

CHAPTER – 2

Cellular Organelles

EXERCISES

2 Mark Questions

Q1: State importance of cell wall in prokaryotic cell.

Answer: Cell wall is a protective layer for the cell which not only determines the shape of cell but also protects the cell from bursting. The prokaryotic cells have two types of cell wall which are known as gram negative and gram positive cell wall in bacterial cell wall. The bacterial cell wall is a sturdy covalent shell of linear peptidoglycan chain which is cross linked by tetrapeptides. The cell wall in prokaryotes especially in bacteria has the cell wall covered with heavily glycosylated proteins called as glycosyls. This is involved in cell to cell interaction. Gram positive bacteria have a thick cell wall with the single plasma membrane and gram-negative bacteria have thin cell wall with dual plasma membrane.

Q2: Mention different types of vacuoles.

Answer: There are different types of vacuoles which are given below:

- Central vacuoles
- Lytic vacuoles
- Protein storage vacuoles
- Storage vacuoles
- Fungal vacuoles
- Food vacuoles
- Contractile vacuoles.

Q3: Peroxisomes share similarities as well as differences with mitochondria and chloroplast. Comment?

Answer: Peroxisomes are the organelles which are small and bounded with membrane. These are involved in energy metabolism in cell by which they serve as a site for enzymes involved in metabolic reaction. These share similarities as well

as differences with mitochondria and chloroplast in terms of assembly and replication i.e. fission, they are derived from endoplasmic reticulum and replicate by fission.

Q4: What are glyoxysomes? Where are these present? Mention their functions.

Answer: Glyoxysomes are the specialized peroxisomes. These glyoxysomes are found in fungi and other higher plants especially found in the fat storage tissues in the

germinating seeds. It functions in conversion of lipids into glucose. These contain all enzymes necessary for fatty acid oxidation, glyoxylate cycle and gluconeogenesis.

Q5: Cell is structural and functional unit of life. Justify the statement.

Answer: We humans do many tasks at a time in many ways in our day to day life. The tasks like food digestion, sending electrical messages to nerves, pumping blood from the heart, circulating nutrients, synthesising proteins, filtering urine and many more. These tasks are done due to the cells in our body which functions according to their structure. So the cell is considered as structural and functional unit of life.

4 Mark Questions

Q1: Describe the various mechanisms of transport across plasma membrane with the help of labeled diagram.

Answer: There are two mechanisms of transport across the plasma membrane they are as follows:

1.) Passive transport- Passive transport is a membrane transport in which the molecules move passively without any expenditure of energy across the membrane along concentration gradient. This passive movement occurs by the process of diffusion and osmosis. In passive transport the charged or uncharged molecules cannot cross plasma membrane by simple diffusion. For the movement of such molecules carrier proteins and channel proteins are facilitated, this is known as facilitated movement. In passive transport one of the critical channel proteins

called aquaporin's is used for transport of water in plant and animal cell across the plasma membrane.

2.) Active transport- Active transport is a membrane transport in which the molecules are transported against the concentration gradient which require utilization of energy from ATP molecules. E.g. Na⁺-K⁺ pump. In active transport some are the ATP independent molecules, which are transported against the concentration gradient without using any energy from ATP hydrolysis. Active transport of ions, sugars, and amino acids using energy derived from the Na⁺ gradient is a coupled transport.

Q2: Match the following:-

Answer:

Column 1	Column 2
Nucleolus	Synthesis of rRNA
Mesosome	Membranous extension of plasma membrane
Vacuoles	Storage and structural support
Cristae	Infoldings of inner mitochondrial membrane
Ribosomes	Protein synthesis
Thylakoid	Membranous sacs in chloroplast
Cisternae	Disc shape sacs in Golgi

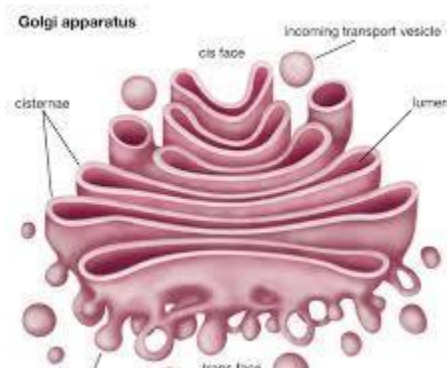
Q3: A eukaryotic cell contains organelles which may be bound by a single-membrane; double-membrane or nonmembrane bound organelles. Classify the various eukaryotic organelles into these three types.

Answer: The eukaryotic cell has all cell organelles. In this some organelles are bounded by single membrane and some are bounded by double membrane, some are without membrane also present in the cell. According to the membrane bounded the cell organelles are classified as below:-

- Bounded by single membrane- The organelles bounded by single membrane are vacuole, lysosome, Golgi apparatus and endoplasmic reticulum.
- Bounded by double membrane- The organelles bounded by double membrane are nucleus, mitochondria and chloroplast.
- Nonmembrane organelles- The organelles which don't have membrane they are non membrane organelles. Ribosomes and cytoskeleton are non membrane organelles.

Q4: Describe the structure and function of the Golgi apparatus.

