Key Stage 3 (KS3) Science – Cells Practice Test (Sample)

Study Guide

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Questions

1. Which structure acts as the control center of the cell?

- **A. Mitochondria**
- **B. Nucleus**
- **C. Ribosome**
- **D. Golgi apparatus**

2. Which part of the cell controls what enters and exits?

- **A. Cell wall**
- **B. Cytoplasm**
- **C. Cell membrane**
- **D. Nucleus**

3. What type of cells line the trachea and have cilia on their surface?

- **A. Muscle Cells**
- **B. Ciliated Epithelial Cells**
- **C. Nervous Cells**
- **D. Specialised Cells**

4. What is the role of the cell membrane in regard to homeostasis?

- **A. It produces energy for the cell**
- **B. It regulates the movement of substances in and out of the cell**
- **C. It synthesizes proteins for the cell**
- **D. It stores genetic information**

5. What are the three main parts of the cell theory?

- **A. Cells are alive, cells form tissues, all cells have membranes**
- **B. All living things are made of cells, cells are the basic units of life, and all cells arise from pre-existing cells**
- **C. Cells can reproduce, cells contain organelles, all cells are similar**
- **D. All cells are microscopic, cells divide to form new cells, cells function independently**

6. Which component is found in plant cells but not in animal cells?

- **A. Chloroplasts**
- **B. Lysosomes**
- **C. Mitochondria**
- **D. Nucleus**

7. What type of cell replication occurs in the formation of somatic cells?

- **A. Binary fission**
- **B. Mitosis**
- **C. Meiosis**
- **D. Fragmentation**

8. Which of the following structures is involved in packaging proteins?

- **A. Nucleus**
- **B. Golgi apparatus**
- **C. Mitochondria**
- **D. Chloroplasts**

9. What is the primary role of ribosomes in a cell?

- **A. To store genetic information**
- **B. To synthesize proteins**
- **C. To generate ATP**
- **D. To transport materials**

10. What is the basic structure of the cell membrane called?

- **A. Phospholipid bilayer**
- **B. Cell wall**
- **C. Protein channel**
- **D. Fluid mosaic model**

Answers

1. B
2. C
3. B
4. B
5. B
6. A
7. B
8. B
9. B
10. A

Explanations

1. Which structure acts as the control center of the cell?

A. Mitochondria

B. Nucleus

C. Ribosome

D. Golgi apparatus

The nucleus acts as the control center of the cell because it contains the genetic material (DNA) that holds the instructions for the cell's functions and activities. It is responsible for regulating cell growth, metabolism, and reproduction by controlling gene expression and the production of proteins. The nucleus ensures that the cell operates correctly by coordinating when genes are turned on or off in response to the cell's needs and external signals. This central role makes the nucleus vital for maintaining the life processes of the cell and, by extension, the organism as a whole. Other organelles like mitochondria, ribosomes, and the Golgi apparatus have their specific functions—mitochondria produce energy, ribosomes synthesize proteins, and the Golgi apparatus modifies and packages proteins—but none of these structures manage the overall activities and genetic information of the cell like the nucleus does.

2. Which part of the cell controls what enters and exits?

A. Cell wall

B. Cytoplasm

C. Cell membrane

D. Nucleus

The cell membrane is the part of the cell that controls what enters and exits. It serves as a selective barrier, ensuring that specific substances can pass into and out of the cell while keeping others out. This selectivity is crucial for maintaining the appropriate environment for cellular functions, allowing essential nutrients to enter and harmful substances to be expelled. The cell membrane is composed of a phospholipid bilayer with embedded proteins that assist in transporting materials. This organization enables the cell to maintain homeostasis, which is the balance of internal conditions. Additionally, the fluid nature of the membrane allows it to adjust and respond to changes in the environment. In contrast, the cell wall provides structural support and protection but is not involved in the selective transport of materials. The cytoplasm is the jelly-like substance within the cell that houses organelles and where many metabolic reactions occur, but it does not control movement across the cell's boundaries. The nucleus, while essential for housing genetic material and controlling cellular activities, does not play a direct role in the transport of substances across the cell's outer limits.

3. What type of cells line the trachea and have cilia on their surface?

A. Muscle Cells

B. Ciliated Epithelial Cells

C. Nervous Cells

D. Specialised Cells

Ciliated epithelial cells are specialized cells that form a lining in various parts of the body, including the trachea. These cells are characterized by their fine hair-like structures called cilia that extend from their surfaces. The primary function of cilia is to help move mucus and trapped particles upward towards the throat, where they can be swallowed or expelled. This mechanism is essential in keeping the airways clear of debris and pathogens, thus playing a critical role in the respiratory system's defense. Muscle cells, while crucial for movement and support in the body, do not have cilia and are not involved in the respiratory tract's lining. Nervous cells are responsible for transmitting signals within the nervous system and also lack the specialized structure of cilia for movement of substances. Specialised cells is a broad term that can refer to any cell that has a particular function, but it does not specifically describe the ciliated epithelial cells that are directly associated with the trachea.

4. What is the role of the cell membrane in regard to homeostasis?

A. It produces energy for the cell

B. It regulates the movement of substances in and out of the cell

C. It synthesizes proteins for the cell

D. It stores genetic information

The role of the cell membrane in maintaining homeostasis is crucial because it regulates the movement of substances in and out of the cell. Homeostasis refers to the process by which living organisms maintain a stable internal environment, despite changes in external conditions. The cell membrane, composed of a lipid bilayer with embedded proteins, acts as a selective barrier. This means it allows certain molecules to pass through while blocking others, thus ensuring that essential nutrients enter the cell and waste products are expelled. By controlling the concentrations of ions, nutrients, and other substances inside the cell, the membrane helps to keep the internal environment balanced. This selective permeability is vital for processes such as osmosis and diffusion, which are essential for maintaining optimal conditions for cellular functions. Therefore, the regulation of substance movement by the cell membrane is fundamental to achieving and sustaining homeostasis, allowing the cell to operate efficiently and effectively.

