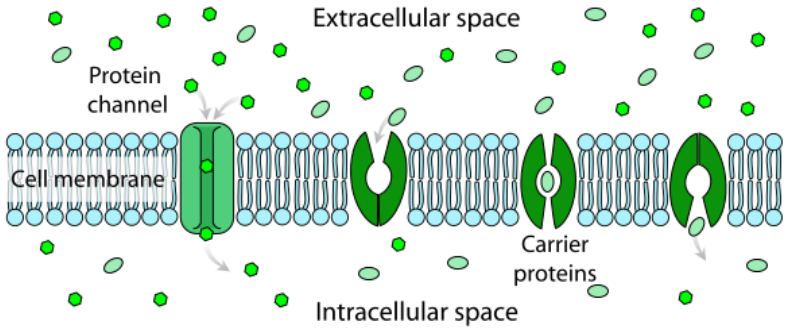


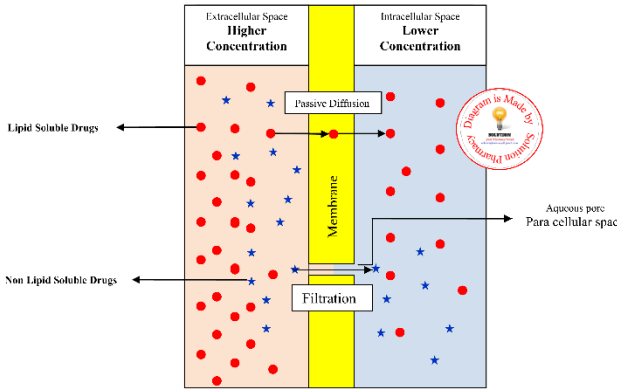
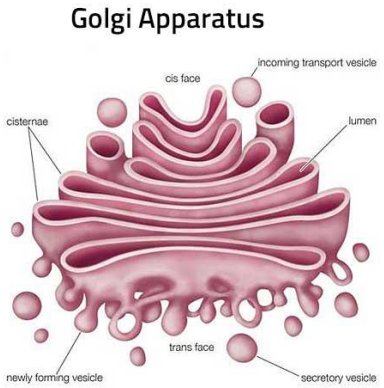
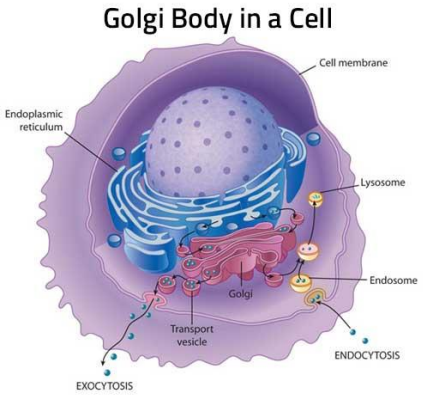
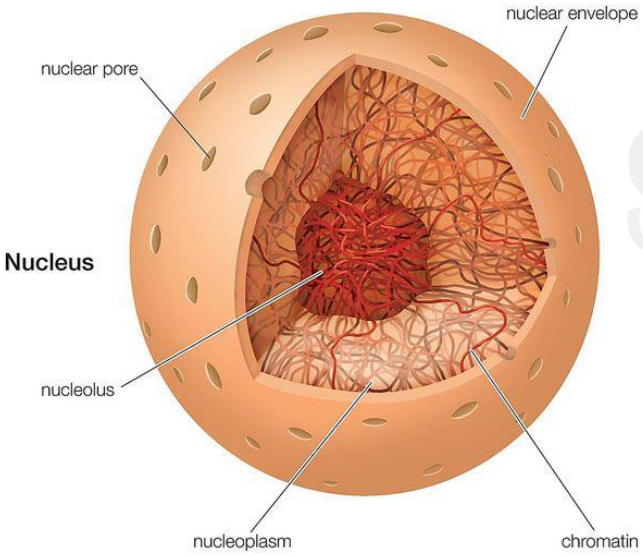


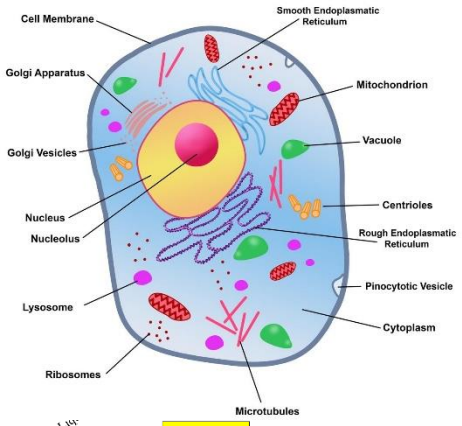
Diagram made by Solution Pharmacy. Idea- KD Tripathi
Passive diffusion and filtration across the lipoid biological membrane.
https://www.youtube.com/c/SOLUTIONpushpendra
Visit and subscribe Solution's YouTube channel, Exclusively for Experiment related videos.