Answer:



The Golgi apparatus is a flattened, sac-like organelle found in eukaryotic cells. It is responsible for packaging and modifying proteins and lipids for transport to other parts of the cell or for secretion. The Golgi apparatus is made up of a stack of membranous sacs called cisternae. The proteins and lipids that are to be packaged are transported to the Golgi apparatus from the endoplasmic reticulum. In the Golgi apparatus, the proteins and lipids are modified by the addition of carbohydrates, phosphates, and sulfates. These modifications can change the proteins' and lipids' functions, solubility, and targeting. Once the proteins and

lipids are modified, they are packaged into vesicles and transported to their destinations.

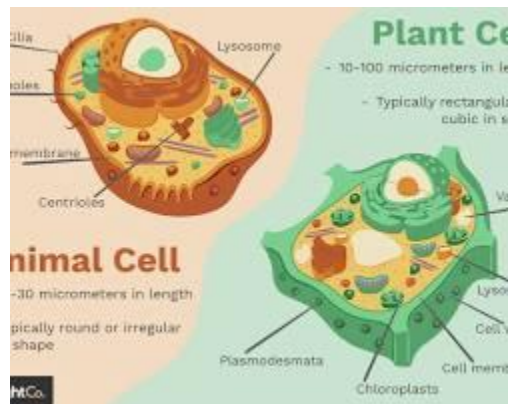
Q5: Explain how the endoplasmic reticulum and Golgi apparatus work together.

Answer: The endoplasmic reticulum (ER) is a network of membranous tubules that is found in eukaryotic cells. The ER is responsible for the synthesis of proteins and lipids. The proteins and lipids that are synthesized in the ER are transported to the Golgi apparatus, where they are modified and packaged into vesicles. The vesicles are then transported to their destinations, such as the cell membrane, the lysosomes, or the endoplasmic reticulum itself.

7 Mark Questions

Q1: Compare and contrast plant and animal cells.

Answer:



Plant and animal cells are both eukaryotic cells, but they have some important differences. Plant cells have a cell wall, which is a rigid outer layer that is made of cellulose. Animal cells do not have a cell wall. Plant cells also have chloroplasts, which are organelles that contain chlorophyll and are used for photosynthesis. Animal cells do not have chloroplasts. In addition, plant cells have a larger central vacuole than animal cells. The central vacuole stores water and nutrients in plant cells.

Q2: Distinguish between:-

1. Cilia and Flagella-

Cilia	Flagella
Cilia are smaller in size and present in large number.	Flagella are larger in size and typically vary from one or two in number.
These occur throughout the surface of cell.	Flagella occur at one end of cell.
The size of cilia is up to 5-10 micro meter	The size of flagella is up to 150 micrometer.
It moves in co-ordinate rhythm and it shows sweeping movement.	It moves independently and show adulatory movement.

Primary and secondary cell wall:-

Primary cell wall	Secondary cell wall
Primary cell wall is thin layer cell wall.	Secondary cell wall is thick and rigid layer.
This is surrounded to growing cell in plants.	It is formed between primary cell wall and plasma membrane.
The primary cell wall has scope for cell expansion.	In secondary cell wall there is deposition of lignin.

Lysosomes and Vacuoles:-

Lysosomes	Vacuoles
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Lysosomes are small spherical vesicles.	Vacuoles are membrane bound organelles found in cytoplasm.
The size of lysosomes is approximately 0.2-0.5 micron diameter.	The size and number of vacuoles varies per plant.
They are bounded by single membrane containing hydrolytic enzymes.	Vacuoles function in storage and structural support and recycling.
Lysosomes carry out intracellular digestion in a variety of circumstances.	Vacuoles are empty sacs which lack the cytoplasmic material.

Microtubules and Actin filaments:-

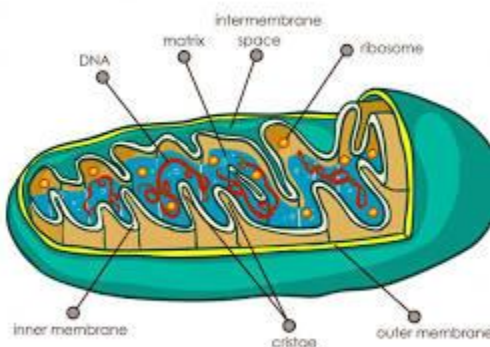
Microtubules	Actin filaments
Microtubule is composed of globular protein called tubulin	Actin filament is found or observed in skeletal muscle.
Microtubules are hollow, rodlike structure.	It plays important role in muscles contraction.
Tubulin protein undergo polymerization to form a protofilament.	Actin filaments are mostly found closer to plasma membrane.
It may contain 10-15 protofilaments.	These provides strength to the cell.

5. Active and passive transport:-

Active transport	Passive transport
The transport of molecules to the membrane against the concentration gradient is called as active transport.	The transport of molecules to the membrane along the concentration gradient is called as passive transport.
In this transport molecules utilise energy from ATP molecules.	This passive movement occurs by process of diffusion and osmosis.
Some molecules are ATP independent molecules.	Some movement of molecules is facilitated by carrier proteins.

