Cytology

The cell

Cytology is the science about a cell .

The cell :is the basic structural and functional unit of all multicellular organisms, limited to an active cell membrane, cytoplasm and nucleus.

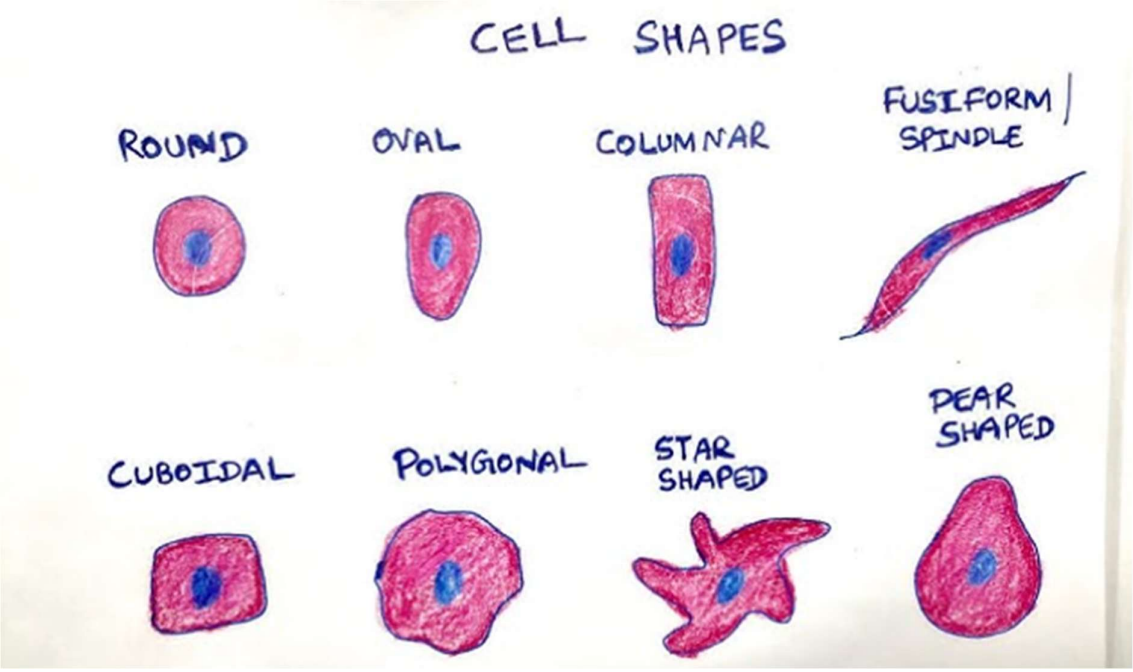
Def: is the structural and functional unit of all tissues

Shape varies: rounded - oval - flat - stellate polygonal -cuboidal - columnar

Animal cell consists of :

1) Cytoplasm

2) Nucleus



Its formed of:

1) Cytoplasmic matrix (cytosol)

Def: is non - organelle component of the cytoplasm occupying the intracellular space between organelles and inclusions It contain

1) Proteins

3) carbohydrates

2) Lipids

4) small ions

2) organelles

3) inclusion

Organelles	Inclusions
Living	non living
Permanent	temporary
Essential	non essential (lifeless)
Active	inert
have a vital function	results from cell activity

They are classified according to the presence of limiting membrane into:

Membranous organelles	Non membranous organelles
Covered by membrane	Uncovered by a membrane
1) cell membrane	1) ribosome
2) mitochondria	2) centriole
3) endoplasmic reticulum	
4) Golgi apparatus	
5) lysosome	
6) peroxisome	

A. Membranous organelles

1) Cell membrane (plasma lemma - plasma membrane)

Def: is the outer membrane of the cell that acts as a barrier between internal and external environment

L.M: it's too thin to be seen (8-10 nm) (not seen by L.M)

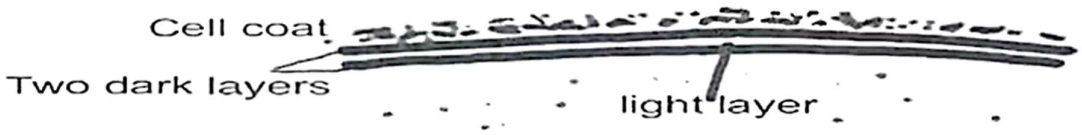
The cell boundary that is often seen (give reason for)? due to

1) Condensation of the cytoplasm on the inner aspect of the cell membrane

2) Condensation of the stain such as (silver stain - PAS stain) on the carbohydrate on

E.M: the cell membrane is appear as trilaminar structure (give reason for)?

The cell membrane consisting of outer and inner electron dense layers separated by an intermediate electron lucent layer



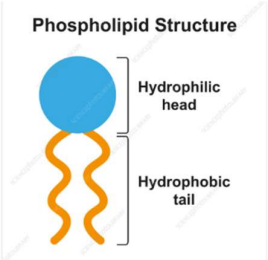
The molecular structure of the cell membrane: the most recent and acceptable model is fluid mosaic model

Fluid mosaic model: according to this model the cell membrane is made up of three major components (phospholipids - proteins - carbohydrates)

1) Phospholipids molecules

Def: molecules form a central bimolecular layer (lipid bilayer)

Each molecule has :



Head	Tall
Polar	Non - polar
Hydrophilic	Hydrophobic
Charged	Non-charged
Has affinity with water	Has no affinity of water
Directed outward	Directed inward (toward centre of membrane)

