

CBSE NCERT Solutions for Class 11 Biology Chapter 08

Back of Chapter Questions

1. Which of the following is not correct?

- (a) Robert Brown discovered the cell.
- (b) Schleiden and Schwann formulated the cell theory.
- (c) Virchow explained that cells are formed from pre-existing cells.
- (d) A unicellular organism carries out its life activities within a single cell.

Solution:

Option A is not correct.

Robert Brown (1773-1858) discovered the nucleus of a cell. The cell discovery happened in 1665 by Robert Hooke.

2. New cells generate from

- (a) bacterial fermentation
- (b) regeneration of old cells
- (c) pre-existing cells
- (d) abiotic materials

Solution:

(c) pre-existing cells

The new cells (daughter cells) are generated from pre-existing cells (parent cells) by cell division.

3. Match the following

Column I	Column II
(a) Cristae	(i) Flat membranous sacs in stroma
(b) Cisternae	(ii) Infoldings in mitochondria
(c) Thylakoids	(iii) Disc-shaped sacs in Golgi apparatus

Solution:

- (a) – (ii)
- (b) – (iii)
- (c) – (i)

4. Which of the following is correct:

- (a) Cells of all living organisms have a nucleus.
- (b) Both animal and plant cells have a well defined cell wall.
- (c) In prokaryotes, there are no membrane bound organelles.
- (d) Cells are formed de novo from abiotic materials.

Solution:

Option c: In prokaryotes, there are no membrane-bound organelles.

Prokaryotes have four main structures: plasma membrane, cytoplasm, ribosomes and genetic material (DNA and RNA). None of the prokaryotic cells has membrane-bound organelles. Hence, option c is the correct option.

5. What is a mesosome in a prokaryotic cell? Mention the functions that it performs.**Solution:**

The invaginations of plasma-membrane in prokaryotic cells are called mesosomes.

Functions of mesosomes are:

1. Mesosomes are **rich in enzymes** and hence help to perform many tasks like cellular respiration, DNA replication, cell division, secretion of the glycocalyx and synthesis of cell-wall. They also help in equal distribution of chromosomes into daughter cells.
2. The most crucial function of mesosomes is that it **increases the surface area** of the cell membrane.

6. **How do neutral solutes move across the plasma membrane? Can the polar molecules also move across it in the same way? If not, then how are these transported across the membrane?**

Solution:

The outermost covering of the cell is the plasma membrane, and it has a crucial role in the regulation of the movement of substances from in and out of the cell.

The **plasma membrane is a selectively permeable membrane**, and it allows the entry of only selective substances and prevents the movement of other materials.

The plasma membrane is **made up of a phospholipid bilayer and proteins**.

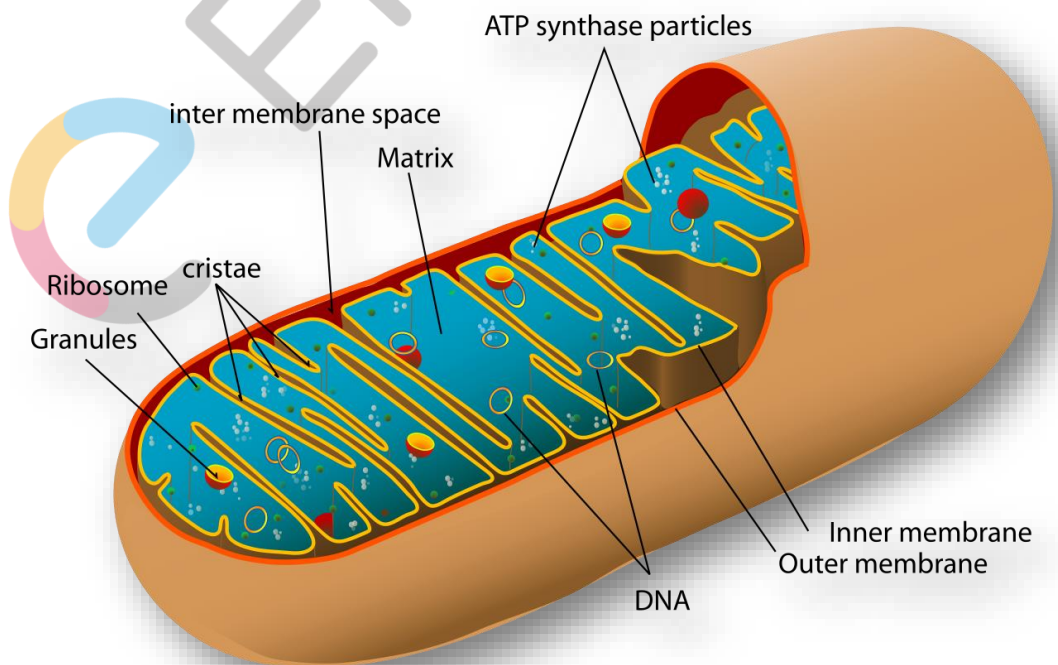
Movement of neutral solutes across the plasma membrane – The neutral molecules move across the cell membrane through the lipid bilayer by **simple diffusion**. The process of movement of molecules from a region of higher concentration to a region of lower concentration is called diffusion.

