

The Fundamental Unit of Life

CLASS-9TH CHAPTER-5TH

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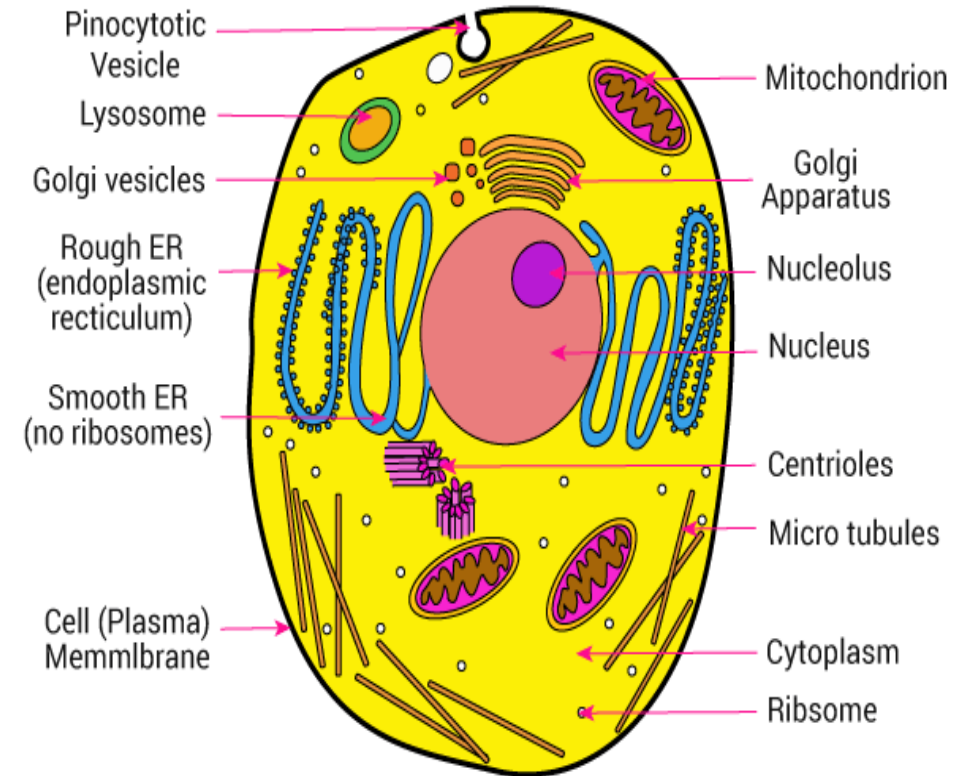
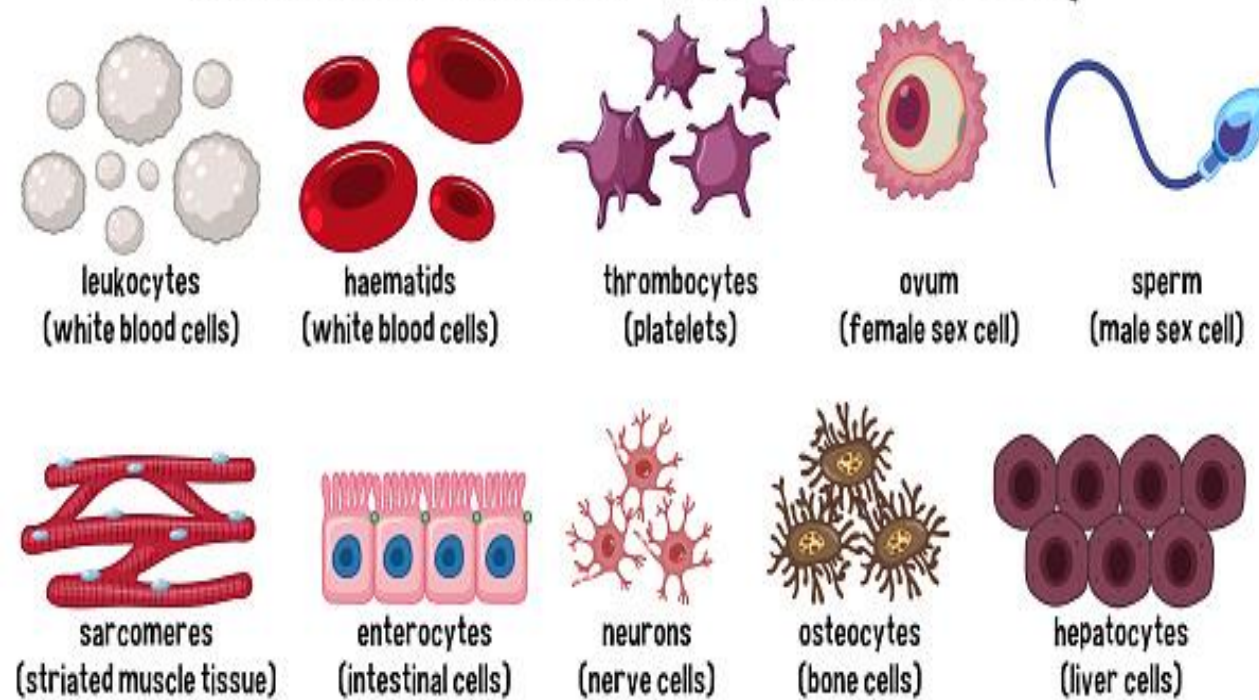
- The smallest functional unit of life is a cell, discovered by Robert Hooke in 1665.
- A cell can independently perform all necessary activities to sustain life. Hence cell is the basic unit of life.
- There are two types of cells plant cell and animal cell. The different cell organelles and their functions are as follows:

Plasma/Cell membrane:

- This is the outermost covering of the cell that separates the contents of the cell from its external environment.
- The plasma membrane allows or permits the entry and exit of some materials in and out of the cell so the cell membrane is called a selectively permeable membrane.

