

STUDY COURSE MATERIAL

BIOLOGY

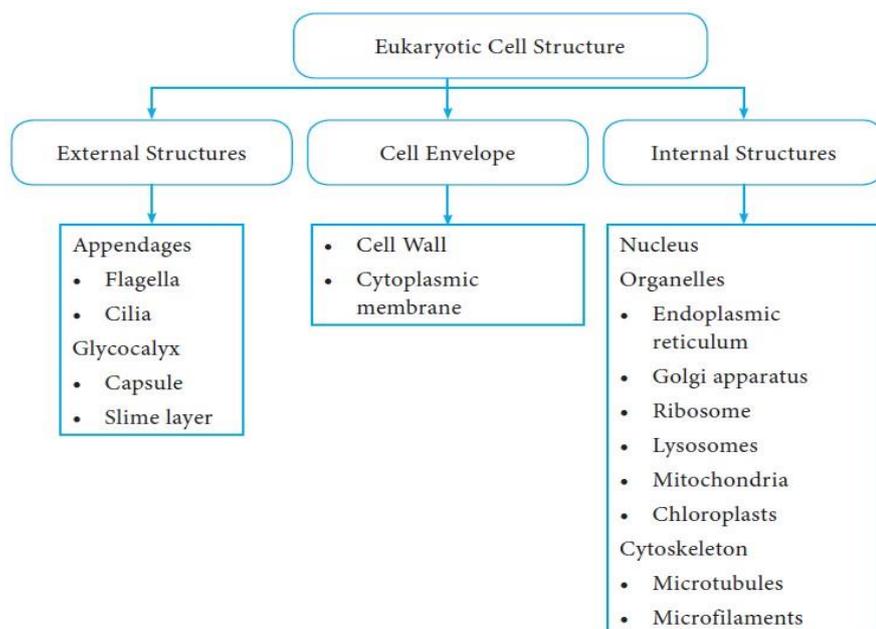
SESSION-2020-21

CLASS-IX

TOPIC: Ch-5-THE FUNDAMENTAL UNIT OF LIFE

DAY-1 (NUCLEUS)

❖ TEACHING MATERIAL



Flowchart 7.1: Eukaryotic Cell Structure

- Nucleus is dense and spherical organelle.
- It is bounded by two membranes, both forming nuclear envelope. Nuclear envelope contains many pores known as nuclear pores.
- The fluid which present inside the nucleus is called nucleoplasm.
- Nucleus contains chromosomes and chromosomes contain genes which are the centres of genetic information.
- 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 (DeoxyriboNucleic 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.

