Vivekanand College, Kolhapur (Autonomous)

B.Sc.-III

Eukaryotic Cell Plant cell

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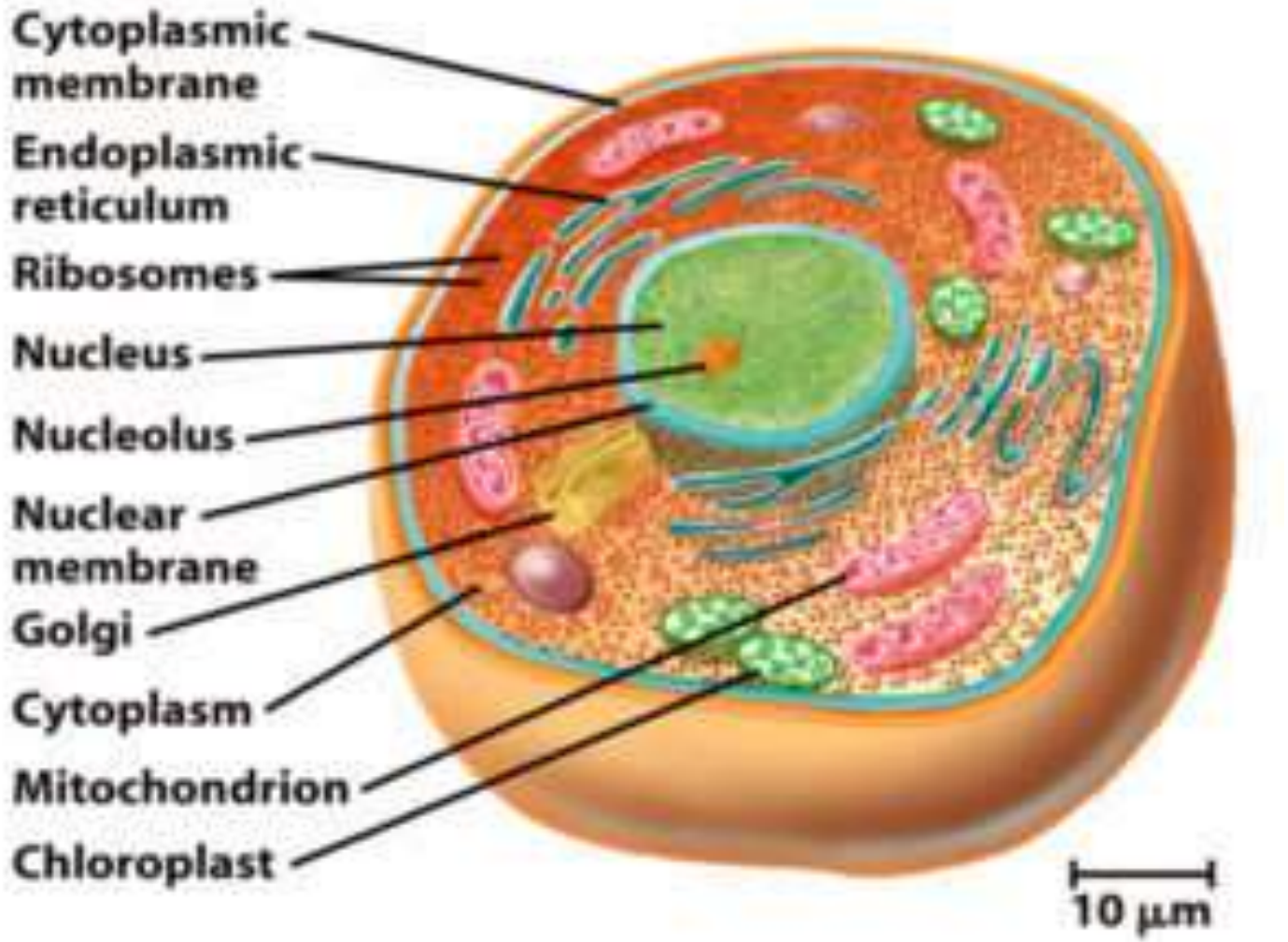
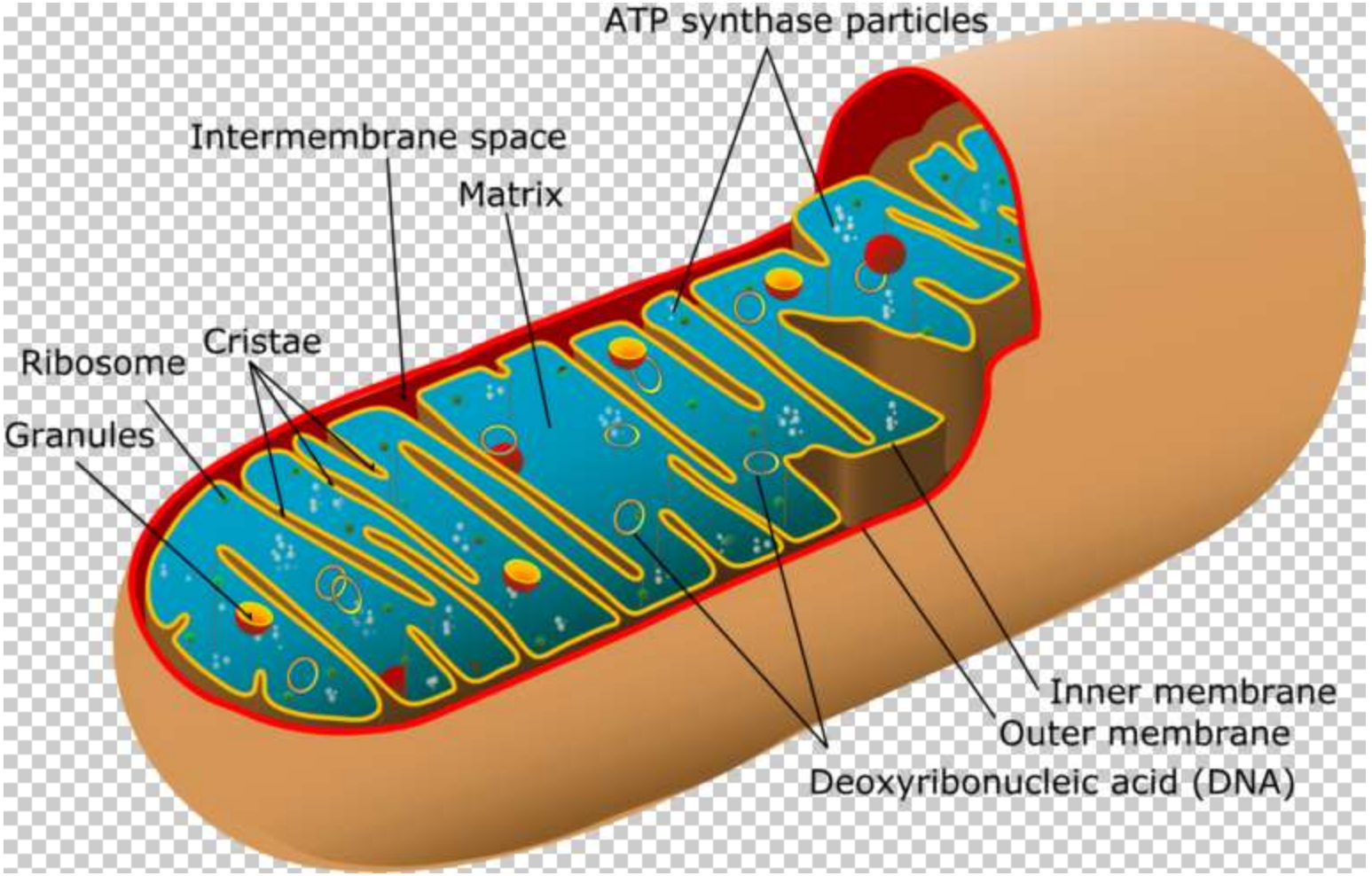