ANIMAL CELL

Common Cells of the Human Body



- Some substances like CO₂ or O₂ gases can move across the cell membrane by a process called diffusion.
- The movement of water molecules (liquid) through such a selectively permeable membrane is called osmosis.
- Osmosis is the passage of water from a region of high water concentration through a semi-permeable membrane to a region of low water concentration.

- If the medium surrounding the cell has a higher water concentration than the cell, the cell will gain water by osmosis. Such a solution is known as a **hypotonic solution**.
- If the medium has exactly the same water concentration as the cell, there will be no net movement of water across the cell membrane.
- Such a solution is known as an **isotonic solution**. If the medium has a lower water concentration than the cell will lose water by osmosis. Such a solution is known as a **hypertonic solution**.
- The plasma membrane is flexible and is made up of organic molecules called lipids and proteins.
- The flexibility of cell membrane also enables the cell to engulf in food and other material from its external environment. Such process is known as **endocytosis**. It is observed in **Amoeba**.

2. Cell wall (Protective wall):

- Plants cells, in addition to the plasma membrane have another rigid outer covering called cell wall.
- The cell wall lies outside the plasma membrane. The plant cell wall is mainly composed of cellulose.
- It is a complex substance and provides structural strength to plant cells.
- When a living plant loses water through osmosis there is shrinkage or contraction of contents of the cell away from cell wall. This phenomenon is known as **plasmolysis**.

