The Cellular Level of Organization

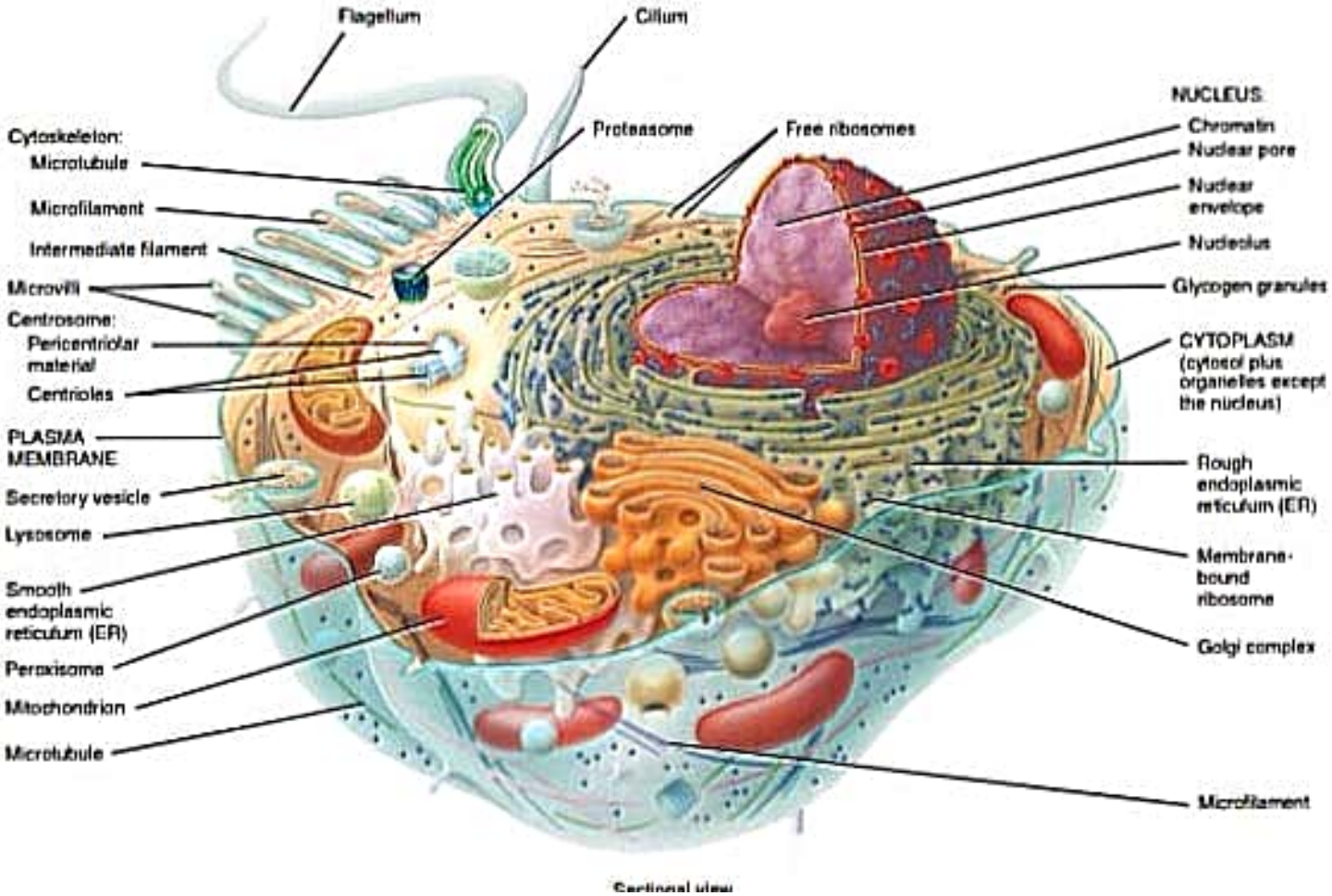
Cell :- Cell is a structural and functional unit of life.

→ Cell carry out multiple of functions that help each System contribute to the homeostasis of the entire Body.

