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Respiratory System

Answers and Explanations

I. Introduction to the Respiratory System

A. Multiple Choice Questions

1. (d) – Respiration can refer to breathing, gas exchange between the air and the blood in the lungs, and oxygen utilization.
2. (d) – The esophagus begins at the level of the larynx and is an organ of the digestive system.
3. (b) – Although some air pressure is created in the mouth as a person swallows, the respiratory system is not involved in the swallowing process.

B. True–False Questions

1. True – A tremendous volume of air is exchanged during strenuous exercise.
2. False – The conducting division includes the nasal cavity, pharynx, larynx, trachea, bronchi, and bronchioles. The respiratory division includes the pulmonary alveoli within the lungs.
3. True – Sensory receptors within the conducting division may trigger a coughing or sneezing response to keep the air passageways clean.

II. Conducting Passages

A. Multiple Choice Questions

1. (c) – The uvula is a pendulous structure that hangs from the middle lower border of the soft palate.
2. (e) – Located in the roof of the nasal cavity, the foramina in the cribriform plate of the ethmoid bone permit passage of olfactory nerves.
3. (a) – Sticky mucus secreted by goblet cells coats the exposed border of the epithelial surface, where it traps inhaled airborne particles.
4. (b) – There are four paranasal sinuses—the maxillary, sphenoidal, frontal, and ethmoidal sinuses.
5. (e) – Enlarged pharyngeal tonsils (adenoids) may restrict air flow through the nasal cavity.
6. (b) – The Adam’s apple is the ridgelike laryngeal prominence of the thyroid cartilage.
7. (d) – The vocal folds laterally border the glottis and span the arytenoid and thyroid cartilages.
8. (e) – The lumina of the trachea and bronchi are lined with pseudostratified ciliated columnar epithelium. Simple squamous epithelium is found within the pulmonary alveoli.
9. (c) – Inhaled air is processed in specific ways through each of the component organs of the respiratory division.
10. (c) – Epithelia are specific in their function. Stratified squamous epithelium is protective and supports nasal hairs; pseudostratified ciliated columnar epithelium secretes mucus and moves trapped particles toward the oral cavity; cuboidal epithelium keeps minute tubules patent (open); and simple squamous epithelium permits diffusion of respiratory gases.

B. True–False Questions

1. True – The nasal septum increases the surface area of the nasal cavity and gives structural support to the nose.
2. False – There is only one nasal cavity, which is divided by the nasal septum into two nasal fossae.
3. True – The three passageways of the nasal cavity are the vestibule, nasal fossa, and choana.
4. False – Both the oropharynx and the laryngopharynx serve the respiratory and digestive systems.
5. False – The larynx consists of nine cartilages: three are single structures and six are paired structures.
6. True – Of the two pairs of vocal folds, only the true vocal cords are involved in sound production.
7. False – As one swallows, the epiglottis remains stationary and the larynx is elevated, sealing the glottis against the epiglottis.
8. False – The cartilaginous tracheal rings are C-shaped rather than complete.

9. True – Autonomic contraction or relaxation of the smooth muscles within the bronchioles determines the amount of air that reaches the pulmonary alveoli.
10. True – The protective structures of the respiratory system ensure that the inhaled air will be suitable for utilization within the pulmonary alveoli of the lungs.

III. Pulmonary Alveoli, Lungs, and Pleurae

A. Multiple Choice Questions

1. (a) – The thin-walled, highly vascular, and consistently moist pulmonary alveoli are the functional units of the respiratory system, where gaseous exchange takes place.
2. (a) – Pulmonary alveoli are lined with simple squamous epithelium.
3. (c) – The hilum of the lung is the depressed medial border, where vessels, nerves, and a bronchus enter or exit.
4. (c) – The right lung contains 10 bronchial segments and the left lung contains 8.
5. (a) – The parietal pleura is in contact with the thoracic wall and the superior surface of the diaphragm.
6. (d) – Respiratory gases diffuse through the walls of the pulmonary alveoli, not through the pleurae.

B. True–False Questions

1. False – It is two cell layers thick—the wall of the pulmonary alveolus and the endothelium of a capillary.
2. False – The area between the lungs is known as the mediastinum.
3. False – The left lung has two lobes separated by a single fissure, and the right lung has three lobes separated by two fissures.
4. True – Both emphysema and lung cancer are clearly linked to heavy smoking, and both are common causes of death among adults.
5. False – The pleural cavity surrounds the lungs, and the pulmonary alveoli are located within the lungs.
6. True – The parietal pleura is continuous with the visceral pleura, effectively compartmentalizing each of the lungs.

