

MISA Biology Practice Exam (Sample)

Study Guide



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Questions

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- 1. What term describes a person whose genotype includes a gene that is not expressed in the phenotype?**
 - A. Carrier**
 - B. Homozygous**
 - C. Phenotype**
 - D. Genotype**
- 2. Which process involves the trapping of energy by plants and algae?**
 - A. Respiration**
 - B. Photosynthesis**
 - C. Transpiration**
 - D. Fermentation**
- 3. What encompasses all surface landforms and the processes that shape the surface?**
 - A. Atmosphere**
 - B. Biosphere**
 - C. Hydrosphere**
 - D. Geosphere/Lithosphere**
- 4. Which system is responsible for hormone regulation and metabolism?**
 - A. Reproductive System**
 - B. Endocrine System**
 - C. Circulatory System**
 - D. Digestive System**
- 5. What does a pyramid of numbers typically represent?**
 - A. Energy distribution**
 - B. Biomass accumulation**
 - C. Population size at each trophic level**
 - D. Ecological balance**

- 6. What is the primary role of the centriole in the cell?**
- A. Energy production**
 - B. Protein synthesis**
 - C. Cell division**
 - D. Cellular respiration**
- 7. What is a feature of acquired mutations?**
- A. They occur randomly in evolution**
 - B. They can result from environmental factors**
 - C. They are inherited from parents**
 - D. They only affect reproductive cells**
- 8. Which structure plays a significant role in cellular digestion and waste processing?**
- A. Endoplasmic Reticulum**
 - B. Vacuole**
 - C. Lysosome**
 - D. Centriole**
- 9. What process results in the formation of haploid cells?**
- A. Mitosis**
 - B. Meiosis**
 - C. Fertilization**
 - D. Binary Fission**
- 10. A collection of multiple populations living together can be referred to as what?**
- A. Community**
 - B. Ecosystem**
 - C. Population**
 - D. Biome**

Answers

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

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Explanations

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1. What term describes a person whose genotype includes a gene that is not expressed in the phenotype?

A. Carrier

B. Homozygous

C. Phenotype

D. Genotype

The term that describes a person whose genotype includes a gene that is not expressed in the phenotype is "carrier." A carrier possesses one allele for a particular trait but does not exhibit the trait themselves. This is often seen in genetic conditions where a recessive allele is present; for example, an individual may have one copy of a recessive gene for a condition but not show any symptoms because the dominant allele masks its effects. In contrast, "homozygous" refers to having two identical alleles for a particular gene, which doesn't necessarily imply that one allele is unexpressed. "Phenotype" is the observable characteristic or trait of an organism, while "genotype" is the genetic makeup of an organism, which includes all alleles, regardless of their expression. Therefore, the most fitting term for someone with an unexpressed gene is a carrier, as it specifically indicates a person who can pass the gene to offspring without manifesting its phenotypic effects.

2. Which process involves the trapping of energy by plants and algae?

A. Respiration

B. Photosynthesis

C. Transpiration

D. Fermentation

Photosynthesis is the process in which plants and algae capture energy from sunlight to convert carbon dioxide and water into glucose and oxygen. This process is essential for producing the organic compounds that serve as food for the plant, and ultimately for other organisms in the ecosystem. During photosynthesis, chlorophyll, the green pigment in plants, absorbs sunlight, which provides the energy needed to power the chemical reactions that synthesize glucose from inorganic molecules. This process is fundamental to life on Earth, as it forms the basis of the food chain and contributes to the oxygen content of the atmosphere, making it crucial for the survival of most living organisms. In contrast, processes like respiration involve the breakdown of glucose to release energy, transpiration is related to the movement of water through plant tissues and its evaporation from aerial parts, and fermentation is an anaerobic process used by some organisms to extract energy without oxygen. Understanding photosynthesis helps in grasping the flow of energy through ecosystems and the significance of primary producers in ecological interactions.

3. What encompasses all surface landforms and the processes that shape the surface?

- A. Atmosphere**
- B. Biosphere**
- C. Hydrosphere**
- D. Geosphere/Lithosphere**

The concept that encompasses all surface landforms and the processes that shape the surface is best represented by the geosphere, or lithosphere. This term refers specifically to the solid, rocky part of the Earth, which includes the Earth's crust and the upper mantle. It covers features such as mountains, valleys, plains, and plateaus, and includes the processes involved in their formation, such as erosion, sedimentation, and tectonic activity. The geosphere is integral to understanding how landforms are created and modified over time. For example, volcanic activity can form mountains, while rivers can carve out valleys through erosion. The geosphere interacts with other Earth systems, like the atmosphere and hydrosphere, but its focus is on the physical characteristics and dynamics of the Earth's surface itself. Thus, it is the most fitting choice when considering the surface landforms and the underlying geological processes.

4. Which system is responsible for hormone regulation and metabolism?

- A. Reproductive System**
- B. Endocrine System**
- C. Circulatory System**
- D. Digestive System**

The endocrine system is the primary system responsible for hormone regulation and metabolism. It consists of a network of glands that produce and release hormones directly into the bloodstream. These hormones serve as chemical messengers that coordinate and regulate various functions throughout the body, including growth, metabolism, and reproductive processes. Hormones are critical for maintaining homeostasis, influencing nearly every cell, organ, and function of the body. For example, insulin, produced by the pancreas, plays a key role in regulating glucose metabolism, while thyroxine, produced by the thyroid gland, influences overall metabolic rate. While other systems, such as the digestive and circulatory systems, play roles in metabolism, they do so in conjunction with the hormonal regulation provided by the endocrine system. The reproductive system deals more with producing gametes and sex hormones, but it is not solely responsible for overall hormone regulation or metabolism.

