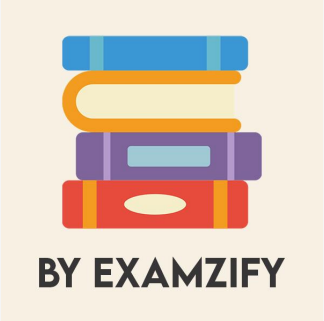
Arizona State University (ASU) BIO202 Human Anatomy and Physiology II Exam 2 Practice Exam (Sample)

Study Guide



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Questions

1. Which organ has a more extensive lymphatic drainage system than any other?

   A. Heart

   B. Liver

   C. Kidneys

   D. Lungs

2. What effect do the internal intercostal muscles have on the ribs?

   A. Elevate the ribs

   B. Stabilize the ribs

   C. Depress the ribs

   D. Expand the thoracic cavity

3. What physiological condition occurs when breathing is rapid enough to expel CO_2 faster than it is produced?

   A. Hypoventilation

   B. Hyperventilation

   C. Apnea

   D. Respiratory acidosis

4. In terms of solubility, how does carbon dioxide compare to oxygen?

   A. Less soluble than oxygen

   B. Equally soluble as oxygen

   C. More soluble than oxygen

   D. Not soluble in water

5. Which condition is characterized by fibrosis of the lungs?

   A. Pneumonia

   B. Emphysema

   C. Tuberculosis

   D. Chronic bronchitis

6. What process describes the flow of air out of the lungs?

A. Active expiration

B. Passive expiration

C. Forced expiration

D. Controlled expiration

7. Which gas is primarily exchanged in systemic gas exchange?

A. Oxygen

B. Nitrogen

C. Carbon Dioxide

D. Carbon Monoxide

8. What is the range of normal PCO_2 levels in the blood?

A. 30-35 mmHg

B. 37-43 mmHg

C. 45-50 mmHg

D. 50-55 mmHg

9. What is the physiological role of accessory muscles during respiration?

A. They stabilize the spine

B. They enhance forced inspiration

C. They enable passive expiration

D. They increase thoracic cavity volume

10. What prevents the rupture of the delicate respiratory membrane?

A. High oxygen levels

B. Low capillary blood pressure

C. High fluid levels

D. Pleurisy

Answers

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

Explanations

1. Which organ has a more extensive lymphatic drainage system than any other?

A. Heart

B. Liver

C. Kidneys

D. Lungs

The lungs have a more extensive lymphatic drainage system than any other organ, primarily due to their crucial role in gas exchange and their exposure to various pathogens and particulate matter from inhaled air. The extensive network of lymphatic vessels in the lungs helps to transport lymph fluid, which contains immune cells and waste products, thereby facilitating the immune response and maintaining fluid balance in lung tissue. The lungs' lymphatic system plays a vital role in clearing away excess fluid and filtering out debris, pathogens, and cancerous cells that may enter the respiratory system. This is particularly important considering that the lungs are constantly interacting with the external environment, necessitating an efficient drainage system to support immune function and tissue health. In contrast, while the heart, liver, and kidneys also possess lymphatic systems, their drainage systems are not as extensive as that of the lungs. The liver, for example, does have a significant lymphatic network due to its metabolic activities and filtration functions, but it does not have the same degree of lymphatic complexity related to direct exposure to external pathogens as the lungs. Each of these organs has distinct lymphatic functions tailored to their specific roles in the body, but the lungs stand out with their highly developed and extensive lymphatic drainage.