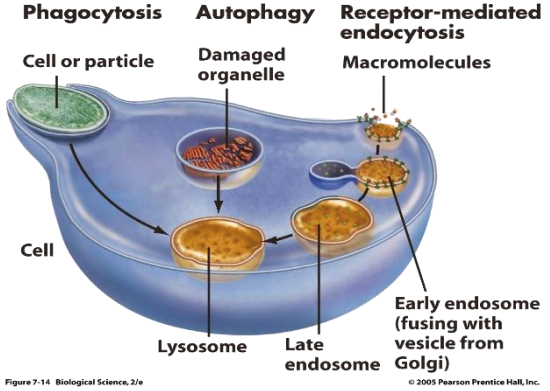


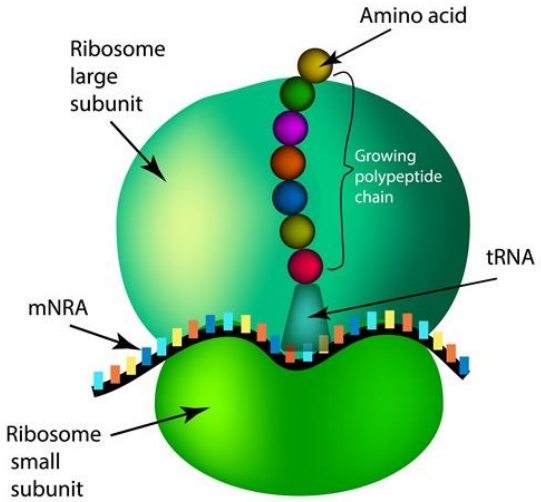


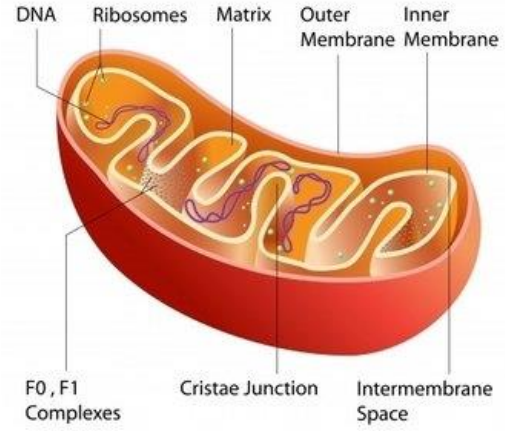


Cell
Structures and Functions
Explained Each Parts HINDI









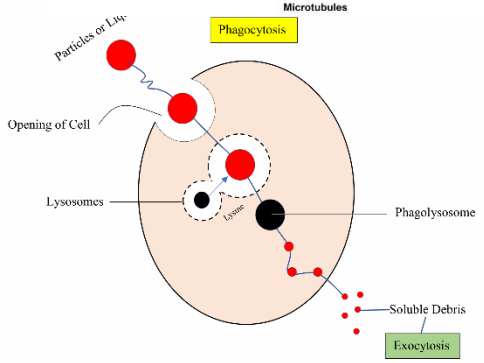
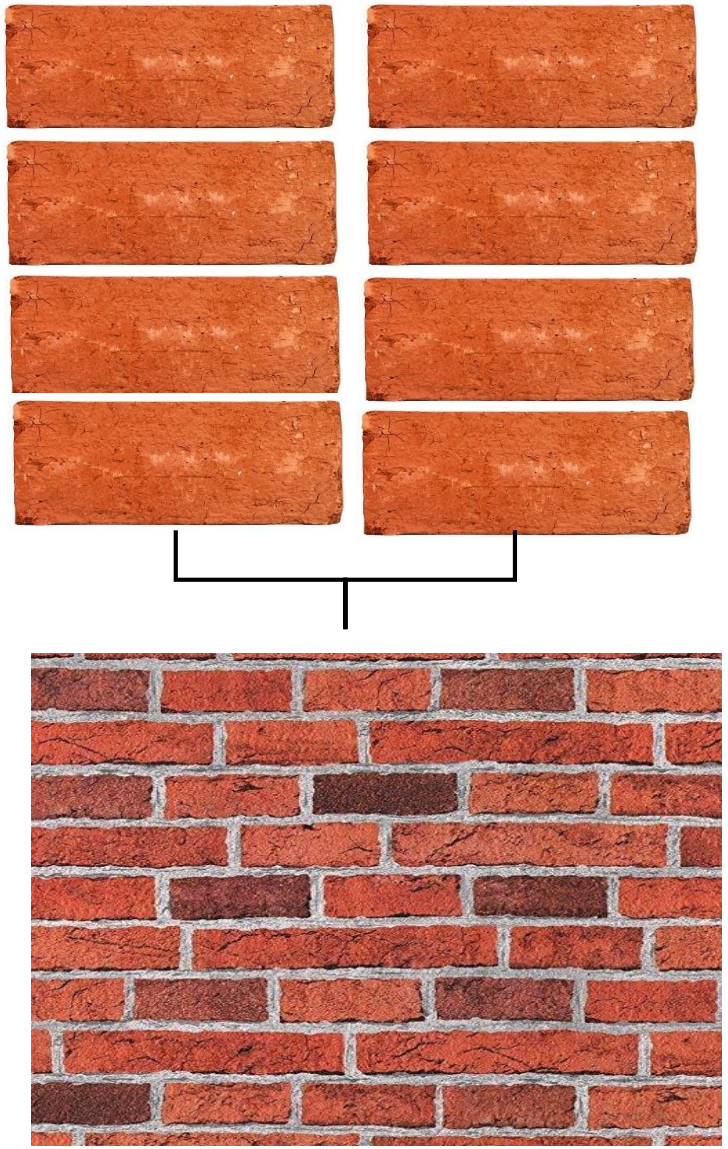


Image- Endocytosis and Exocytosis
https://www.youtube.com/c/SOLUTIONpushpendra
Visit and subscribe Solution's YouTube channel, Exclusively for Experiment related videos.

Introduction of Cell

A cell can be defined as the smallest unit of life. It is the structural, functional and biological unit of all living beings. A cell can replicate itself independently and are thus referred to as the **building blocks of life.** Each cell contains a cytoplasm which is enclosed by a membrane and contains several biomolecules like proteins, nucleic acids, etc. Cells are similar to small factories with different laborers and departments that work all the time to make life possible. Various kinds of cells perform different functions like protein synthesis and energy production.



There are two major kinds of living organisms based on their cellular structure namely: ***prokaryotes*** and ***eukaryotes***.

Prokaryotes are made up of cells with no nucleus. They all are single-celled microorganisms including archaic, bacteria and photosynthetic blue-green algae which are also known as ***cyanobacteria.***

Eukaryotes consists of cells with a nucleus. This large category involves all plants, fungi (such as molds, yeast, and mushrooms), protozoa (Plasmodium falciparum and parasite that cause malaria) and animals. The plasma membrane is responsible for monitoring the transport of nutrients and electrolytes in and out of the cell and also responsible for cell to cell communication

