Chapter: Cell: The Unit of Life

Exercise

Question 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.

Answer: (a) Robert Brown discovered the cell.

The cell was not discovered by Robert Brown. Robert Hook was the one who found the cell.

Question 2. New cells generate from

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

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

Answer: (c) pre-existing cells

New cells can only develop from pre-existing cells, according to the biogenic theory. Only complete cells can give birth to new cells under ideal conditions.

Question 3. Match the following

(a) Cristae (i) Flat membranous sacs in stroma

(b) Cisternae (ii) Infoldings in mitochondria

(c) Thylakoids (iii) Disc-shaped sacs in Golgi apparatus

Answer:

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

Question 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.

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

Organelles surrounded by a double membrane are known as membrane-bound organelles. Organelles such as the nucleus, mitochondria, chloroplasts, and others are examples of such organelles. Prokaryotes do not have these cell organelles.

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

Answer: The invagination of the plasma membrane in a prokaryotic cell forms a convoluted membranous structure called a mesosome. It has the following features:

- The creation of the cell wall and DNA replication are both aided by these extensions. They also aid in chromosomal dispersion in daughter cells.
- It also enhances the plasma membrane's surface area, allowing it to carry out a variety of enzymatic functions.
- It aids bacterial respiration and secretion activities.

Question 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?

Answer: The plasma membrane is the cell's outermost layer, which protects it from the outside world. It controls the flow of chemicals into and out of the cell. It only lets certain substances pass through and restricts the movement of others. As a result, the membrane can be selectively permeable.

- **Neutral solute movement across the cell membrane** — Neutral molecules travel through the plasma membrane via passive diffusion. The transfer of molecules from a location of higher concentration to a region of lower concentration is referred to as diffusion.
- **Movement of polar molecules across the cell membrane-** The cell membrane is composed of a phospholipid bilayer and proteins that allow polar molecules to move across it. Carrier proteins are required for the transport of polar molecules across a non-polar lipid bilayer. Integral protein particles with a specialized affinity for specific solutes are known as carrier proteins. As a result, they help molecules traverse the membrane more easily.

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

Answer:

Mitochondria and chloroplasts are the two organelles that are double-membrane-bound.

Characteristics of the mitochondria

Mitochondria are membrane-bound entities with two membranes. A mitochondrion's membrane is divided into two parts: the inner and outer membranes, which are separated by two aqueous compartments: the outer and inner compartments. The exterior membrane (which contains the organelle) is highly porous, but the inner membrane is deeply folded.

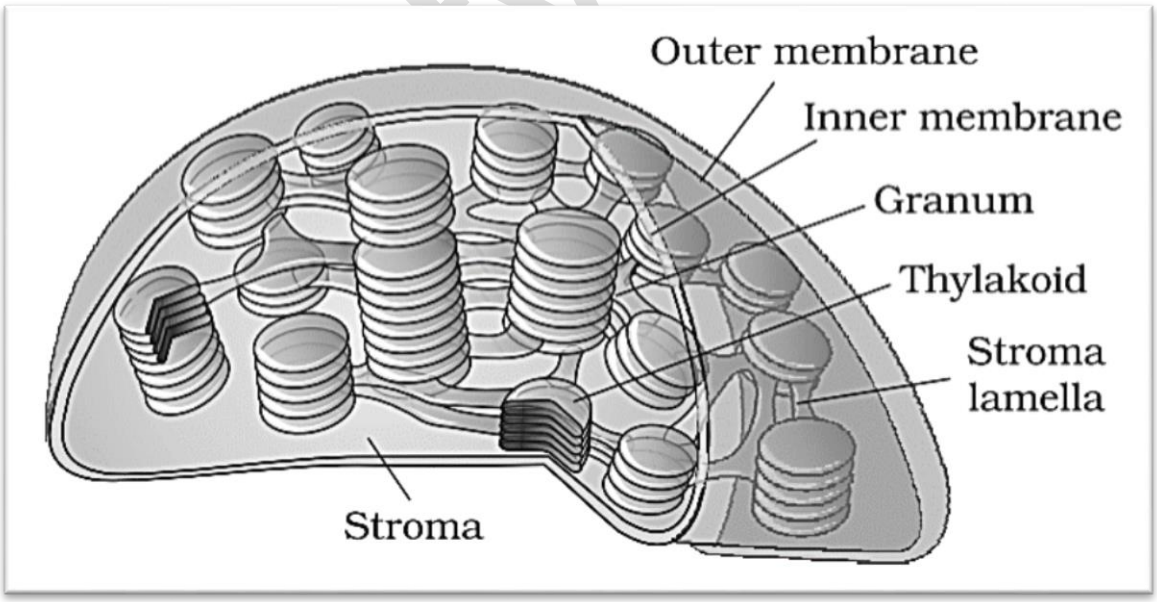
Cristae are the name for these folds. Inside the cell, cristae increase the surface area. They are the locations of chemical processes that produce ATP. A mitochondrion's membrane contains enzymes that perform specialized mitochondrial tasks. As a result, aerobic respiration takes place in the mitochondria. They have their own ribosomes and DNA.