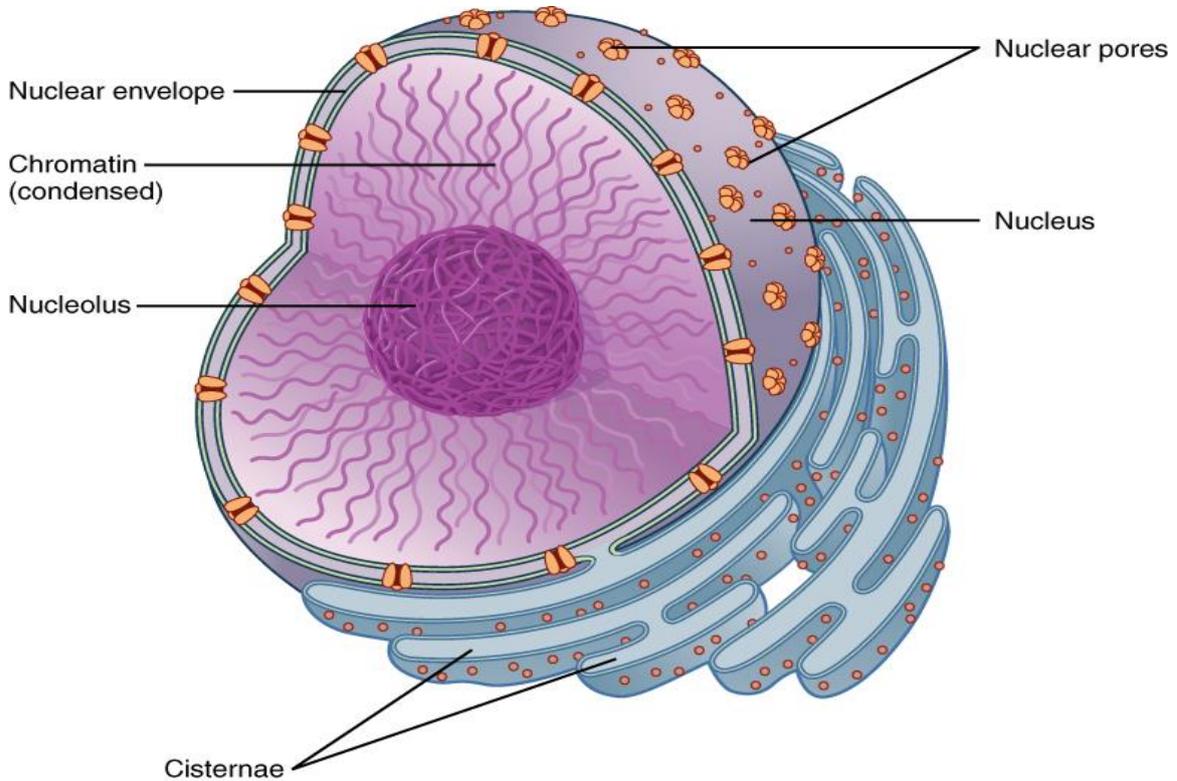


Fig: Structure of Nucleus

Functions:

- Nucleus controls all the metabolic activities of the cell.
- It regulates the cell cycle.
- Nucleus is the storehouse of genes. It is concerned with the transmission of hereditary traits from the parent to offspring.

*NCERT Book Link-

<http://ncert.nic.in/textbook/textbook.htm?iesc1=5-15>

*PPT-Link -

<https://www.slideshare.net/mobile/Salman437/nucleus-structure>

*Video Link –

https://youtu.be/v_xlBmFYu5Y

*Assignments –

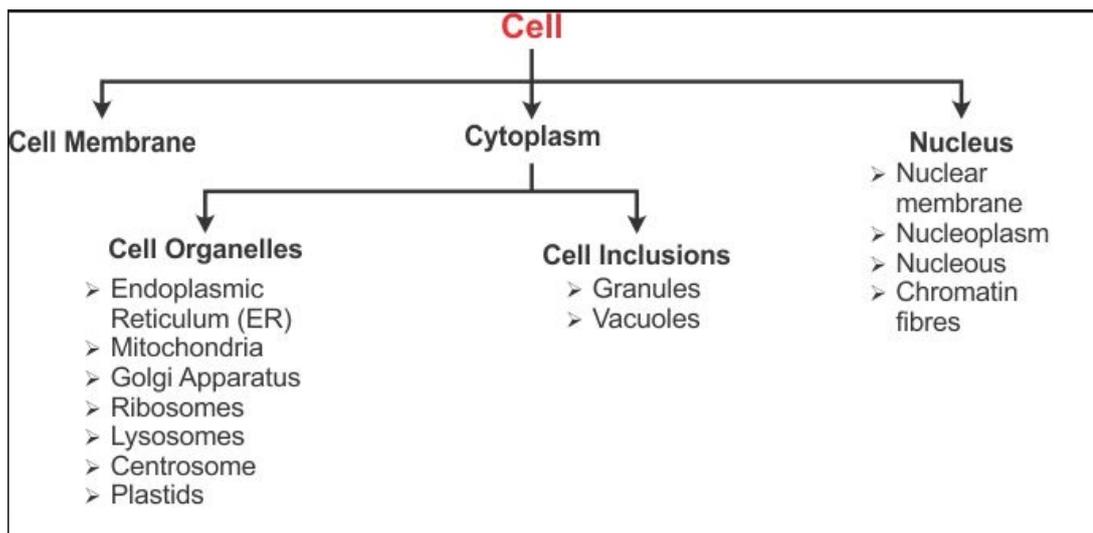
1. Draw a well labeled diagram of nucleus.
2. Write at least three functions of nucleus.

DAY-2

❖ TEACHING MATERIAL

Topic- Cell organelles:-

You already know that all living organisms are made up of cells, which are the tiniest units. But do you know that cells are made up of even smaller objects? 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.