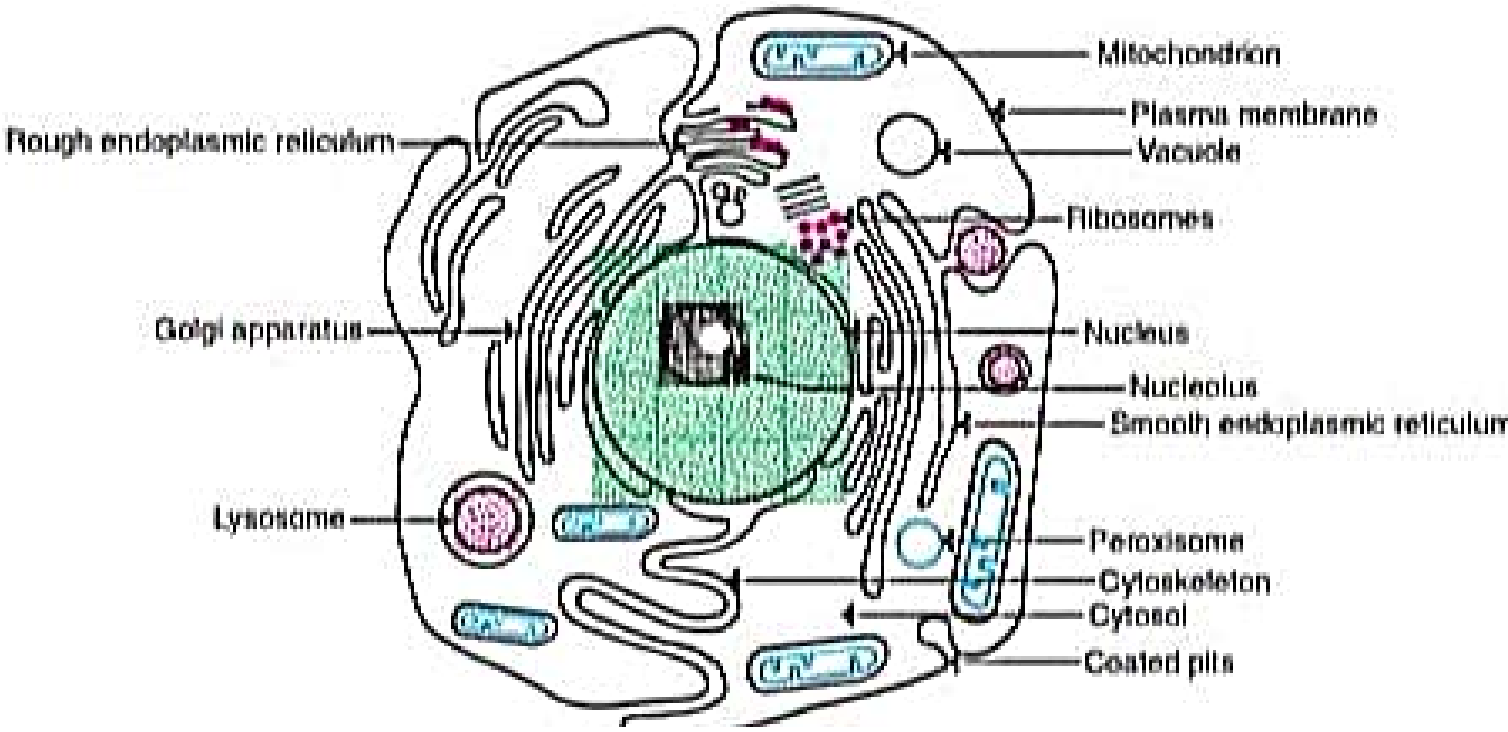
→ All cell arise from Existing and mother cell by the process of cell division.

Cell Biology :- Also known as cytology.

→ Cytology is the Study of Cellular Structure and function. Study the various cell parts and their Relationship to one another.



Sectional view


Mitochondrion
Plasma membrane
Rough endoplasmic reticulum
Vacuole
Ribosomes
Golgi apparatus
Nucleus
Nucleolus
Smooth endoplasmic reticulum
Lysosome
Peroxisome
Cytoskeleton
Cytosol
Coated pits

Function of Cell

Different Parts of Cell Perform different functions but interconnected to Each other

① Plasma Membrane :- The outer surface that Separate the Cell's Internal Environment from External Environment.

→ It is also called Cell Membrane

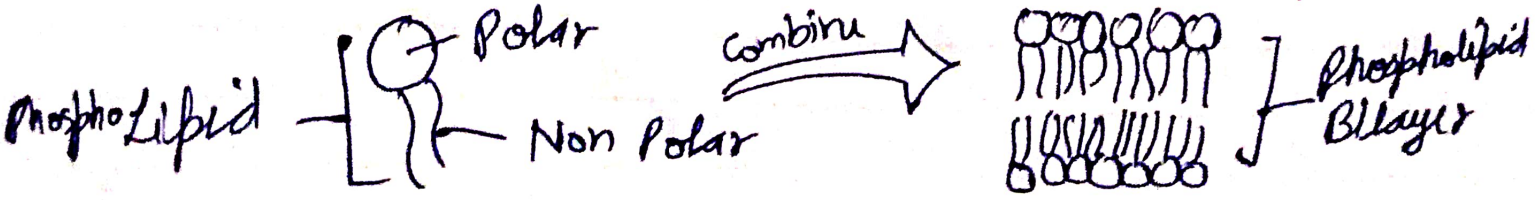
→ It is a Selective Barrier help in flow of materials into and out of cell.