Movement of polar molecules across the plasma membrane – The movement of polar molecules across the non-polar lipid bilayer requires carrier-proteins. The carrier-proteins are integral proteins having a certain affinity for specific solutes. They facilitate the transport of molecules across the membrane.

7. **Name two cell-organelles that are double membrane-bound. What are the characteristics of these two organelles? State their functions and draw labelled diagrams of both.**

Solution:**Mitochondria****Characteristics of Mitochondria:**

- The mitochondrion is a **double membrane**-bound cell organelle present in eukaryotic cells. Its size is 0.5 to 1.0 μm in diameter and 1.0-4.1 μm in length. The structure includes an outer membrane, an inner membrane, and a gel-like material called the matrix. The space between the outer membrane and the inner membrane is called the intermembrane space.
- The inner membrane of mitochondria has several folds that form a layered structure called **cristae**. It increases the surface area of the inside of the organelle. The cristae and the proteins of the inner membrane have a crucial role to play in the ATP synthesis through oxidative phosphorylation. Hence, it is called the **powerhouse** of the cell.
- The inner membrane is strictly permeable to only oxygen and ATP molecules. The outer membrane has special proteins known as porins. It is freely permeable to ions, nutrients, ADP and ATP.
- The mitochondrial **matrix** is a viscous fluid and contains a mixture of enzymes and proteins. These enzymes are very important for ATP synthesis. It also contains ribosomes (the 70s), inorganic ions, single circular mitochondrial DNA, few RNA molecules and organic molecules.
- The mitochondria divide by fission.



Functions of Mitochondria:

1. The most crucial function of the mitochondria is to **produce energy** through oxidative phosphorylation. Hence, it is called the powerhouse of the cell.
2. They are the sites of **aerobic respiration**.
3. They contain ribosomes which are the sites of **protein synthesis**.

Golgi apparatus**Characteristics of the Golgi apparatus:**

Camillo Golgi (1898) first observed densely stained cell organelle and hence the name Golgi apparatus.

The Golgi apparatus is a **double membrane-bound** cell organelle present in eukaryotic cells.

They contain many flat, disc-shaped sacs of 0.5 μm to 1.0 μm diameter, stacked parallel to each other are called **cisternae**.

The cisternae are originating near a nucleus which is called **convex cis**, or the forming face and its opposite end is called **concave trans** or the maturing face.