A small organ-like structure present inside the cell is called a cell organelle. It has a particular structural makeup and performs a specific function. Depending upon the presence or absence of membrane, cell organelles can be classified into three categories, namely:

1. Double membrane bound organelles

- Mitochondria
- Endoplasmic Reticulum
- Golgi bodies
- Plastids

2. Single membrane bound organelles

- Vacuole
- Lysosomes

3. No membrane bound organelles

- Ribosomes.

***NCERT Book Link-**

<http://ncert.nic.in/textbook/textbook.htm?iesc1=5-15>

***Video Link**

<https://youtu.be/ZyWYID2cTK0>

***Practical – To prepare stained temporary mount of human cheek cells**

***Document Link for practical-**

<https://www.cbsepapers.com/cbse/cbse-class-9-science-practical-skills-slide-of-onion-peel-and-cheek-cells>

***Assignments –**

1. Write a short note on cell organelles.

In practical file

1. Write the activity 'to prepare the temporary mount of human cheek cell'.

DAY-3

Topic – Endoplasmic Reticulum:-

- The large network of membranous sheets and tubes is called endoplasmic reticulum.

- They are filled with fluids and carries materials throughout the cell due to which it is also called transport system of the cell.
- It transports materials between the regions of cytoplasm or between the cytoplasm and nucleus.
- It also provides a surface for some biochemical activities of cell.
- It can be classified into two types:
 - RER (Rough Endoplasmic Reticulum)
 - SER (Smooth Endoplasmic Reticulum)

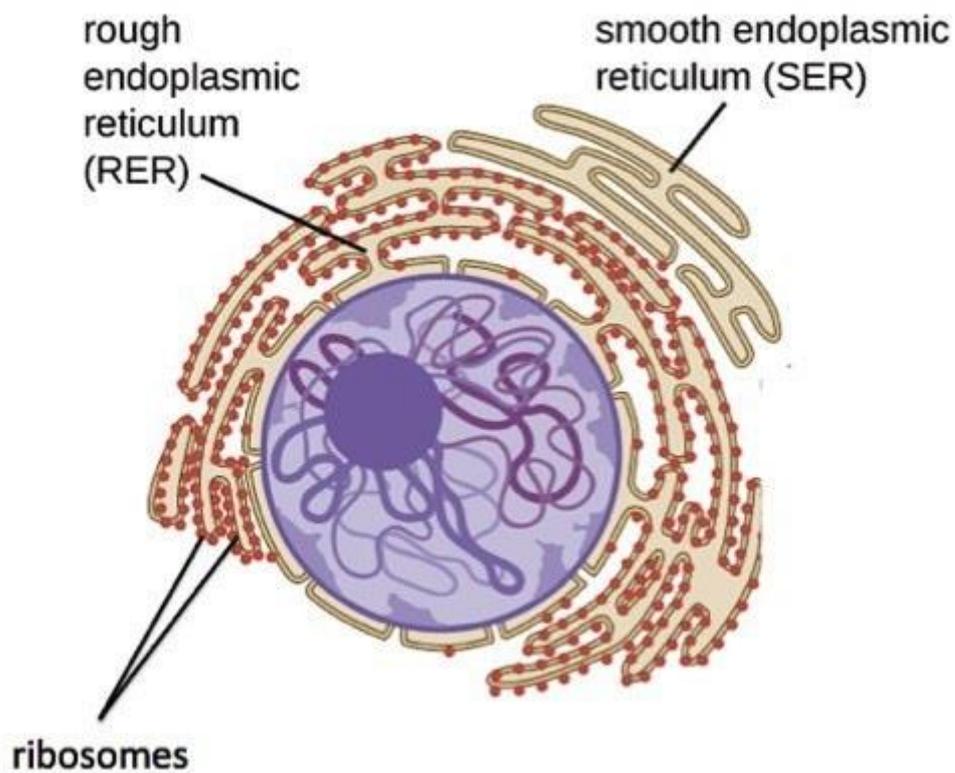


Fig. Endoplasmic reticulum

1. **Rough Endoplasmic Reticulum (RER)**

- The RER appears rough under a microscope as it is lined with ribosomes.
- The ribosomes manufactures the proteins which are then transported throughout the cell by the Endoplasmic Reticulum.

2 Smooth Endoplasmic Reticulum (SER)

- The SER appears smooth under microscope due to absence of ribosomes.
- It also manufactures fat molecules or lipids that are important for proper functioning of cell and detoxifies the poisons present in liver cells of vertebrates.