PLANT CELL DIAGRAM

Chloroplast

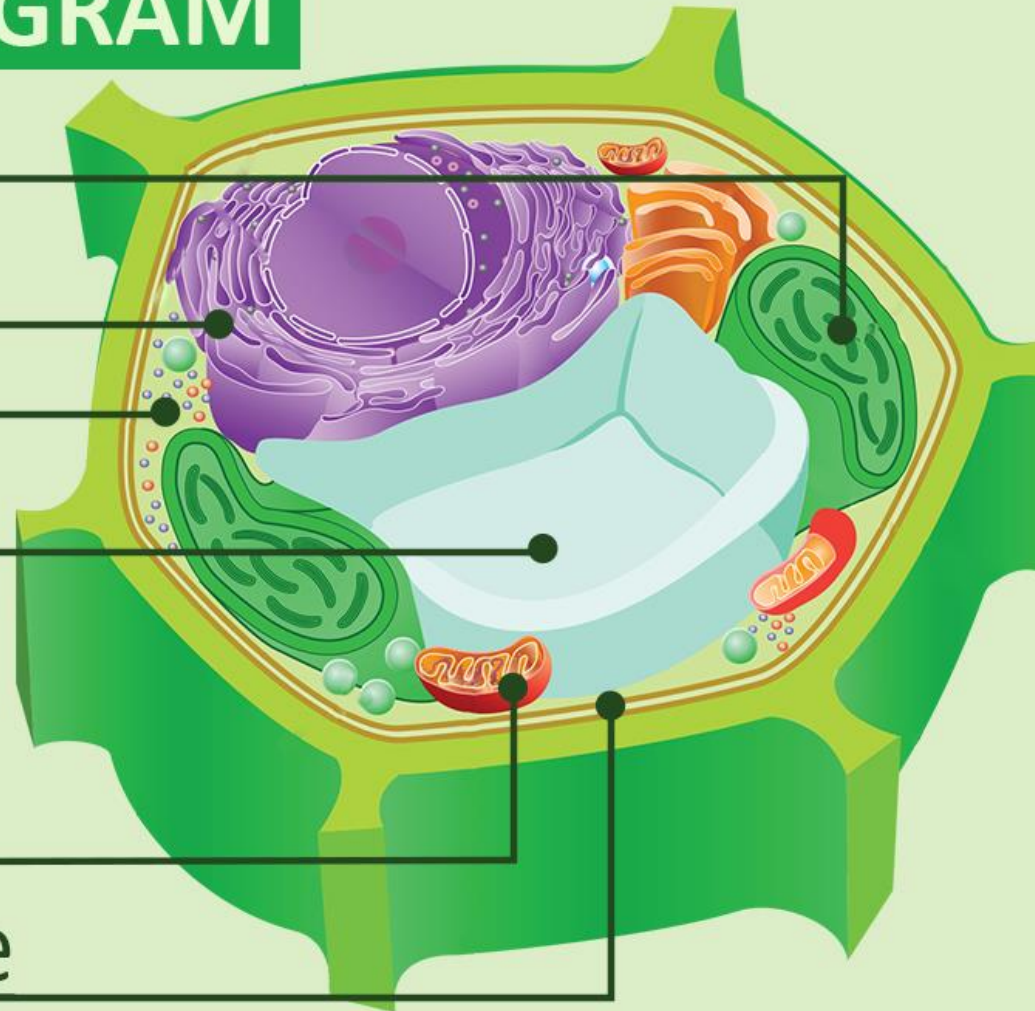
Nucleolus

Ribosomes

Large central
vacuole

Mitochondrion

Cell membrane



3. Nucleus (Brain of a cell):

- The nucleus has a double-layered covering called nuclear membrane.
- The nuclear membrane has pores which allow the transfer of material from inside the nucleus to its outside, i.e., to the cytoplasm.
- The nucleus contains chromosomes, which are visible as rod-shaped structures only when the cell is about to divide.
- Chromosomes — contain information for inheritance of features from parents to next generation in form of DNA [Deoxyribose Nucleic Acid] molecules.
- Chromosomes are composed of DNA and protein. Functional segments of DNA are called **genes**. The nucleus plays a central role in **cellular reproduction**.

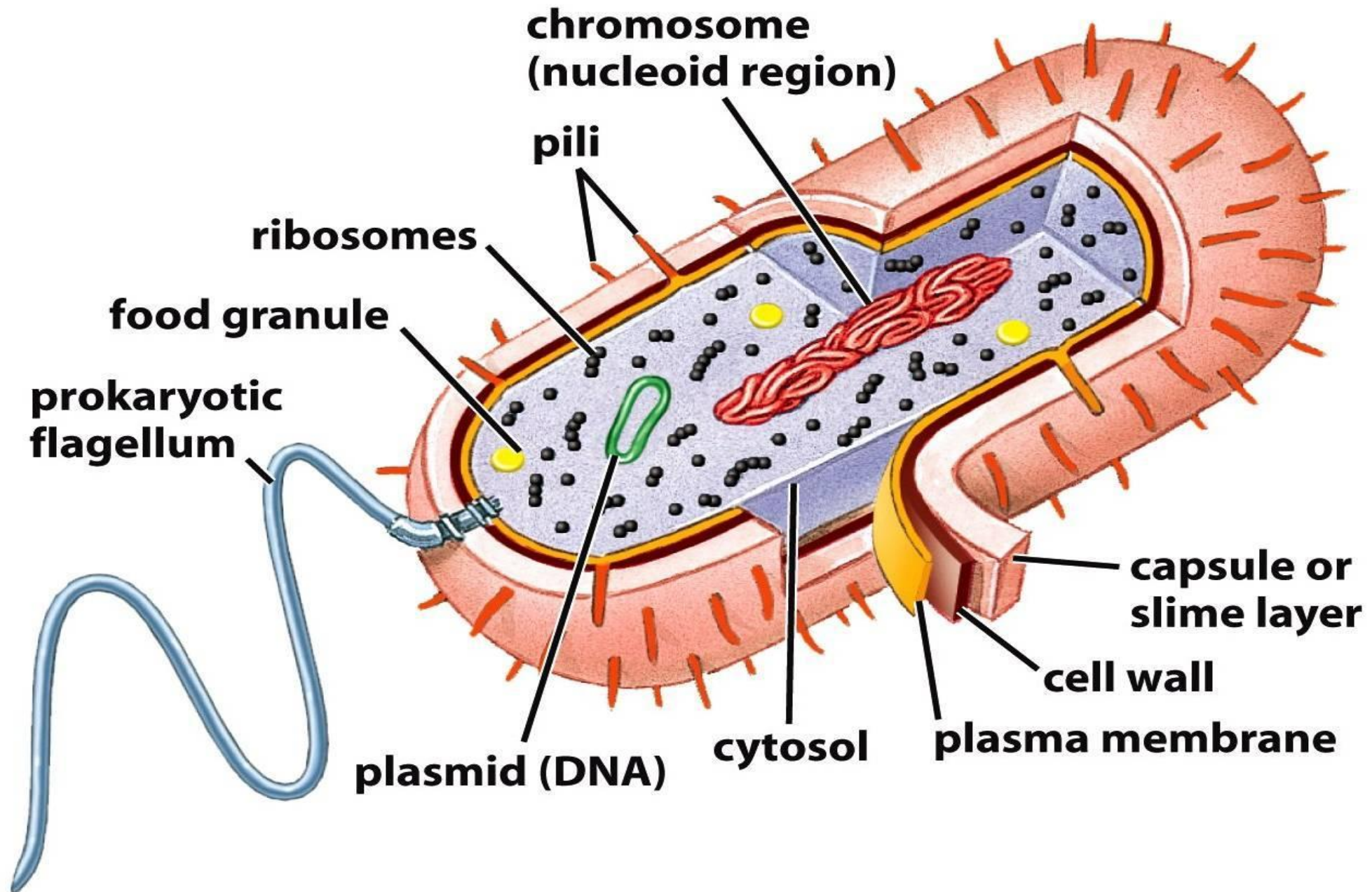
Prokaryotic Cells:

- Organisms like bacteria, the nuclear material is not enclosed by nuclear membrane and membrane bound cell **organelle** are absent.
- Such nucleus is called **nucleoid** and such cells are known as prokaryotic cell. Such cells have single chromosome.