IV. Mechanics of Breathing

A. Multiple Choice Questions

1. (d) – Although the diaphragm is the major muscle of inspiration, the external intercostal muscles and the interchondral part of the internal intercostal muscles work with it synergistically.
2. (b) – Contraction of the external intercostal muscles causes the rib cage to be expanded in the anteroposterior dimension.
3. (c) – The diaphragm is a muscle of inspiration, not expiration.
4. (a) – Tidal volume of air ventilation is achieved in normal breathing.
5. (d) – The inspiratory reserve volume of air is that volume that can be forcefully inspired into the lungs following a normal inhalation.
6. (c) – Residual air is the small volume that cannot be exhaled. When the thorax is traumatized, however, a portion of the residual air is forced out and the person experiences the “wind” being knocked out of the lungs.

B. True–False Questions

1. True – Technically, O₂ is not within the body until pulmonary ventilation takes place and the O₂ molecules attach to the hemoglobin of the red blood cells.
2. False – The diaphragm is elevated when relaxed and lowered when contracted.
3. True – The normal recoiling of the rib cage and the elevation of the diaphragm accounts for most of the air movement during relaxed expiration.
4. False – Dyspnea is a feeling of shortness of breath.
5. True – An example of expiratory reserve volume would be the air that is forced out of the lungs with a cough or a sneeze.
6. True – A hiccup is actually a muscle twitch within the diaphragm.

V. Regulation of Breathing

A. Multiple Choice Questions

1. (d) – Trauma to the medulla oblongata frequently affects respiration and may cause death.
2. (b) – The phrenic nerves arise from the cervical plexus and pass through the mediastinum to innervate the diaphragm.
3. (c) – Monitoring of respiratory activity occurs in sites other than the lungs.
4. (e) – The glossopharyngeal nerves transmit respiratory sensations from the neck, and the vagus nerves transmit respiratory sensations from the thorax.

B. True–False Questions

1. True – For effective ventilation, the antagonistic functions of inspiration and expiration are not simultaneously stimulated.
2. True – Both the pons and the medulla oblongata contain respiratory nuclei.
3. False – Basic respiratory rates are initiated in the pons and the medulla oblongata.
4. False – The aortic and carotid bodies are chemoreceptors.

VI. Developmental Exposition of the Respiratory System

A. Multiple Choice Questions

1. (a) – Invagination of the olfactory placode precedes the formation of the nasal cavity.
2. (e) – Formation of the larynx, trachea, and structures of the lungs begins as laryngotracheal buds develop from the primitive gut of endoderm.

B. True–False Questions

1. True – As development of the respiratory system progresses, the ectodermal derivatives unite with the endodermal derivatives, and the respiratory passageway is established.
2. False – A cleft palate forms when the two portions of horizontal plate fail to fuse.
3. False – Although the organs of the respiratory system form early in embryonic development, they are not functionally mature until about the twenty-sixth week.

VII. Clinical Considerations

A. Multiple Choice Questions

1. (e) – Influenza is a viral disease that causes an inflammatory condition of the upper respiratory tract.
2. (c) – Eupnea is normal, relaxed breathing.
3. (a) – Emphysema is a chronic disease that gradually makes breathing more difficult as pulmonary alveoli are destroyed.

B. True–False Questions

1. False – Dyspnea is difficult breathing that may occur during shock or following hyperventilation.
2. True – Some of the residual air can be forced from the lungs by sharply compressing the abdomen, driving the diaphragm against the lungs.
3. False – Cyanosis is not a disease; rather, it is a symptom of a disease or a body dysfunction.

C. Matching Questions

Set 1:

- | | |
|--------|--------|
| 1. (b) | 4. (e) |
| 2. (c) | 5. (a) |
| 3. (d) | 6. (f) |

Set 2:

- | | |
|--------|--------|
| 1. (f) | 6. (c) |
| 2. (g) | 7. (a) |
| 3. (e) | 8. (i) |
| 4. (d) | 9. (h) |
| 5. (b) | |

VIII. Chapter Review

A. Completion Questions

1. nasal fossa
2. meatuses
3. uvula
4. adenoids
5. goblet
6. tracheotomy/tracheostomy
7. pulmonary alveoli
8. Surfactant
9. mediastinum
10. cardiac notch
11. visceral pleura
12. medulla oblongata
13. bronchial tree
14. diaphragm
15. 26