Q3: Explain the structure and function of the mitochondria, including the process of oxidative phosphorylation.

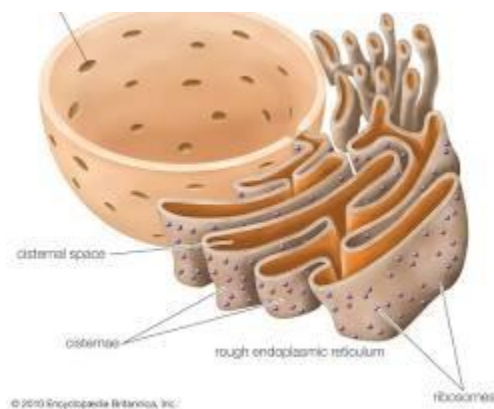
Answer:



- **Structure:** Mitochondria are double-membraned organelles with an outer and inner membrane. The inner membrane folds inwards to form cristae, which increase the surface area for ATP production.
- **Function:** Mitochondria are known as the "powerhouses of the cell" because they are responsible for cellular respiration, a process that converts glucose into ATP (adenosine triphosphate), the energy currency of the cell.
- **Oxidative phosphorylation:** This process occurs in the inner membrane of mitochondria and involves the transfer of electrons from food molecules (like glucose) to oxygen through a series of protein complexes. This electron transport chain creates a proton gradient across the inner membrane, which is used by ATP synthase to generate ATP.

Q4: Describe the different types of endoplasmic reticulum (ER) and their specific functions.

Answer:



- **Rough ER:** Studded with ribosomes, the rough ER is responsible for protein synthesis.
- **Smooth ER:** Lacks ribosomes and is involved in various functions like lipid synthesis, detoxification, and calcium storage.

Fill in the Blanks

1. The _____ is a network of membranous tubules involved in protein and lipid synthesis.

Answer: Endoplasmic reticulum (ER)

2. The inner membrane of the _____ folds inwards to form _____ which increase surface area for ATP production.

Answer: Mitochondria, cristae

3. Ribosomes attached to the rough ER assist in _____ while the smooth ER is responsible for _____ like lipid synthesis and detoxification.

Answer: protein synthesis, functions

4. The Golgi apparatus modifies proteins by adding sugar molecules in a process called _____.

Answer: glycosylation.

5. _____ are membranous sacs within the Golgi apparatus that perform specific functions like receiving proteins from the ER or sorting and packaging them for transport.

Answer: Cisternae

Multiple Choice Questions

1. Which organelle is known as the "powerhouse of the cell"?

A) Golgi apparatus

B) Endoplasmic reticulum

C) Mitochondria

D) Lysosome

Answer: C) Mitochondria

2. Ribosomes are mainly involved in:

A) Lipid synthesis

B) Protein synthesis

C) DNA replication

D) Cellular respiration

Answer: B) Protein synthesis

3. The Golgi apparatus modifies proteins by:

A) Removing amino acids

B) Adding sugar molecules

C) Breaking down proteins

D) Folding proteins

Answer: B) Adding sugar molecules

4. Which of the following is NOT a function of the smooth ER?

A) Lipid synthesis

B) Detoxification

C) Protein synthesis

D) Calcium storage

Answer: C) Protein synthesis

5. Phagocytosis and pinocytosis are both types of:

- A) Exocytosis
- B) Endocytosis
- C) Active transport
- D) Passive transport

Answer: B) Endocytosis

SUMMARY:

Powering the Cell: The journey begins with the mitochondria, the "powerhouses" that generate ATP, the cell's energy currency, through a process called oxidative phosphorylation.

Protein Factories: Proteins, essential for various functions, are manufactured in the endoplasmic reticulum (ER). The rough ER, studded with ribosomes, acts as a protein assembly line, while the smooth ER handles diverse tasks like lipid synthesis and detoxification.

Modifying and Packaging: The Golgi apparatus receives proteins from the ER, modifies them by adding sugar molecules (glycosylation), and packages them into vesicles for transport to their destinations within the cell or for secretion.

Membrane Gatekeepers: The cell membrane controls what enters and leaves the cell. Processes like phagocytosis (engulfing large particles) and pinocytosis (taking in smaller molecules) allow the cell to take in important materials.

Cellular Recycling: Maintaining a clean and healthy environment is crucial. Autophagy is the process by which the cell breaks down and recycles its own components, ensuring efficient waste management and providing energy during times of stress.

Plant Uniqueness: Plant cells have a special feature – the cell wall, a rigid outer layer made of cellulose, providing support and protection.

Specialized Helpers: Other organelles play vital roles too. Lysosomes contain digestive enzymes to break down macromolecules, while vacuoles store water, nutrients, and waste products.

Beyond Organelles: The cytoskeleton, a network of protein fibers, maintains cell shape, facilitates movement, and organizes internal components.

This brief summary provides a glimpse into the intricate world of cellular organelles in Class 11th Biotechnology. Remember, each organelle holds its own unique function, contributing to the complex and fascinating world inside a cell.