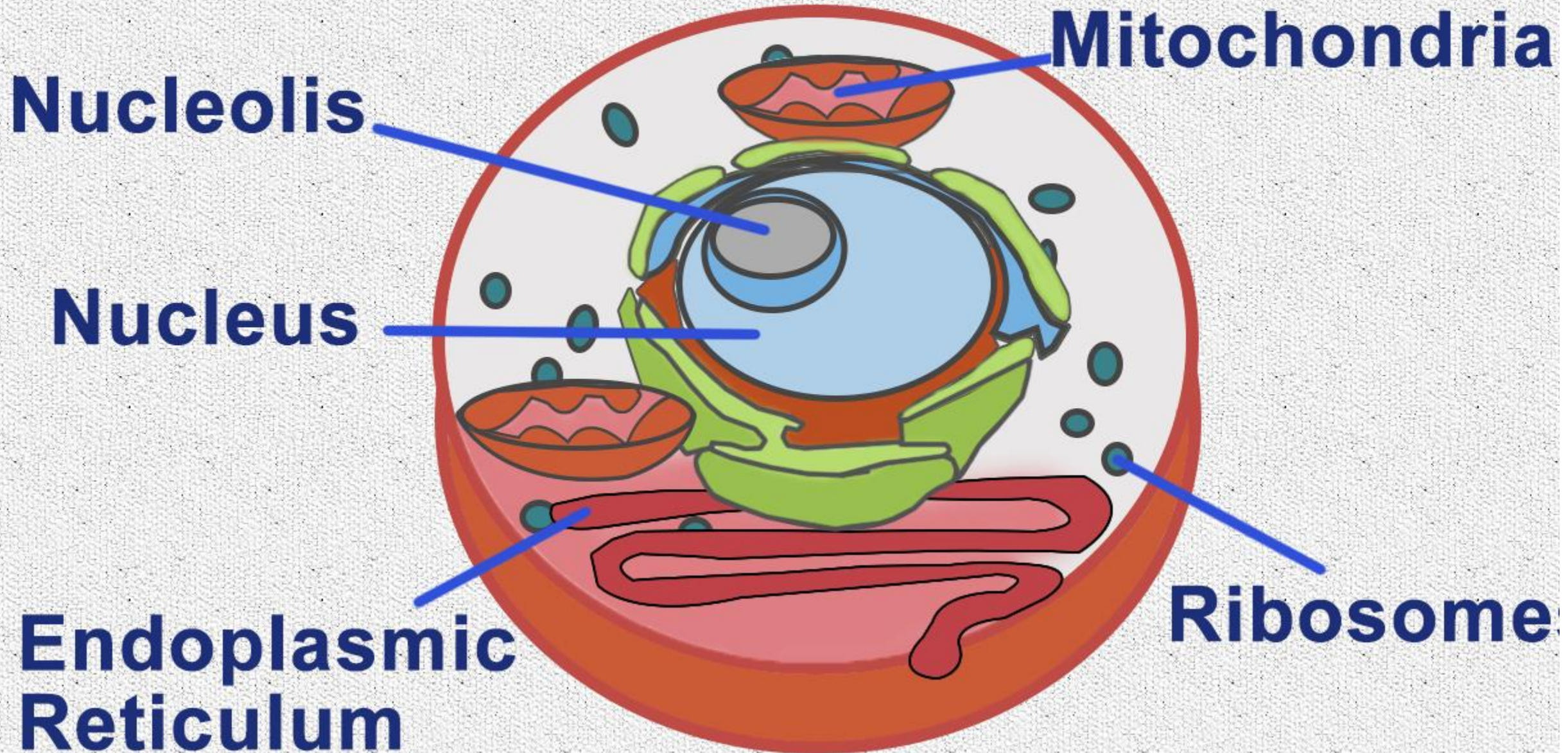
Eukaryotic Cells:

- Cells having well defined nucleus and having membrane bound cell organelle is termed as eukaryotic cell.
- Such cells have more than one chromosomes.

Prokaryotic Cells



EUKARYOTE DIAGRAM



4. Cytoplasm:

The cytoplasm is the fluid content inside the plasma membrane.

It also contains many specialised cell organelles. Each of these organelles performs a specific function for the cell.

5. Cell Organelles:

Every cell has a membrane around it to keep its content separate from the external environment.

The different components of cell perform different function and these components are called cell organelles.