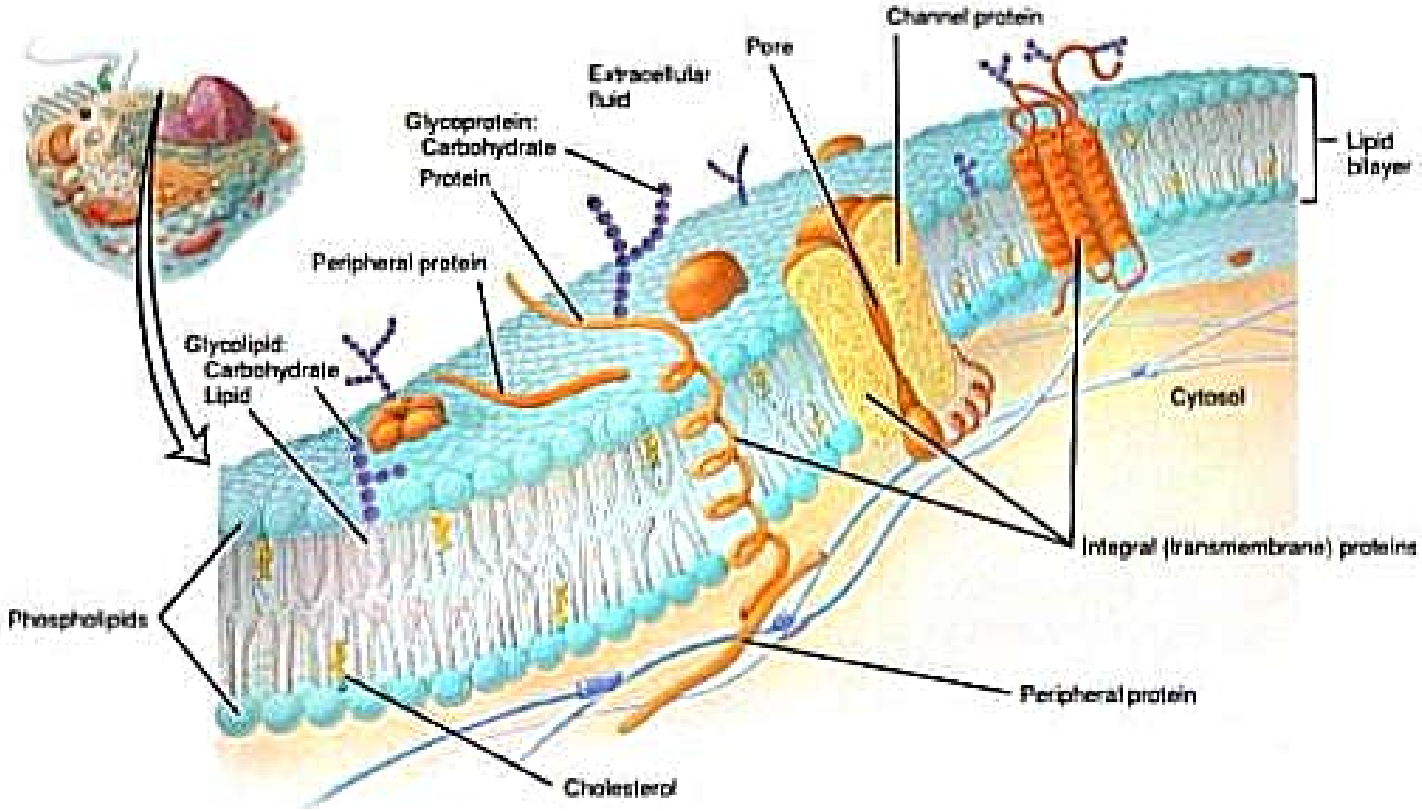
Structure

★ Membrane consist of lipid bilayer made up of 3 types of lipid (fat) molecules - Phospholipids Cholesterol and glycolipids.

→ 75% of membrane are Phospholipids, 20% of cholesterol, 5% glycolipids, etc.

→ Lipids contain Polar and Non-Polar parts.




Channel protein
Pore
Extracellular fluid
Glycoprotein: Carbohydrate
Protein
Lipid bilayer
Peripheral protein
Glycolipid: Carbohydrate
Lipid
Cytosol
Integral (transmembrane) proteins
Phospholipids
Peripheral protein
Cholesterol

→ Plasma of or cell membrane consist Protein channels, cholesterol molecules, carbohydrate etc other proteins and other atoms

☆ Functions :-

→ Some Protein makes ion channels or holes that allow only single type of ion to pass through.

→ Some Protein forms carriers, that selectively moving and carry any specific attached substance from outer to inner or inner to out by shape changing.

→ Some Protein form receptor on the surface, Drug or Other material attached to it and Activate a specific function.

→ Membrane glycoprotein and glycolipids help in
- Recognize other cells of same kind during tissue formation
- Support of Plasma membrane
- Gave Shape to the cell

② Cytoplasm :- Cytoplasm contain fluid (without organelle) called cytosol and other parts of the cell called organelles (combinely)

→ Cytoplasm = Cytosol(55%) + Organelles

→ Cytosol consist of 75-90% of water and other suspended components like ions, glucose, Amino Acids, fatty acids, ATP etc.

Functions- It is the main site of Chemical Reactions require for cell's Existence.