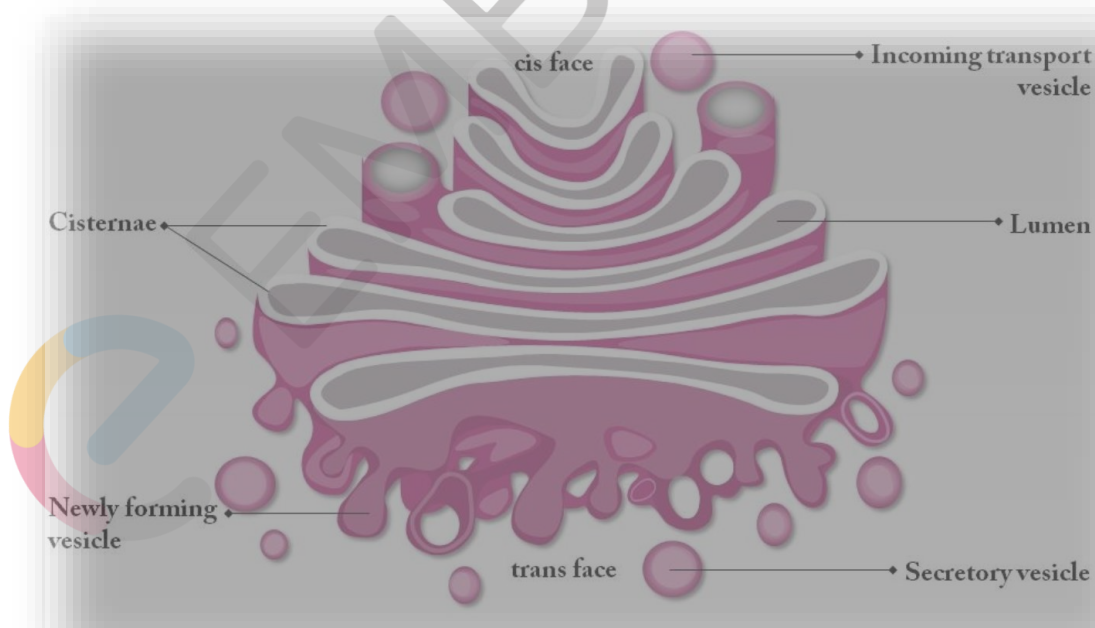


Figure: Schematic representation of the Golgi apparatus

Functions of Golgi apparatus:

1. Its function is of **packaging** materials, to be secreted outside the cell.

- Several proteins synthesised by ribosomes on the endoplasmic reticulum are **modified** in the cisternae of the Golgi apparatus before they are released from its trans face.
- It is an important site for the **synthesis of glycoproteins and glycolipids**.

8. What are the characteristics of prokaryotic cells?

Solution:

- The prokaryotic cells are found in the **unicellular** organisms like **bacteria** (1-2 μm), **blue-green algae** (10-20 μm), **mycoplasma** (10-20 μm), **PPLO** (Pleuro Pneumonia Like Organisms – about 0.1 μm). Prokaryotes have four main structures: plasma membrane, cytoplasm, ribosomes and genetic material (DNA and RNA).
- All prokaryotes have a cell wall surrounding a cell except in mycoplasma. Many prokaryotic cells are covered by three layers: outer most **glycocalyx**, middle **cell wall** and innermost **plasma membrane**. The cell matrix is filled with a fluid called **cytoplasm**.
- The nucleus in prokaryotes is not well-defined, and hence it is called **nucleoid**, and the DNA is called **naked-DNA** (as it is not surrounded by the nuclear membrane).
- The prokaryotic cells have a **single circular chromosome**. They may also have smaller pieces of circular DNA called **plasmids**.
- The prokaryotic cells have invaginations of the plasma membrane, which are called mesosomes. They are **rich in enzymes** and hence help to perform many tasks like cellular respiration, DNA replication, cell division, secretion of the glycocalyx and synthesis of cell-wall. They also help in equal distribution of chromosomes into daughter cells. The most crucial function of mesosomes is that it **increases the surface area** of the cell membrane.
- Prokaryotic cells do not have any membrane-bound cell organelles. They contain ribosomes. All prokaryotes have the 70S (made up of a 50S and 30S subunits, where S=Svedberg units) ribosomes while eukaryotes contain larger 80S ribosomes in their cytosol.

9. Multicellular organisms have division of labour. Explain.

Solution:

- Multicellular organisms are comprised of millions of cells. All these cells are specialised in performing a specific function by process of **cell differentiation**.
- A group of differentiated cells which perform similar functions are grouped together as **tissues**, and they perform **specialised functions** in the body.
- Hence, each tissue has a particular function to carry out at a definite place in the body. So, different functions are carried out by different groups of cells in an organism.
- Hence, it is called the “division of labour” in the multicellular organisms.

10. Cell is the basic unit of life. Discuss in brief.**Solution:**

- Cells are the structural and functional units of life, which are responsible for all the biochemical processes necessary for all the organisms to live. The necessary biochemical processes happening in all the living organisms are respiration, digestion food for obtaining energy, excretion, etc.
- Cells are capable of performing all these metabolic functions of the body. Therefore, cells are called the basic units of life.

