marrow , around blood vessel and muscles

Function : forms stroma of organs



Dense Connective Tissue

In dense connective tissue , fibres are closely packed and fibre content is higher and cell content is lower.
They are also divided in two sub categories :

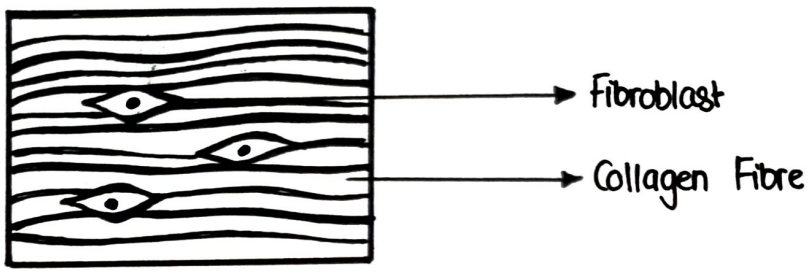
① Dense Regular Tissue
② Dense Irregular Tissue

Dense Regular Tissue :

In this fibres are arranged in a regular (parallel) pattern.

Location : Tendons (Attach muscle to bone)
Ligaments (Attach bone to bone)

Function : Provides strong attachment

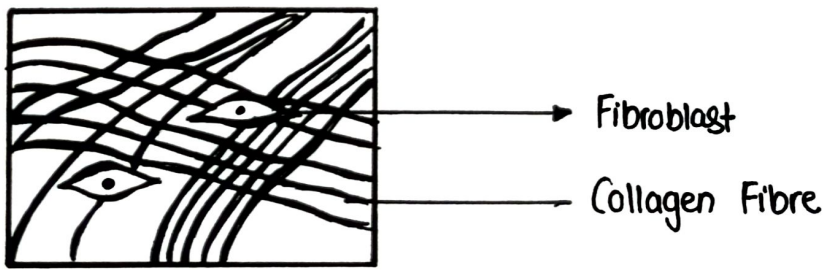


Dense Irregular Tissue :

In Dense irregular tissue fibres are arranged irregularly (randomly)

Location : Dermis of skin, liver, testes, Lymph node

Function : Provides strength



Specialized Connective Tissue

Rather than above Connective tissue, these are supportive that help in maintaining correct posture and support internal organs.

① Cartilage
② Bones
③ Blood

Bones :

- Bone is the hardest connective tissue
- It helps in maintaining the shape and posture of body.
- It is composed of 25% water, 30% organic material and 45% inorganic salts.

Blood :

- It is a fluid connective tissue
- It is composed of 55% plasma and 45% of cells.
- Blood cells are of three types :

① Red Blood Cells (RBCs)
② White Blood Cells (WBCs)
③ Platelets

Cartilage :

- Cartilage is mostly present in the embryonic stages and work as a supporting skeleton.
- Most of the cartilage is replaced by bones in adults, however it supports some structures in adults too.

MUSCULAR TISSUE

Muscular tissue also known as 'Muscle Tissue' is made up of elongated cells called as 'Muscle Fibres' that uses ATP to generate force.

The main functions of muscle tissue are :

- Produce movement
- Stabilize body positions and maintain posture
- Producing heat

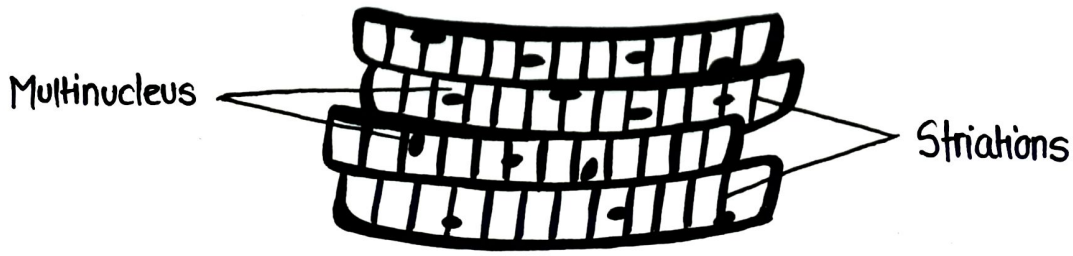
Types of Muscle Tissue

The muscular tissue is of three types

① Skeletal Muscle Tissue
② Smooth Muscle Tissue
③ Cardiac Muscle Tissue

Skeletal Muscle Tissue :

- The cells are long and cylindrical in shape
- The cells of skeletal muscles are multinucleated
- These muscles are also known as striated muscles.
- Skeletal muscles are voluntary in nature
- These muscle are attached to bone and hence called skeletal muscles.
- 40 %. of body mass comprises skeletal muscles.