Eukaryotic Cell- Plant cell



Mitochondria

Structure:

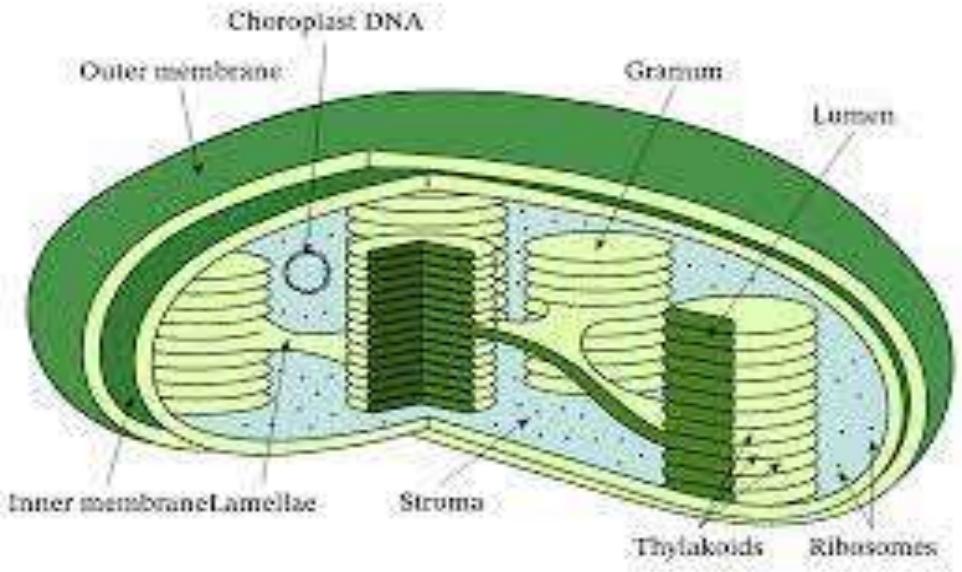
It has two membranes – outer and inner. The outer membrane forms a continuous boundary around the mitochondria. The inner membrane is semi-permeable and divided into folds called ‘cristae’. The membranes divide the lumen of the mitochondria into an inner and outer compartment. The inner compartment is called matrix and outer compartment forms the intermembrane space.

Functions:

1.They produce energy (ATP) and therefore are called the ‘powerhouse of the cell’.

2.Helps in regulating cell metabolism.