*Structure-

- The general structure of the endoplasmic reticulum is a network of membranes called cisternae.
- These sac-like structures are held together by the cytoskeleton.
- The phospholipid membrane encloses the cisternal space (or lumen), which is continuous with the perinuclear space but separate from the cytosol.

*NCERT Book Link-

<http://ncert.nic.in/textbook/textbook.htm?iesc1=5-15>

*Video Link –

<https://youtu.be/-2tqYcT-te8>

*Assignments –

1. Explain the detailed structure of endoplasmic reticulum.
2. Write the functions of:
 - a. SER
 - b. RER

❖ PPT LINKS

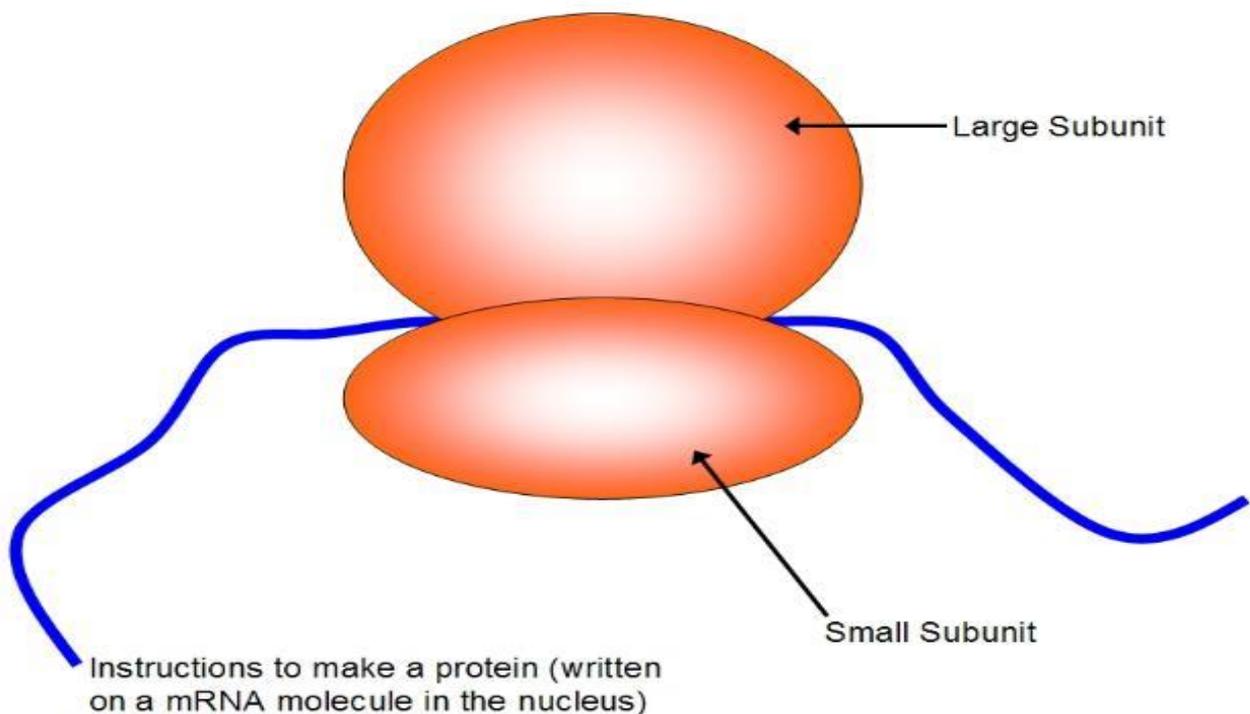
<https://www.slideshare.net/kainthjashan/euclids-division-lemma>

DAY-4

Topic- Ribosomes:-

- The ribosome is a complex molecular machine found inside the living cells that make proteins from amino acids in the process called protein synthesis or translation.
- Protein synthesis is a major task performed by living cells.
- Ribosomes are special organelles as they are found in both prokaryotic and eukaryotic cells.
- Every cell needs ribosomes to manufacture proteins.
- It binds to a messenger ribonucleic acid (mRNA) and decodes the information carried by the nucleotide sequence of the mRNA.
- The transfer RNAs (tRNAs) containing amino acids enter the ribosome at the acceptor site. When it binds correctly, it adds amino acid to the growing protein chain on tRNA.

