

PLTW Biomedical Science Practice Test (Sample)

Study Guide



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SAMPLE

Questions

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- 1. What is the main function of the skeletal system?**
 - A. To transport substances throughout the body**
 - B. To protect and support body organs**
 - C. To facilitate movement**
 - D. To regulate body temperature**
- 2. What is the Fahrenheit equivalent of 20°C?**
 - A. 50°F**
 - B. 68°F**
 - C. 70°F**
 - D. 60°F**
- 3. Which of the following is NOT a major component of a neuron?**
 - A. Axon**
 - B. Dendrites**
 - C. Soma**
 - D. Nucleus pulposus**
- 4. The muscular system is responsible for:**
 - A. Protecting vital organs**
 - B. Generating electrical impulses**
 - C. Moving the body and substances around**
 - D. Storing minerals**
- 5. What does a phylogenetic tree illustrate?**
 - A. The hierarchical structure of living organisms**
 - B. The feeding relationships in an ecosystem**
 - C. The evolutionary relationships among biological species**
 - D. The anatomical structure of various species**
- 6. What is one major function of the kidneys beyond filtering blood?**
 - A. Hormone production**
 - B. Regulating oxygen levels**
 - C. Digestive enzyme secretion**
 - D. Neurological function**

- 7. Which function is associated with the liver in digestion?**
- A. Absorbs nutrients directly**
 - B. Produces enzymes to break down proteins**
 - C. Produces bile for fat digestion**
 - D. Stores water for hydration**
- 8. What aspect of death most often requires data and information collected outside of the autopsy process?**
- A. Cause of death**
 - B. Manner of death**
 - C. Mechanism of death**
 - D. Internal examination**
- 9. What is one of the key components involved in performing an internal examination during an autopsy?**
- A. Collecting urine samples**
 - B. Examining the digestive system**
 - C. Determining the manner of death**
 - D. Assessing neurological functions**
- 10. What characterizes a controlled experiment?**
- A. Testing multiple variables simultaneously**
 - B. Keeping all conditions constant except for one variable**
 - C. Allowing random variation in the results**
 - D. Using observational data instead of experimental data**

Answers

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

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Explanations

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1. What is the main function of the skeletal system?

- A. To transport substances throughout the body
- B. To protect and support body organs**
- C. To facilitate movement
- D. To regulate body temperature

The main function of the skeletal system is to protect and support body organs. The skeletal system provides a framework that supports the body and gives it shape. This structure not only helps maintain posture but also protects vital organs such as the brain, heart, and lungs by encasing them within hard bone structures. For instance, the skull protects the brain, while the rib cage shields the heart and lungs from external damage. While the skeletal system does play a role in facilitating movement through the attachment of muscles, its primary function centers on support and protection. Additionally, it is important to note that the skeletal system does not transport substances throughout the body—that function is primarily handled by the circulatory system. Similarly, regulating body temperature is not a function of the skeletal system but rather involves the integumentary system and various physiological processes.

2. What is the Fahrenheit equivalent of 20°C?

- A. 50°F
- B. 68°F**
- C. 70°F
- D. 60°F

To convert Celsius to Fahrenheit, you can use the formula: $^{\circ}\text{F} = (^{\circ}\text{C} \times 9/5) + 32$. For 20°C, you would substitute 20 into the formula: $^{\circ}\text{F} = (20 \times 9/5) + 32$. First, calculate $20 \times 9/5$, which equals 36. Then, add 32: $36 + 32 = 68^{\circ}\text{F}$. Thus, the Fahrenheit equivalent of 20°C is correctly calculated to be 68°F. This temperature conversion is key in many scientific disciplines, including biomedical science, where accurate readings in temperature can significantly affect experiments, screenings, and patient care.

3. Which of the following is NOT a major component of a neuron?

- A. Axon
- B. Dendrites
- C. Soma
- D. Nucleus pulposus**

The nucleus pulposus is the correct answer as it is not a major component of a neuron. Neurons consist of three primary components: the axon, which transmits electrical signals away from the cell body; dendrites, which receive signals from other neurons; and the soma (or cell body), which contains the nucleus and organelles necessary for the neuron's functionality. The nucleus pulposus, on the other hand, is a gelatinous substance found in the center of intervertebral discs in the spinal column and serves as a shock absorber, playing no role in the structure or function of neurons. Understanding this distinction is essential for grasping the anatomy of the nervous system and how different tissues function within the body.

4. The muscular system is responsible for:

- A. Protecting vital organs**
- B. Generating electrical impulses**
- C. Moving the body and substances around**
- D. Storing minerals**

The muscular system plays a crucial role in the movement of the body and the transportation of substances within it, making this option the most accurate choice. Muscles work in conjunction with the skeletal system to facilitate movement, enabling actions such as walking, running, and lifting. Beyond just locomotion, muscles are also essential for processes like digestion and circulation, as they help move food through the digestive tract and blood through vessels. While the muscular system contributes to protecting vital organs through posture and movement, this is not its primary function. The generation of electrical impulses is primarily the role of the nervous system, particularly neurons and specialized cells. The storage of minerals is mainly a function of the skeletal system, where bones act as reservoirs for essential minerals like calcium and phosphorus. Therefore, the primary function of the muscular system is aptly identified as facilitating movement and helping transport various substances throughout the body.