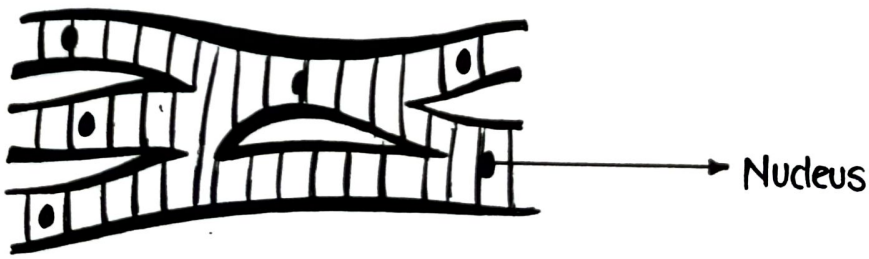
IMPERFECT PHARMACY

Smooth Muscle Tissue :

- The cells are spindle shaped
- The cells of smooth muscle tissue are uninucleated (single nucleus)
- Smooth muscle tissue are Non-striated
- Smooth muscle tissue are involuntary in nature

Cardiac Muscle Tissue :

- They are found only in the heart
- The cells are uninucleated
- Cardiac Muscle tissue are striated
- They are involuntary in nature



Nervous Tissue

- Nervous tissue is the most complex tissue in the human body.
- It is the main tissue of our nervous system
- It is formed by a network of more than 100 million nerve cells.
- Nervous tissue consist of two cells

① Nerve cells or Neurons
② Glial cells

Functions of Nervous Tissue

- Regulates and controls body functions
- Generates and transmits nerve impulse.
- Support, insulates and protect impulse generating neurons.

Nerve Cell / Neuron

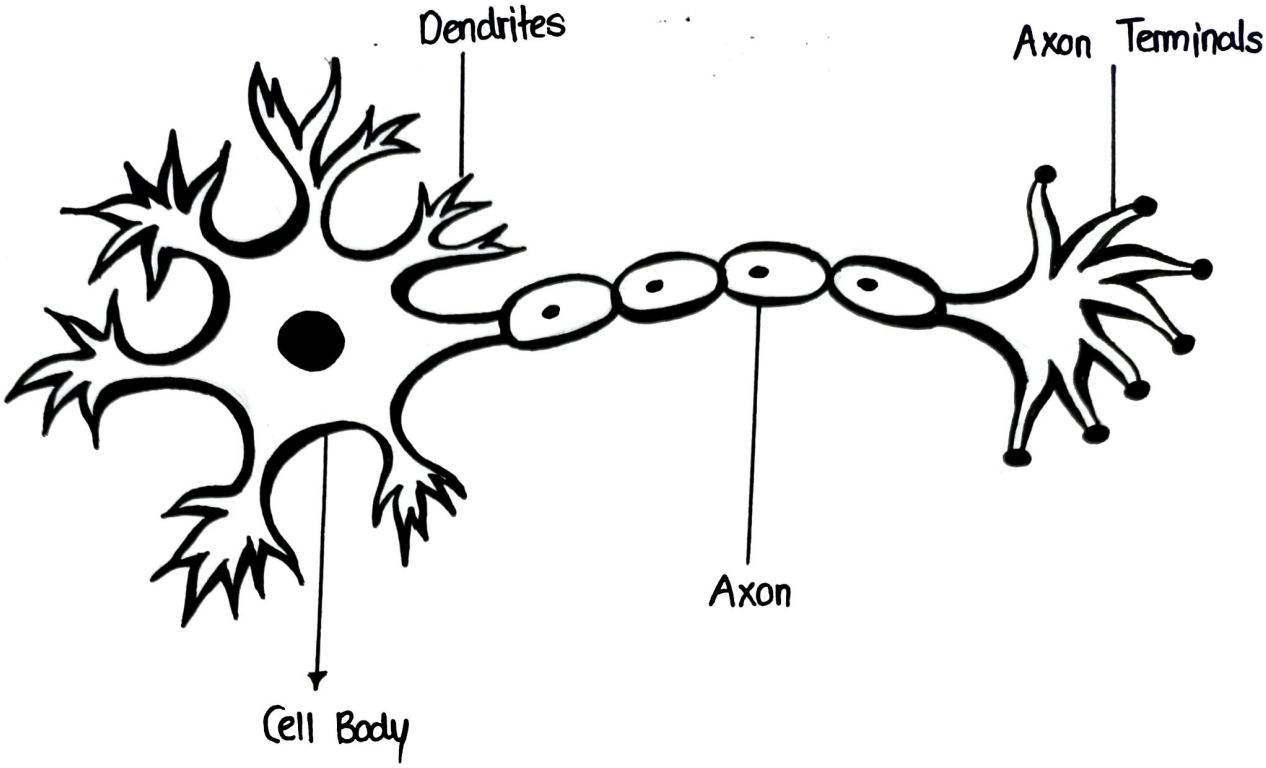
Neurons (also called as nerve cells) is the fundamental unit of brain and nervous system and is composed of cell body, Dendrites, Axon and Axon terminals

Cell Body : It contains nucleus and other cell organelles

Dendrites : These are short branch like structure that receive messages from other neurons

Axon : It is thin, long and cylindrical process, carries electrical impul

Axon Terminals : End part of axon, transmit signals to other neurons



Glial Cells

- Glial cells also known as neuroglia, are non-neuronal cells
- They ~~pro~~ do not produce electrical impulse
- They maintain homeostasis
- The provide support and protection for neurons.

THANK YOU

FOR CHOOSING IMPERFECT PHARMACY AS YOUR STUDY PARTNER

IMPERFECT PHARMACY

JOIN US ON :

- IMPERFECT PHARMACY
- IMPERFECT PHARMACY
- @IMPERFECTPHARMA
- IMPERFECT PHARMACY
- @IMPERFECTPHARMACY
- IMPERFECT PHARMACY

IMPERFECTPHARMACY@GMAIL.COM