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Respiratory System

I. Introduction to the Respiratory System

☞ *Concept:* The respiratory system can be divided structurally into upper and lower divisions, and functionally into a conducting division and a respiratory division. The principal functions of the respiratory system are gaseous exchange, sound production, and assistance in abdominal compression.

A. Multiple Choice Questions

- ___ 1. The term *respiration* refers to
(a) ventilation (breathing).
(b) gas exchange within the lungs.
(c) O₂ utilization within the cells.
(d) all of the above.
- ___ 2. A structure that is *not* a part of the respiratory system is
(a) the nasal cavity. (d) the esophagus.
(b) the pharynx. (e) the larynx.
(c) the trachea.
- ___ 3. The functions of the respiratory system include all of the following *except*
(a) providing O₂ to the bloodstream and removing CO₂.
(b) creating air pressure that allows for swallowing.
(c) enabling vocalization as expired air passes over the vocal cords.
(d) assisting in abdominal compression.

B. True–False Questions

- ___ 1. During strenuous exercise, a person may breathe about 100 liters of air each minute.
- ___ 2. The conducting division of the respiratory system includes the nasal cavity and pharynx, whereas the respiratory division includes the larynx, trachea, and lungs.
- ___ 3. Reflexive nonbreathing air movements, such as coughing and sneezing, keep the air passageways clean.

II. Conducting Passages

☞ *Concept:* Air is conducted through the oral and nasal cavities to the pharynx, and then through the larynx to the trachea and bronchial tree. These structures deliver warmed and humidified air to the respiratory division within the lungs.

A. Multiple Choice Questions

- ___ 1. Which of the following is (are) *not* located within the nasal cavity?
(a) conchae (d) nasal septum
(b) meatuses (e) vibrissae
(c) uvula

- _____ 2. The roof of the nasal cavity is formed medially by
(a) the superior concha. (d) the choana.
(b) the nasal bone. (e) the cribriform plate of the
(c) the sphenoid bone. ethmoid bone.
- _____ 3. Mucus is secreted into the nasal cavity by
(a) the goblet cells. (d) the choanae.
(b) the vestibule. (e) the mast cells.
(c) the adenoids.
- _____ 4. Which of the following does *not* refer to a paranasal sinus?
(a) maxillary (d) frontal
(b) pterygoidal (e) ethmoidal
(c) sphenoidal
- _____ 5. A child who is a persistent mouth-breather because of blocked air passage in the nasopharynx probably has
(a) palatine tonsils. (d) lingual tonsils.
(b) nasal meatuses. (e) pharyngeal tonsils.
(c) paranasal sinuses.
- _____ 6. “Adam’s apple” is used to refer to
(a) the trachea. (d) the epiglottis.
(b) the thyroid cartilage. (e) the forbidden fruit.
(c) the larynx.
- _____ 7. The vocal folds are attached to
(a) the cricoid and thyroid cartilages.
(b) the cuneiform and cricoid cartilages.
(c) the corniculate and thyroid cartilages.
(d) the arytenoid and thyroid cartilages.
- _____ 8. Which of the following does (do) *not* apply to the trachea or bronchi?
(a) goblet cells (d) hyaline cartilage
(b) carina (e) simple squamous epithelium
(c) cilia
- _____ 9. Which of the following is the correct sequence in which inspired air flows?
(a) choana, pharynx, nasal fossa, larynx, trachea, bronchus, and lung
(b) nasal fossa, pharynx, larynx, choana, trachea, bronchus, and lung
(c) nasal fossa, choana, pharynx, larynx, trachea, bronchus, and lung
(d) choana, nasal fossa, larynx, pharynx, trachea, bronchus, and lung
- _____ 10. On its way to the pulmonary alveoli, inspired air comes in contact with various kinds of epithelia in the sequence
(a) simple squamous, stratified squamous, simple cuboidal, and pseudostratified ciliated columnar epithelia.
(b) pseudostratified ciliated columnar, stratified squamous, simple cuboidal, and simple squamous epithelia.
(c) stratified squamous, pseudostratified ciliated columnar, simple cuboidal, and simple squamous epithelia.
(d) pseudostratified ciliated columnar, stratified squamous, simple squamous, and simple cuboidal epithelia.

B. True–False Questions

- ___ 1. The supporting framework of the nasal septum consists of the perpendicular plate of the ethmoid bone, the vomer, and the septal cartilage.
- ___ 2. The nasal septum divides the nose into right and left nasal cavities.
- ___ 3. All inspired air through the nose has to pass through the vestibule, nasal fossa, and choana of the nasal cavity before entering the nasopharynx.
- ___ 4. Of the three pharyngeal regions, only the oropharynx serves both the respiratory and digestive systems.
- ___ 5. The larynx is composed of nine paired cartilages.
- ___ 6. The ventricular folds (false vocal cords) support the true vocal cords and are not used in sound production.
- ___ 7. The act of swallowing depresses the epiglottis, closing the glottis so that food or fluid does not enter the trachea.
- ___ 8. The patency of the trachea is maintained by a series of complete hyaline cartilaginous rings.
- ___ 9. The bronchioles contain smooth muscles that can autonomically determine the amount of air reaching the alveoli.
- ___ 10. Protective structures of the respiratory system include vibrissae, ciliated cells, patent (open) passageways, and mucus secreted from goblet cells.

