

# Biochemistry

## **Biochemistry –**

The study dealing with the chemistry of living organism in its different phases of activity is called as biochemistry.

### **Significance:**

- i) Biochemistry deals with the study of living system & its working.
- ii] It deals with study of nature and working of biomolecules like proteins, carbohydrates , lipids and nucleic acid.
- iii] It is useful in diagnosis of various metabolic disorders like diabetes mellitus, phenyl ketoneuria etc.
- iv] Biochemistry helps in study of various deficiency diseases such as scurvy, rickets, beriberi, pellagra due to deficiency of various vitamins.
- v] It helps in synthesizing various new molecules.

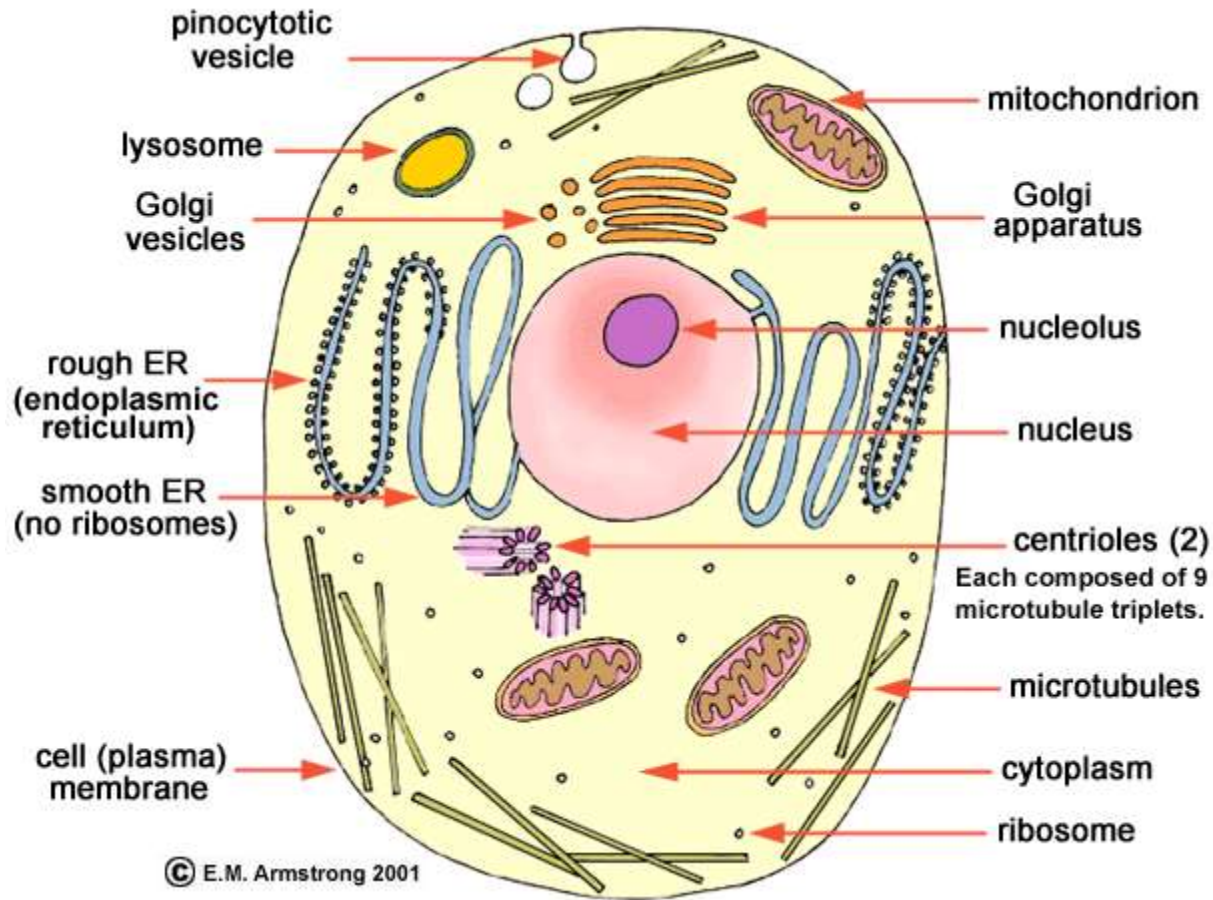
Thus knowledge of biochemistry is used to control diseases , abnormal metabolism & treatment.