Ribosome diameter = 10 nm



Ribosomes Structure:-

A ribosome is a complex of RNA and protein and is, therefore, known as a ribonucleoprotein. It is made up of two subunits. The smaller subunit is where the mRNA binds and is decoded. While the larger subunit is where the amino acids get added. Both of the subunits are made up of 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 cell.

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.

Ribosomes Function

The important ribosome function includes:

1. It assembles amino acid to form proteins that are essential to carry out cellular functions.
2. The DNA produces mRNA by the process of DNA transcription.
3. The mRNA is synthesised in the nucleus and transported to the cytoplasm for the process of protein synthesis.
4. The ribosomal subunits in the cytoplasm are bound around mRNA polymers. The tRNA then synthesises proteins.
5. The proteins synthesised in the cytoplasm are utilised in the cytoplasm itself, the proteins synthesised by bound ribosomes are transported outside the cell.

A ribosome is composed of two subunits:

- the small ribosomal subunits- these read the mRNA
- the large ribosomal subunits- they form polypeptide chains of amino acids.

*Types of Ribosomes -

The two different types of ribosomes include:

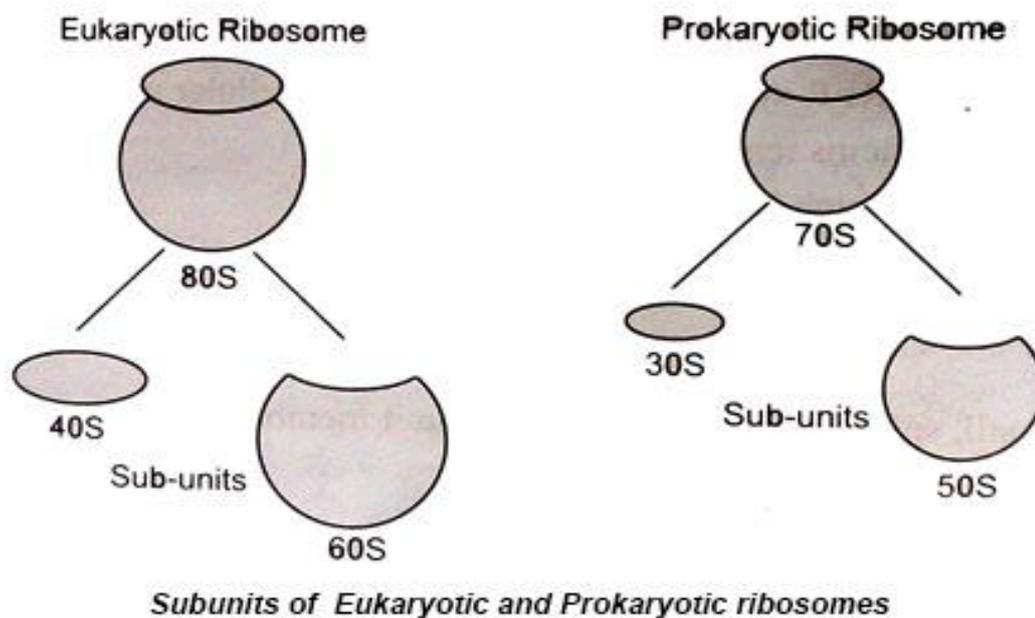
- 70 S-found in prokaryotic cells
- 80 S-found in eukaryotic cells

