

MoCA Science Practice Test (Sample)

Study Guide



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SAMPLE

Questions

SAMPLE

- 1. What is the role of blood within the circulatory system?**
 - A. To provide insulation for organs**
 - B. To transport gases, nutrients, and wastes**
 - C. To produce hormones and enzymes**
 - D. To store energy for muscle movements**
- 2. What best describes the energy transfer when a panel absorbs energy from the sun to power a yard light?**
 - A. Water energy to electrical energy**
 - B. Solar energy to light energy**
 - C. Nuclear energy to kinetic energy**
 - D. Wind energy to mechanical energy**
- 3. What is cellular respiration?**
 - A. The process by which plants convert sunlight into energy**
 - B. The process in which cells convert glucose and oxygen into energy (ATP), carbon dioxide, and water**
 - C. The breakdown of fatty acids for energy**
 - D. The synthesis of proteins within cells**
- 4. Which phenomenon best describes a lunar eclipse?**
 - A. The Moon is between the Earth and Sun**
 - B. The Earth is between the Sun and Moon**
 - C. The Sun is behind the Earth**
 - D. The Moon reflects sunlight**
- 5. What distinguishes dominant alleles from recessive alleles?**
 - A. Dominant alleles are always beneficial**
 - B. Dominant alleles express their trait even with one copy present**
 - C. Recessive alleles dominate in all circumstances**
 - D. Dominant alleles are more stable over time**

- 6. What kept the box of books from moving when Karol suddenly stopped the rolling cart?**
- A. Gravity**
 - B. Momentum**
 - C. Friction**
 - D. Inertia**
- 7. Which of the following best defines phenotype?**
- A. The genetic makeup of an organism**
 - B. The physical expression or characteristics of a genotype**
 - C. The survival of the fittest in evolution**
 - D. The variation in traits among individuals**
- 8. What is the primary factor to consider when assessing population density in a specific area?**
- A. Population by square mile**
 - B. Population by total area**
 - C. Population growth rate**
 - D. Average household size**
- 9. What type of bond holds base pairs together in DNA?**
- A. Covalent bonds**
 - B. Ionic bonds**
 - C. Peptide bonds**
 - D. Hydrogen bonds**
- 10. What type of energy transformation occurs when a battery powers a flashlight?**
- A. Thermal to electrical**
 - B. Chemical to electrical**
 - C. Mechanical to kinetic**
 - D. Electrical to thermal**

Answers

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

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Explanations

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1. What is the role of blood within the circulatory system?

- A. To provide insulation for organs
- B. To transport gases, nutrients, and wastes**
- C. To produce hormones and enzymes
- D. To store energy for muscle movements

Blood plays a vital role in the circulatory system primarily by transporting gases, nutrients, and wastes throughout the body. This essential function is carried out through the movement of blood, which flows continuously through a network of blood vessels, including arteries, veins, and capillaries. One critical aspect of this transportation role is the carrying of oxygen from the lungs to the cells of the body and returning carbon dioxide from the tissues back to the lungs for exhalation. Additionally, blood transports essential nutrients from the digestive tract to cells, provides hormones from various glands to target organs, and carries metabolic wastes, such as urea and creatinine, to the kidneys for excretion. While insulation for organs and energy storage might involve other biological systems, they do not specifically pertain to the primary function of blood in circulation. Likewise, hormone and enzyme production occurs in specialized glands and tissues, rather than being a direct role of blood itself. Thus, the correct answer reflects the essential functions that blood performs in supporting overall physiology and homeostasis within the body.

2. What best describes the energy transfer when a panel absorbs energy from the sun to power a yard light?

- A. Water energy to electrical energy
- B. Solar energy to light energy**
- C. Nuclear energy to kinetic energy
- D. Wind energy to mechanical energy

The correct answer describes the process in which solar energy is converted into light energy. When a solar panel absorbs energy from the sun, it captures sunlight—this sunlight is a form of solar energy. The solar panel then converts this energy into electrical energy, which can power various devices, including a yard light. The crucial point here is that the conversion of energy captured from sunlight leads directly to the light produced by the yard light, making the transfer from solar energy to light energy the most fitting description of the energy transfer taking place. In this context, while other forms of energy—like water, nuclear, or wind energy—are significant in other scenarios, they do not pertain to the operation of the solar panel in generating light for the yard light. This focus on how solar energy is transformed into light energy makes the choice a clear and accurate representation of the energy transfer process involved.