11. What are nuclear pores? State their function.**Solution:**

The nucleus is covered by a nuclear envelope/membrane (double membranes) which separates the nucleus from the cytoplasm. The nuclear envelope is interrupted by minute pores at some intervals, formed by the fusion of its two membranes. These pores are called nuclear pores.

The nuclear pores on the membrane selectively allow the transport of RNA and ribosomal proteins from the nucleus to the cytoplasm and proteins (such as DNA polymerase and lamins), carbohydrates, signalling molecules and lipids from the cytoplasm to the nucleus.

12. Both lysosomes and vacuoles are endomembrane structures, yet they differ in terms of their functions. Comment.

Solution:

The endomembrane system is the set of membranes that form a single functional and developmental unit, either being connected directly or exchanging material through vesicle transport in a cell.

The endomembrane system includes: Nuclear membrane, Endoplasmic reticulum, Golgi apparatus, Lysosomes, Vesicles, Endosomes, and Plasma (cell) membrane.

Functions of the mitochondria, peroxisomes and chloroplast are not coordinated with the above components; these are not part of the endomembrane system.

Although lysosomes and vacuoles both are endomembrane structures; they differ in terms of their functions as tabulated below:

Lysosome	Vacuole
<ul style="list-style-type: none"> - They hold a variety of hydrolytic enzymes such as lipases, proteases, and carbohydrases for digestion of damaged cells. - They perform intracellular digestion of foreign microbes and food particles also. - They do self-digestion of cells, and hence they are called the suicidal bags. - They are the waste disposal systems of a cell. 	<ul style="list-style-type: none"> - The vacuoles store water, excretory product, sap, and other not useful materials for the cell. - In plants, the vacuoles store many ions and other materials. - In Amoeba the role of the contractile vacuole is for excretion. - In protists, food vacuoles are formed by engulfing the food particles.

13. Describe the structure of the following with the help of labelled diagrams.

- (i) Nucleus (ii) Centrosome

Solution:

(i) Nucleus:

- Nucleus was first described by **Robert Brown** in 1831. The nucleus has **four parts**: nucleolus, nucleoplasm, nuclear membrane, nuclear pores.

- The **nuclear membrane** consists of two parallel membrane and the space between them is called perinuclear space. The nuclear membrane separates cytoplasm from the inside of

the nucleus. The outer membrane continues with the endoplasmic reticulum and also have ribosomes on it.

- The nuclear envelope is interrupted by minute pores at some intervals, formed by the fusion of its two membranes. These pores are called **nuclear pores**. The nuclear pores on the membrane selectively allow the transport of RNA and ribosomal proteins from the nucleus to the cytoplasm and proteins (such as DNA polymerase and lamins), carbohydrates, signalling molecules and lipids from the cytoplasm to the nucleus.

- The **nucleoplasm** or nuclear matrix contains nucleolus and chromatin.

- In the nucleoplasm, there is a network of nucleoprotein fibres called **chromatin** (made of DNA, RNA and Proteins). They can be seen as heterochromatin (densely packed, non-coding genes) and euchromatin (lightly packed, contains active genes and hence often under active transcription) in the nucleoplasm.

- The **nucleolus** is a small spherical dense structure found in the nucleus of a cell during interphase. It is the largest structure of the nucleus in eukaryotic cells. It is the site of ribosomal RNA biogenesis and active protein synthesis. The content of nucleolus is continuous with the rest of the nucleoplasm as it is not a membrane-bound structure.