5. What does a phylogenetic tree illustrate?

- A. The hierarchical structure of living organisms**
- B. The feeding relationships in an ecosystem**
- C. The evolutionary relationships among biological species**
- D. The anatomical structure of various species**

A phylogenetic tree illustrates the evolutionary relationships among biological species. It is a diagram that represents the evolutionary history of a group of organisms, showing how species are related through common ancestors. Each branch of the tree represents a lineage, and the points where branches split indicate when two lineages diverged from a common ancestor. This representation helps scientists and researchers understand how species have evolved over time, including the genetic distances between them. It visually conveys the concept of descent with modification, highlighting the connections among diverse forms of life. Phylogenetic trees are constructed based on various data, including genetic, morphological, and molecular characteristics, which provide evidence of the evolutionary pathways that have shaped the diversity of life on Earth. The other options, while related to biological concepts, do not accurately describe the function of a phylogenetic tree. Hierarchical structures of living organisms or anatomical structures pertain to classification or morphology and do not directly depict evolutionary relationships. Feeding relationships are typically represented in food webs or ecological diagrams rather than in a phylogenetic context. Hence, recognizing the specific purpose of phylogenetic trees as a tool for illustrating evolutionary connections highlights why the correct answer is based on evolutionary relationships.

6. What is one major function of the kidneys beyond filtering blood?

- A. Hormone production**
- B. Regulating oxygen levels**
- C. Digestive enzyme secretion**
- D. Neurological function**

One major function of the kidneys, beyond their primary role in filtering blood and removing waste products, is the production of hormones. The kidneys play a significant role in maintaining homeostasis and regulating various physiological processes through the secretion of hormones such as erythropoietin (EPO) and renin. Erythropoietin is crucial for the production of red blood cells in the bone marrow, enhancing oxygen delivery to tissues. Renin is involved in the regulation of blood pressure and fluid balance by influencing the renin-angiotensin-aldosterone system, which helps control blood volume and systemic vascular resistance. This hormone production is essential for maintaining overall bodily functions and ensuring the body's response to various needs, such as adjusting blood cell production in response to oxygen levels. Other choices, such as regulating oxygen levels, digestive enzyme secretion, and neurological function, do not pertain to the primary roles of the kidneys. These functions are handled by different organs and systems, highlighting the kidneys' unique position in endocrine regulation as well as waste removal.

7. Which function is associated with the liver in digestion?

- A. Absorbs nutrients directly**
- B. Produces enzymes to break down proteins**
- C. Produces bile for fat digestion**
- D. Stores water for hydration**

The liver plays a vital role in digestion primarily through the production of bile, which is essential for the digestion and absorption of fats. Bile acts as an emulsifier, breaking down large fat globules into smaller droplets, making it easier for digestive enzymes to access and break down these fats. This process enhances the body's ability to absorb fatty acids and fat-soluble vitamins, thus contributing to overall digestive efficiency. While other functions are important to the digestive system, such as nutrient absorption occurring primarily in the intestines and various enzymes produced by the pancreas rather than the liver, the liver's role in bile production is distinct and crucial for effective fat digestion. It is also not involved in direct water storage, making the liver's association with bile production a defining characteristic of its role in digestion.

8. What aspect of death most often requires data and information collected outside of the autopsy process?

- A. Cause of death**
- B. Manner of death**
- C. Mechanism of death**
- D. Internal examination**

The mechanism of death refers to the specific physiological or biochemical process that leads to death, such as heart failure, respiratory failure, or hemorrhage. Understanding the mechanism of death often requires additional data and information collected from various sources outside of the autopsy process. This includes patient medical history, clinical findings, laboratory test results, and information about any pre-existing medical conditions or contributing factors that may have led to the death. Unlike the cause of death, which is determined through findings during the autopsy, the mechanism involves a more detailed understanding of how the physiological processes occurred and typically requires correlating autopsy findings with gathered data to form a comprehensive picture of the events that led to death. Therefore, a thorough examination of the patient's life leading up to the death, including treatments and medications, is critical to accurately determine the mechanism. This emphasizes the complex relationship between autopsy findings and external information, highlighting why understanding the mechanism of death is particularly reliant on broader data collection.

9. What is one of the key components involved in performing an internal examination during an autopsy?

- A. Collecting urine samples**
- B. Examining the digestive system**
- C. Determining the manner of death**
- D. Assessing neurological functions**

During an autopsy, one of the key components is examining the digestive system. This examination provides essential insights into the cause of death and the medical history of the deceased. By analyzing the digestive organs, such as the stomach and intestines, pathologists can identify the presence of substances that could indicate poisoning or the condition of the organs that may suggest diseases. Understanding the state of the digestive system can also help reconstruct the last meals and the health status of the individual before death, offering critical information about potential contributing factors to their demise. This makes it a fundamental part of the internal examination process during an autopsy. While collecting urine samples can provide important toxicological information, it is not a direct internal examination of the body's systems. Similarly, determining the manner of death and assessing neurological functions are important aspects of an autopsy, but they do not specifically represent a component of examining internal organs in this context.

10. What characterizes a controlled experiment?

- A. Testing multiple variables simultaneously
- B. Keeping all conditions constant except for one variable**
- C. Allowing random variation in the results
- D. Using observational data instead of experimental data

A controlled experiment is characterized by the practice of keeping all conditions constant except for one variable. This approach ensures that any observed effects on the dependent variable can be confidently attributed to changes in the independent variable that is being tested. By controlling all other factors, researchers minimize the potential influence of extraneous variables, allowing for a clear relationship to be established between the variable of interest and the outcome. This method is fundamental to scientific inquiry, as it helps to establish cause-and-effect relationships. For instance, if you're testing the effect of a new drug on blood pressure, you would keep factors like diet, exercise, and age constant among participants while varying only the dosage of the drug. This level of control enhances the reliability and validity of the findings. In contrast, testing multiple variables simultaneously introduces confounding factors, making it difficult to pinpoint which variable is responsible for any changes observed. Allowing random variation in results does not support the systematic investigation of a hypothesis, as it introduces noise rather than clarity. Finally, relying on observational data rather than experimental data typically lacks the level of control necessary to establish causal relationships, as the researcher cannot manipulate variables.