3. What is cellular respiration?

- A. The process by which plants convert sunlight into energy
- B. The process in which cells convert glucose and oxygen into energy (ATP), carbon dioxide, and water**
- C. The breakdown of fatty acids for energy
- D. The synthesis of proteins within cells

Cellular respiration is the process through which cells convert glucose and oxygen into energy (in the form of adenosine triphosphate or ATP), carbon dioxide, and water. This biochemical pathway is fundamental to cellular metabolism and occurs in several stages, including glycolysis, the citric acid cycle, and oxidative phosphorylation. During this process, glucose is broken down in a series of reactions that release energy. The oxygen taken in is essential for the electron transport chain, which is a critical step in producing ATP efficiently. The end products, carbon dioxide and water, are then expelled from the cell as waste products. This process is vital for providing the energy that cells need to perform various functions, such as growth, repair, and maintenance. Other options outline different biological processes. The first choice describes photosynthesis rather than cellular respiration, focusing on how plants convert sunlight to energy. The third refers to fatty acid metabolism, which is a type of metabolic process but not a comprehensive description of cellular respiration, which primarily deals with glucose. The fourth option mentions protein synthesis, a distinct process that is not directly related to the production of energy from glucose and oxygen.

4. Which phenomenon best describes a lunar eclipse?

- A. The Moon is between the Earth and Sun
- B. The Earth is between the Sun and Moon**
- C. The Sun is behind the Earth
- D. The Moon reflects sunlight

A lunar eclipse occurs when the Earth passes directly between the Sun and the Moon, causing the Earth's shadow to fall on the Moon. This alignment can only happen during a full moon, when the Sun, Earth, and Moon are nearly in a straight line. During the event, the Earth obstructs the sunlight that would normally illuminate the Moon, resulting in the Moon appearing darkened or even taking on a reddish hue, known as a "blood moon," due to the refraction of light through the Earth's atmosphere. The other options describe different celestial arrangements. The scenario where the Moon is between the Earth and the Sun describes a solar eclipse, not a lunar eclipse. The statement about the Sun being behind the Earth represents a situation that may not necessarily relate directly to an eclipse phenomenon but rather the general arrangement of celestial bodies. The Moon reflecting sunlight is a constant characteristic of the Moon but does not pertain directly to the event of a lunar eclipse itself. Therefore, the most accurate description of a lunar eclipse is when the Earth is positioned between the Sun and the Moon.

5. What distinguishes dominant alleles from recessive alleles?

- A. Dominant alleles are always beneficial
- B. Dominant alleles express their trait even with one copy present**
- C. Recessive alleles dominate in all circumstances
- D. Dominant alleles are more stable over time

Dominant alleles are characterized by their ability to express a specific trait in an organism even when only one copy of that allele is present. This means that in a heterozygous genotype, where an organism has one dominant allele and one recessive allele, the dominant allele will determine the phenotype, or observable characteristics, of the organism. For example, in a gene that controls flower color, if the allele for red flowers is dominant and the allele for blue flowers is recessive, a plant with one red allele and one blue allele will still have red flowers due to the dominance of the red allele. This trait being expressed with just one copy present is the hallmark of dominant alleles. In contrast, recessive alleles require two copies—one from each parent—to manifest their associated traits in the phenotype. Thus, only when an organism is homozygous for the recessive allele (having two copies) will the recessive trait be expressed. The other choices do not accurately define the concept of dominant versus recessive alleles. For instance, the idea that dominant alleles are "always beneficial" is misleading, as the effects of alleles can range from neutral to harmful, depending on the context and environment. Moreover, the

6. What kept the box of books from moving when Karol suddenly stopped the rolling cart?

- A. Gravity
- B. Momentum
- C. Friction**
- D. Inertia

The correct answer is inertia. Inertia is the property of an object to resist changes in its state of motion. When Karol stopped the rolling cart suddenly, the box of books inside it had a tendency to continue moving forward due to its own inertia. It was the inertia of the box that kept it from sliding out of the cart immediately. Gravity, while it does act on the box by pulling it downward, does not directly influence its horizontal motion in this scenario. Momentum refers to the mass of an object multiplied by its velocity, but it doesn't describe the reason the box remained stationary when the cart stopped. Friction involves the resistance between the box and the surface of the cart, which can contribute to the box staying in place, but it is predominantly inertia that explains why the box continued to resist the change in motion when the cart abruptly halted.