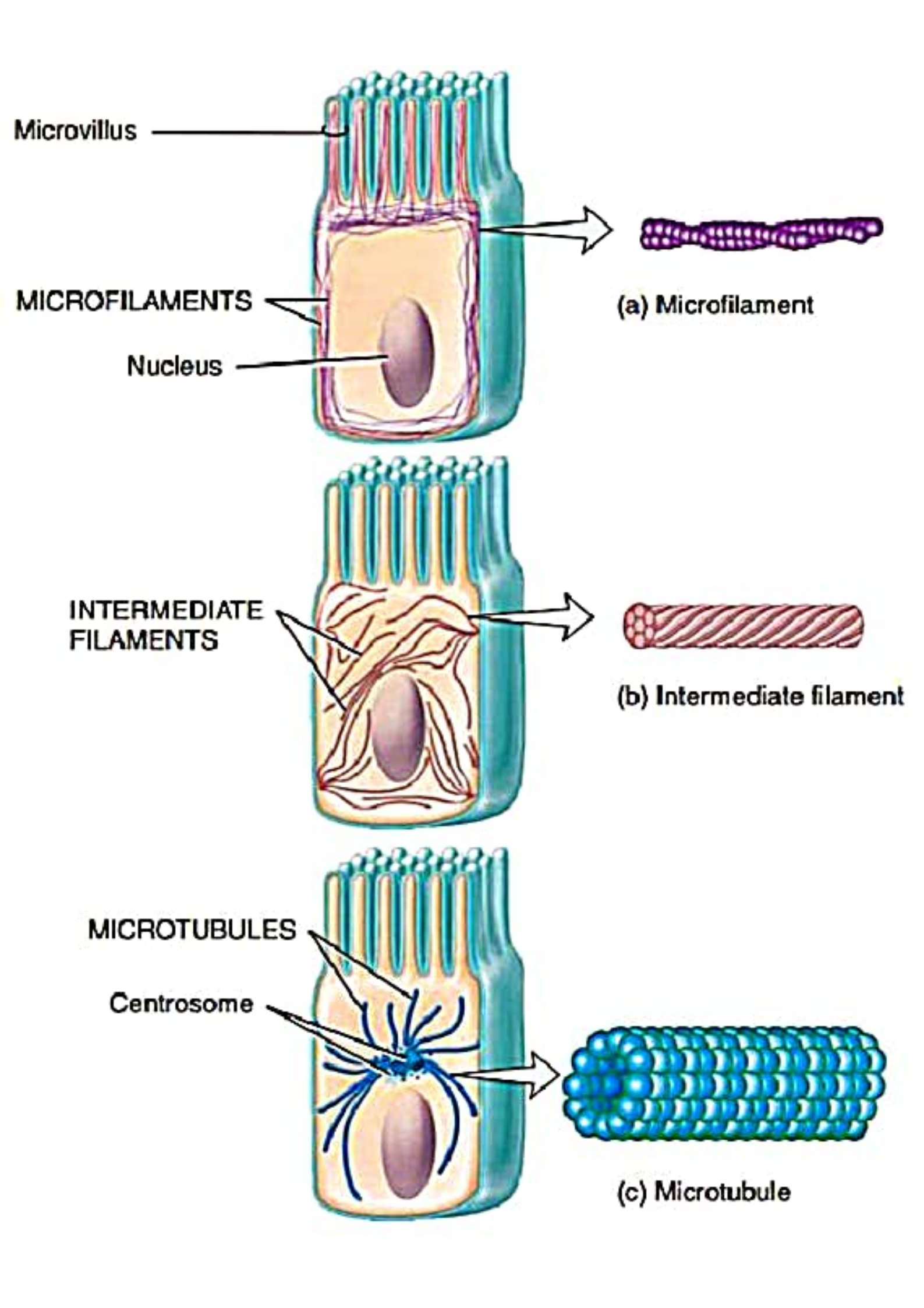
③ Cytoskeleton :- Network of protein filaments that provide and maintain cell Structure.

☆ Cytoskeleton consist of mainly 3 filaments :-

↳ Microfilaments (Contain Actin and Myosin)
(Provide mechanical Support)
(help in muscle contraction, cell division, locomotion etc)

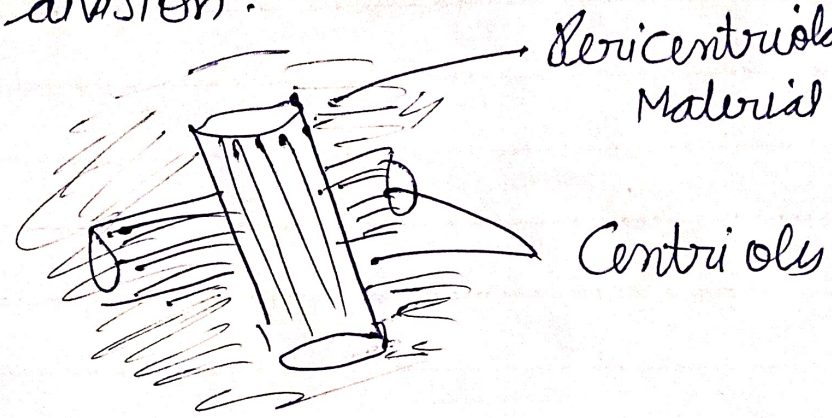
↳ Intermediate filament (thicker than Microfilament)
(Provide mechanical Support)
(help in Stabilize organelle Position)

↳ Microtubule :- (determine cell Shape and function in Movement of organelle in Some Cases)


Microvillus
MICROFILAMENTS
Nucleus
(a) Microfilament
INTERMEDIATE FILAMENTS
(b) Intermediate filament
MICROTUBULES
Centrosome
(c) Microtubule

④. Centrosome :- It located Near the Nucleus contain Pair of centrioles and Pericentriolar Material.

Function - helps in growth of mitotic Spindle during cell division.



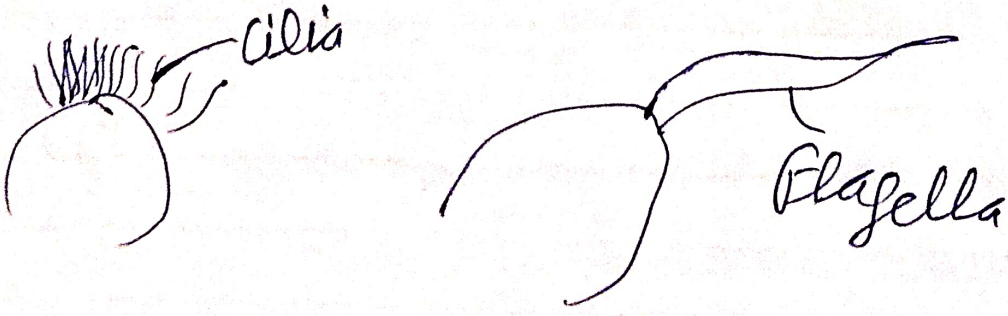
Centrosome

⑤ Cilia & flagella :- hair like Structure present on cell surface.

Cilia - more in Number, Small in length.

