

College Biology Placement Practice Test (Sample)

Study Guide



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SAMPLE

Questions

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- 1. What is the main output of cellular respiration?**
 - A. Glucose and oxygen**
 - B. Carbon dioxide and water**
 - C. Adenosine triphosphate (ATP)**
 - D. Nucleotides and proteins**
- 2. What process do chemoautotrophs perform?**
 - A. Photosynthesis**
 - B. Cellular respiration**
 - C. Chemosynthesis**
 - D. Fermentation**
- 3. What is biology primarily concerned with?**
 - A. The study of life**
 - B. The study of ecosystems**
 - C. The study of chemical processes**
 - D. The study of non-living systems**
- 4. Which of the following is an example of a prokaryote?**
 - A. Fungi**
 - B. Bacteria**
 - C. Humans**
 - D. Plants**
- 5. What are the two portions of the endoplasmic reticulum?**
 - A. Rough ER and smooth ER**
 - B. Cytoplasmic reticulum and nuclear reticulum**
 - C. Granular ER and tubular ER**
 - D. Outer ER and inner ER**
- 6. What distinguishes dominant alleles from recessive alleles?**
 - A. Dominant alleles have no effect on phenotype**
 - B. Dominant alleles manifest in phenotype; recessive alleles do not unless homozygous**
 - C. Dominant alleles are always inherited; recessive alleles are not**
 - D. Dominant alleles exist in multiple forms; recessive alleles do not**

- 7. What is the result of hydrogen bonding among water molecules?**
- A. Higher boiling point**
 - B. Lower viscosity**
 - C. Increased electrical conductivity**
 - D. Reduced density**
- 8. How does facilitated transport differ from simple diffusion?**
- A. Facilitated transport requires energy**
 - B. Facilitated transport occurs only in prokaryotic cells**
 - C. Facilitated transport involves carrier proteins**
 - D. Facilitated transport occurs more rapidly**
- 9. What is the function of the lysosome?**
- A. To provide structural support to the cell**
 - B. To synthesize proteins**
 - C. To digest waste materials and cellular debris**
 - D. To transport materials within the cell**
- 10. What is the role of organelles in cells?**
- A. They are protective barriers**
 - B. They serve as energy sources**
 - C. They are internal compartments with specialized functions**
 - D. They provide structural support**

Answers

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

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Explanations

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1. What is the main output of cellular respiration?

- A. Glucose and oxygen
- B. Carbon dioxide and water**
- C. Adenosine triphosphate (ATP)
- D. Nucleotides and proteins

The main output of cellular respiration is adenosine triphosphate (ATP). ATP is often referred to as the energy currency of the cell, as it is the primary molecule used to store and transfer energy within cells. Cellular respiration includes several stages: glycolysis, the Krebs cycle, and oxidative phosphorylation, all of which work together to convert the chemical energy in glucose into ATP. While carbon dioxide and water are produced as byproducts of the process, the goal of cellular respiration is to produce ATP from the energy stored in glucose. This process is essential for cells to perform biological functions, as ATP provides the energy needed for various cellular activities, including muscle contraction, nerve impulse propagation, and biosynthetic reactions. The choices that mention glucose and oxygen or nucleotides and proteins do not accurately represent the primary purpose or output of cellular respiration, which is focused on generating ATP. Thus, the correct identification of ATP as the main output highlights its critical role in energy transfer within biological systems.

2. What process do chemoautotrophs perform?

- A. Photosynthesis
- B. Cellular respiration
- C. Chemosynthesis**
- D. Fermentation

Chemoautotrophs perform chemosynthesis, which is the process by which these organisms convert inorganic substances into organic compounds using energy derived from chemical reactions, often involving the oxidation of molecules like hydrogen sulfide or ammonia. Unlike autotrophs that rely on sunlight to produce food through photosynthesis, chemoautotrophs thrive in environments where sunlight is not available—such as deep-sea vents—by utilizing the energy from chemical reactions to synthesize the organic material they need to survive. This process is essential in various ecosystems, particularly in extreme environments where light does not penetrate, illustrating the diverse strategies life employs to capture energy and build nutrients. Chemosynthesis plays a crucial role in sustaining these ecosystems, forming the base of the food web for many extremophiles.