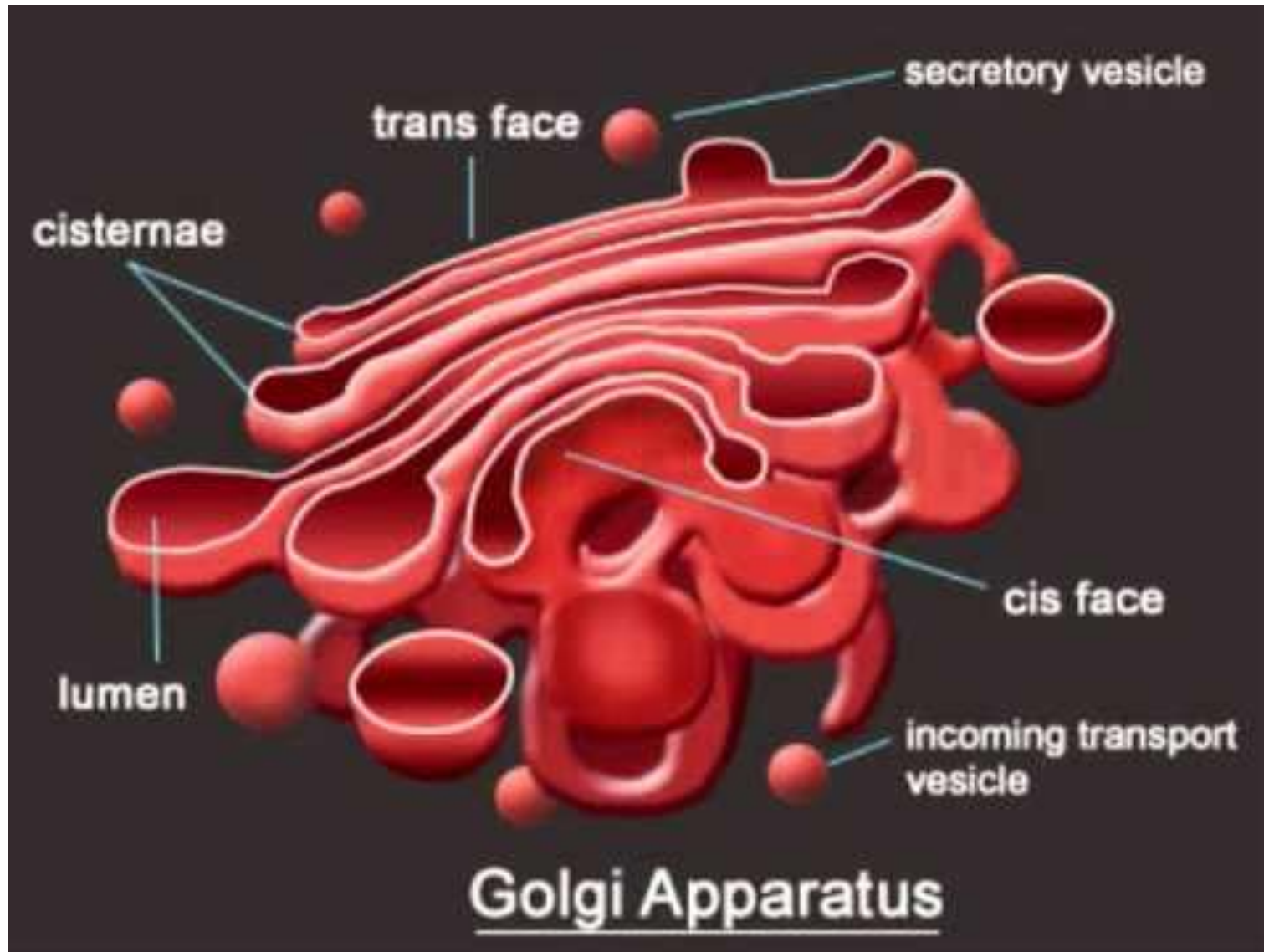
(i) Endoplasmic Reticulum (ER) (Channels, Network for transport):

- The ER is a large network of membrane-bound tubes and sheets. It looks like long tubules or round or oblong bags.
- There are two types of ER-Rough endoplasmic reticulum [RER] and smooth endoplasmic reticulum [SER].
- RER has particles called ribosomes attached to its surface. The ribosomes Endoplasmic Reticulum are the sites of protein manufacture.
- The SER helps in the manufacture of fat molecules, or lipids, important for cell function.
- Some of these proteins and lipids help in building the cell membrane.
- This process is known as **membrane biogenesis**. Some other proteins and lipids function as **enzymes** and **hormones**.

- The one function of ER is to serve as channels for the transport of materials between various regions of the cytoplasm or between the cytoplasm and the nucleus.
- The ER also functions as a cytoplasmic framework providing a surface for some of the biochemical activities of the cell.

(ii) Golgi Apparatus (Packaging):

- The Golgi apparatus, first described by Camillo Golgi, consists of a system of membrane-bound vesicles arranged approximately, parallel to each other in stacks called cisterns.
- The material synthesised near the ER is packaged and dispatched to various targets inside and outside the cell through the Golgi apparatus.
- It's function include the storage, modification and packages of products in vesicles.
- In some cases complex sugar may be made from simple sugar in the **Golgi apparatus**.
- It is also involved in the formation of **lysosomes**.



(iii) Lysosomes [Suicide bags] (Cleanliness of cell):