3. Mitochondria possess their own DNA, RNA and components required for protein synthesis.



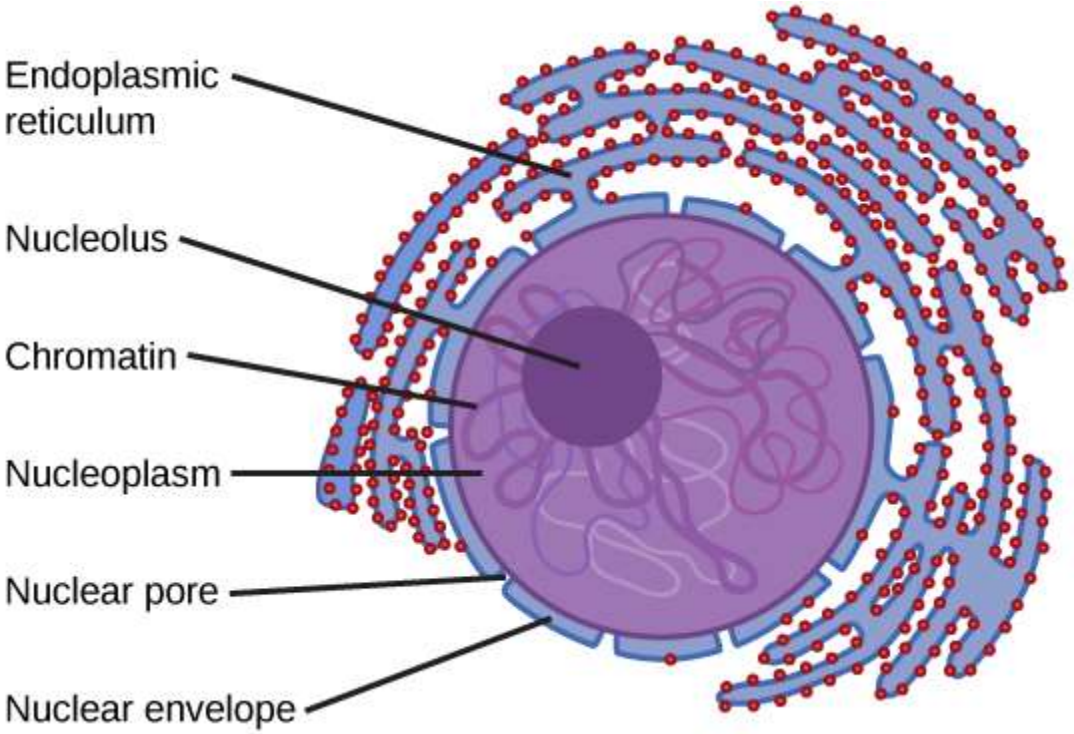
Structure of Chloroplasts :

Chloroplasts are commonly found in guard cells located in plant leaves, roughly 1–2 μm thick and 5–7 μm in diameter. Chloroplasts are oval-shaped and have two membranes: an outer membrane and an inner membrane. Between the outer and inner membrane is the intermembrane space approximately 10-20 nm wide. The space within the inner membrane is the stroma, the dense fluid within the chloroplast. This is the site at where the conversion from carbon dioxide to carbohydrates takes place.

Other chloroplast structures include:
Thylakoid System: internal membrane system consisting of flattened sac-like membrane structures called thylakoids where light energy is converted into chemical energy. Thylakoids contain the light-harvesting complex, including the electron transport chains used in photosynthesis and pigments like chlorophyll and carotenoids.
Granum: densely layered stacks of thylakoids (10 to 20) that are the sites of conversion of light energy to chemical energy.
Chlorophyll: a green photosynthetic pigment sitting on the surface of thylakoids that absorbs light energy.
DNA Ring: the circular DNA that is distinct from the nuclear DNA

Function of Chloroplasts

Chloroplasts are essential for the survival and growth of plants and photosynthetic protists. They are responsible to carry out photosynthesis, the process of conversion of light energy into sugar and other organic molecules that are used by plants or algae as food. They also produce amino acids and lipid components that are necessary for chloroplast membrane production.



Nucleus

Structure: Nucleus is the main organelle of a cell. It is a double membrane structure with all the genetic information. Therefore, it is also called the 'brain' of a cell. The nucleus is found in all eukaryotic cells except human RBCs and sieve cells of plants.

Nuclear envelope – It is a double membrane structure that surrounds the nucleus. The outer membrane is continuous with the endoplasmic reticulum. The inner membrane has small pores called 'nuclear pores'.

Nucleoplasm – It is the fluid material in the nucleus that contains the nucleolus and chromatin.