5. What does a pyramid of numbers typically represent?

- A. Energy distribution**
- B. Biomass accumulation**
- C. Population size at each trophic level**
- D. Ecological balance**

A pyramid of numbers illustrates the population size of individual organisms at each trophic level within an ecosystem. This representation shows how many organisms are present at each level of the food chain, with the producer level typically having the largest number, and the higher trophic levels, such as primary consumers, secondary consumers, and so forth, decreasing in number. This shape indicates the relative abundance of different species, reflecting how energy and resources are distributed among them. It provides valuable insights into the structure of an ecosystem and helps ecologists understand the relationships between various organisms. For instance, in terrestrial ecosystems, you might find a large number of plants (producers) compared to a smaller number of herbivores (primary consumers) and even fewer carnivores (secondary consumers).

6. What is the primary role of the centriole in the cell?

- A. Energy production**
- B. Protein synthesis**
- C. Cell division**
- D. Cellular respiration**

The primary role of the centriole in the cell is in cell division. Centrioles are cylindrical structures composed of microtubules, and they play a critical role during mitosis and meiosis. They are involved in the formation of the spindle fibers, which are essential for separating chromosomes into the daughter cells during cell division. As the cell prepares to divide, the centrioles replicate and move to opposite poles of the cell, where they help organize and anchor the microtubules that will pull the chromosomes apart, ensuring that each new daughter cell receives the correct number of chromosomes. This function is vital for maintaining genetic stability and proper cell function, making it fundamental to the life cycle of a cell. While energy production, protein synthesis, and cellular respiration are essential cellular processes, these functions are carried out by other organelles such as mitochondria for energy production, ribosomes for protein synthesis, and the overall metabolic pathways for cellular respiration. Therefore, the centriole's specific and crucial role in cell division marks it as the correct answer in this context.

7. What is a feature of acquired mutations?

- A. They occur randomly in evolution
- B. They can result from environmental factors**
- C. They are inherited from parents
- D. They only affect reproductive cells

Acquired mutations, also known as somatic mutations, are changes to the DNA that occur after conception and can result from various environmental factors. These mutations may arise due to exposure to certain chemicals, radiation, or even viral infections. Unlike inherited mutations, which are passed from parents to offspring through germline cells, acquired mutations are typically present only in specific cells of an individual and are not passed on to the next generation. This feature highlights that acquired mutations can have important implications for an individual's health and development, as they can contribute to various conditions, including cancer. While evolutionary processes involve random mutations as a broader concept, acquired mutations specifically refer to those alterations that arise during an individual's lifetime due to external factors, which is why this option accurately reflects a key characteristic of acquired mutations.

8. Which structure plays a significant role in cellular digestion and waste processing?

- A. Endoplasmic Reticulum
- B. Vacuole
- C. Lysosome**
- D. Centriole

The lysosome is a vital cellular structure that plays a significant role in digestion and waste processing within the cell. It contains a variety of hydrolytic enzymes that are capable of breaking down biomolecules, such as proteins, lipids, carbohydrates, and nucleic acids. When cells take in materials through processes like endocytosis, lysosomes fuse with these vesicles, allowing their enzymes to catalyze the breakdown of the material into smaller, absorbable units. This process is essential for recycling cellular components and eliminating waste products, which helps maintain cellular health. Moreover, lysosomes are integral to autophagy, a process in which damaged organelles or proteins are degraded and recycled, further highlighting their role in managing cellular waste. The proper functioning of lysosomes is crucial for overall cellular homeostasis and energy balance, and dysfunction in these organelles can lead to various diseases, including lysosomal storage disorders. In contrast, while the endoplasmic reticulum is involved in the synthesis of proteins and lipids, the vacuole primarily serves various functions such as storage and maintaining turgor pressure in plant cells, and the centriole is primarily involved in cell division rather than digestion. Thus, the lysosome stands out as the specialized structure primarily dedicated

9. What process results in the formation of haploid cells?

- A. Mitosis
- B. Meiosis**
- C. Fertilization
- D. Binary Fission

The formation of haploid cells occurs through the process of meiosis, which is a specialized type of cell division that leads to the production of gametes—sperm and eggs in animals. During meiosis, a diploid cell (which contains two sets of chromosomes, one from each parent) undergoes two rounds of division. In the first division, homologous chromosomes are separated into different cells, which reduces the chromosome number by half. This first division is called meiosis I. Following that, meiosis II separates the sister chromatids, resulting in four genetically distinct haploid cells from one original diploid cell. Each of these haploid cells retains only one set of chromosomes, which is critical for sexual reproduction, as it ensures that when fertilization occurs, the resulting zygote will have the correct diploid number of chromosomes. This process is essential for maintaining the chromosome number across generations and supports genetic diversity, as the independent assortment of chromosomes and crossing-over during meiosis create new combinations of genes.

10. A collection of multiple populations living together can be referred to as what?

- A. Community**
- B. Ecosystem
- C. Population
- D. Biome

A collection of multiple populations living together is referred to as a community. In ecological terms, a community consists of different species that coexist in the same environment, interacting with one another in various ways, such as through competition, predation, or symbiosis. Understanding this concept is foundational in biology, as it emphasizes the relationships and interactions among different organisms, which can influence their survival and reproductive success. In contrast, an ecosystem includes not just the living organisms (the community) but also the physical environment and how these biotic and abiotic components interact. A population refers specifically to a group of individuals of the same species in a given area, whereas a biome describes a larger ecological area characterized by specific climate conditions and organisms, typically spanning across multiple ecosystems. This distinction highlights the importance of the community concept in understanding ecological relationships at a more localized level.