- **Metabolism**-transformation of chemical energy into biological one is referred as metabolism.
- OR**

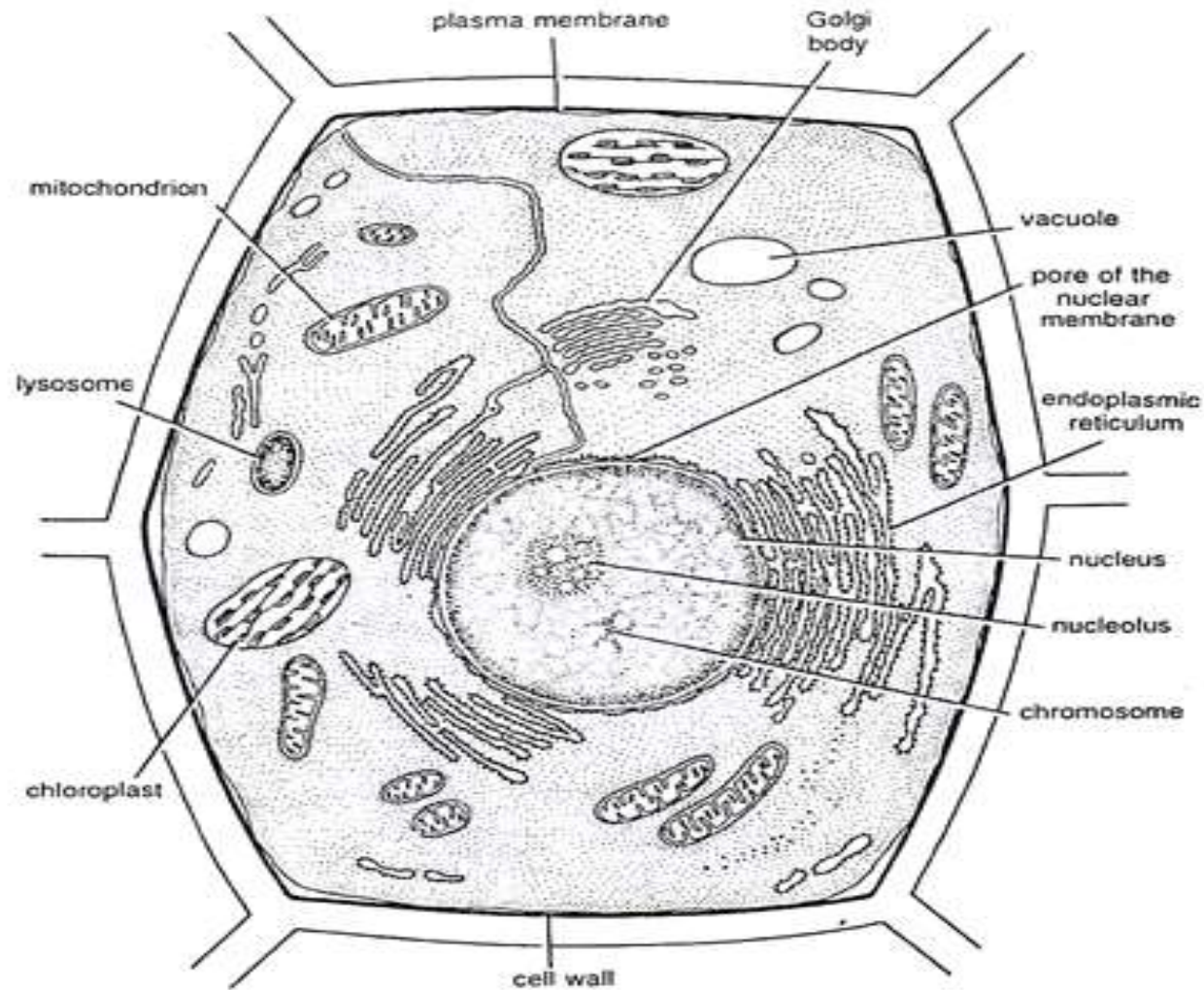
All biochemical changes that occur in biological system are called as metabolism.

- **Anabolism** -it is biosynthetic phase of metabolism in which larger biomolecules like carbohydrates, proteins, nucleic acid and lipids are synthesized from small precursors.
- **Catabolism:** Catabolism is degradative phase of metabolism in which organic nutrient molecule (carbohydrates ,fats ,proteins ) are converted into smaller, simpler end products .( Lactic acid , $\text{CO}_2$  )
- **Abnormal Metabolism:** A metabolic disorder occurs when the normal metabolism process fails. It may be due to genetic defect, dietary deficiencies or disease conditions
- **Cell:** It is defined as structural and functional unit of living organism and capable of carry on processes of life independently.
- **Prokaryotic cell**- an organism without true nucleus, but the nuclear material being scattered in the cytoplasm of cell.
- **Eukaryotic cell** - an organism containing highly developed very complex nucleus, surrounded by the nuclear envelope consisting of two membrane.

