Cell: The Unit of Life

Prepared by Mr. B. John Ebenezer

CLASS: XI **BIOLOGY**

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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.

Ans: (a) Robert Brown discovered the cell

It is incorrect because Robert Brown discovered nucleus in the cell.

2. New cells generate from

(a) bacterial fermentation (b) regeneration of old cells

(c) pre-existing cells (d) abiotic materials

Ans: (c) pre-existing cells

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

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

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

Ans: (c) In prokaryotes, there are no membrane-bound organelles.

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

A mesosome is a unique membranous structure formed by the extensions of plasma membrane into the cell.

If it is found attached to the nucleoid, it is known as septal mesosome and is known as lateral mesosome if the mesosome is free from the nucleoid.

Functions of mesosome are as follows

- They help in cell-wall formation
- They help in DNA replication and distribution to daughter cells.
- They also help in respiration, secretion processes, to increase the surface area of the plasma membrane and enzymatic content.

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?

The neutral solutes are lipid-soluble hence they pass through lipid bilayer.

No, polar molecules cannot move across the plasma membrane in the same way as neutral solutes; they require particular hydrophilic areas for their passage.

They get transported by three types of transport mechanisms – ions, channels, permeases and active transport utilising ATP.

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.

Two organelles that are double membrane-bound are Mitochondria and Chloroplasts.

Characteristics of mitochondria

The mitochondrion is a double membrane-bound structure with the outer membrane and the inner membrane dividing its lumen distinctly into two aqueous compartments, i.e., the outer compartment and the inner compartment.

- Mitochondria are semi-autonomous organelles as they possess their own DNA.
- Mitochondrion is the place of aerobic respiration.

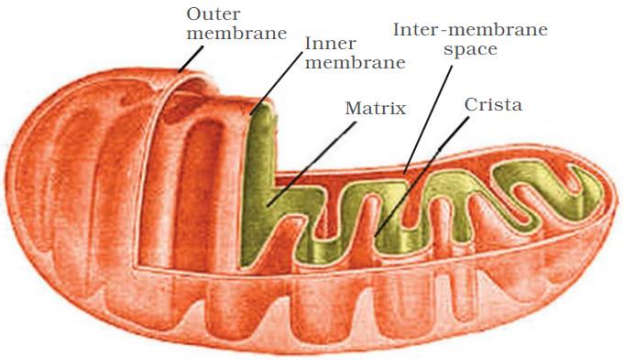


Figure 8.7 Structure of mitochondrion (Longitudinal section)

Characteristics of Chloroplasts

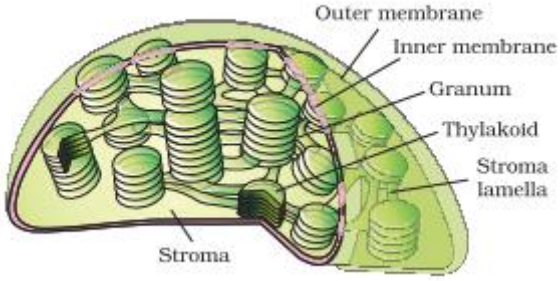
They are found in plants and euglenoids, variously shaped in lower plants and disc-shaped in higher plants

They have specific pigments which imparts colour to the leaves of the plants

Chloroplasts possess their own DNA.

Pigments help to trap sunlight thereby helps in photosynthesis.

Consists of membrane-flattened sacs known as thylakoids located in their matrix. At some locations, thylakoids are stacked and are known as grana.



8. What are the characteristics of prokaryotic cells?

The nuclear membrane is absent and the genetic material is not enclosed by an envelope.

The naked DNA is found to be coiled in the cytoplasm and is referred to as a genophore or nucleoid

They lack membrane-bound organelles and membrane-bound nucleus

Cell lumen is filled with a fluid known as cytoplasm

Prokaryotic DNA is situated in the nucleoid of the cell

Prokaryotic cell wall acts as a layer of protection and helps in maintaining cell shape

Ribosome is the only cytoplasmic organelle that is found in prokaryotic cells

9. Multicellular organisms have division of labour. Explain.

Cells are organized to form tissues which make organ and organ system.

A cell is an autonomous structure which is capable of carrying out functions on its own.

Hence the division of labour is essential to carry out different functions for increased efficiency and higher survival.

10. The cell is the basic unit of life. Discuss in brief

Every plant and animal cells are made of organ systems and organ systems are made up of organs.

Organs are constructed by tissues, and tissues are made up of a cluster of cells.

Since cells are autonomous structures capable of carrying out functions on their own, it is said that cell is the basic unit of life.

11. What are nuclear pores? State their functions.

At several places, the nuclear membrane is surrounded by minute pores formed by the fusion of two membranes called a nuclear pore. They are simple perforations on the nuclear envelope.

Functions:

Retains the shape of the nucleus

Known to preserve the stability of the genetic material by safe guarding it from respiratory breakdown occurring in the cytoplasm

Responsible for the movement of RNA and protein molecules in both directions between the nucleus and the cytoplasm.

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

The endomembrane is an intercellular system responsible for the flow of materials from one to another part through vesicles.

Some of its components are vacuoles, plasma membrane, endoplasmic reticulum, lysosomes and golgi apparatus.