*NCERT Book Link-

<http://ncert.nic.in/textbook/textbook.htm?iesc1=5-15>

*Video Link –

<https://youtu.be/4n7GJAaibVk>



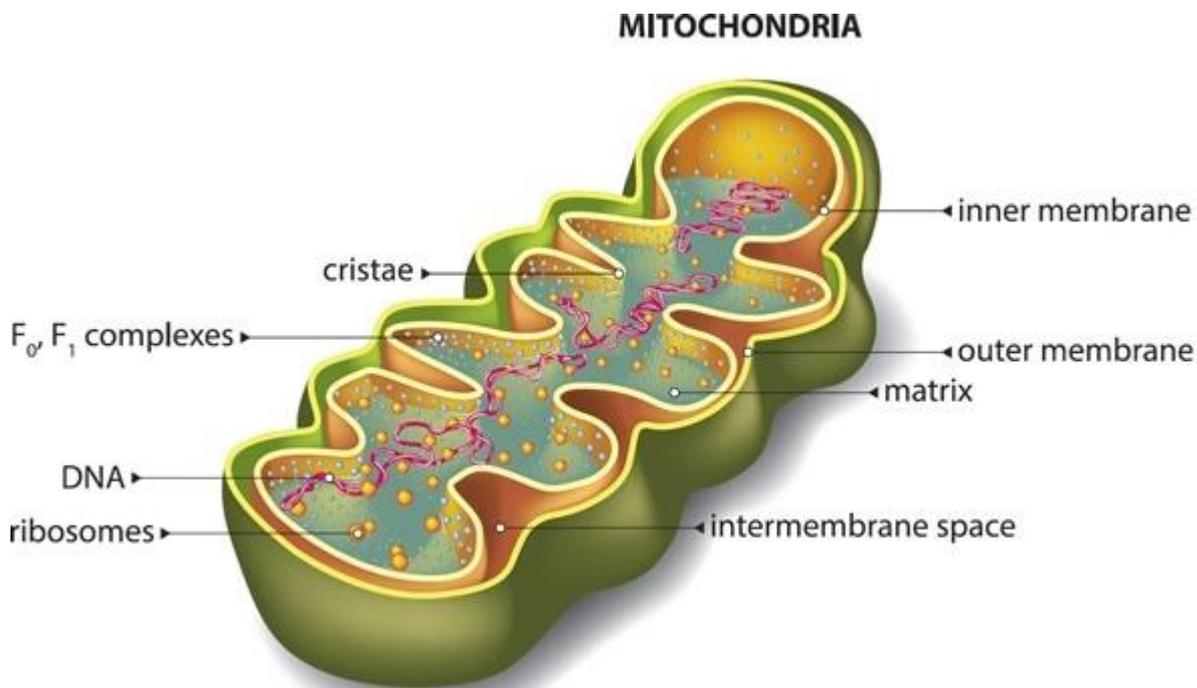
*Assignments –

1. Why ribosomes are considered as 'protein factory of a cell'?
2. What is the difference between 70s and 80s ribosomes?

DAY-5

Topic – Mitochondria

- Mitochondria are double membrane-bound cell organelles (mitochondrion, singular) that generate most of the chemical energy needed to power the cell's biochemical reactions.
- Chemical energy produced by the mitochondria is stored in a small molecule called adenosine triphosphate (ATP).
- Mitochondria contain their own small chromosomes. Generally, mitochondria, and therefore **mitochondrial DNA**, are inherited only from the mother.



*Structure of Mitochondria –

- The mitochondrion is a double-membrane, rod-shaped structure found in both plant and **animal cell**.
- Its size ranges from 0.5 to 1.0 micrometre in diameter.

- The structure comprises an outer membrane, an inner membrane, and a gel-like material called the matrix.
- The outer membrane and the inner membrane are made of proteins and phospholipid layers separated by the intermembrane space.
- The outer membrane covers the surface of the mitochondrion and has a large number of special proteins known as porins.
- It is freely permeable to ions, nutrient molecules, energy molecules like the ADP and ATP molecules.

Cristae

- The inner membrane of mitochondria is rather complex in structure. It has many folds that form a layered structure called cristae, and this helps in increasing the surface area inside the organelle.
- The cristae and the proteins of the inner membrane aids in the production of ATP molecules.
- The inner membrane is strictly permeable only to oxygen and to ATP molecules.
- A number of chemical reactions take place within the inner membrane of mitochondria.

Mitochondrial Matrix

- The mitochondrial matrix is a viscous fluid that contains a mixture of enzymes and proteins.
- It also comprises ribosomes, inorganic ions, mitochondrial DNA, nucleotide cofactors, and organic molecules.
- The enzymes present in the matrix play an important role in the synthesis of ATP molecules.

Function of mitochondria:-

- Mitochondria is known as powerhouse of the cell because it generates ATP that is required for different metabolic functions of a cell.

***NCERT Book Link-**

<http://ncert.nic.in/textbook/textbook.htm?iesc1=5-15>

***Video Link –**

<https://youtu.be/r6C54HHFTwE>

***Assignments –**

1. Draw a labelled structure of mitochondria.
2. Write a short note on the structure and function of mitochondria.