Structure and Location In Cell

Cell Membrane

Golgi Apparatus

Golgi Vesicles

Nucleus

Nucleolus

Lysosome

Ribosome

Microtubules

Cytoplasm

Pinocytic Vesicle

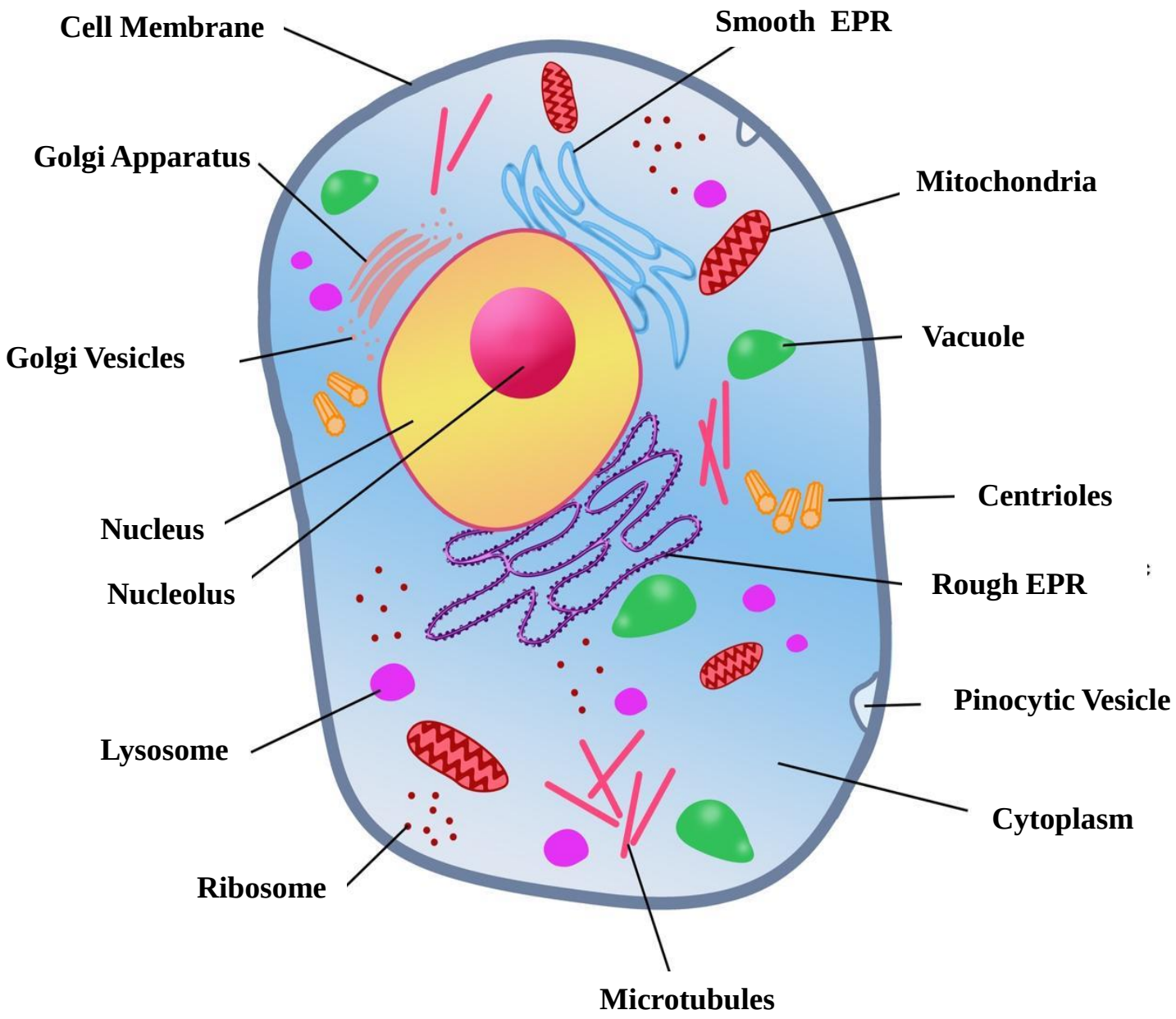
Rough Endoplasmic Reticulum

Centrioles

Vacuole

Mitochondria

Smooth Endoplasmic Reticulum



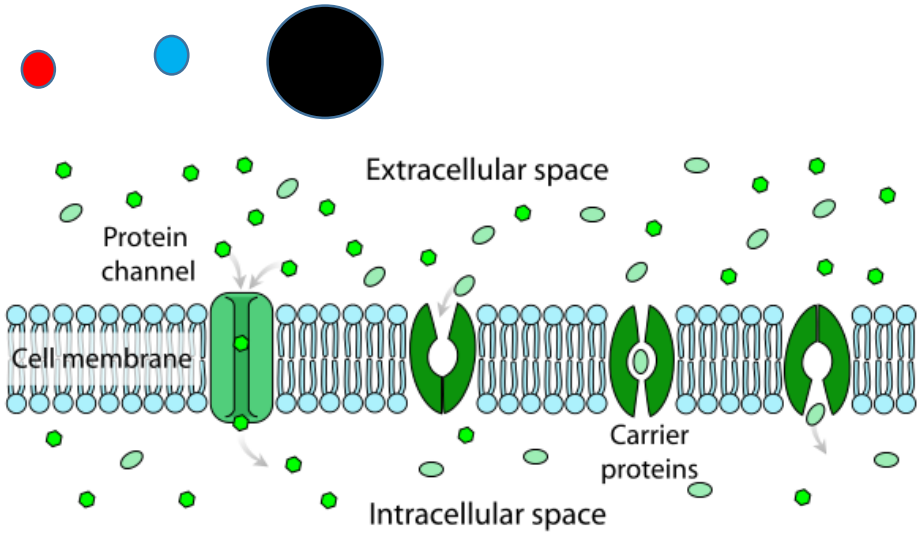
Cell Membrane

Introduction and Functions

The cell membrane, also called the plasma membrane, physically separates the intracellular space (inside the cell) from the extracellular environment (outside the cell). All plant and animal cells have cell membranes. The cell membrane surrounds and protects the cytoplasm. Cytoplasm is part of the protoplasm and is the living component of the cell.

The membrane enclosing a cell is made up of two lipid layers called a "bilipid" membrane. The lipids that are present in the plasma membrane are called "phospholipids". These lipid layers are made up of a number of fatty acid building blocks. The fatty acid that makes up this membrane has two different parts to it- a small water loving head- hydrophilic head. *Hydro* stands for water and *philic* means liking or loving. The other part of this fatty acid is a long water-repelling or water hating tail.

This tail is hydrophobic- *Hydro* stands for water and *phobic means* fear. The plasma membrane is arranged in such a way so that the tails face each other on the inside and the heads face towards the outside of the membrane.



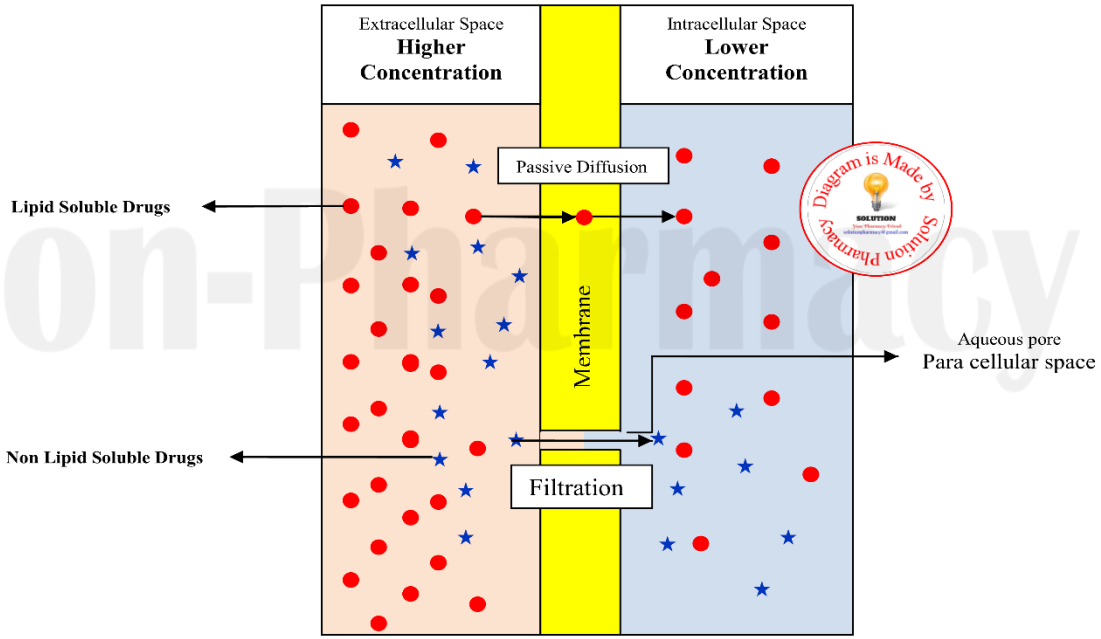


Diagram made by Solution Pharmacy. Idea- KD Tripathi

Passive diffusion and filtration across the lipoid biological membrane.

https://www.youtube.com/c/SOLUTIONpushpendra

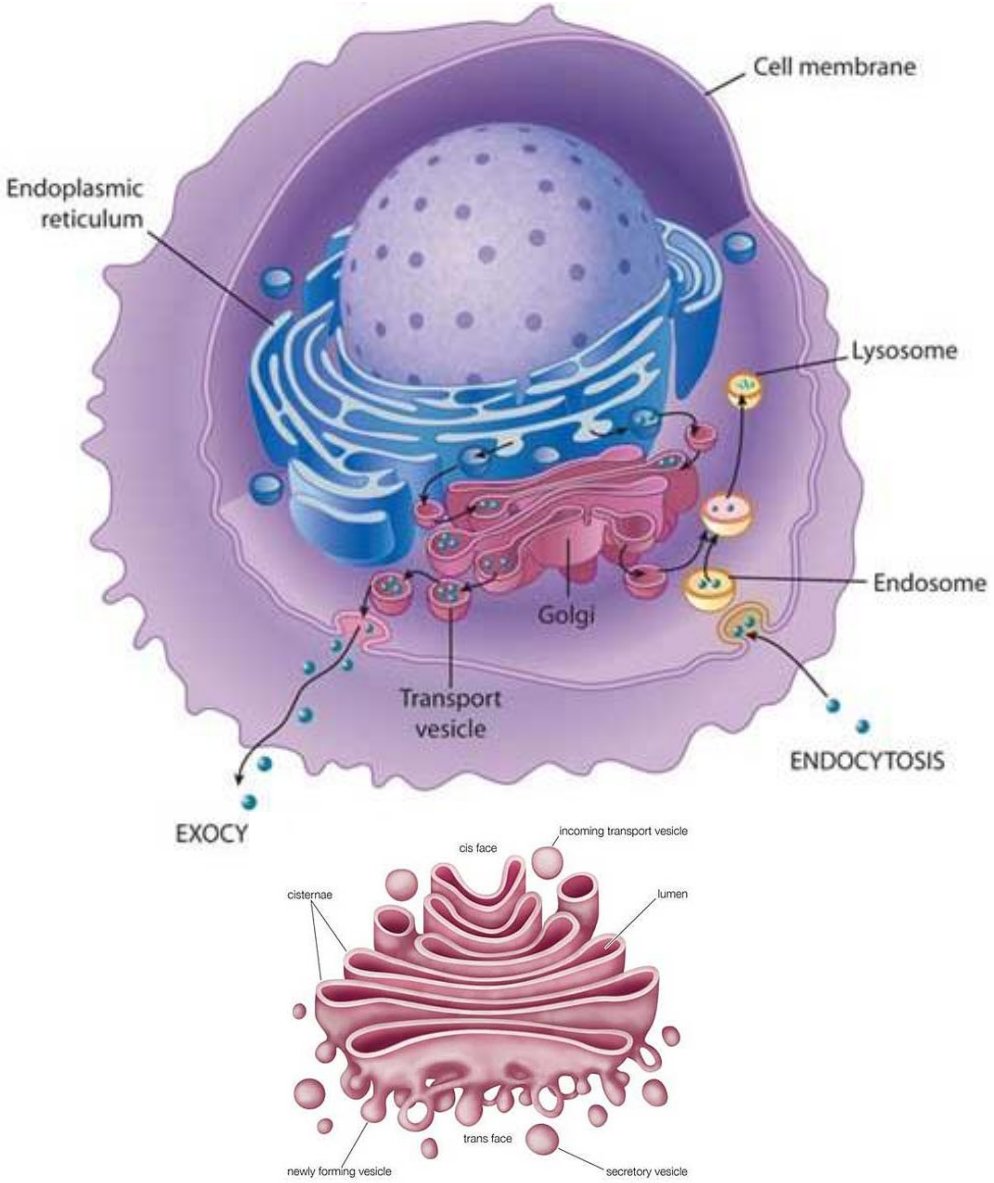
Visit and subscribe Solution's YouTube channel, Exclusively for Experiment related videos.