# Animal Cell



# Plant Cell



**Fig. 291.** Ultrastructure of a plant cell covered by cell wall.

# Part of Cell & their functions

- Cell membrane (Plasma membrane):
- nucleus
- Mitochondria
- Endoplasmic Reticulum
- *Golgi apparatus*
- *Ribosomes*
- *Lysosomes:*
- *Cytoplasm*
- Microtubules :
- Microfilaments

# cell membrane / Plasma membrane

- The cell membrane is the protective barrier that surrounds the cell and prevents unwanted material from getting into it. The cell membrane is made up of a phospholipid bilayer.

## **Functions,**

- Main function that it has is to transport materials (salts, electrolytes, glucose and other necessary molecules) into the cell to support necessary life functions.
- Not only does the membrane let molecules into the cell, but it also lets wastes such as carbon dioxide out of the cell.

# nucleus

- The nucleus is a membrane bound structure that contains the cell's hereditary information and controls the cell's growth and reproduction.
- It is generally the most prominent organelle in the cell. It is surrounded by a structure called the nuclear envelope.
- This membrane separates the contents of the nucleus from the cytoplasm.
- The cell's chromosomes are also enclosed within it.

Chromosomes contain DNA which provides the genetic information necessary for the production of other cell components and for reproduction of life.

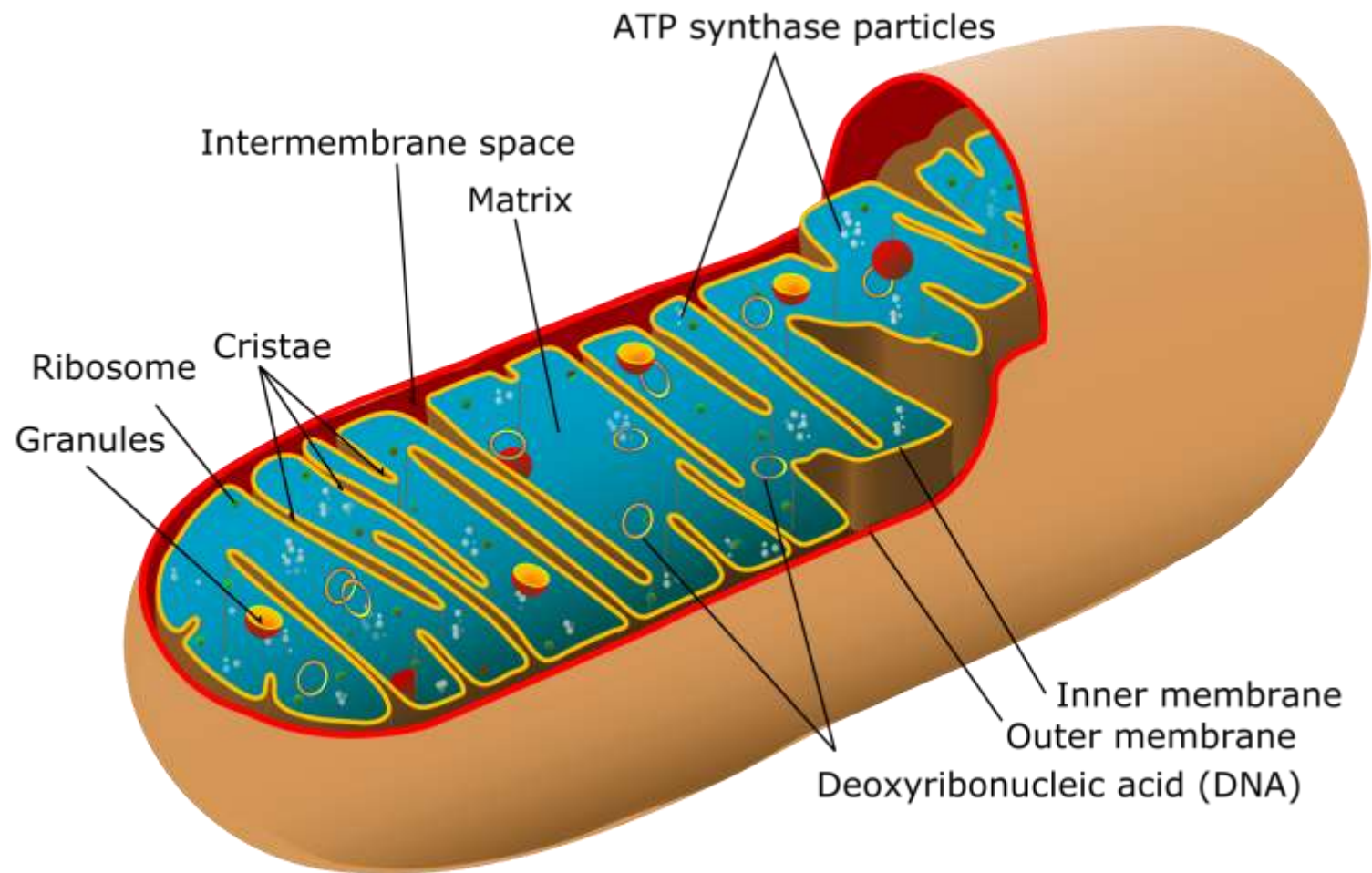
## **Function:**

- It controls the heredity characteristics of an organism.
- It is responsible for protein synthesis, cell division, growth and differentiation.
- Stores heredity material in the form of deoxy-ribonucleic acid (DNA) strands.
- Also stores proteins and ribonucleic acid (RNA) in the nucleolus.
- It is a site for transcription process in which messenger RNA (m RNA) are produced for protein synthesis.
- Aids in exchange of DNA and RNA (heredity materials) between the nucleus and the rest of the cell.
- Nucleolus produces ribosomes and are known as protein factories.



# Mitochondria Structure

- They are made of two membranes, in which the outer one covers the organelle and holds it like a skin. The inner membrane, on the other hand, folds over many times and creates layered structures called **cristae**.
- The fluid contained in the mitochondria is called the **matrix**. They are special because they have their own **ribosomes** and DNA floating in the matrix.
- There are also structures called **granules** which would control the concentration of ions.



# Mitochondria Functions

- They are organelles that act like a digestive system which takes in nutrients, breaks them down and generates energy-rich molecules for the cell.