Flagella - 1 or 2 in Number, long.

Function :- helps in Movement of cells.



⑦ Ribosomes :- Site of Protein Synthesis . contain high content of RNA or rRNA.

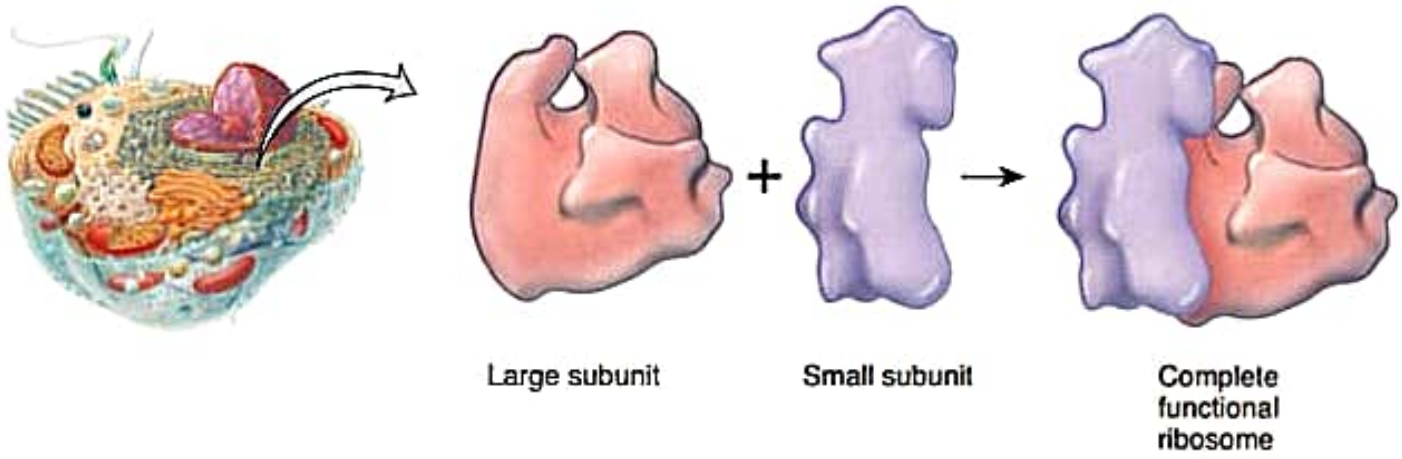
→ Structure of Ribosome divides into 2 Subunits

large small.

→ Small and large Subunits form separately in nucleolus and exit out to nucleus and attached to form Ribosomal Body

Functions :- → Protein Synthesis (formation)

→ Also locate in mitochondria and form mitochondrial Protein.



Details of ribosomal subunits

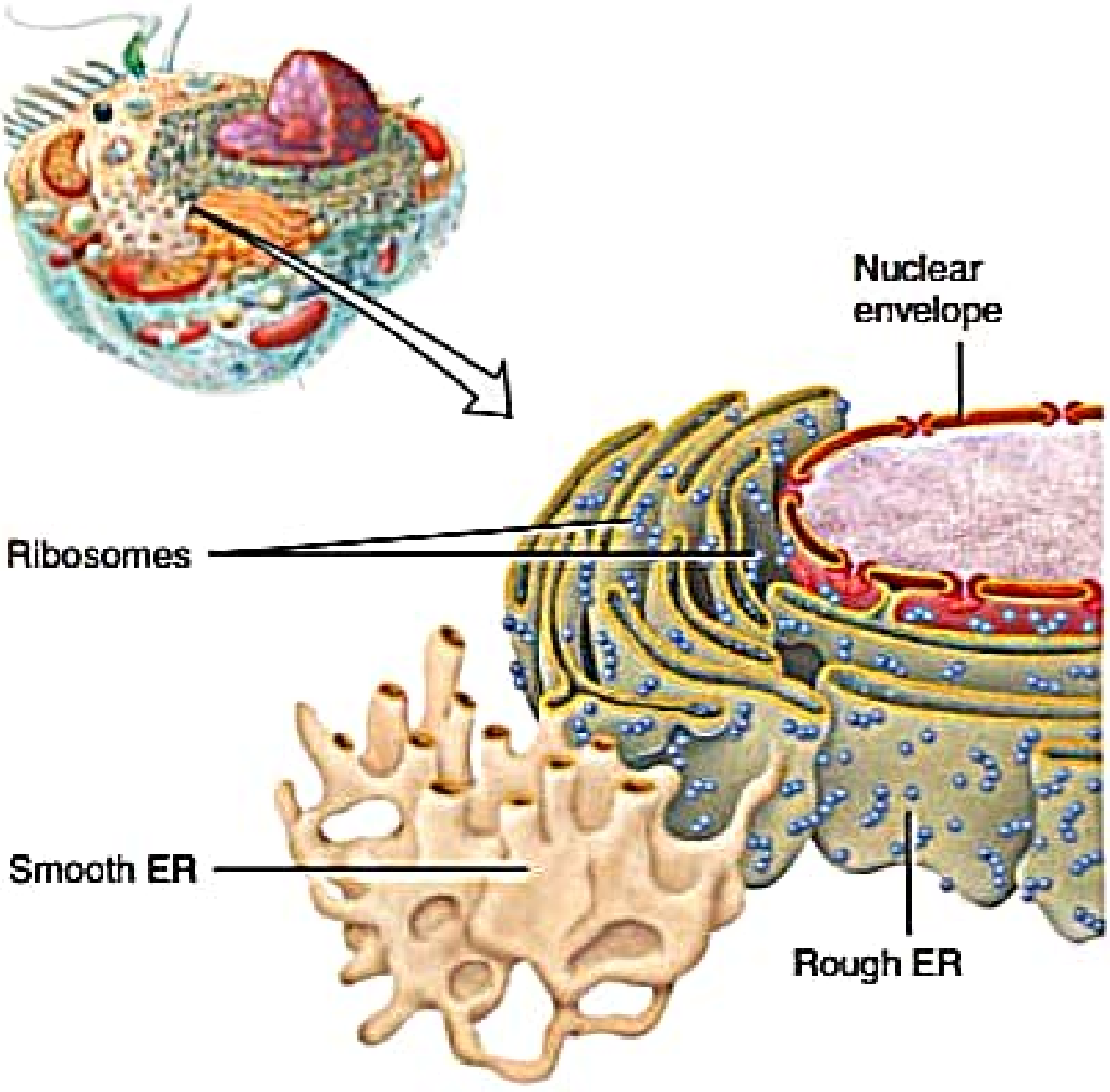
(7) Endoplasmic Reticulum: Tubular network of membranes extend / develop from the nuclear envelope - connected and projected throughout the cytoplasm.