Golgi Apparatus

Introduction and Functions

The Golgi apparatus is an organelle present in most eukaryotic cells. It is made up of membrane-bound sacs, and is also called a Golgi body, Golgi complex, or dictyosome. The job of the Golgi apparatus is to process and bundle macromolecules like proteins and lipids as they are synthesized within the cell. The Golgi apparatus is sometimes compared to a post office inside the cell since one major function is to modify, sort, and package proteins to be secreted. This organelle is also important in other ways, specifically in the transport of lipids throughout the cell and the creation of lysosomes.

The principal function of Golgi complex is secretion. In several types of cells, synthetic products from the rough endoplasmic reticulum are transferred to Golgi region, from where they are liberated from the cell through plasma membrane by pinocytosis. Secretory function of Golgi seems to be well founded experimentally. This organelle was named after an Italian physician, *Camillo Golgi*. He was the first person to describe this organelle in the cell.



https://factslegend.org/wp-content/uploads/2018/04/golgi-body.jpg

Nucleolus

Introduction and Functions

The nucleolus is the distinct structure present in the nucleus of eukaryotic cells. It is mainly involved in assembling the ribosomes, modification of transfer RNA and sensing cellular stress. The nucleolus is composed of RNA and proteins which form around specific chromosomal regions. The nucleus is the control center of the cell. It is the largest organelle in the cell and it contains the DNA of the cell. The main function of nucleolus is to produce and assemble subunits which form the ribosome. Ribosome is the site for protein synthesis. Nucleolus plays an indirect but crucial role in protein synthesis by assembling the ribosome subunits. The nucleolus carries out 50% of the total production of RNA that takes place in cells. This functionality is attributed to hundreds of r-genes that are present in the nucleolus. It produces 70-90% of cellular RNA in many cells. It is source of RNA. The chromatin in nucleolus contains genes or ribosomal DNA (rRNA) for coding ribosomal RNA.

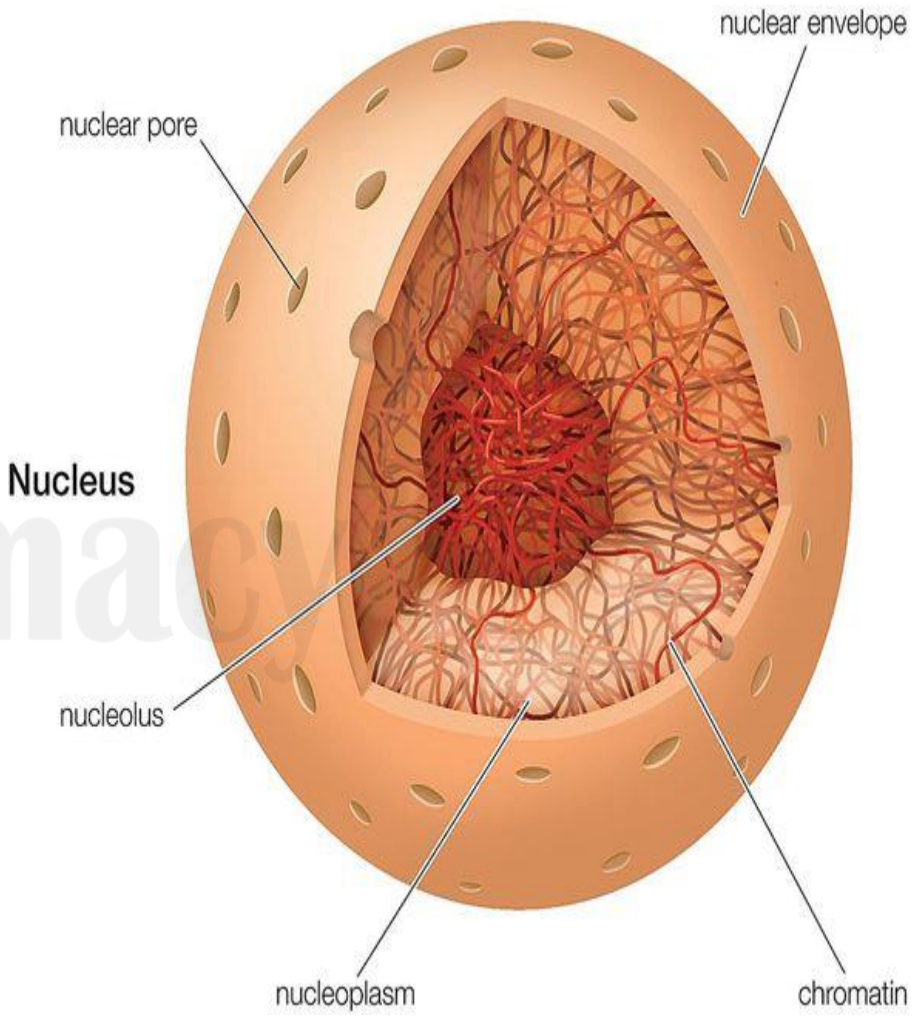


Image Reference- https://www.thoughtco.com/the-cell-nucleus-373362

Lysosomes

Introduction and Functions

The function of lysosomes is to remove waste as well as destroying a cell after it has died, called autolysis. A lysosome is an organelle containing digestive enzymes which it uses to function as the digestion and waste removal for cells, food particles, bacteria, etc. The membrane contains acids and enzymes capable of digesting and decomposing macromolecules. Macromolecules are molecules with a large number of atoms, such as nucleic acids, synthetic polymers, and proteins. The general function of lysosomes is to degrade or break down macromolecules. This includes processing old and worn out cell parts to recycle their components and making harmful toxins or bacteria safe by degrading them. They process many of the vacuoles which move either in or out of the cell, ensuring things run smoothly. Exocytosis is how materials leave a cell through the cell membrane. ATP energy, is used to transport the vacuole containing material outside of the cell. The lysosomes which are responsible for this process are called secretory lysosomes.