Lysosomes are membrane-bound organelles that release lytic enzymes to digest worn-out cells hence they are known as suicidal bags.

Vacuoles help cells to maintain their shape.

Vacuoles also store food, water and waste products.

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

(i) Nucleus (ii) Centrosome

(i) The nucleus is an oval shaped or round structure having a double membrane containing the genetic material.

Nucleus consists of five parts, namely – nuclear envelope, nuclear matrix, nucleoplasm, nucleolus and chromatin.

Nuclear envelope:

The nucleus is constrained by the nuclear pore which is a double membrane nuclear envelope having tiny pores in the membrane which serve as a channel for substances to pass in and out of the nucleus.

The endoplasmic reticulum is connected to the outer membrane which also contains the ribosomes.

Nucleoplasm:

It is the fluid filled in the nucleus containing enzymes, nucleosides, proteins and other factors responsible for the functioning of the genetic material.

It also embeds the chromatin fibres and nucleolus.

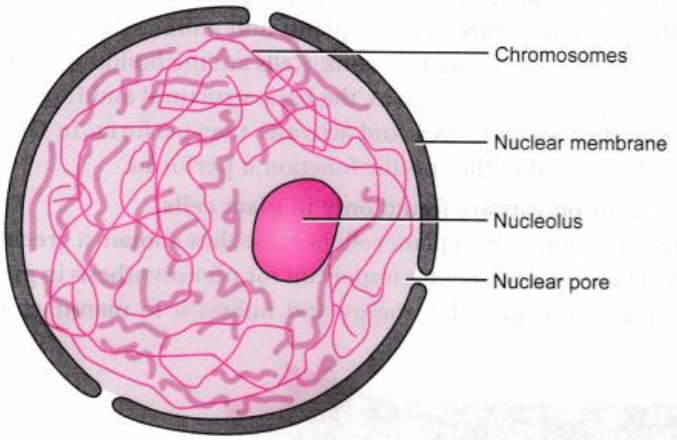
Chromatin:

It is found inside the nucleus, they are a fine network of thread-like structures containing DNA and a few basic proteins such as histones, RNA and non-histone proteins.

These chromatin fibres during the process of cell division condense to form the chromosomes.

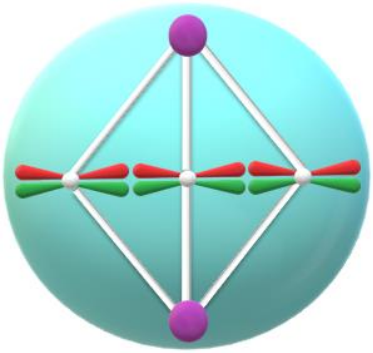
Nucleolus:

It is attached with the chromatin and are round, lightly irregular, naked structures that produce the ribosome subunits. They produce proteins.



(ii) Centrosome

- Consists of two cylindrical structures known as centrioles which lie perpendicular to one another, organized as a cartwheel
- Engirdled by amorphous pericentriolar materials
- Consists of 9 evenly spaced peripheral fibrils of the tubulin protein, wherein each is a triplet and adjacent triplets are linked to each other
- The centre of the centriole is a proteinaceous hub attached to the triplets through radial spokes
- It is critical during cell division as it organizes the spindle fibres and astral rays



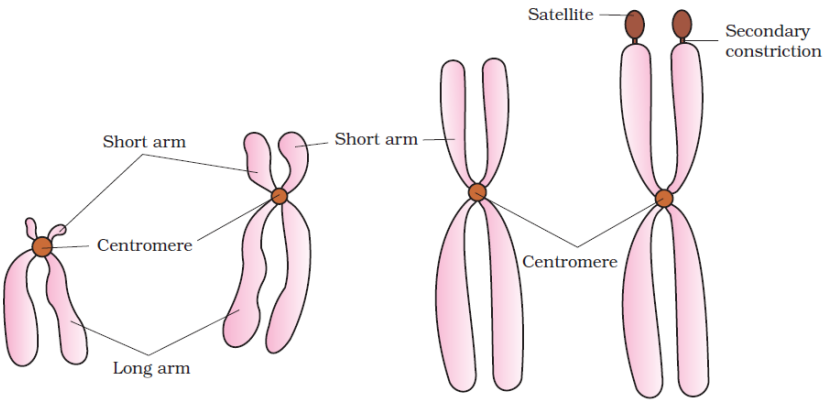
14. What is centromere? How does the position of centromere form the basis of classification of chromosomes? Support your answer with a diagram showing the position of the centromere on different types of chromosomes.

Primary constriction present in a chromosome is called the centromere.

Centromere holds two chromatids of a chromosome.

Based on the position of the centromere, the chromosomes can be classified into four types:

- Metacentric has middle centromere forming two equal arms of the chromosomes.
- Submetacentric chromosomes have centromere slightly away from the middle of the chromosomes resulting in one shorter arm and one more extended arm.
- Acrocentric chromosomes have centromere situated close to its end forming one extremely short and one very long arm.
- The telocentric chromosome has a terminal centromere.


Satellite
Secondary constriction
Short arm
Short arm
Centromere
Centromere
Long arm

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