- The biochemical processes of the cell are known as [cellular respiration](#). Many of the reactions involved in cellular respiration occur in the mitochondria.
- They act as the power plants of the cell hence called the powerhouse of the cell.
- Mitochondria are engaged in oxidative metabolism, and are responsible for the transportation of chemical energy into biological energy, in the form of ATP compounds.
- All enzymes involved in Kreb's cycle are present in mitochondria.

# Endoplasmic Reticulum

- 1. The endoplasmic reticulum is a collection of interconnected tubes and flattened sacs that begin at the nucleus and ramble through the cytoplasm.
- 2. There are two types distinguished by the presence or absence of ribosomes:
  - a. ***Rough ER*** consists of stacked, flattened sacs with many ribosomes attached; oligosaccharide groups are attached to polypeptides as they pass through on their way to other organelles or to secretory vesicles.
  - b. ***Smooth ER*** has no ribosomes; it is the area from which vesicles carrying proteins and lipids are budded; it also inactivates harmful chemicals

# Endoplasmic Reticulum

## Functions

- It is mainly responsible for the transportation of proteins and other carbohydrates to another organelle, which includes lysosomes, Golgi apparatus, plasma membrane, etc.
- They play a vital role in the formation of the skeletal framework.
- They provide the increased surface area for cellular reactions.
- They help in the formation of nuclear membrane during cell division.
- They play a vital role in the synthesis of proteins, lipids, glycogen and other steroids like cholesterol, progesterone, testosterone, etc.

***Golgi apparatus:*** They are flattened stacks of membrane bound sacs.

- They **function** as the packaging unit, the proteins formed by the endoplasmic reticulum are packed into small membrane sacs called **vesicles**.

***Ribosomes:*** Ribosomes are found on the endoplasmic reticulum

- Together they help in manufacturing proteins for the cell

***Lysosomes:*** Lysosomes are membrane bound organelles,

***Functions:***

- they contain digestive enzymes.
- They break down the waste products and detoxify the cell

***Cytoplasm:*** It is the fluid substance that fills the cell. All the cell organelles are suspended in the cytoplasm.

***Functions:***

- The cytoplasm maintains the osmotic concentration of the cells and prevents them from bursting or shrinking.

## **Microtubules :**

- These are tubular structure composed of globular protein & held in intracellular transport

## **Microfilaments,**

- These are protein filaments in the cytoplasm meant for contraction & mobility of cell.