3. What is biology primarily concerned with?

- A. The study of life**
- B. The study of ecosystems**
- C. The study of chemical processes**
- D. The study of non-living systems**

Biology is primarily concerned with the study of life and living organisms. This encompasses a vast range of topics, including the structure, function, growth, reproduction, evolution, distribution, and taxonomy of various forms of life. By focusing on life, biology explores the intricate interactions among organisms and between organisms and their environments. While the other options touch on important aspects related to biology, they do not capture the full scope of the discipline. For example, studying ecosystems is a significant area within biology, but it represents just one aspect of the broader study of life. Similarly, investigating chemical processes falls under biochemistry, a subfield of biology that examines the molecular mechanisms underlying biological processes. The study of non-living systems pertains more to disciplines such as physics or chemistry and does not relate directly to the living world that biology seeks to understand. Therefore, the primary focus of biology is indeed the study of life in all its complexity.

4. Which of the following is an example of a prokaryote?

- A. Fungi**
- B. Bacteria**
- C. Humans**
- D. Plants**

Bacteria are classified as prokaryotes because they lack a membrane-bound nucleus and other membrane-bound organelles. Instead, their genetic material is located in a region called the nucleoid, which is not enclosed by a membrane. Prokaryotic cells are typically simpler and smaller compared to eukaryotic cells, which include organisms like fungi, humans, and plants. Eukaryotic cells possess a defined nucleus and various organelles, which are not present in prokaryotes. This fundamental difference in cellular structure is why bacteria serve as a prime example of prokaryotic organisms.

5. What are the two portions of the endoplasmic reticulum?

- A. Rough ER and smooth ER**
- B. Cytoplasmic reticulum and nuclear reticulum**
- C. Granular ER and tubular ER**
- D. Outer ER and inner ER**

The endoplasmic reticulum (ER) is a vital cellular organelle that plays a significant role in the synthesis and transport of proteins and lipids. It consists of two distinct regions: the rough endoplasmic reticulum (Rough ER) and the smooth endoplasmic reticulum (Smooth ER). The Rough ER is characterized by the presence of ribosomes on its cytoplasmic surface, which gives it a "rough" appearance. These ribosomes are the sites of protein synthesis, particularly for proteins that are to be secreted from the cell or incorporated into cellular membranes. The Rough ER is involved in the folding and modification of these proteins as they are synthesized. On the other hand, the Smooth ER lacks ribosomes, giving it a smooth appearance. Its functions include the synthesis of lipids, metabolism of carbohydrates, and detoxification of drugs and poisons. The Smooth ER is also involved in storage of calcium ions, which are crucial for various cellular functions. Understanding the distinct functions of both portions of the endoplasmic reticulum is essential for appreciating how cells maintain their internal environment and produce the necessary molecules for survival and function.

6. What distinguishes dominant alleles from recessive alleles?

- A. Dominant alleles have no effect on phenotype**
- B. Dominant alleles manifest in phenotype; recessive alleles do not unless homozygous**
- C. Dominant alleles are always inherited; recessive alleles are not**
- D. Dominant alleles exist in multiple forms; recessive alleles do not**

Dominant alleles are defined by their ability to express their traits in the phenotype even when present in just one copy, which is referred to as being heterozygous. In contrast, recessive alleles only display their traits in the phenotype when an individual is homozygous for that allele, meaning that both alleles are recessive. This distinction is fundamental to understanding patterns of inheritance, as dominant alleles can 'mask' the presence of recessive ones in a heterozygous genotype. For instance, if a dominant allele codes for brown eyes and a recessive allele codes for blue eyes, an individual with one copy of the brown eye allele (heterozygous) will have brown eyes, while an individual with two copies of the blue eye allele (homozygous) will have blue eyes. This dynamic explains why the assertion regarding the manifestation of dominant versus recessive alleles accurately identifies their key difference in terms of phenotypic expression.