ER → SER (Smooth Endoplasmic Reticulum)
ER → RER (Rough Endoplasmic Reticulum)

Function:

SER – √No Ribosomes attached with them.
→ SER Synthesizes Fatty acids and Steroids such as Estrogen and testesterone.

RER - Ribosomes attached to the ER.
→ helps to make glycoprotein and Phospholipids



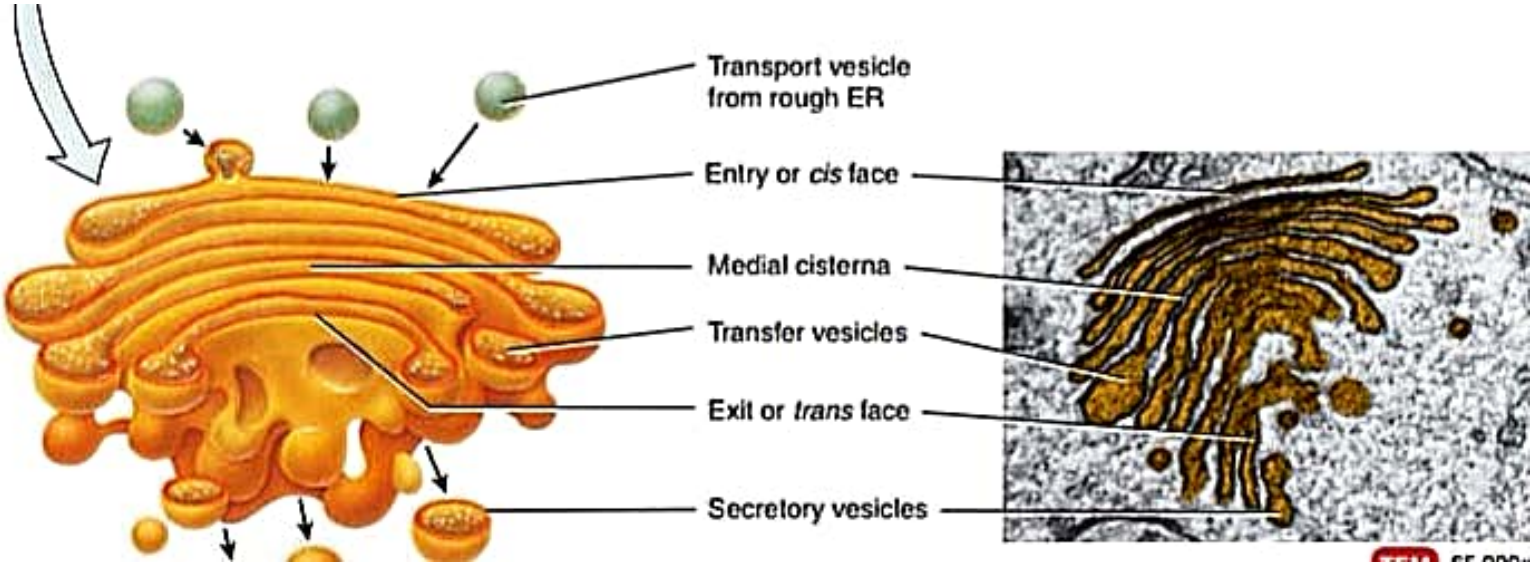
(a) Details

(8) Golgi Complex :- The way to transport protein from ER to other parts is golgi complex.

→ It is small, flattened membranous Sac Structured Body.

→ It consist of 3 to 20 Cisternae.
↓
giving cup like shape.

→ Entry, medial and Exit Cisternae of the golgi complex helps to modify, sort and Package Protein in Vesicles for Transport


Transport vesicle
from rough ER
Entry or *cis* face
Medial cisterna
Transfer vesicles
Exit or *trans* face
Secretory vesicles

(9) Lysosomes :- Membrane enclosed Vesicles formed by the golgi Complex.