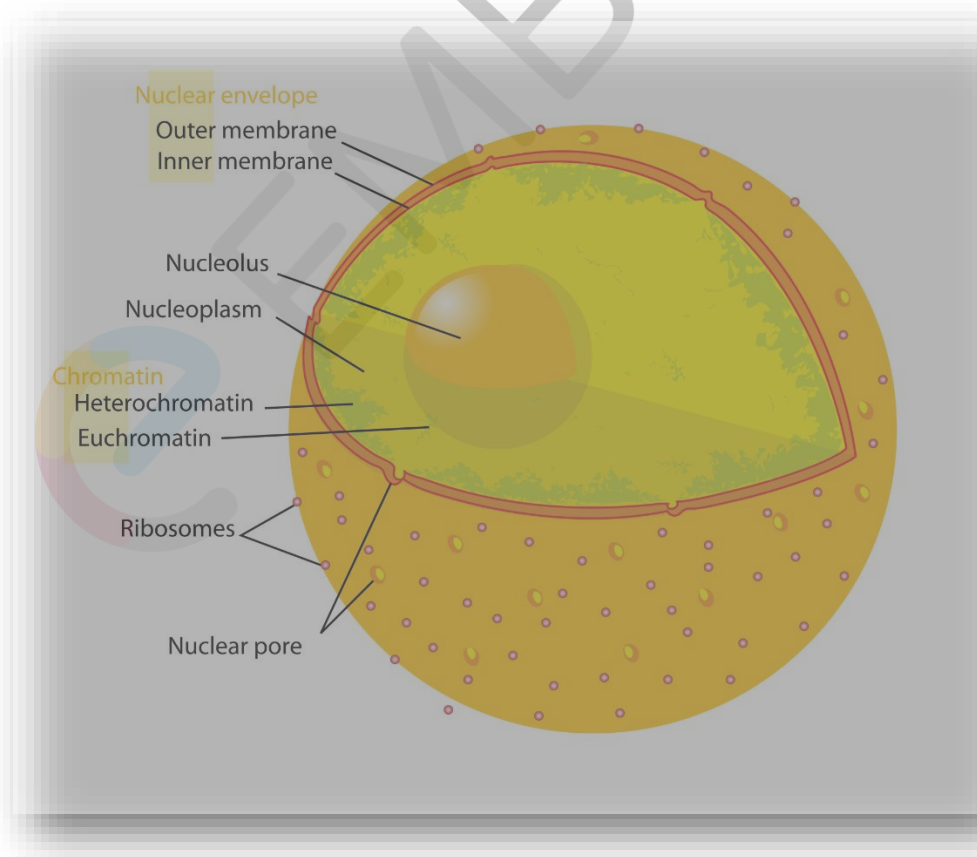


Figure: Schematic representation of the nucleus

(ii) Centrosome:

- A centrosome is an organelle **found in animal cells**.
- The centrosome is the main place where cell microtubules are organized.
- The centrosome has one pair of cylindrical structures called **centrioles**.
- The centrioles lie perpendicular with each other and are made up of **nine** evenly spaced peripheral fibrils of **tubulin** protein.
- Each fibril is a **triplet**, and adjacent fibril triplets are joined. The central part of the fibril triplet is proteinaceous and called the **hub**, is connected to the adjacent peripheral fibril triplets by **radial spokes** made of protein.
- The chief purpose of a centrosome is to organise microtubules and provide structure for the cell, as well as work to pull chromatids apart during cell division.

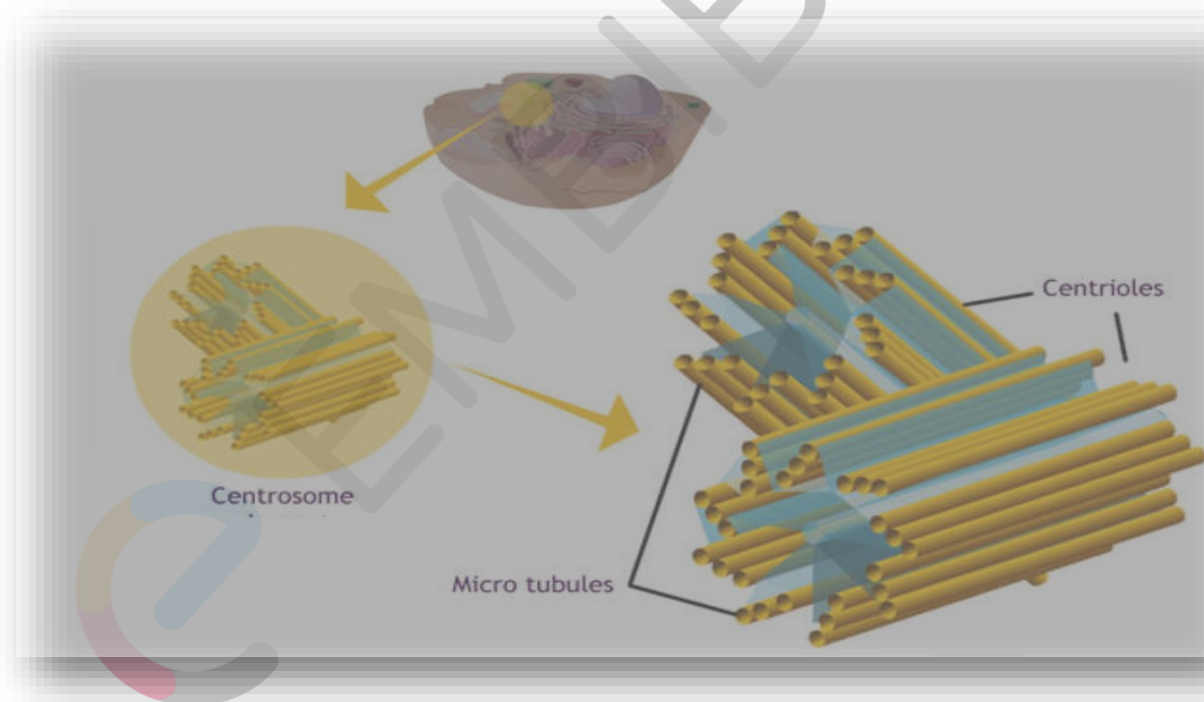
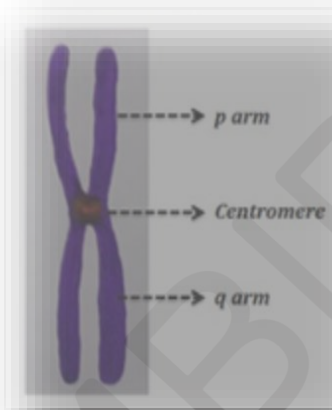


