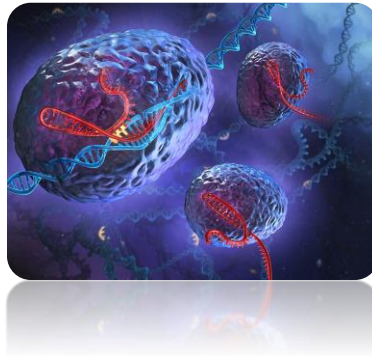


Cell Structures and Functions

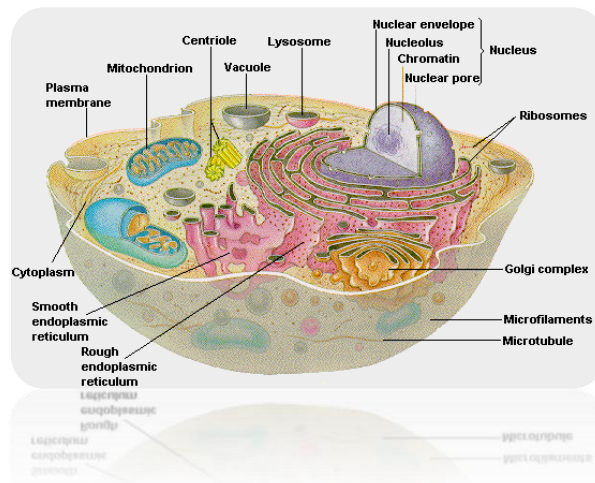


What are Cells?

Cells are the fundamental units of all living organisms. Organisms can be composed of one or more cells, with specialized cells performing specific tasks to optimize overall function within an organism. Living organisms are classified into kingdoms such as Animal, Plant, Fungus, Prokaryote, and Protocist.

Animal Cell Structures and Functions

The main components of an animal cell are the cell membrane, cytoplasm, nucleus, mitochondria, and ribosomes

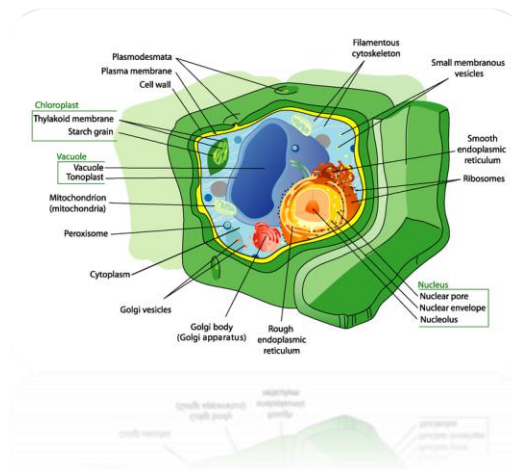


- **Cell Membrane:** A flexible outer boundary that controls the movement of substances in and out of the cell. It is selectively permeable, regulating the passage of molecules to maintain cellular balance.

- **Cytoplasm:** The jelly-like substance inside the cell membrane. It contains the organelles and is where many metabolic reactions occur.
- **Nucleus:** Contains the cell's genetic material (DNA) which controls the cell's activities. It is involved in protein synthesis and cell division.
- **Mitochondria:** These are the sites of aerobic respiration, releasing energy for the cell to use. They are often referred to as the "powerhouse of the cell".
- **Ribosomes:** Tiny organelles responsible for protein synthesis.

Plant Cell Structures and Functions

Plant cells have all the components of an animal cell, plus three additional structures:



- **Cell Wall:** A rigid outer layer made of cellulose that provides the cell with extra support and a fixed shape.
- **Chloroplasts:** These organelles are the sites of photosynthesis. They contain the green pigment chlorophyll, which absorbs light energy to produce food for the plant.
- **Large Sap Vacuole:** A large membrane-bound sac that contains cell sap (a solution of sugars, salts, and water). It helps to maintain turgor pressure, providing support to the cell and the plant as a whole.

Past Paper Questions and Answers

Constructed-Answer Questions

Question 1

(a) Name two structures found in a plant cell that are not found in an animal cell. (2 marks)

(b) Explain the function of each structure you named in part (a). (2 marks)

Answer

(a) Cell wall and chloroplasts.

(b) The cell wall provides a fixed shape and structural support to the cell. Chloroplasts are the site of photosynthesis, where light energy is converted into chemical energy for food.

Examiner Report Notes: Candidates should be specific when naming structures. For part (b), a common mistake is to only provide the location of the structure and not its function. For example, stating that chloroplasts are "in the cytoplasm" without mentioning photosynthesis would not get the mark.

Question 2

Explain why plant cells do not burst when placed in pure water, but animal cells do. (3 marks)

Answer

When an animal cell is placed in pure water, water moves into the cell by osmosis. The cell membrane is not strong enough to withstand the pressure, so the cell bursts. A plant cell, however, has a rigid cell wall outside the cell membrane. As water enters the plant cell by osmosis, the cell swells and the cell membrane is pushed against the cell wall, but the rigid cell wall prevents the cell from bursting.

Examiner Report Notes: This is a common question. Students must mention both the movement of water via osmosis and the role of the cell wall in plant cells to gain full marks.