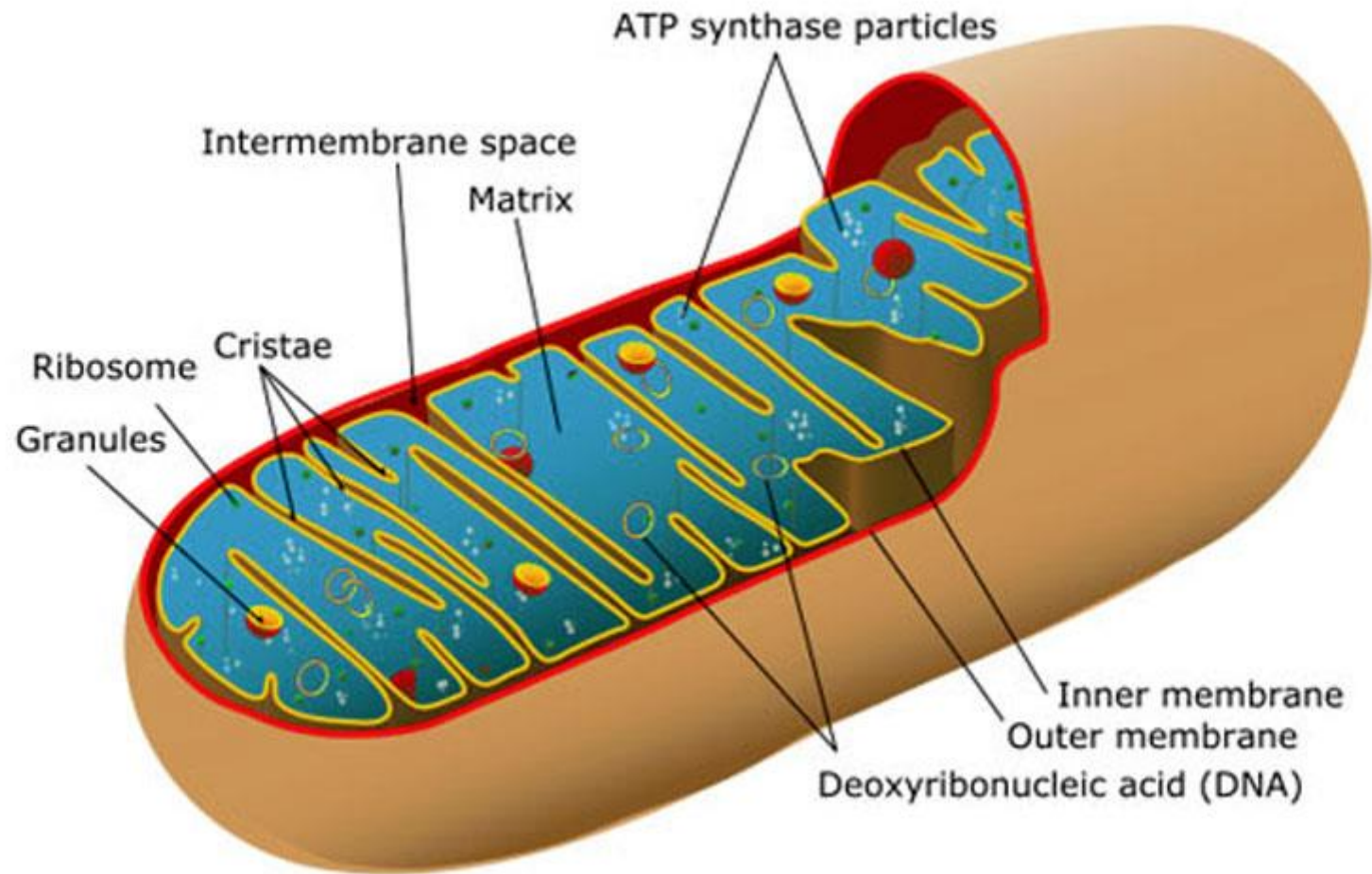
- Lysosomes are a kind of waste dispatch and disposal system of the cell.
- Lysosome help to keep the cell clean by digesting any foreign material as well as worn-out cell organelles.
- Foreign materials entering the cells such as bacteria or food, as well as old organelles, end up in the lysosome, which break them up into small pieces.
- They are able to do this because they contain powerful digestive enzymes capable of breaking down all organic material.
- Under abnormal condition, when the cell gets damaged, lysosomes may burst and the enzymes digest their own cell. Therefore they are also known as “suicide bags”



Lysosome

(iv) Mitochondria (Powerhouse, Energy provider):