5. What are the three main parts of the cell theory?

A. Cells are alive, cells form tissues, all cells have membranes

B. All living things are made of cells, cells are the basic units of life, and all cells arise from pre-existing cells

C. Cells can reproduce, cells contain organelles, all cells are similar

D. All cells are microscopic, cells divide to form new cells, cells function independently

The three main parts of the cell theory are foundational concepts that describe the nature of cells and their role in all living organisms. The first part, stating that all living things are made of cells, emphasizes that cells are the building blocks of life. This means every organism, whether unicellular or multicellular, is composed of cells, highlighting their importance in the structure of living things. The second part, that cells are the basic units of life, signifies that cells are the smallest units that can carry out the processes essential for life. This means all the functions necessary for an organism's survival, growth, and reproduction occur within cells, establishing them as critical to understanding biology. The third part, which states that all cells arise from pre-existing cells, introduces the concept of cell division, underscoring that cells do not spontaneously generate but rather come from other cells, reinforcing the continuity of life through cellular reproduction. This understanding of cell theory is crucial in biology as it connects all living organisms and forms the basis of various biological research and medical advancements.

6. Which component is found in plant cells but not in animal cells?

A. Chloroplasts

B. Lysosomes

C. Mitochondria

D. Nucleus

Chloroplasts are specialized organelles found in plant cells that play a crucial role in photosynthesis, the process by which plants convert sunlight into energy. This energy is essential for the plant's growth and development as it allows them to produce their food in the form of glucose. Chloroplasts contain chlorophyll, the green pigment that captures light energy. In contrast, animal cells do not have chloroplasts because they do not perform photosynthesis; instead, they obtain energy from the consumption of food. This fundamental difference highlights the unique adaptations that plant cells have developed to thrive in their environment, making chloroplasts a distinguishing feature of plant cells.

7. What type of cell replication occurs in the formation of somatic cells?

A. Binary fission

B. Mitosis

C. Meiosis

D. Fragmentation

Somatic cells undergo mitosis during their replication. Mitosis is the process by which a single cell divides to produce two identical daughter cells, each with the same number of chromosomes as the original cell. This is essential for growth, development, and tissue repair in multicellular organisms. In humans and many other organisms, somatic cells are all body cells excluding gametes (reproductive cells). Mitosis ensures that when somatic cells replicate, they maintain the same genetic information, which is crucial for the normal functioning of tissues and organs. This process involves several stages: prophase, metaphase, anaphase, and telophase, culminating in cytokinesis, which is the division of the cytoplasm. The ability of somatic cells to replicate through mitosis allows for the maintenance of healthy cells and the replacement of dead or damaged cells.

8. Which of the following structures is involved in packaging proteins?

A. Nucleus

B. Golgi apparatus

C. Mitochondria

D. Chloroplasts

The Golgi apparatus plays a crucial role in the processing and packaging of proteins within the cell. Once proteins are synthesized in the endoplasmic reticulum, they are transported to the Golgi apparatus, where they undergo further modifications, such as adding carbohydrate or lipid groups. This processing ensures that proteins are correctly folded and fully functional. After modifications, the Golgi apparatus packages these proteins into vesicles, which then transport them to their specific destinations—either inside the cell or outside of it through secretion. This organization is essential for maintaining proper cellular function and communication. The nucleus is primarily responsible for housing genetic material and controlling cellular activities, while mitochondria are involved in energy production through respiration. Chloroplasts are specific to plant cells and are involved in photosynthesis, converting light energy into chemical energy. Thus, the Golgi apparatus is uniquely suited for the task of packaging proteins, making it the correct choice.

9. What is the primary role of ribosomes in a cell?

A. To store genetic information

B. To synthesize proteins

C. To generate ATP

D. To transport materials

Ribosomes play a crucial role in the cell by synthesizing proteins, which are essential for numerous cellular functions. They do this by reading the messenger RNA (mRNA) that has been transcribed from DNA, and using the information in the mRNA to assemble amino acids in the correct sequence to form a protein. This process is known as translation. Proteins produced by ribosomes are vital for various biological processes, including structural roles, enzyme functions, and signaling. Every cell relies on ribosomes to produce the specific proteins it needs to function properly and to respond to its environment. Thus, understanding the primary role of ribosomes emphasizes their importance in maintaining cellular activities and overall life processes.

10. What is the basic structure of the cell membrane called?

A. Phospholipid bilayer

B. Cell wall

C. Protein channel

D. Fluid mosaic model

The basic structure of the cell membrane is known as the phospholipid bilayer. This structure consists of two layers of phospholipids, which are molecules that have a hydrophilic (water-attracting) "head" and two hydrophobic (water-repelling) "tails." The arrangement of these phospholipids creates a barrier that is selectively permeable, allowing certain substances to pass in and out of the cell while keeping others contained. The hydrophilic heads face outward, towards the aqueous environments both inside the cell and outside, while the hydrophobic tails face inward, shielding themselves from water. This configuration is essential for maintaining the integrity of the cell and supporting various functions, such as communication and transport. The term "fluid mosaic model" describes the overall structure of the cell membrane, incorporating the phospholipid bilayer along with proteins, cholesterol, and carbohydrates that float within or on the bilayer. However, the question specifically asks for the basic structure, which is the phospholipid bilayer itself. Other choices like "cell wall" refer to a different cellular structure found in plant cells, and "protein channel" is a component that exists within the membrane but does not represent the membrane's basic structure.