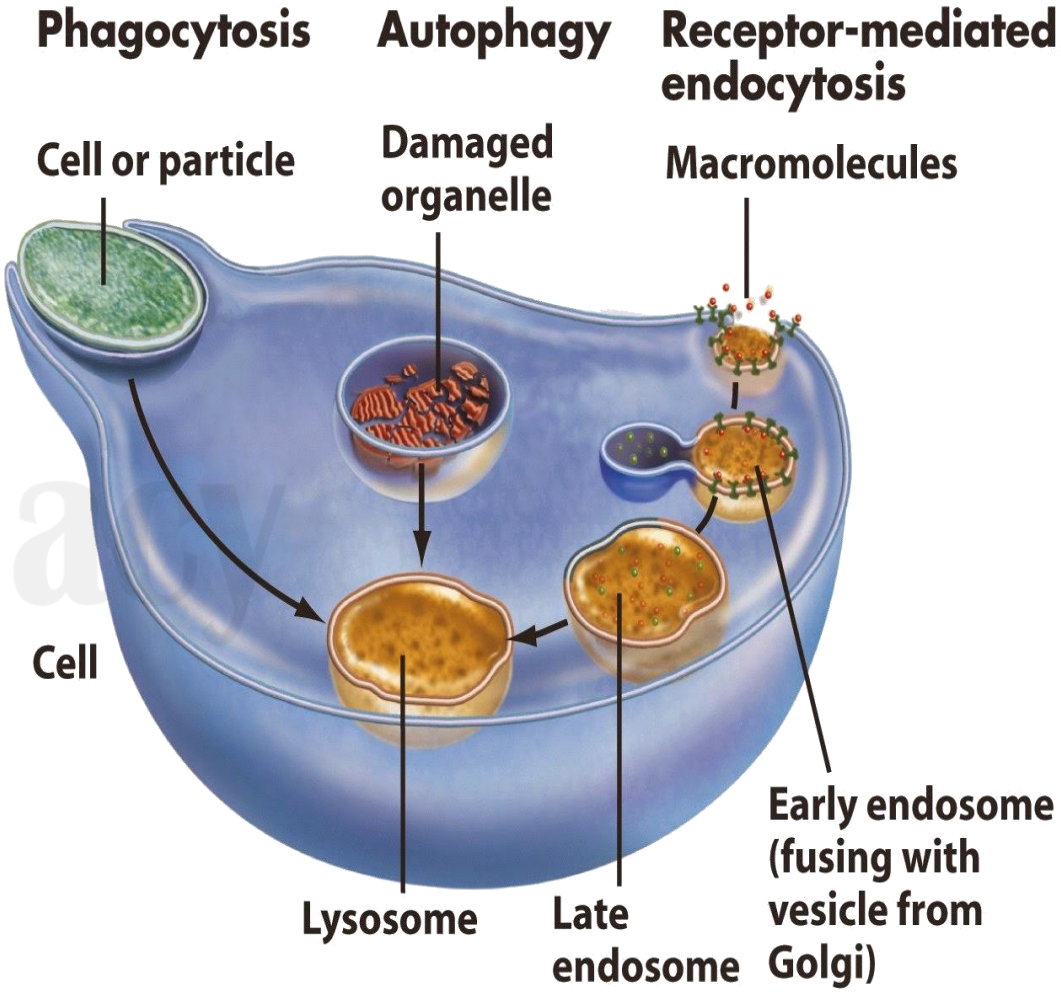
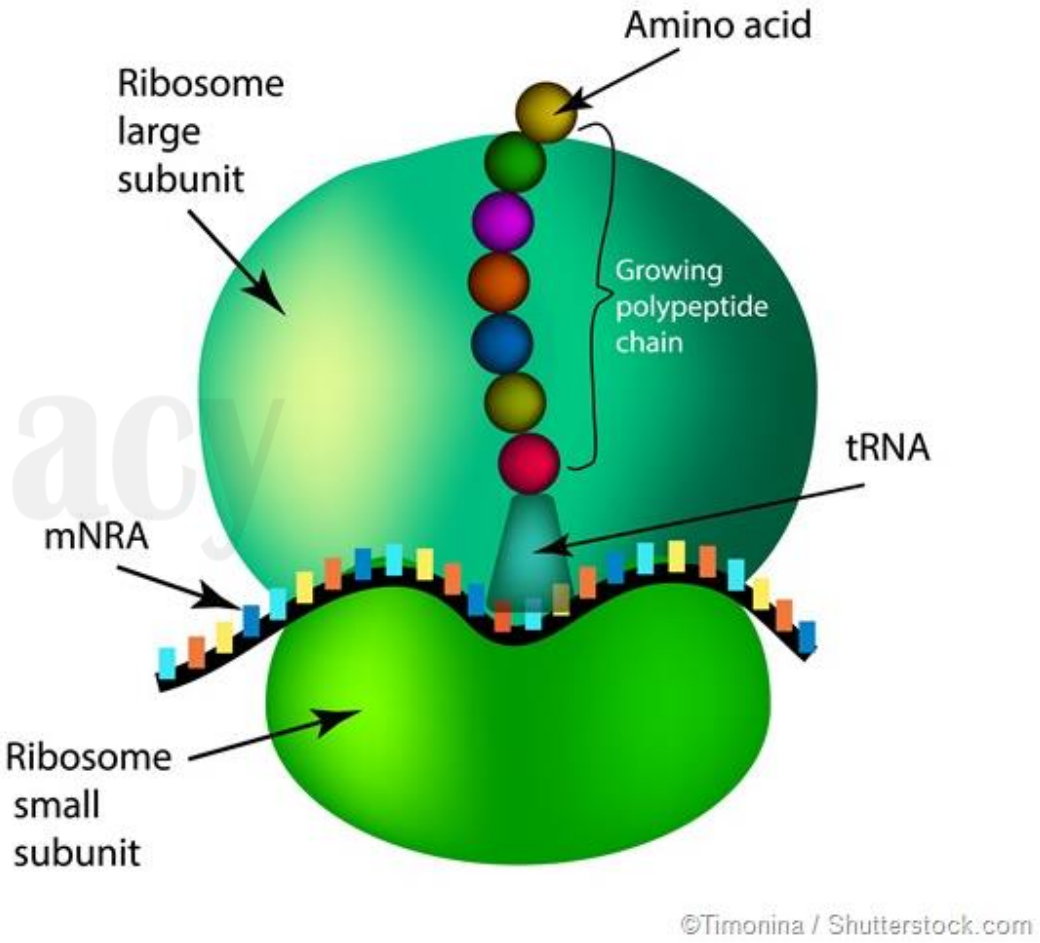


Image Ref- https://marinscienceseminar.blogspot.com/2015/04/all-about-lysosomes.html

Ribosome

Introduction and Functions

The function of ribosomes is to synthesize proteins as directed in the messenger RNA. Ribosomes are organelles and help produce proteins with many different functions in the body, they can be found within the cytoplasm or the endoplasmic reticulum. Ribosomes are responsible for protein synthesis. They are located as free particles throughout the cell in both prokaryotic, like bacteria, and eukaryotic, like us, cells. They can also be found attached to the rough endoplasmic reticulum because the rough ER also helps in the production and movement of proteins. They have been also found in the mitochondria and chloroplast. Ribosomes are composed of ribosomal RNA (rRNA) and ribosomal proteins. The ratio between the two components varies as prokaryotes are around 60% rRNA and 40% protein while eukaryotes can be an even split between the two. Human ribosomes and that of other eukaryotes are composed of four rRNA strands while bacterial ribosomes are made of three strands of rRNA. These rRNA are coupled with proteins that form the overall structure of a ribosome



Microtubules

Introduction and Functions

Microtubules are microscopic hollow tubes made of the proteins alpha and beta tubulin that are part of a cell's cytoskeleton a network of protein filaments that extends throughout the cell, gives the cell shape, and keeps its organelles in place. Microtubules are the largest structures in the cytoskeleton at about 24 nanometers thick. They have roles in cell movement, cell division and transporting materials within cells. Microtubules are polar molecules, with a positively charged end that grows relatively fast and a negatively charged end that grows relatively slow. Protofilaments arrange themselves parallel to each other in a microtubule, so the positive end of the microtubule always has beta subunits exposed, while the negative end has alpha subunits exposed. Having polarity allows the microtubule to assemble in a specific way and function correctly. Microtubules give structures like cilia and flagella their structure. Cilia are small protuberances of a cell. In humans, they are found on cells lining the trachea, where they prevent materials like mucus and dirt from entering the lungs. Microtubules play a key role in forming the mitotic spindle, also called the spindle apparatus.