2. What effect do the internal intercostal muscles have on the ribs?

A. Elevate the ribs

B. Stabilize the ribs

C. Depress the ribs

D. Expand the thoracic cavity

The internal intercostal muscles play a crucial role during forced expiration. When these muscles contract, they pull the ribs downward and inward, which results in the depression of the ribs. This action helps to reduce the volume of the thoracic cavity, thereby facilitating the expulsion of air from the lungs. By actively lowering the ribs, these muscles increase intrathoracic pressure, making it more efficient to push air out, especially during vigorous breathing activities. This is why the choice indicating that the internal intercostal muscles depress the ribs is correct. In contrast, the other actions associated with the ribs, such as elevation or expansion of the thoracic cavity, are primarily functions of the external intercostal muscles and the diaphragm during inhalation rather than the internal intercostal muscles during exhalation.

3. What physiological condition occurs when breathing is rapid enough to expel CO_2 faster than it is produced?

A. Hypoventilation

B. Hyperventilation

C. Apnea

D. Respiratory acidosis

Hyperventilation is the physiological condition characterized by rapid and deep breathing that results in the expulsion of carbon dioxide (CO_2) from the body at a rate faster than it is produced. This rapid loss of CO_2 leads to a decrease in the partial pressure of carbon dioxide in the blood, causing respiratory alkalosis, which can result in symptoms such as lightheadedness, tingling in the extremities, and shortness of breath. When hyperventilation occurs, the balance of acids and bases in the body is disrupted as the bicarbonate buffering system is affected by the reduced levels of CO_2. This situation can arise from various triggers, including anxiety, fever, or certain medical conditions that stimulate increased respiration. Understanding hyperventilation helps in recognizing the potential clinical implications, such as the need for interventions to restore normal breathing patterns and correct pH balance.

4. In terms of solubility, how does carbon dioxide compare to oxygen?

A. Less soluble than oxygen

B. Equally soluble as oxygen

C. More soluble than oxygen

D. Not soluble in water

Carbon dioxide is indeed more soluble in water compared to oxygen, making it the correct answer to the question about their solubility. The solubility of gases in water is influenced by various factors, including their chemical properties and interactions with water molecules. When carbon dioxide is dissolved in water, it reacts to form carbonic acid, which contributes to its higher solubility. This reaction allows a greater amount of carbon dioxide to be present in solution compared to oxygen, which does not undergo such reactive changes in water. Oxygen's solubility is considerably lower due to its nonpolar characteristics and weaker interactions with water. As a result, while both gases can dissolve in water, carbon dioxide's ability to form carbonic acid and its general chemical properties contribute to its greater solubility when compared to oxygen.

5. Which condition is characterized by fibrosis of the lungs?

A. Pneumonia

B. Emphysema

C. Tuberculosis

D. Chronic bronchitis

The correct answer is associated with a condition characterized by lung fibrosis, which is the formation of excess fibrous connective tissue in the lungs. Tuberculosis is known to cause pulmonary fibrosis due to the inflammatory response that occurs during the infection. As the body tries to fight off the bacterial infection, it can lead to the scarring and stiffening of lung tissue, ultimately affecting lung function. In contrast, pneumonia primarily involves inflammation of the lung tissue due to infection, but it does not characteristically lead to fibrosis. Emphysema leads to the destruction of alveoli and is more associated with loss of elastic recoil rather than fibrosis. Chronic bronchitis involves inflammation and excess mucus production but does not typically result in the fibrotic changes seen in tuberculosis. Therefore, tuberculosis is the condition most closely linked to fibrosis of the lungs.

6. What process describes the flow of air out of the lungs?

A. Active expiration

B. Passive expiration

C. Forced expiration

D. Controlled expiration

The flow of air out of the lungs is accurately described by passive expiration under normal resting conditions. During passive expiration, the diaphragm and external intercostal muscles relax after inhalation, leading to an increase in intrathoracic pressure and causing air to flow out of the lungs due to elastic recoil of the lung tissue. In this process, energy is not actively expended by the body; rather, the natural elasticity of the lungs and the thoracic cage facilitate the movement of air. This is why passive expiration is a key feature of normal breathing, allowing for a smooth transition between inhalation and exhalation without requiring additional muscular effort. Activities like heavy exercise or anything requiring forceful exhalation might utilize other mechanisms, such as forced expiration, which involves the contraction of additional muscles to push air out more vigorously. However, these apply to specific conditions and do not represent the typical resting state of pulmonary function.