7. What is the result of hydrogen bonding among water molecules?

- A. Higher boiling point**
- B. Lower viscosity**
- C. Increased electrical conductivity**
- D. Reduced density**

The result of hydrogen bonding among water molecules significantly contributes to a higher boiling point. Water, being a polar molecule, has a partial positive charge on the hydrogen atoms and a partial negative charge on the oxygen atom. This polarity leads to the formation of hydrogen bonds between adjacent water molecules, where the positive hydrogen end of one molecule is attracted to the negative oxygen end of another. These hydrogen bonds are relatively strong compared to other types of intermolecular forces, which means that a considerable amount of energy is required to break these bonds and convert water from its liquid phase to its gaseous phase (steam). Consequently, the boiling point of water is higher than that of many other similar molecular compounds that lack such hydrogen bonding. In terms of the other options, the viscosity of water is actually relatively high due to these hydrogen bonds rather than lower. Electrical conductivity in pure water is not increased by hydrogen bonding; pure water is a poor conductor of electricity. Additionally, water's density is not reduced due to hydrogen bonding; in fact, in its liquid state, water is denser than in its solid state (ice) due to the arrangement of hydrogen bonds.

8. How does facilitated transport differ from simple diffusion?

- A. Facilitated transport requires energy**
- B. Facilitated transport occurs only in prokaryotic cells**
- C. Facilitated transport involves carrier proteins**
- D. Facilitated transport occurs more rapidly**

Facilitated transport is a specific type of passive transport that involves the movement of molecules across a cell membrane through the assistance of specialized proteins known as carrier proteins or channel proteins. These proteins help to facilitate the passage of larger or polar molecules that cannot readily diffuse through the lipid bilayer of the membrane due to their size or polarity. In facilitated transport, the molecules still move down their concentration gradient, which means they move from an area of higher concentration to an area of lower concentration without the expenditure of cellular energy (ATP). This sets it apart from active transport, where energy is required to move substances against their concentration gradient. The use of carrier proteins is crucial in this process; they change shape to move the bound substances across the membrane, thereby allowing substances like glucose or ions to enter or exit the cell more efficiently than they would through simple diffusion alone. Understanding this mechanism is pivotal for comprehending how cells maintain homeostasis and transport necessary nutrients efficiently.

9. What is the function of the lysosome?

- A. To provide structural support to the cell
- B. To synthesize proteins
- C. To digest waste materials and cellular debris**
- D. To transport materials within the cell

The primary function of the lysosome is to digest waste materials and cellular debris. Lysosomes contain a variety of hydrolytic enzymes that are capable of breaking down different types of biomolecules, including proteins, lipids, carbohydrates, and nucleic acids. This process is essential for maintaining cellular health by removing damaged organelles, processing cellular waste, and recycling cellular components, which contributes to the overall homeostasis of the cell. The enzymes within lysosomes are active at the acidic pH typically maintained inside these organelles, ensuring efficient breakdown of materials. When cells undergo turnover, such as during growth or repair, lysosomes play a critical role in helping to eliminate unwanted substances and recycling valuable molecules back into the cytoplasm for reuse. This digestive function is vital for the cell's ability to manage its environment and respond to changes, ensuring cellular efficiency and longevity.

10. What is the role of organelles in cells?

- A. They are protective barriers
- B. They serve as energy sources
- C. They are internal compartments with specialized functions**
- D. They provide structural support

Organelles are essential components of eukaryotic cells that serve as internal compartments, each performing specialized functions vital for the cell's overall operation. Their compartmentalization allows for distinct biochemical environments within the cell, enabling various processes to occur simultaneously without interference. For example, the mitochondria are responsible for energy production through cellular respiration, while the endoplasmic reticulum plays a key role in protein and lipid synthesis. This specialization enhances efficiency and regulation within the cell, allowing complex metabolic activities to take place in an organized manner. By having dedicated organelles, cells can optimize their functions, respond to environmental changes, and maintain homeostasis, which is crucial for their survival and overall health. Understanding the roles and functions of organelles is fundamental to cell biology, as it highlights the intricacy of cellular life and the coordination needed for life processes.