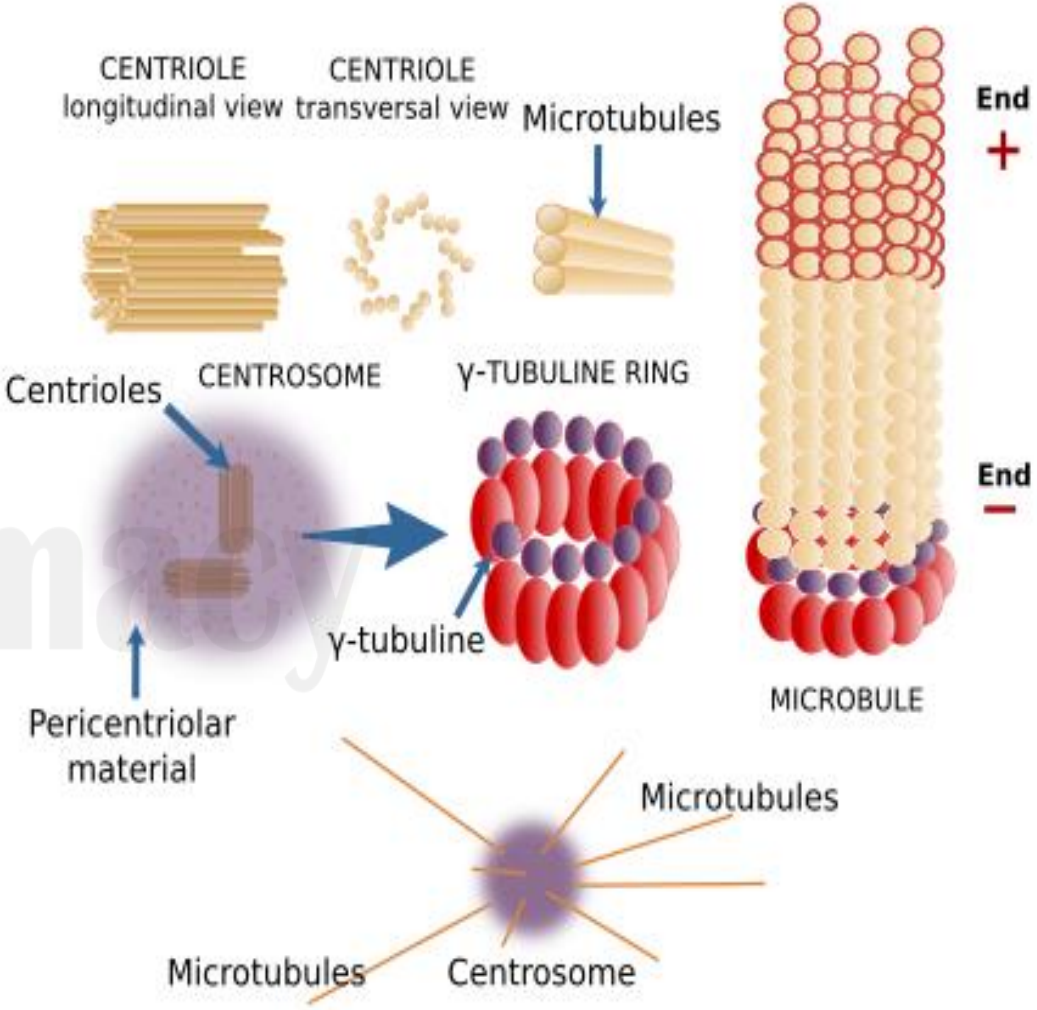


Image Ref - https://mmegias.webs.uvigo.es/02-english/5-celulas/imagenes/citoesq-centrosoma.png

Cytoplasm

Introduction and Functions

The cytoplasm is the gel-like substance enclosed within the cell membrane, which is made up of water, proteins, lipids, nucleic acids, inorganic salts, etc. Most metabolic activities take place within the cytoplasm, and subcellular structures, such as ribosomes, plasmids, and cytoplasmic granules, are located in the cytoplasm. In eukaryotic cells, cytoplasm refers to the contents of the cell with the exception of the nucleus. Eukaryotes have elaborate mechanisms for maintaining a distinct nuclear compartment separate from the cytoplasm. The physical nature of the cytoplasm is variable. Sometimes, there is quick diffusion across the cell, making the cytoplasm resemble a colloidal solution. At other times, it appears to take on the properties of a gel-like or glass-like substance. The cytoplasm functions to support and suspend organelles and cellular molecules. Many cellular processes also occur in the cytoplasm. Some of these processes include protein synthesis the first stage of cellular respiration (known as glycolysis, mitosis and meiosis In addition, the cytoplasm helps to move materials, such as hormones around the cell and also dissolves cellular waste.