Characteristics of chloroplasts

Chloroplasts are structures with two membranes joined together. They are separated into two distinct regions: outer and inner membranes, and two distinct regions:

(i)Grana are flattened disc stacks that contain chlorophyll molecules. Thylakoids are flattened membranous sacs. The thylakoids of nearby grana are joined by stroma lamellae, which are membranous tubules.

(ii) Stroma is a homogeneous mixture that contains grana. It contains enzymes that aid in the production of carbohydrates and proteins. It has its own DNA and ribosomes as well.



Functions of the mitochondria:

(i) They are the sites for cellular respiration.

(ii)They give energy in the form of ATP to all living cells' critical functions.

(iii)They have their own DNA and ribosomes, for example. As a result, they're classified as semiautonomous organelles.

(iv) They have a number of enzymes that are intermediates in the synthesis of diverse compounds such as fatty acids, steroids, and amino acids.

Functions of chloroplasts:

(i) They capture solar energy and use it to produce food for plants. As a result, they participate in the photosynthetic process.

(ii) They contain the enzymes needed for glucose and protein synthesis.

Question 8. What are the characteristics of prokaryotic cells?

Answer:

A prokaryotic cell is a single-celled organism that does not have membrane-bound organelles.

Prokaryotic cells have the following characteristics:

- they are mostly unicellular.
- They are usually of a tiny size. A prokaryotic cell can be anywhere between 0.5 and 5 micrometers in size.
- Due to the lack of a nuclear membrane, the nuclear area of a prokaryotic cell is poorly defined. As a result, a prokaryotic cell does not have a proper nucleus.
- Prokaryotic cells' genetic contents are exposed. They have only one circular chromosome. They have tiny circular plasmid DNA in addition to the genomic DNA.
- Mesosomes are specialized membranous structures found in them. Mesosomes are generated when the cell membrane invaginates. These extensions aid in the formation of the cell wall as well as DNA replication. They also aid in the dispersion of chromosomes evenly across the daughter cells.
- A prokaryotic cell lacks membrane-bound cell organelles such as mitochondria, plastids, and the endoplasmic reticulum.
- The outermost glycocalyx, the middle cell wall, and the innermost plasma membrane make up the three-layered structure of most prokaryotic cells. This structure serves as a defense mechanism.

Blue-green algae, bacteria, and other prokaryotic cells are examples.

Question 9. Multicellular organisms have the division of labor. Explain.

Answer:

Millions and billions of cells make up multicellular creatures. All of these cells have distinct purposes. Tissues in the body are made up of cells that specialize in performing similar jobs. As a result, a group of cells at a certain location in the body performs a specific job. Similarly, distinct groups of cells in

an organism perform diverse functions. In multicellular organisms, this is referred to as the division of labor.

Question 10. Cell is the basic unit of life. Discuss in brief.

Answer:

Cells are the fundamental units of life, capable of performing all of the metabolic activities that a typical cell needs to survive. All living species have the same basic requirements for survival. All living things must breathe, digest food to obtain energy, and eliminate metabolic waste.

Cells are capable of completing all of the body's metabolic tasks. As a result, cells are referred to as the functional units of life.

Question 11. What are nuclear pores? State their function.

Answer:

Nuclear pores are microscopic gaps in the nucleus' nuclear membrane. They are made up of two nuclear membranes fused together. Specific substances can be transported into and out of cells through these pores. They let molecules like RNA and proteins travel between the nucleus and the cytoplasm in both directions.

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

Answer:

Lysosomes are membrane-bound vesicular structures that contain lipases, proteases, and carbohydrates, among other enzymes. Lysosomes are cells that have been worn out and need to be digested. They aid in the digestion of foreign food particles and bacteria within the cell. They can also be used as suicide packs. They are engaged in the digestion of cells by themselves. They are a type of cell waste disposal device. Vacuoles, on the other hand, are storage sacs present in cells. They could be used to store cell waste. The eaten food particles are stored in the food vacuole of unicellular organisms. It also aids in the removal of excess water and some wastes from the cell.

Question 13. Describe the structure of the following with the help of labeled diagrams.