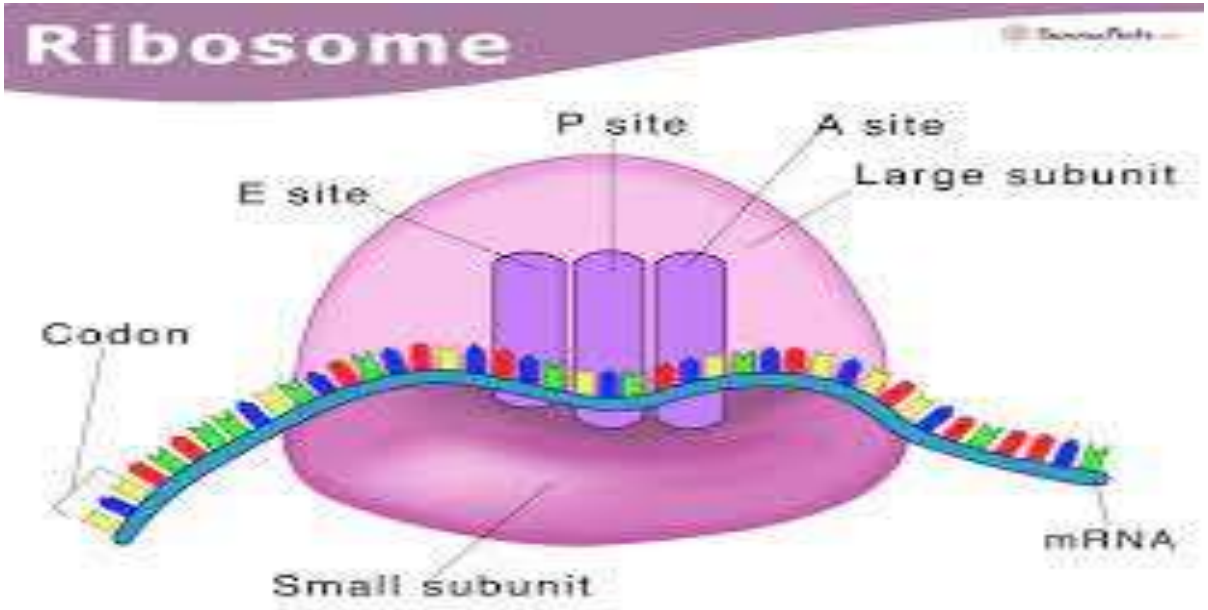
Nucleolus – Nucleoli are not membrane-bound and are active sites for ribosomal RNA synthesis.

Chromatin – It consists of DNA and proteins called ‘histones’. The DNA is organised into chromosomes. Chromosomes have certain constriction sites called ‘centromeres’. Based on the position of the centromere, they can be divided as follows:

Metacentric – With centromere in the centre and having equal chromosome arms.
Sub-metacentric – Centromere is slightly off-centre creating one short and one long arm.
Acrocentric – Centromere is extremely off-centre with one very long and one very short chromosome arm.
Telocentric – Centromere is placed at one end of the chromosome. Humans do not possess telocentric chromosomes.

Functions

It stores genetic information (in the form of DNA) necessary for development and reproduction.
It contains all information necessary for protein synthesis and cellular functions.



Structure:

A ribosome is a complex of RNA and protein and is, therefore, known as a ribonucleoprotein. It is composed of two subunits – smaller and larger.

The smaller subunit is where the mRNA binds and is decoded, and in the larger subunit, the amino acids get added. Both of the subunits contain both protein and ribonucleic acid components.

The two subunits are joined to each other by interactions between the rRNAs in one subunit and proteins in the other subunit.

Ribosomes are located inside the cytosol found in the plant cell and animal cells.

The ribosome structure includes the following:

It is located in two areas of cytoplasm.

Scattered in the cytoplasm.

Prokaryotes have 70S ribosomes while eukaryotes have 80S ribosomes.
Around 62% of ribosomes are comprised of RNA, while the rest is proteins.
The structure of free and bound ribosomes is similar and is associated with protein synthesis.

Functions:

The important ribosome function includes:

•It assembles amino acids to form proteins that are essential to carry out cellular functions.

