Penn Foster Biology – The Cell Practice Test (Sample)

Study Guide

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Questions

1. What type of biomolecule are enzymes classified as?

- **A. Carbohydrates**
- **B. Proteins**
- **C. Nucleic acids**
- **D. Lipids**

2. What happens to the pH in the presence of an acid?

- **A. It remains neutral**
- **B. It increases**
- **C. It decreases**
- **D. It becomes more alkaline**

3. During which phase of the cell cycle do chromatids form?

- **A. Prophase**
- **B. Interphase**
- **C. Metaphase**
- **D. Telophase**

4. What are valence electrons?

- **A. Electrons in the innermost shell**
- **B. Electrons that are shared in covalent bonds**
- **C. Electrons in the outermost shell**
- **D. Electrons that can be transferred**

5. What term describes the energy currency of the cell?

- **A. ADP**
- **B. NADH**
- **C. ATP**
- **D. FADH2**

6. What does the term "semipermeable" refer to in cellular contexts?

- **A. A membrane that allows certain molecules to pass through while blocking others**
- **B. A structure that prevents all substances from entering the cell**
- **C. A type of signaling molecule in the cell**
- **D. A layer that does not allow any water to pass through**

7. What is the primary function of mitochondria?

- **A. Photosynthesis**
- **B. ATP production**
- **C. Protein synthesis**
- **D. Cellular repair**

8. What defines a substance that is alkaline?

- **A. It has a pH less than 7**
- **B. It can neutralize acids**
- **C. It maintains a neutral pH**
- **D. It derives from acidic substances only**

9. What does extinction refer to in biological terms?

- **A. The reduction in population size of a species**
- **B. The disappearance of individuals within a species**
- **C. The death of every member of a species or a larger taxonomy group**
- **D. The migration of species to a different habitat**

10. What characteristic distinguishes living things from non-living things?

- **A. Ability to reproduce**
- **B. Total cellular structure**
- **C. Presence of DNA**
- **D. The ability to move spontaneously**

Answers

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

Explanations

1. What type of biomolecule are enzymes classified as?

A. Carbohydrates

B. Proteins

C. Nucleic acids

D. Lipids

Enzymes are classified as proteins because they are made up of long chains of amino acids that fold into specific three-dimensional structures. This structure is critical for their function, allowing them to catalyze biochemical reactions by lowering the activation energy required. Proteins, including enzymes, are essential for nearly all biological processes, including metabolism, signaling, and cellular repair. Their specificity and efficiency make them vital for maintaining the proper functioning of cells and the entire organism. The other biomolecules listed—carbohydrates, nucleic acids, and lipids—serve different roles in biological systems. Carbohydrates primarily function as energy sources and structural components; nucleic acids are involved in the storage and transmission of genetic information; and lipids primarily serve as energy storage molecules and structural components of cell membranes. These roles distinguish them from proteins and specifically from enzymes, which are directly involved in facilitating biochemical reactions.

2. What happens to the pH in the presence of an acid?

A. It remains neutral

B. It increases

C. It decreases

D. It becomes more alkaline

When an acid is introduced to a solution, it releases hydrogen ions (H+) which increases the concentration of these ions in the solution. As the concentration of hydrogen ions rises, the pH of the solution decreases. The pH scale ranges from 0 to 14, with lower values indicating more acidic conditions. Therefore, the presence of an acid lowers the pH, making the solution more acidic. This understanding of acids and pH is a fundamental concept in biology and chemistry, as it affects various biological processes and reactions.

3. During which phase of the cell cycle do chromatids form?

A. Prophase

B. Interphase

C. Metaphase

D. Telophase

The formation of chromatids occurs during interphase, notably in the S (synthesis) phase. During this phase, the cell's DNA is replicated, resulting in the duplication of each chromosome, which then consists of two sister chromatids. These chromatids are identical copies of the chromosome joined at a region called the centromere. As the cell progresses through interphase, it prepares for division by ensuring that each new cell will receive an exact copy of the genetic material. In contrast, other phases mentioned focus on different processes. Prophase involves the condensation of chromatin into visible chromosomes, but the chromatids have already formed by that point. Metaphase is characterized by the alignment of chromosomes at the cell's equator, and telophase involves the separation of the chromatids to opposite ends of the cell, followed by the formation of two distinct nuclei. Therefore, interphase is the correct phase where the formation of chromatids takes place, making it an essential part of the cell cycle leading up to mitosis.

4. What are valence electrons?

A. Electrons in the innermost shell

B. Electrons that are shared in covalent bonds

C. Electrons in the outermost shell

D. Electrons that can be transferred

Valence electrons are the electrons located in the outermost shell of an atom. These electrons play a crucial role in chemical bonding and reactions because they are involved in the formation of bonds with other atoms. An atom's ability to bond with others, whether through sharing (as seen in covalent bonds) or transferring (as seen in ionic bonds), is determined by the number of valence electrons it has. While other options touch on concepts related to electrons, they do not accurately describe valence electrons. The innermost shell, for example, does not contain the valence electrons, as these are specifically found in the outermost shell where they can interact with electrons from other atoms. Understanding that valence electrons are the key players in chemical bonding helps clarify why this choice is the correct one.

