HESI A2 28 Anatomy and Physiology Practice Exam Sample Study Guide

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Featuring practice questions, answers, and explanations for each question.

Questions

1. What is the name for the cells that compose compact bone?

A. Osteocytes

B. Osteoblasts

C. Chondrocytes

D. Osteoclasts

2. What is the primary role of the motor (efferent) neurons in the body?

A. Relaying sensory information to the CNS

B. Activating motor responses in muscles and organs

C. Connecting different parts of the CNS

D. Receiving sensory signals from the environment

3. What major function does the endocrine system control?

A. Motor response

B. Cognitive functions

C. Growth and metabolism

D. Sensory perception

4. Which hormone is primarily responsible for regulating water retention in the body?

A. Oxytocin

B. Growth hormone

C. Antidiuretic hormone (ADH)

D. Testosterone

5. How do the kidneys contribute to homeostasis?

A. By producing hormones only

B. By filtering the blood and regulating electrolytes

C. By storing nutrients

D. By aiding digestion

6. Which of the following bones is paired in the cranium?

A. Ethmoid

B. Occipital

C. Frontal

D. Temporal

7. Which of the following is NOT a characteristic of steroid hormones?

A. They can cross cell membranes

B. They alter gene expression

C. They are built from amino acids

D. They are synthesized from cholesterol

8. Which organ is responsible for detoxification of blood?

A. Pancreas

B. Liver

C. Kidneys

D. Gallbladder

9. What is the main role of the upper passageways in the respiratory system?

A. To exchange gases with the bloodstream

B. To warm, filter, and moisten incoming air

C. To facilitate the movement of the diaphragm

D. To prevent the entrance of pathogens into the bloodstream

10. How many sacral vertebrae are found within the human skeletal system?

A. 2

B. 5

C. 7

D. 9

Answers

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

Explanations

1. What is the name for the cells that compose compact bone?

A. Osteocytes

B. Osteoblasts

C. Chondrocytes

D. Osteoclasts

The cells that compose compact bone are osteoblasts. These specialized cells are responsible for the formation and mineralization of bone tissue. Osteoblasts secrete the components of the bone matrix, including collagen and other proteins, which are essential for the structure and strength of compact bone. Once osteoblasts become embedded in the bone matrix they produce, they differentiate into osteocytes, which maintain the bone tissue. This function is crucial in the development and maintenance of the skeletal system, and in regulating mineral content within the bones. Other cell types mentioned have distinct roles in bone physiology: osteocytes are mature bone cells involved in the maintenance of bone, while osteoclasts are responsible for bone resorption, breaking down bone tissue. Chondrocytes are involved in the formation of cartilage, not bone. Understanding the specific functions of these cell types helps clarify their roles in the overall structure and health of the skeletal system.

2. What is the primary role of the motor (efferent) neurons in the body?

A. Relaying sensory information to the CNS

B. Activating motor responses in muscles and organs

C. Connecting different parts of the CNS

D. Receiving sensory signals from the environment

The primary role of motor (efferent) neurons is to activate motor responses in muscles and organs. These neurons transmit signals away from the central nervous system (CNS) to effectors, such as muscle fibers and glands, essentially commanding them to perform specific actions or functions. This process is crucial for motor control, allowing the body to respond to stimuli and execute coordinated movements. For example, when you decide to move your arm, motor neurons relay that command from the brain to the muscles in the arm, causing them to contract and produce movement. In terms of the overall function of the nervous system, motor neurons play a key role in translating neural impulses into action, making them integral to physical responses and behaviors.

3. What major function does the endocrine system control?

A. Motor response

B. Cognitive functions

C. Growth and metabolism

D. Sensory perception

The endocrine system plays a critical role in regulating various physiological processes throughout the body, with growth and metabolism being two of its primary functions. It achieves this through the secretion of hormones, which are chemical messengers released into the bloodstream. These hormones influence growth by regulating cellular development and differentiation, affecting processes such as puberty, tissue repair, and overall body growth. Metabolism, which encompasses all chemical reactions in the body, including how we convert food into energy and how nutrients are utilized, is also heavily influenced by hormones. For instance, insulin and glucagon regulate glucose metabolism, while thyroid hormones play a significant role in determining the metabolic rate. By maintaining homeostasis for growth and metabolic activities, the endocrine system ensures the body functions optimally over time.

4. Which hormone is primarily responsible for regulating water retention in the body?

A. Oxytocin

B. Growth hormone

C. Antidiuretic hormone (ADH)

D. Testosterone

The hormone primarily responsible for regulating water retention in the body is antidiuretic hormone (ADH), also known as vasopressin. ADH is produced in the hypothalamus and stored in the posterior pituitary gland. Its main function is to conserve body water by promoting water reabsorption in the kidneys. When secreted, ADH acts on the renal collecting ducts, making them more permeable to water, allowing for increased water reabsorption back into the bloodstream. This process helps to concentrate urine and maintain serum osmolality, which is crucial for fluid balance and hydration. The other hormones mentioned are involved in different physiological processes. Oxytocin is primarily related to childbirth and lactation processes. Growth hormone plays a significant role in growth and metabolism but does not directly influence water retention. Testosterone is a key hormone in the development of male characteristics and reproductive functions, with no direct role in water retention regulation. Thus, ADH's specific action on the kidneys makes it the principal hormone for regulating water balance in the body.