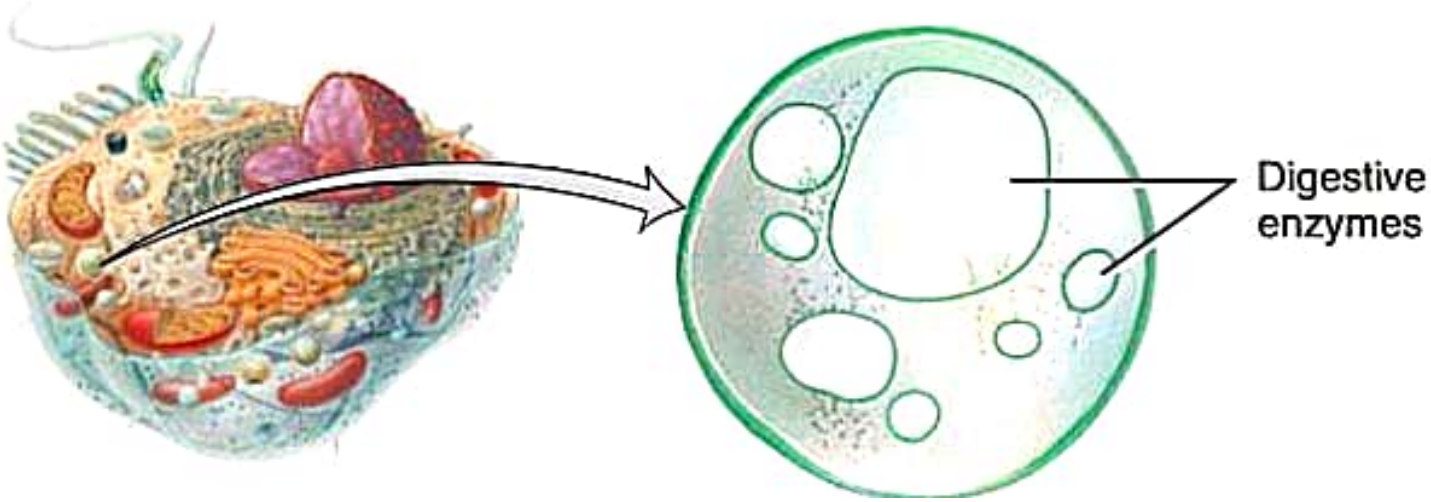
→ Contain 60 Kinds of Enzymes that are digestive and hydrolytic.

→ It works best at an acidic PH. (5)

→ Also Called Suicidal Bags of cell.

Functions - They can recycle the cell structures by engulf, digest and return digested component to cell's Cytosol for reuse.

Lysosomes contain several types of powerful digestive enzymes.



(10) Peroxisomes :- Similar to lysomes, but smaller. also called microbodies.

→ Contain oxidases enzyme that oxidize various organic substance.

exam - Amino Acids and Fatty acids are oxidized by Peroxisomes.

Function :-

→ Reduces Toxic substances also like alcohol etc.

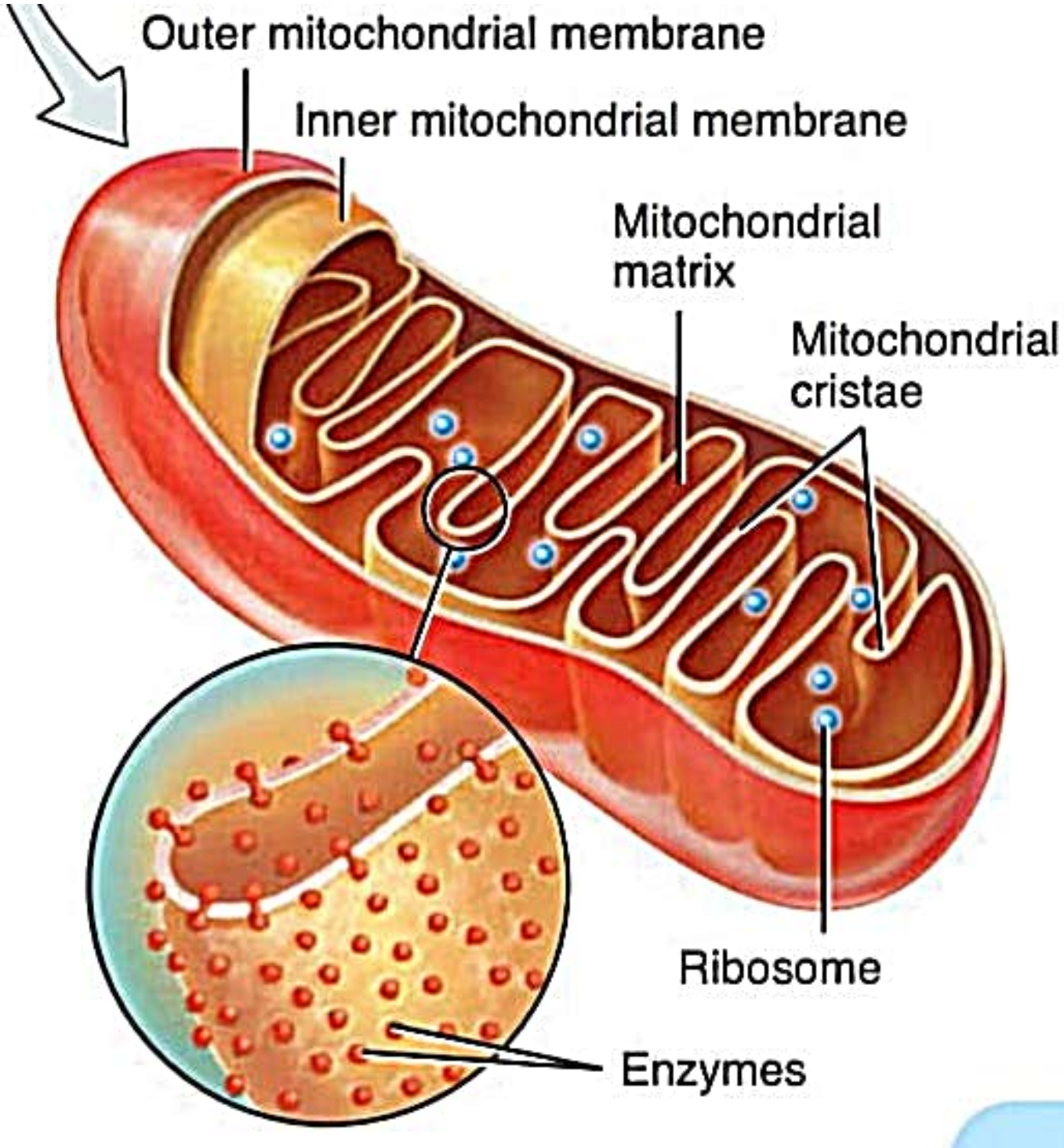
(11) Mitochondria :- Also called Power house of the cell. that generate ATP by aerobic respiration.