7. Which gas is primarily exchanged in systemic gas exchange?

A. Oxygen

B. Nitrogen

C. Carbon Dioxide

D. Carbon Monoxide

In systemic gas exchange, the primary function occurs at the level of the tissues, where oxygen is delivered to cells and carbon dioxide is removed from them. Carbon dioxide is produced as a byproduct of cellular metabolism, specifically from processes such as cellular respiration. The concentration of carbon dioxide is typically higher in the tissues compared to the blood, which drives its diffusion from the tissues into the bloodstream. This gas exchange is crucial for maintaining the acid-base balance in the body and ensuring that cells continue to function efficiently. While oxygen is also involved in this exchange process, its primary function is to enter the cells rather than being expelled. Therefore, carbon dioxide is predominantly the gas that is exchanged in systemic circulation, reflecting the metabolic processes occurring throughout the body's tissues.

8. What is the range of normal PCO2 levels in the blood?

A. 30-35 mmHg

B. 37-43 mmHg

C. 45-50 mmHg

D. 50-55 mmHg

The range of normal PCO2 (partial pressure of carbon dioxide) levels in the blood is indeed 37-43 mmHg. This value is important because it reflects the balance of carbon dioxide production and elimination in the body, indicating how well the respiratory system is functioning. When the carbon dioxide level falls within this range, it generally signifies that the body is effectively regulating its acid-base balance and ensuring that the tissues are getting sufficient oxygen while efficiently removing CO2. Abnormal levels outside this range can indicate respiratory or metabolic issues; for instance, lower levels may suggest hyperventilation or decreased CO2 production, whereas higher levels may indicate hypoventilation or respiratory acidosis. Understanding these normal ranges is crucial for evaluating a patient's respiratory function in clinical situations, and helps in diagnosing conditions related to respiratory dysfunction.

9. What is the physiological role of accessory muscles during respiration?

A. They stabilize the spine

B. They enhance forced inspiration

C. They enable passive expiration

D. They increase thoracic cavity volume

The physiological role of accessory muscles during respiration primarily involves enhancing forced inspiration. These muscles become particularly important during situations requiring increased respiratory effort, such as during intense exercise or respiratory distress. Accessory muscles, which include those in the neck (like the sternocleidomastoid and scalene muscles) and the chest (pectoralis major and minor), assist in expanding the thoracic cavity by elevating the rib cage and further enlarging the volume of the thoracic cavity. This action increases the amount of air drawn into the lungs during a forceful inhalation, making them critical for meeting heightened oxygen demands in various physiological circumstances. The other options do not accurately reflect the main function of these muscles in respiration. While they may contribute in a minor way to other processes, their primary purpose is to maximize inhalation efficiency when needed.

10. What prevents the rupture of the delicate respiratory membrane?

A. High oxygen levels

B. Low capillary blood pressure

C. High fluid levels

D. Pleurisy

The prevention of rupture in the delicate respiratory membrane, which is crucial for gas exchange in the lungs, is primarily due to low capillary blood pressure. The respiratory membrane is composed of a thin layer of alveolar epithelial cells and capillary endothelial cells, and it is vital for efficient diffusion of oxygen and carbon dioxide. Low capillary blood pressure ensures that there is not excessive force exerted on the delicate membrane. This low pressure allows for efficient gas exchange while maintaining the integrity of the respiratory structures. When capillary blood pressure is kept low, the likelihood of fluid accumulation in the alveoli is reduced, which is important because excessive fluid can contribute to complications such as pulmonary edema, which would disrupt normal gas exchange and potentially lead to rupture. Thus, the regulation of capillary pressure is a critical factor in maintaining the stability and function of the respiratory membrane.