5. How do the kidneys contribute to homeostasis?

A. By producing hormones only

B. By filtering the blood and regulating electrolytes

C. By storing nutrients

D. By aiding digestion

The kidneys play a crucial role in maintaining homeostasis by filtering the blood, regulating electrolytes, and managing the volume of fluids in the body. They filter out waste products and excess substances from the bloodstream, which are then excreted as urine. This filtration process not only removes toxins and excess ions but also helps in the regulation of pH balance and the concentration of electrolytes such as sodium, potassium, and calcium. Furthermore, the kidneys adjust the volume and concentration of urine based on the body's hydration status, which is vital for maintaining fluid balance. When the body needs to conserve water, the kidneys can concentrate urine, ensuring that minimal water is lost. Conversely, if there is excess fluid, the kidneys can dilute the urine, excreting more water and helping to regulate blood pressure and overall fluid homeostasis. While the kidneys do produce hormones, such as erythropoietin and renin, these are part of their broader function in homeostasis rather than their primary mechanism. The kidneys do not store nutrients or aid in digestion, which are functions carried out by other systems in the body. Therefore, the primary contributions of the kidneys to homeostasis come from their roles in filtration and electrolyte regulation.

6. Which of the following bones is paired in the cranium?

A. Ethmoid

B. Occipital

C. Frontal

D. Temporal

The temporal bones are paired in the cranium, meaning that there are two temporal bones, one on each side of the skull. These bones play a crucial role in forming the sides and base of the skull and house structures important for hearing and balance, including the inner ear. In contrast, the ethmoid, occipital, and frontal bones are all unpaired. The ethmoid bone is located at the roof of the nasal cavity and contributes to the eye sockets. The occipital bone forms the back and base of the skull and contains the foramen magnum, which allows the spinal cord to connect with the brain. The frontal bone forms the forehead and the upper parts of the eye sockets. Each of these unpaired bones serves distinct structural and protective roles within the cranial cavity, but they are not categorized as paired bones. Therefore, the correct answer highlights the unique pairing of the temporal bones within the cranium.

7. Which of the following is NOT a characteristic of steroid hormones?

A. They can cross cell membranes

B. They alter gene expression

C. They are built from amino acids

D. They are synthesized from cholesterol

Steroid hormones are unique in their structure and function compared to other types of hormones. One of the defining characteristics of steroid hormones is that they are synthesized from cholesterol, which serves as the precursor. This allows them to be lipid-soluble, enabling them to easily cross cell membranes, which are composed of lipid bilayers. Once inside the target cells, steroid hormones interact with specific receptors and can alter gene expression, leading to changes in protein synthesis and cellular activity. In contrast, hormones that are built from amino acids, such as peptide hormones, operate differently. They are typically water-soluble and cannot easily pass through the lipid membrane without specific receptor-mediated processes. This distinction is crucial, as it relates directly to how different types of hormones function and exert their effects within the body. Therefore, stating that steroid hormones are built from amino acids does not align with their true biochemical nature and is the rationale behind identifying it as the correct answer to the question.

8. Which organ is responsible for detoxification of blood?

A. Pancreas

B. Liver

C. Kidneys

D. Gallbladder

The liver is the primary organ responsible for the detoxification of blood in the body. It performs this essential function by metabolizing various substances, including drugs, alcohol, and toxins, converting them into less harmful compounds that can be excreted from the body. The liver accomplishes this through a series of biochemical reactions, which can involve oxidation, reduction, hydrolysis, and conjugation. Additionally, the liver produces important proteins that are crucial for blood clotting and synthesis of biochemicals necessary for digestion. It filters out toxins and waste products that arise from metabolism, ensuring that these do not accumulate in the blood and cause harm to other organs. While the kidneys also play a significant role in filtering blood by removing waste products and excess substances, their main function is the excretion of urine rather than detoxification. The pancreas is involved in digestion and blood sugar regulation, while the gallbladder primarily stores bile produced by the liver, which aids in the digestion of fats.

9. What is the main role of the upper passageways in the respiratory system?

A. To exchange gases with the bloodstream

B. To warm, filter, and moisten incoming air

C. To facilitate the movement of the diaphragm

D. To prevent the entrance of pathogens into the bloodstream

The primary role of the upper passageways in the respiratory system is to warm, filter, and moisten incoming air. This function is critical for preparing the air before it enters the lungs, ensuring that it is at an appropriate temperature and humidity level. The nasal cavity, a key part of the upper airway, contains structures called turbinates that help to increase surface area and promote the warming and humidifying processes. Additionally, the mucus and cilia present in this region trap dust, allergens, and other particles, filtering out potential irritants before the air reaches the more delicate tissues of the lower respiratory system. This preparation of incoming air protects the lungs from potential damage and ensures effective gas exchange can occur once the air reaches the alveoli. Proper air conditioning—warming, filtering, and moisturizing—is essential to maintain the health of the respiratory system and enhance the efficiency of gas exchange, which is why this option accurately reflects the main role of the upper passageways.

10. How many sacral vertebrae are found within the human skeletal system?

A. 2

B. 5

C. 7

D. 9

The human skeletal system contains five sacral vertebrae, which are fused together to form a single structure known as the sacrum. These vertebrae are typically labeled S1 to S5. The sacrum plays a crucial role in the body by providing a strong, stable base for the spinal column and connecting it to the hip bones, which are integral to the pelvic girdle. This specific count of five vertebrae is consistent across the majority of the adult population, though variations can occur in some individuals. The sacral vertebrae help in supporting the weight of the upper body, facilitating movements like walking, and protecting the nerves that run through the spinal canal. Understanding the structure and number of sacral vertebrae is essential in the study of human anatomy, as they play a pivotal role in both structural support and the neurological functions of the lower body.