2) Proteins

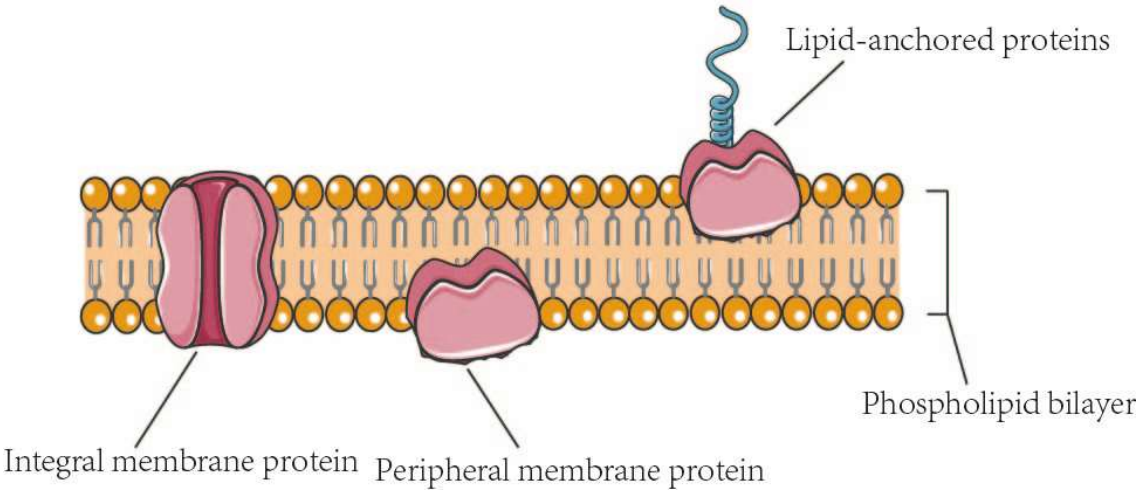
Def: the second major constituents of the cell membrane

Are arranged as globules moving freely within the lipid bilayer - present in two forms

a) Intrinsic protein (integral protein - transmembrane protein)

✓ Firmly attached to the lipid bilayer

✓Some of them extends through the entire thickness of the membrane and constitute transmembrane channels for the passage of water soluble ions and molecules



b) Extrinsic protein (peripheral protein)

✓ Outside the lipid bilayer

✓ Partially embedded to either aspects of the membranes (inner - outer aspect)

3) Carbohydrates: at the outer surface of cell membrane as a (cell coat - glycocalyx)

✓ Glycoproteins: carbohydrates conjugated to proteins

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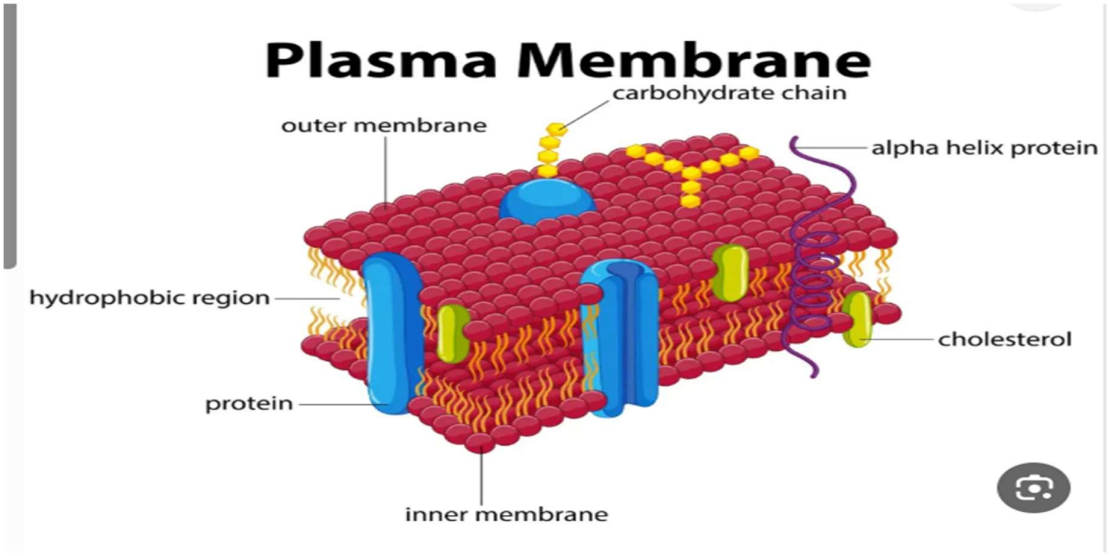
✓ Glycoproteins: carbohydrates conjugated to proteins

✓ Glycolipids: carbohydrates conjugated to lipids

These glycoproteins and glycolipids form cell coat (glycocalyx)

The glycocalyx :is the fuzzy, gel-like, sticky layer made up mainly of proteins and sugars. It surrounds the outermost cellular membrane of cells.



Functions of the cell membrane

The cell membrane is the prat of the cell that regulates the exchange of molecules and ions between its internal and external environment by several ways:

1. Passive diffusions

Entrance of small molecules into the cytoplasm it depends on concentration gradient across plasma lemma

Small molecules as (lipid soluble substances- oxygen -Co2 - water - small ions)

2. Facilitated diffusion s

Type of diffusion depends on concentration gradient and transport of large soluble molecules

Large soluble molecules as (glucose - amino acids)

Facilitated diffusion require a carrier

3. Active transport :

Process require the utilization of energy (energy is provided as ATP)

Such as (sodium - potassium pump)

4. Selective transport

It depends on the presence of specific cell surface receptors to pick specific molecules into the cytoplasm

Growth Hor

Such as (hormones)

Endocytosis (endo = inside / cytosis = cell)

Def: bulk movement of substances into the cell forming vesicle

Receptor mediated **endocytosis**