7. Which of the following best defines phenotype?

- A. The genetic makeup of an organism
- B. The physical expression or characteristics of a genotype**
- C. The survival of the fittest in evolution
- D. The variation in traits among individuals

Phenotype refers to the observable physical properties of an organism, which include traits such as appearance, development, and behavior that result from the interaction of its genotype (the organism's genetic makeup) with the environment. Selecting the option that defines phenotype as the physical expression or characteristics of a genotype accurately captures this concept. In genetics, while the genotype provides the underlying information encoded in the DNA, the phenotype is what is manifested in the organism. This includes traits like height, eye color, and the ability to metabolize certain substances, all shaped by gene expression influenced by environmental factors. Understanding this relationship highlights why phenotype is essential in the study of biology as it connects genetics with observable features. The other options focus on different concepts; for instance, one option describes genotype, another relates to evolutionary concepts, and a third discusses variation among individuals rather than defining what phenotype specifically entails. By understanding that phenotype encompasses the physical manifestations derived from genotype, the definition becomes clear and applicable in biological sciences.

8. What is the primary factor to consider when assessing population density in a specific area?

- A. Population by square mile**
- B. Population by total area
- C. Population growth rate
- D. Average household size

The primary factor to consider when assessing population density in a specific area is the population by square mile. This measure provides a clear indication of how many individuals are living within a defined unit of area, allowing for a straightforward understanding of how crowded or sparse a population is in that location. Population density is typically calculated by dividing the total population by the area in square miles (or kilometers). This figure reveals not only the size of the population but also how concentrated it is relative to the physical space it occupies. In simplistic terms, it answers the question of how many individuals are living in each unit of area, which is crucial for urban planning, resource allocation, and understanding social dynamics within different regions. While population by total area provides a context for the size of the area being considered, it does not give insight into how many people are residing there in relation to that space. Population growth rate and average household size are also important demographic factors but are not directly related to calculating population density itself. These factors can influence population density over time but do not serve as the primary measure when assessing current density levels.

9. What type of bond holds base pairs together in DNA?

- A. Covalent bonds
- B. Ionic bonds
- C. Peptide bonds
- D. Hydrogen bonds**

In DNA, the base pairs are held together by hydrogen bonds. This type of bond is particularly suitable for the double helix structure of DNA because it is relatively weak compared to covalent bonds. This characteristic allows the two strands of DNA to separate easily during processes like replication and transcription, where the genetic information needs to be accessed. Base pairs, such as adenine-thymine (A-T) and guanine-cytosine (G-C), form specific pairs through hydrogen bonding, with A forming two hydrogen bonds with T, and G forming three hydrogen bonds with C. This specificity is crucial for maintaining the integrity of genetic information and the overall stability of the DNA molecule while still allowing for flexible interaction with other molecules. Covalent bonds, while strong and important within the DNA structure (such as between the sugar and phosphate backbone), do not form between the bases within the strands. Ionic bonds are typically found in interactions between charged molecules, and peptide bonds link amino acids in proteins rather than nucleotides in nucleic acids.

10. What type of energy transformation occurs when a battery powers a flashlight?

- A. Thermal to electrical
- B. Chemical to electrical**
- C. Mechanical to kinetic
- D. Electrical to thermal

When a battery powers a flashlight, the type of energy transformation that occurs is from chemical energy to electrical energy. In this process, the chemical energy stored in the battery, derived from the chemical reactions within its cells, is converted into electrical energy. This electrical energy then flows through the flashlight's wiring and powers the light bulb, allowing it to emit light. The transformation is fundamental to how batteries operate. They rely on specific chemical reactions that release energy in the form of electrons, which create an electric current. This current is what provides the energy needed for the flashlight to function. Understanding this energy transformation is crucial because it illustrates the principles of energy conversion in practical applications, such as portable lighting devices. This underscores the importance of chemical energy in powering electrical devices and lays the groundwork for grasping more complex energy interactions in various systems.