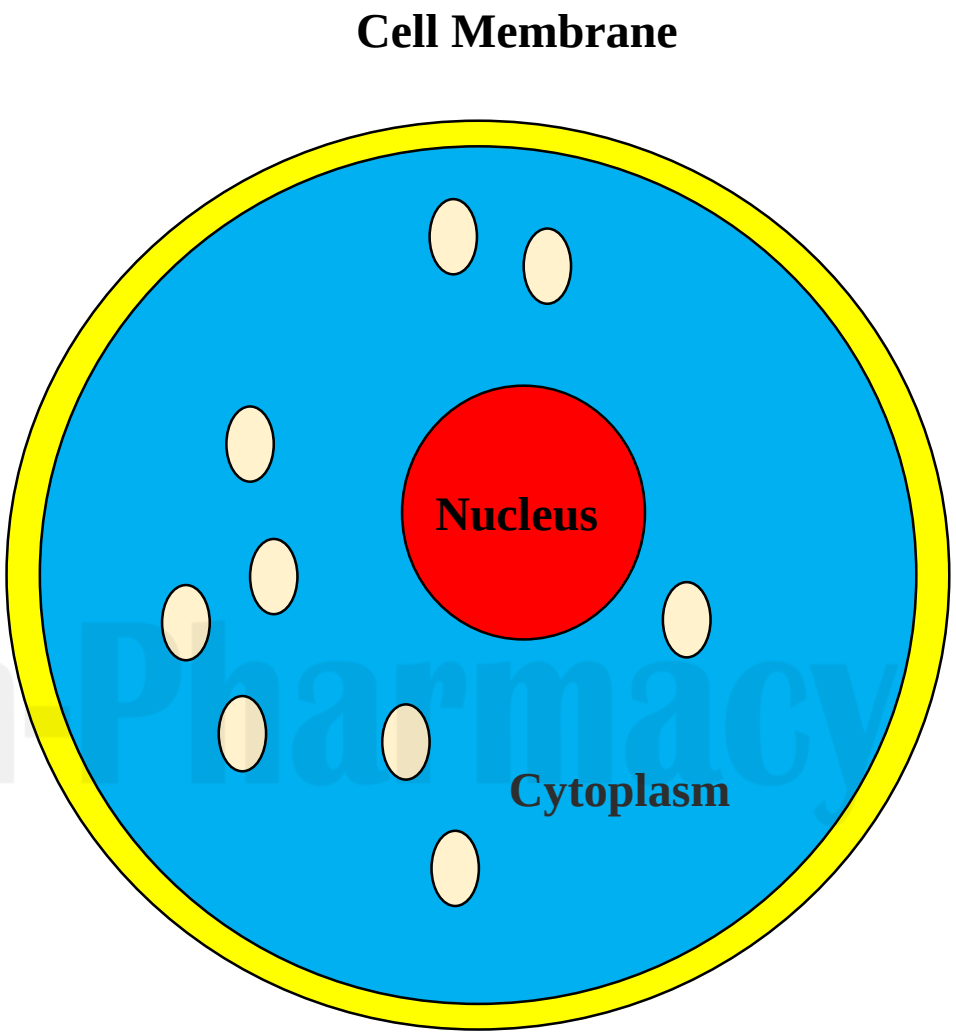


Diagram- Made by Solution- Pharmacy

Pinocytic Vesicles

Introduction and Functions

Pinocytosis is the method by which a cell absorbs small particles outside the cell and brings them inside. The word pinocytosis comes from the Greek for "cell drinking". During this process, the cell surrounds particles and then "pinches off" part of its membrane to enclose the particles within vesicles, which are small spheres of the membrane. This process is usually used for taking in extracellular fluid (ECF). Pinocytosis is a type of endocytosis. Endocytosis is when a cell takes in particles by engulfing them with its membrane. The other types of endocytosis are phagocytosis ("cell eating"), which is nearly the same as pinocytosis but involves the cell takes in a greater amount of particles, and receptor-mediated endocytosis, which is when particles are taken into a cell by binding to receptors. Small particles of substances in the ECF are absorbed into the cell via pinocytosis. It is a process that requires active transport. Microvilli in the gut use this process to absorb nutrients from food. Cells in the kidney can use pinocytosis to separate nutrients and fluids from the urine that will be expelled from the body. In addition, human egg cells also use it to absorb nutrients prior to being fertilized.

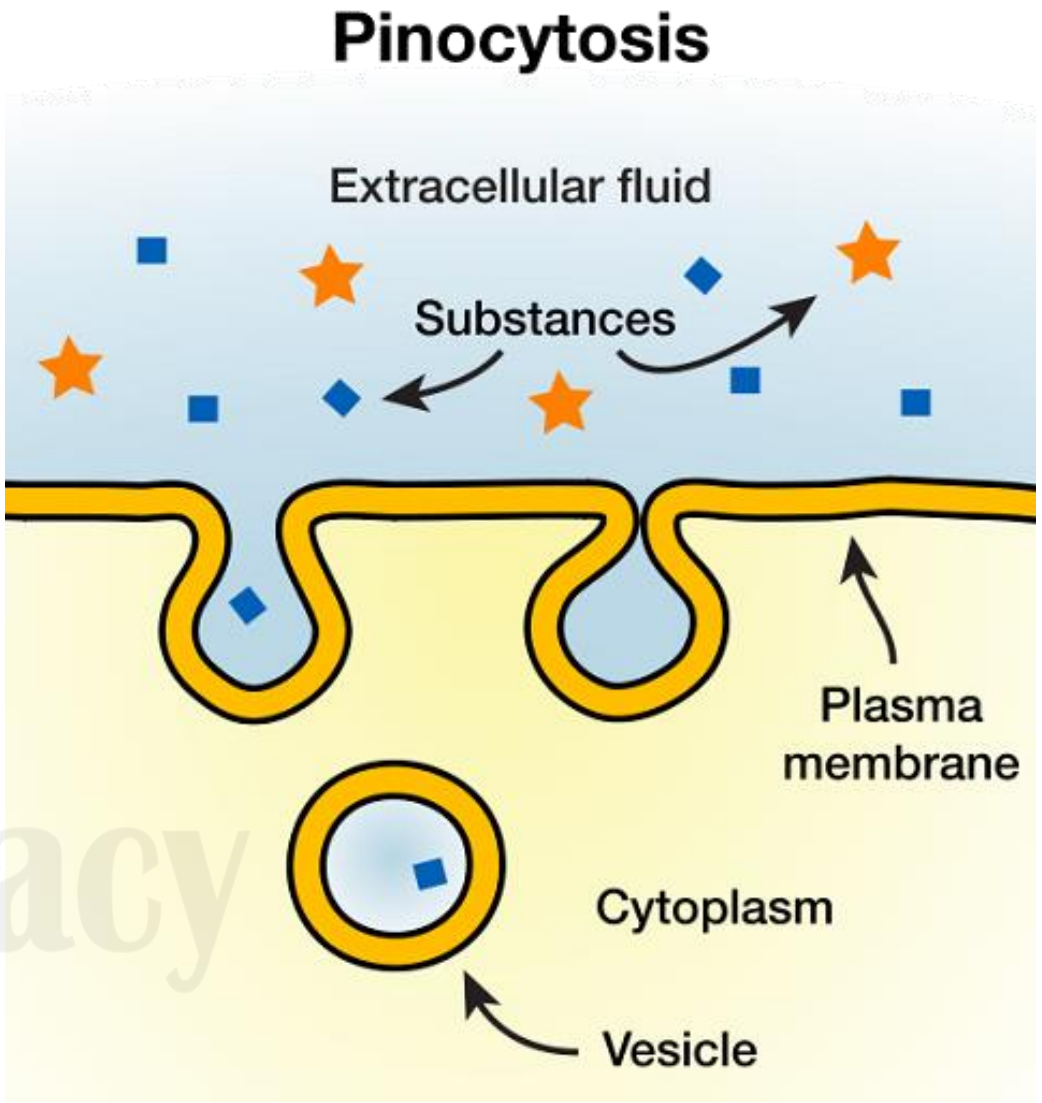
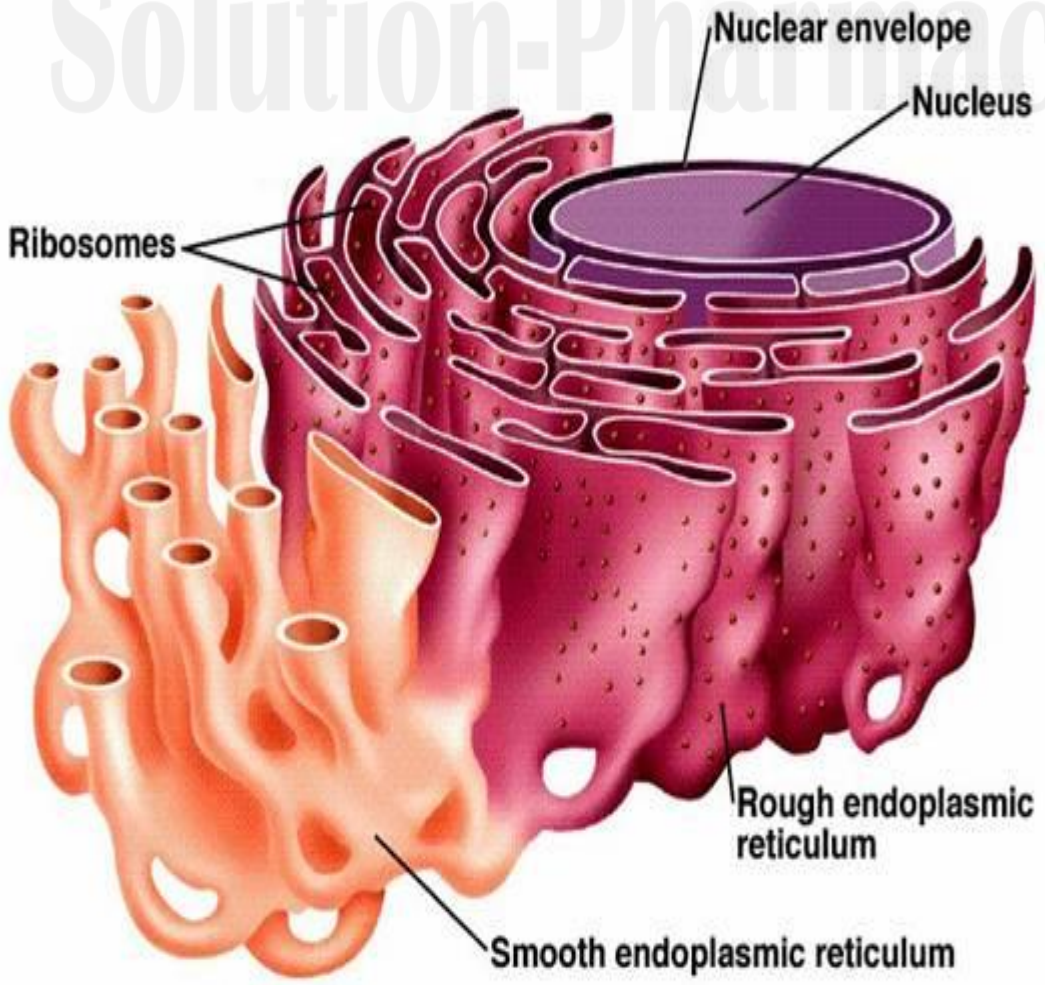