Figure: Schematic representation of Centrosome

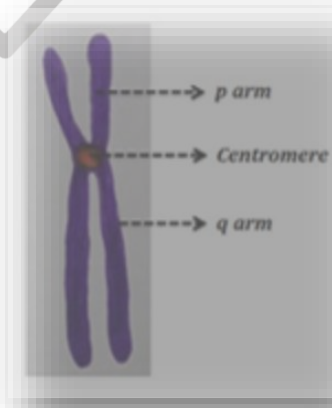
14. What is a centromere? How does the position of centromere form the basis of classification of chromosomes. Support your answer with a diagram showing the

position of centromere on different types of chromosomes.**Solution:**

- The centromere is a narrowing point of the chromosomes where the two chromatids are held together.
- Chromosomes can be divided into four types based on the position of the centromere:
 - (i) Metacentric chromosome: The centromere is present in the middle that divides the chromosome into two equal arms. They appear V-Shaped during anaphase.

**Figure: Metacentric chromosome**

- (ii) Sub-metacentric chromosome: The centromere is slightly away from the middle region, and hence, one arm is slightly longer than the other. During anaphase, they appear L-Shaped.

**Figure: Sub-metacentric chromosome**

- (iii) Acrocentric chromosome: The centromere is located close to one of the terminal ends, and hence, one arm is extremely long, and the other is extremely short. During anaphase, they appear J-Shaped.

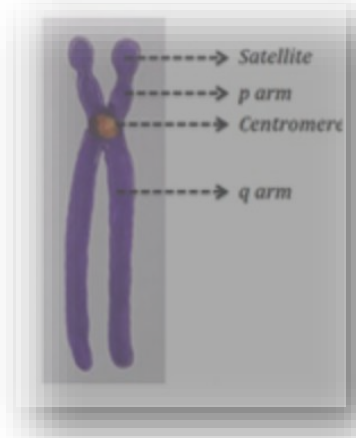


Figure: Acrocentric chromosome

(iv) Telocentric chromosome: The centromere is located at one of the terminal ends. During anaphase, they appear i-Shaped.

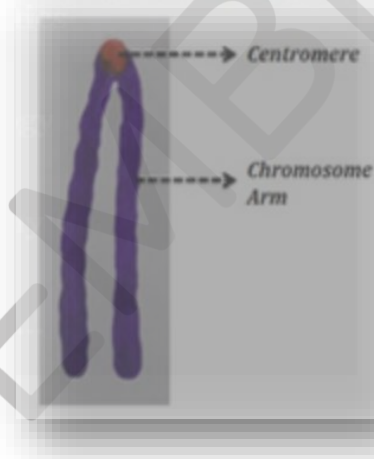


Figure: Telocentric chromosome