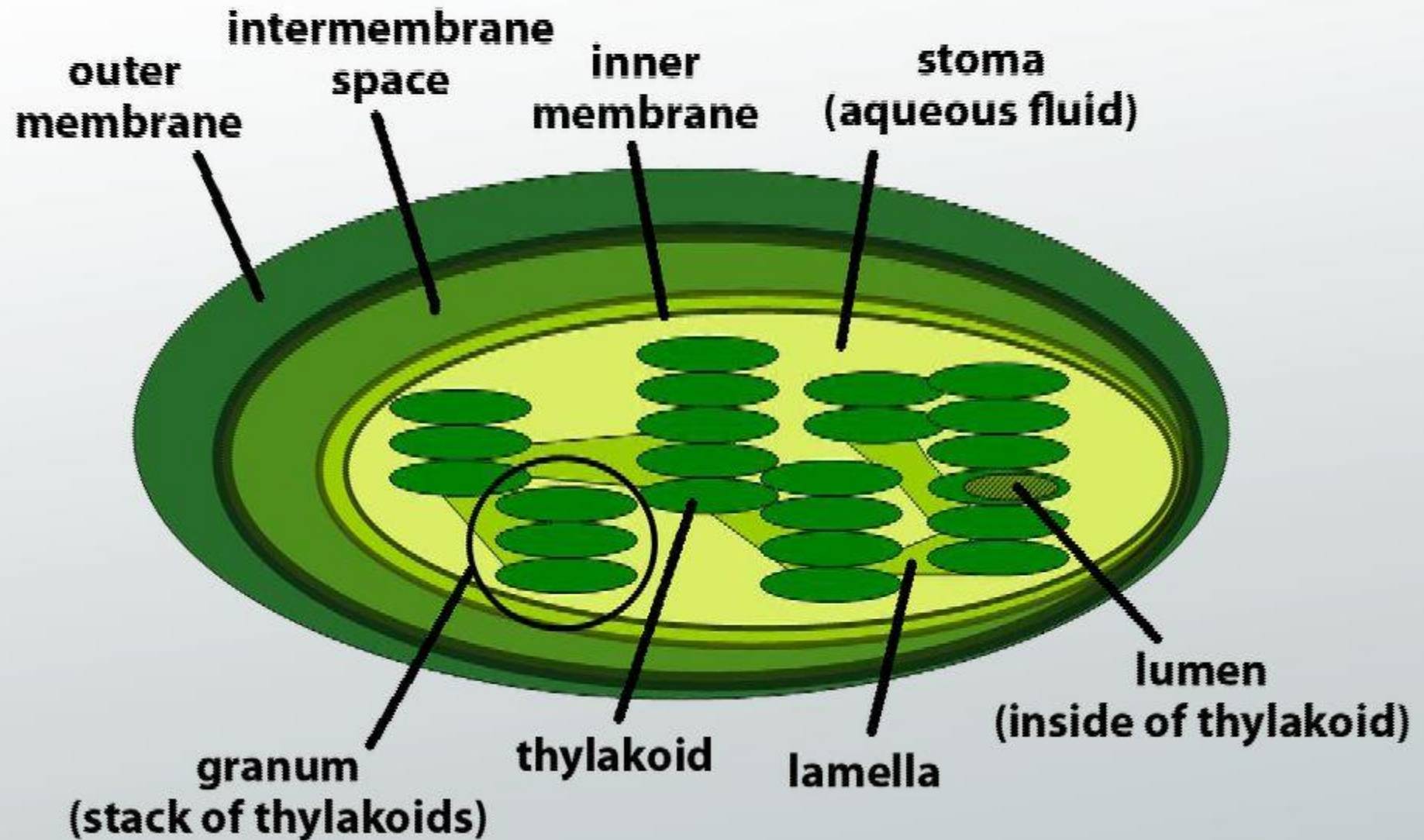
- Mitochondria are known as powerhouses of the cell.
- The energy required for various chemical activities needed for life is released by mitochondria in the form of ATP [Adenosine Triphosphate] molecules.
- ATP is known as energy currency of the cell.
- Mitochondria have two membrane coverings instead of just one. The outer membrane is very porous while the inner membrane is deeply folded. They are able to make some of their own protein.



(v) Plastids:

- Plastids are present only in plant cells. There are two types of plastids chromoplasts and leucoplasts.
- Chromoplasts are the coloured plastids present in leaves, flowers and fruits.
- Plastids containing the pigment chlorophyll are known as chloroplasts. They are important for photosynthesis in plants.
- Chloroplasts also contain various yellow or orange pigments in addition to chlorophyll.
- Leucoplasts are found primarily in organelles in which materials such as starch, oils and protein granules are stored.
- The internal organisation of the plastids consists of numerous membrane layers embedded in a material called stroma.

TYPES AND FUNCTIONS OF PLASTIDS



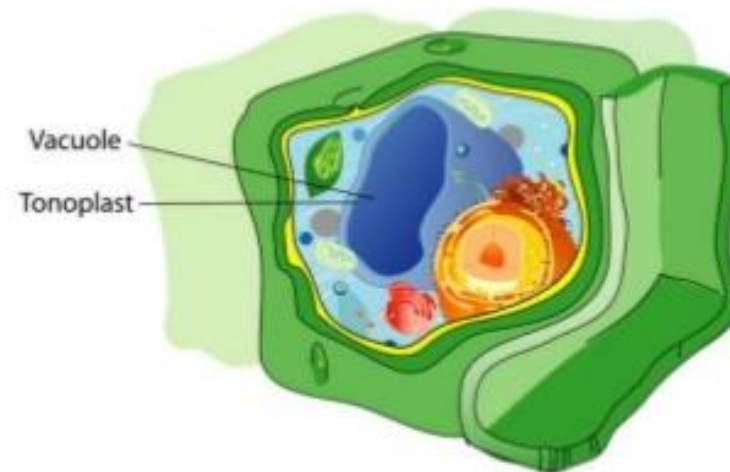
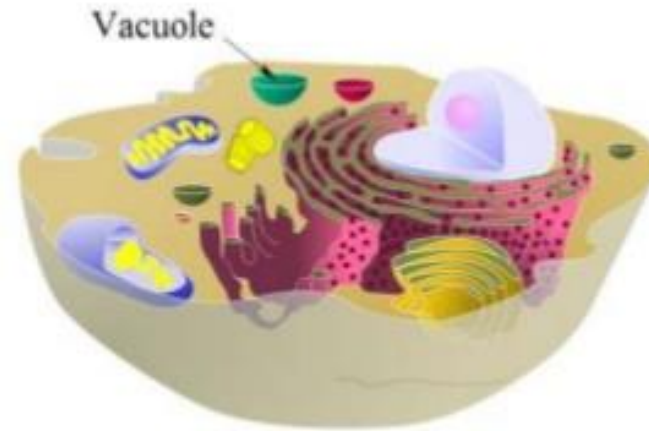
- Plastids are similar to mitochondria in external structure. Plastids have their own DNA and ribosomes.