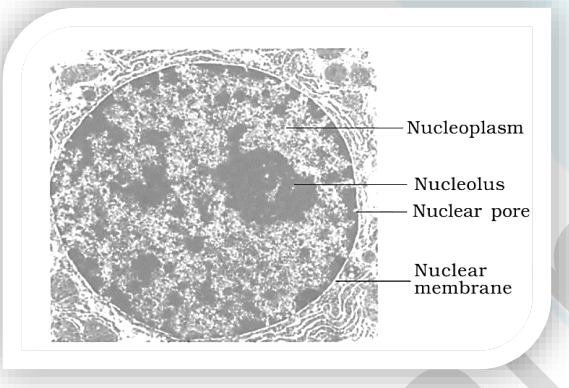
(i) Nucleus (ii) Centrosome

Answer:

(i) Nucleus- The cell's nucleus is in charge of all of the cell's functions. Its form is spherical. It is made up of the following elements:

- Nucleoplasmic membrane: It is a double membrane that separates the nucleus' contents from the cytoplasm. The perinuclear gap is the thin space between the two membranes. Nuclear pores are small gaps in the nuclear membrane. Specific substances can be transported into and out of cells through these pores.

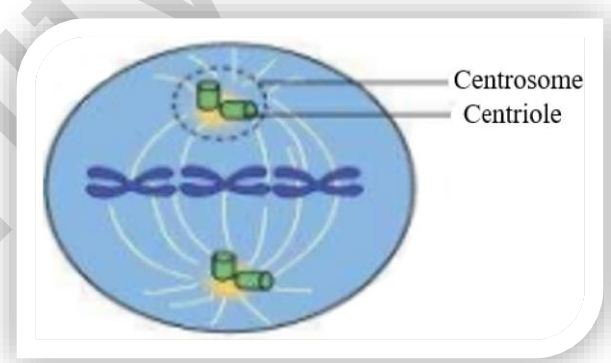
- Nucleoplasm/Nuclear Matrix (nucleoplasm/nuclear matrix): Inside the nucleus, there is a homogeneous granular fluid. It houses the nucleolus as well as chromatin. The nucleolus is a spherical structure with no membrane surrounding it.



(ii) Centrosome-

Centrioles are two cylindrical structures that make up the centrosome. The centrioles are parallel to one other. Each is organized in a cartwheel pattern.

Microtubule triplets are uniformly placed in a ring to form a centriole. The triplets next to each other are linked. The core section of a centriole has a proteinaceous hub. The triplets are connected to the hub via radial spokes. During cell division, these centrioles aid in the organization of the spindle threads and astral rays. Cilia and flagella have a basal body made up of them.



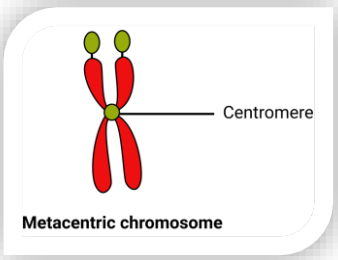
Question 14. What is a centromere? How does the position of the centromere form the basis of the classification of chromosomes? Support your answer with a diagram showing the position of the centromere on different types of chromosomes.

Answer:

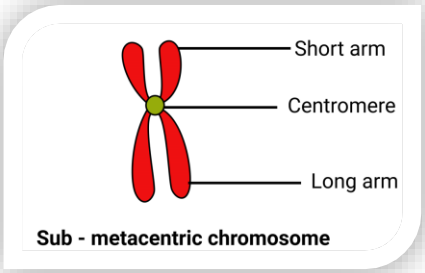
The centromere is a constriction on the chromosomes that holds the chromatids together.

Based on the position of the centromere, chromosomes are classified into four categories.

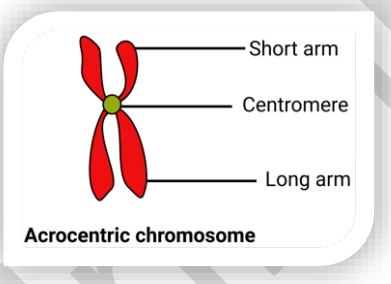
(i) Metacentric chromosome- A metacentric chromosome is one in which the centromere is located in the middle and divides the chromosome into two equal arms.



(ii) Sub-metacentric chromosome- A sub-metacentric chromosome is one in which the centromere is located somewhat distant from the central region. One arm is slightly longer than the other in this situation.



(iii) Acrocentric chromosome-An acrocentric chromosome is one in which the centromere is near to one of the terminal ends. One arm is incredibly long, while the other is incredibly short.



(iv) Telocentric chromosome- A telocentric chromosome is one in which the centromere is positioned at one of the terminal ends.