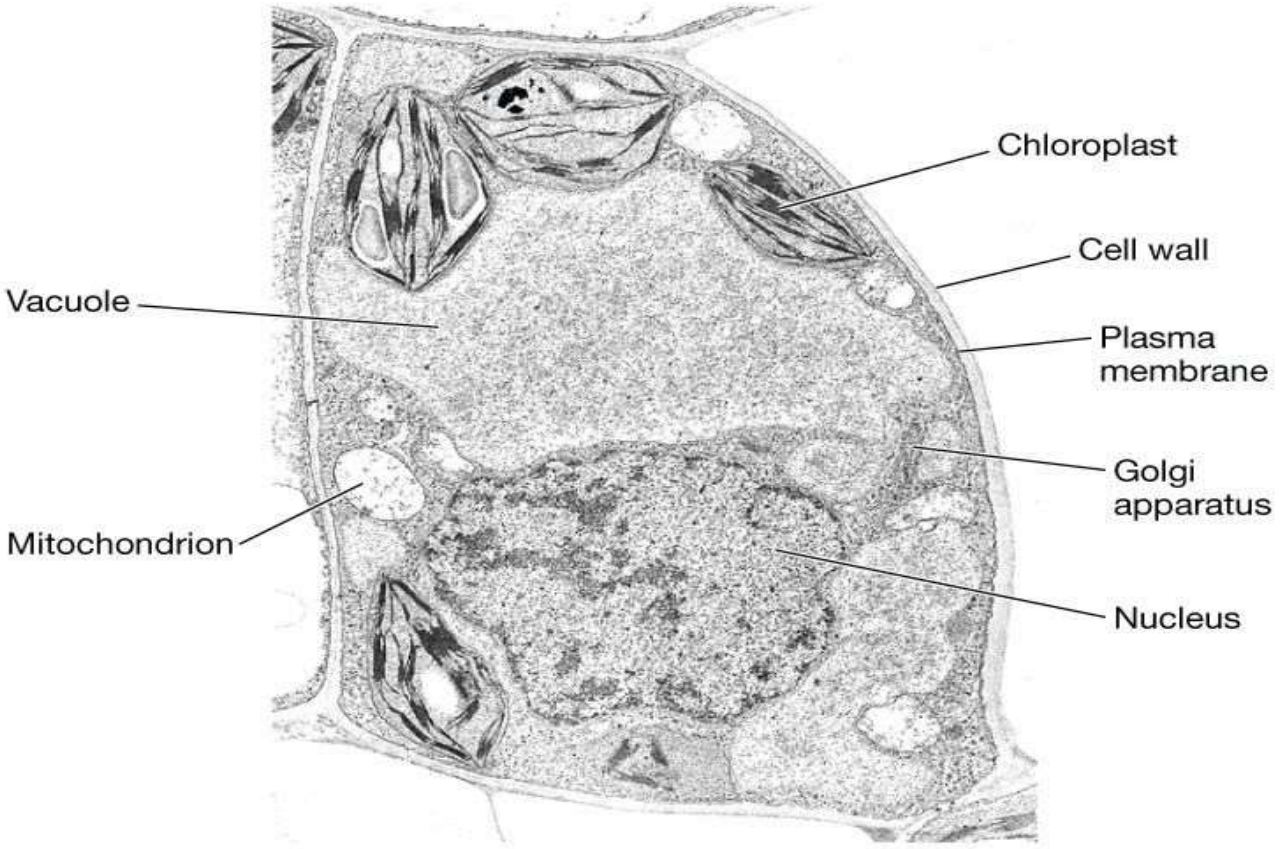
•The DNA produces mRNA by the process of DNA transcription.

•The mRNA is synthesized in the nucleus and transported to the cytoplasm for the process of protein synthesis.

•The ribosomal subunits in the cytoplasm are bound around mRNA polymers. The tRNA then synthesizes proteins.

•Ribosomes are the site of protein synthesis.

•The proteins synthesized in the cytoplasm are utilized in the cytoplasm itself, the proteins synthesized by bound ribosomes are transported outside the cell.



Electron Micrograph: Plant Cell