→ A cell may have few hundred mitochondria.

Functions :-

→ Self relicate property at time of increase Energy Demand.

→ Provide Energy Energy to the Different Parts.


Outer mitochondrial membrane
Inner mitochondrial membrane
Mitochondrial matrix
Mitochondrial cristae
Ribosome
Enzymes

(12) Nucleus :- Spherical or oval shaped structure, most important part of cell.

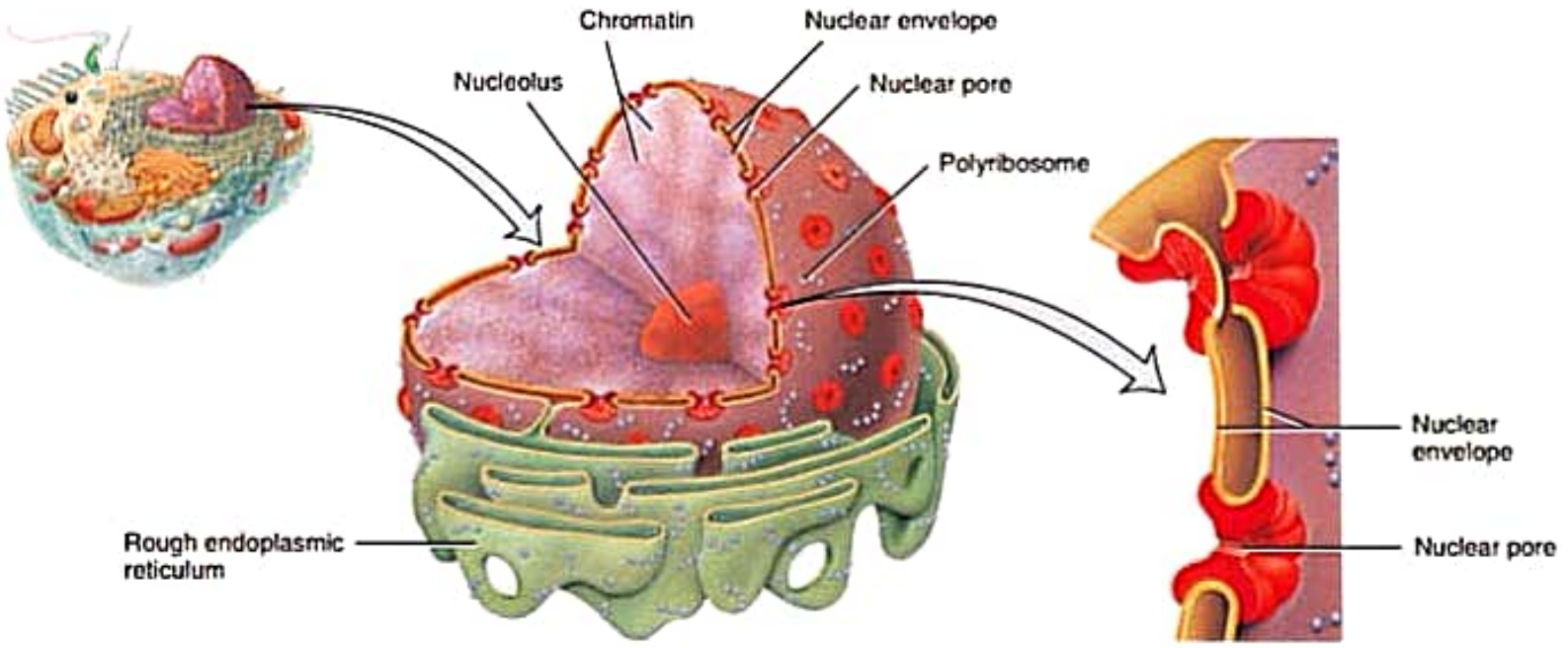
→ Outer membrane called nuclear envelope or membrane

→ Openings in nuclear membrane are called Pores.

→ Nucleoli in nucleus helps to produce Ribosomes
(Nucleolus - Singular)
→ Nucleolus contain protein, DNA and RNA in cluster. (ரிபோ)
→ Nucleus contain hereditary units called genes.
→ genes attached to chromosomes.
→ Each chromosom is long DNA molecule that coiled with proteins.
→ Cell carry genetic information called genome.

Functions :-

→ Carry genetic information from generation to generation
→ Functional unit of a cell.
→ Initial site of protein synthesis.



(a) Details of the nucleus

(b) Details of the nuclear envelope