(vi) Vacuoles (Storage):

- Vacuoles are storage sacs for solid or liquid contents.
- Vacuoles are small-sized in animal cells while plant cells have very large vacuoles [50% to 90% cell volume].
- In plant cells, vacuoles are full of cell sap and provide turgidity and rigidity to the cell.
- In Amoeba, the food 'vacuole' contains the food items that it consumes and contractile vacuoles expel excess water and some wastes from the cell.

Vacuoles and Storage

- Cells have membrane-bound compartments, called **vacuoles**, for temporary storage of materials. A vacuole is a sac surrounded by a membrane. Vacuoles often store food, enzymes, and other materials needed by the cell and some vacuoles store waste products.

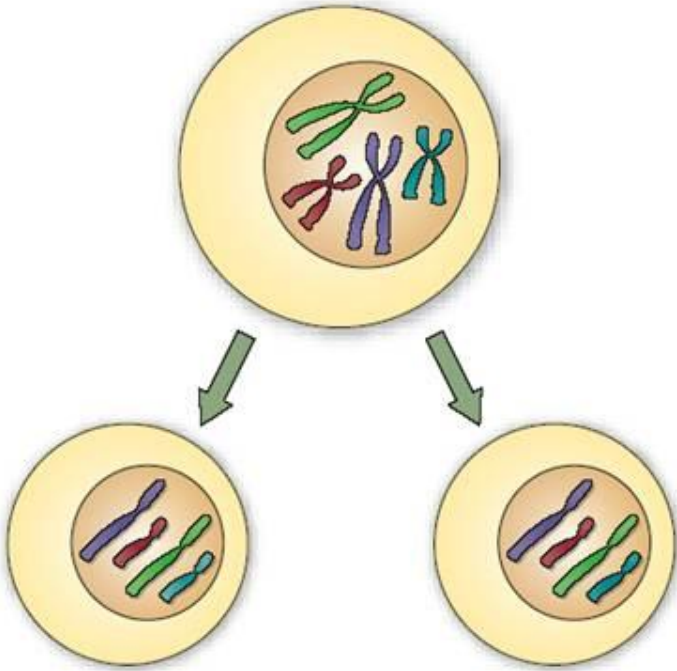


Cell Division

- New cells are formed in organisms in order to grow, to replace old, dead and injured cells, and to form gametes required for reproduction.
- The process by which new cells are made is called cell division.
- There are two main types of cell division: mitosis and meiosis. The process of cell division by which most of the cells divide for growth is called mitosis.
- In this process, each cell called mother cell divides to form two identical daughter cells .
- The daughter cells have the same number of chromosomes as mother cell.
- It helps in growth and repair of tissues in organisms.

- Specific cells of reproductive organs or tissues in animals and plants divide to form gametes, which after fertilisation give rise to offspring.
- They divide by a different process called meiosis which involves two consecutive divisions.
- When a cell divides by meiosis it produces four new cells instead of just two. The new cells only have half the number of chromosomes than that of the mother cells.

MITOSIS



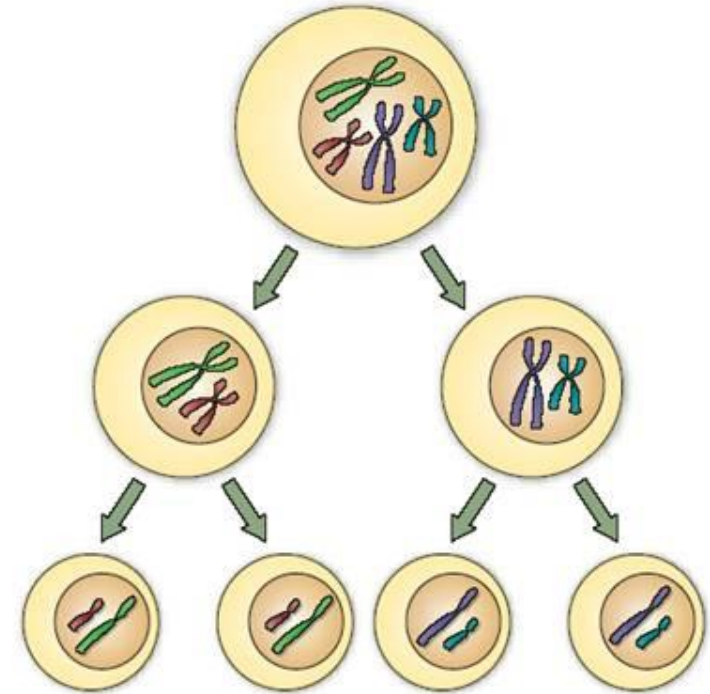
Produces genetically identical cells

Results in diploid cells

Takes place throughout an organism's lifetime

Involved in asexual reproduction

MEIOSIS



Produces genetically unique cells

Results in haploid cells

Takes place only at certain times in an organism's life cycle

Involved in sexual reproduction

THANKYOU...