Image Ref- https://biologydictionary.net/pinocytosis/

Endoplasmic Reticulum

Introduction and Functions

The rough endoplasmic reticulum plays a number of roles within the cell, largely associated with protein synthesis. Polypeptides are synthesized, modified, folded into their correct 3-D shape and sorted towards an organelle or marked for secretion. It also plays an important role in modulating the response of cell to stress and in quality control for correct protein folding. When the number of unfolded proteins increases, cells alter their tubules: sheets ratio. This could arise from the greater area available within the sheets of the rough ER to rescue unfolded protein, or could reflect the need for the distinct proteome of the rough ER. Translation for all proteins begins in the cytoplasm, after a processed mRNA transcript is exported from the nucleus. Translation begins with the binding of a ribosome to a mature mRNA transcript. There are two types of endoplasmic reticulum: rough endoplasmic reticulum (rough ER) and smooth endoplasmic reticulum (smooth ER). Both types are present in plant and animal cells. The two types of ER often appear as if separate, but they are sub-compartments of the same organelle



https://sites.google.com/a/asu.edu/the-almighty-cell/the-source/animal-cell/endoplasmic-reticulum

Mitochondria

Introduction and Functions

Mitochondria are well-defined cytoplasmic organelles of the cell which take part in a variety of cellular metabolic functions. Survival of the cells requires energy to perform different functions. The mitochondria are important as the fact that these organelles supply all the necessary biological energy of the cell, and they obtain this energy by oxidizing the substrates of the Krebs cycle. Hence, the mitochondria re referred to as the 'power houses' of the cell. Almost all the eukaryotic cell have mitochondria, though they are lost in the later stages of development of cell like in the red blood cells or in elements of phloem sieve tube. Mitochondria is a membrane bound cellular structure and is found in most of the eukaryotic cells. The mitochondria ranges from 0.5 to 1.0 micrometer in diameter. The mitochondria are sometimes described as power plants of the cells. These organelles generate most of the energy of the cell in the form of adenosine triphosphate (ATP) and it is used a source of chemical energy. The mitochondria also involved in other cellular activities like signaling, cellular differentiation, cell senescence and also control of cell cycle and cell growth.

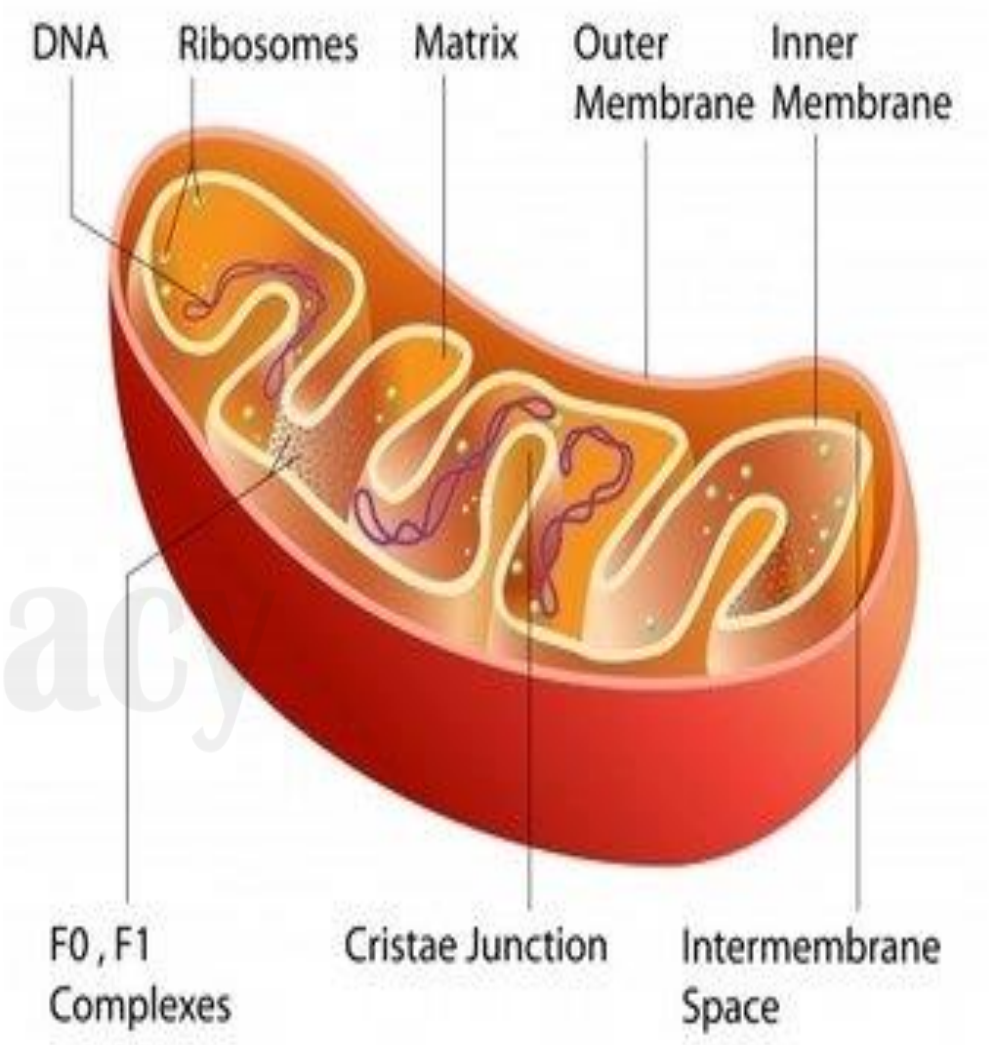


Image Ref- https://biology.tutorvista.com/animal-and-plant-cells/mitochondria.html

References

1. https://pixfeeds.com/images/19/473314/1200-506174298-animal-cell-structure.jpg
2. https://askabiologist.asu.edu/cell-parts
3. https://www.siyavula.com/read/science/grade-10-lifesciences/cells-the-basic-units-of-life/02-cells-the-basic-units-of-life-03
4. https://www.thoughtco.com/the-cell-nucleus-373362
5. https://sciencetrends.com/the-function-of-ribosomes/
6. https://www.news-medical.net/life-sciences/Ribosome-Structure.aspx
7. https://biologydictionary.net/cytoplasm/
8. https://biology.tutorvista.com/animal-and-plant-cells/mitochondria.html