Question 3

Describe the function of the cell membrane and cytoplasm. (2 marks)

Answer

The cell membrane controls the movement of substances into and out of the cell. The cytoplasm is a jelly-like substance where most of the cell's metabolic reactions take place.

Examiner Report Notes: A clear distinction between the two functions is necessary. Students who confuse the roles or give vague descriptions may lose marks.

Question 4

A student views a plant cell under a microscope. Name the organelle that would be responsible for producing ATP for the cell's activities. (1 mark)

Answer

Mitochondria.

Examiner Report Notes: A straightforward recall question. Students should not confuse this with chloroplasts, which are for photosynthesis, not energy release through respiration.

Question 5

What is the function of the vacuole in a plant cell? (2 marks)

Answer

The vacuole contains cell sap which stores water, salts, and sugars. It also helps to maintain turgor pressure, supporting the shape of the cell.

Examiner Report Notes: Students often only mention storage. The role in maintaining turgor pressure and providing support is also a key function that should be included for full marks.

Question 6

State the function of a ribosome. (1 mark)

Answer

Ribosomes are the site of protein synthesis.

Examiner Report Notes: Another direct recall question. The term "protein synthesis" is the expected answer.

Question 7

Name the structure in a plant cell that gives it a fixed, regular shape. (1 mark)

Answer

Cell wall.

Examiner Report Notes: Candidates should be precise. Simply stating "the wall" is not sufficient.

Question 8

Explain the term "selectively permeable" with reference to the cell membrane. (2 marks)

Answer

A selectively permeable membrane allows certain substances or molecules to pass through it while blocking others, controlling what enters and leaves the cell.

Examiner Report Notes: The answer must include the idea of both allowing some things to pass and blocking others.

Question 9

State two similarities between plant and animal cells. (2 marks)

Answer

Both have a nucleus, cytoplasm, cell membrane, mitochondria, and ribosomes.

Examiner Report Notes: Candidates need to name two common structures. Simply stating "they both have organelles" is too general.

Question 10

A bacterial cell lacks a nucleus. What is the term for this type of cell? (1 mark)

Answer

Prokaryotic.

Examiner Report Notes: Students should know the difference between prokaryotic (no nucleus) and eukaryotic (with a nucleus) cells.

Multiple-Choice Questions

1. Which structure is found in a plant cell but not in an animal cell?

- A) cell membrane
- B) cytoplasm
- C) cell wall
- D) nucleus

Correct Answer: C

Examiner Report Notes: This is a core concept. Students who choose A, B, or D have likely misunderstood the fundamental differences between the two cell types.

2. The photomicrograph shows part of an animal cell. What is the structure labeled X? [Assume X is a mitochondrion]

- A) chloroplast
- B) mitochondrion
- C) ribosome
- D) vacuole

Correct Answer: B

Examiner Report Notes: This question tests a student's ability to identify organelles from a diagram. Common errors arise from confusing mitochondria with other organelles like the nucleus or chloroplasts.

3. What is the function of the cell wall?

- A) To control what enters and leaves the cell
- B) To provide energy for the cell
- C) To provide a fixed shape and support
- D) To store food and water

Correct Answer: C

Examiner Report Notes: Many students incorrectly choose A, confusing the function of the cell wall with that of the cell membrane.

4. Which organelle is responsible for respiration and the release of energy?

- A) Chloroplast
- B) Mitochondrion
- C) Nucleus
- D) Ribosome

Correct Answer: B

Examiner Report Notes: A fundamental function. Incorrect answers suggest a lack of understanding of the roles of key organelles.

5. A plant cell wall is mainly composed of:

- A) Protein
- B) Cellulose
- C) Lipid
- D) Starch

Correct Answer: B

Examiner Report Notes: This is a recall question about the chemical composition of the cell wall. Students often confuse cellulose with starch, which is a carbohydrate storage molecule.

6. Which of the following is an example of a eukaryotic cell?

- A) Bacteria
- B) Virus
- C) Plant cell
- D) Protocist

Correct Answer: C

Examiner Report Notes: Students should remember that eukaryotic cells have a nucleus and other membrane-bound organelles, unlike prokaryotic bacteria.

7. Which structure contains the genetic material and controls the activities of the cell?

- A) Cell membrane
- B) Mitochondrion
- C) Nucleus
- D) Cytoplasm

Correct Answer: C

Examiner Report Notes: The nucleus is the control center of the cell. Confusing it with the cytoplasm or cell membrane is a common error.

8. What is the term for the diffusion of water across a selectively permeable membrane?

- A) Osmosis
- B) Active transport
- C) Facilitated diffusion
- D) Brownian motion

Correct Answer: A

Examiner Report Notes: This tests the specific definition of osmosis. Students often confuse it with other types of transport.

9. Which organelle is responsible for protein synthesis?

- A) Mitochondria
- B) Ribosomes
- C) Chloroplasts
- D) Vacuole

Correct Answer: B

Examiner Report Notes: Students need to recall the specific function of ribosomes.

10. Which of these characteristics is common to both plant and animal cells?

- A) Presence of a cell wall
- B) Presence of chloroplasts
- C) Presence of a large central vacuole
- D) Presence of mitochondria

Correct Answer: D

Examiner Report Notes: This question tests the similarities. A, B, and C are unique to plant cells, so D is the only correct option.