5. What term describes the energy currency of the cell?

A. ADP

B. NADH

C. ATP

D. FADH2

The term that describes the energy currency of the cell is ATP, or adenosine triphosphate. ATP is a molecule that stores and provides energy for various cellular processes. When a cell requires energy for activities such as muscle contraction, cell division, or active transport, it hydrolyzes ATP, releasing a phosphate group and transferring energy to the target process. The ability of ATP to release energy so readily makes it essential for powering cellular functions. ADP (adenosine diphosphate) is closely related to ATP; it is what ATP becomes after the release of one phosphate group. While ADP can be converted back into ATP, it does not function as the primary energy currency in its unphosphorylated form. NADH and FADH2 are important molecules in cellular respiration and play crucial roles in the electron transport chain, acting as electron carriers. However, they are not the direct energy currency of the cell. Instead, they help produce ATP through oxidative phosphorylation. In summary, ATP is specifically designed for carrying and delivering energy within cells, making it the most recognized and utilized form of energy currency in biological systems.

6. What does the term "semipermeable" refer to in cellular contexts?

A. A membrane that allows certain molecules to pass through while blocking others

B. A structure that prevents all substances from entering the cell

C. A type of signaling molecule in the cell

D. A layer that does not allow any water to pass through

The term "semipermeable" in cellular contexts refers to a membrane that selectively allows certain molecules to pass through while blocking others. This selective permeability is crucial for maintaining the internal environment of the cell, allowing it to control what enters and exits. For example, water, ions, and small molecules may pass through more easily than larger molecules or charged particles, which may need specific transport mechanisms to cross the membrane. This property is fundamental to processes such as osmosis, diffusion, and the regulation of ion concentrations, thereby facilitating essential functions such as nutrient uptake and waste removal. The other options do not correctly define "semipermeable." A membrane that prevents all substances from entering the cell would be impermeable, which is not the case for semipermeable membranes. Signaling molecules are not defined by the term semipermeable; rather, they pertain to communication within and between cells. Lastly, a layer that does not allow any water to pass through contradicts the idea of semipermeability, as some semipermeable membranes are specifically designed to allow water to move freely while restricting other substances.

7. What is the primary function of mitochondria?

A. Photosynthesis

B. ATP production

C. Protein synthesis

D. Cellular repair

The primary function of mitochondria is ATP production, which is essential for providing energy to the cell. Mitochondria are often referred to as the "powerhouses" of the cell because they convert the energy stored in food molecules into adenosine triphosphate (ATP) through the process of cellular respiration. This process involves multiple steps, including glycolysis, the citric acid cycle, and oxidative phosphorylation, which occur in various parts of the mitochondria. ATP serves as the energy currency of the cell, powering a multitude of cellular processes, such as muscle contractions, active transport across cell membranes, and biochemical reactions necessary for cellular maintenance and function. Without sufficient ATP, cells would be unable to perform vital functions, leading to impaired health and function. The other choices refer to processes that occur in different cellular components. Photosynthesis is a process that takes place in chloroplasts found in plant cells, protein synthesis occurs at the ribosomes, and cellular repair involves multiple cellular mechanisms that do not specifically designate a single organelle like mitochondria.

8. What defines a substance that is alkaline?

A. It has a pH less than 7

B. It can neutralize acids

C. It maintains a neutral pH

D. It derives from acidic substances only

A substance that is considered alkaline is defined by its ability to neutralize acids. Alkaline substances, also known as bases, typically have a pH greater than 7, which allows them to react with acids to form water and salt, effectively reducing the acidity. This characteristic is crucial in various biological processes, including maintaining acid-base balance in living organisms and facilitating biochemical reactions. The other options, while related to pH and acidity, do not accurately capture the defining trait of alkaline substances. For instance, a pH less than 7 corresponds to acidic substances, and a neutral pH indicates a balance between acids and bases. Additionally, the statement that alkaline substances derive from acidic substances only does not hold true, as many bases can be formed from non-acidic sources or synthetic processes. Thus, the ability to neutralize acids is the most defining feature of alkaline substances.

9. What does extinction refer to in biological terms?

A. The reduction in population size of a species

B. The disappearance of individuals within a species

C. The death of every member of a species or a larger taxonomy group

D. The migration of species to a different habitat

In biological terms, extinction refers specifically to the death of every member of a species or a larger taxonomic group. This means that once a species is declared extinct, there are no remaining individuals alive anywhere on the planet. Extinction signifies a complete loss of that species from the ecosystem, and it has significant implications for biodiversity and ecological balance. The other choices reflect different concepts related to population dynamics or ecological changes, but they do not address the complete and irreversible loss signified by extinction. For example, a reduction in population size or the disappearance of individuals within a species does not imply that the species itself has entirely vanished; some members may still exist. Similarly, migration to a different habitat involves the movement of individuals to new areas but does not constitute extinction. Therefore, understanding extinction as the total eradication of a species is crucial for studying ecology and conservation efforts.

10. What characteristic distinguishes living things from non-living things?

A. Ability to reproduce

B. Total cellular structure

C. Presence of DNA

D. The ability to move spontaneously

The ability to reproduce is a fundamental characteristic that distinguishes living things from non-living things. This property ensures the continuation of a species and the transmission of genetic material across generations. Reproduction can occur in various forms, such as sexual and asexual reproduction, enabling organisms to create offspring that may inherit traits from their parents, contributing to genetic diversity. While the presence of DNA is also a critical aspect of living organisms—serving as the genetic blueprint for development and functioning—not all living things reproduce through DNA in the same way (e.g., some viruses contain RNA instead). Total cellular structure is a feature of living organisms, as they are made up of cells. However, non-living things can also be composed of cells in certain contexts, such as when dead organisms are considered. The ability to move spontaneously is often observed in many living entities, but not all living organisms exhibit movement (for instance, plants do not move in the same way animals do). Ultimately, reproduction stands out as the key distinction, as it encapsulates the essential process by which life perpetuates itself and diversifies.