III. Pulmonary Alveoli, Lungs, and Pleurae

☞ *Concept:* Pulmonary alveoli are the functional units of the lungs, where gas exchange occurs. Right and left lungs are separately contained in pleural membranes.

A. Multiple Choice Questions

- ___ 1. The functional units of the respiratory system, where gas exchange occurs are
 - (a) the pulmonary alveoli.
 - (b) the pleurae.
 - (c) the lungs.
 - (d) the pulmonary vessels.
 - (e) the terminal bronchioles.
- ___ 2. Which of the following statements is *false* concerning the pulmonary alveoli?
 - (a) They are lined with ciliated epithelium.
 - (b) They are moistened with surfactant.
 - (c) They number about 350 million per lung.
 - (d) They permit diffusion of respiratory gases.
- ___ 3. The region where a bronchus and pulmonary vessel enter and exit the lung is
 - (a) the capsule.
 - (b) the base.
 - (c) the hilum.
 - (d) the apex.
 - (e) the cupola.
- ___ 4. Which of the following statements is *false* concerning the structure of the left lung?
 - (a) It is subdivided into a superior lobe and an inferior lobe.
 - (b) It contains a cardiac notch.
 - (c) It contains 10 bronchial segments.
 - (d) Its apex extends above the level of the clavicle.
 - (e) It is covered with parietal pleura.

- ___ 5. Of the following serous membranes, the one that lines the thoracic walls and the thoracic surface of the diaphragm is
- (a) the parietal pleura. (d) the visceral pleura.
 (b) the pleural peritoneum. (e) the costal pleura.
 (c) the mediastinal pleura.
- ___ 6. The pleurae perform all of the following functions *except* that of
- (a) separating the thoracic viscera.
 (b) secreting serous fluid.
 (c) forming an effective pressure chamber.
 (d) facilitating the diffusion of respiratory gases.

B. True–False Questions

- ___ 1. The air-blood barrier within the lungs is only one cell layer thick.
- ___ 2. The area between the lungs is known as the pleural septum.
- ___ 3. Both lungs have three lobes and two fissures.
- ___ 4. Emphysema and lung cancer are diseases that are linked to heavy smoking.
- ___ 5. The pleural cavity represents the total volume of the pulmonary alveoli.
- ___ 6. The parietal pleura and visceral pleura converge to form the pulmonary ligament at the root of the lung.

IV. Mechanics of Breathing

☞ *Concept:* Normal quiet inspiration is achieved by muscle contraction, and quiet expiration results from muscle relaxation and elastic recoil. A deeper inspiration and expiration can be forced by contractions of the accessory respiratory muscles. The amount of air inspired and expired can be measured to test pulmonary function.

A. Multiple Choice Questions

- ___ 1. The principal muscles responsible for the inspiration phase of pulmonary ventilation are
- (a) the diaphragm and internal intercostal muscles.
 (b) the scalenes and internal intercostal muscles.
 (c) the internal and external intercostal muscles.
 (d) the diaphragm, external intercostal muscles, and internal intercostal muscles (interchondral part).
 (e) the scalenes and external intercostal muscles.
- ___ 2. When the external intercostal muscles contract, the thoracic volume increases
- (a) vertically. (c) inferiorly.
 (b) anteroposteriorly. (d) superiorly.
- ___ 3. Which of the following muscles does (do) *not* contract during extreme forced expiration—as in coughing?
- (a) the internal intercostals (d) the internal abdominal oblique
 (b) the transverse abdominis (e) the external abdominal oblique
 (c) the diaphragm
- ___ 4. Air that is moved in and out of the lungs during normal quiet breathing is called
- (a) tidal volume. (d) inspiratory reserve volume.
 (b) vital capacity. (e) vital volume.
 (c) residual volume.

- _____ 5. When a person takes a very deep breath of air just prior to diving into water, this volume of air is referred to as
 (a) the tidal volume. (d) the inspiratory reserve volume.
 (b) the vital capacity. (e) the vital volume.
 (c) the residual volume.
- _____ 6. When the “wind” is knocked out of a football player because of a hard blow to the thorax or abdomen, the air that is actually forced out of his lungs is
 (a) the tidal volume. (d) the inspiratory reserve volume.
 (b) the vital capacity. (e) the vital volume.
 (c) the residual volume.

B. True–False Questions

- _____ 1. Breathing is the movement of air through the respiratory passageways, whereas ventilation is movement of respiratory gases through the alveolar walls.
- _____ 2. Nerve impulses through the phrenic nerve cause the diaphragm to elevate as it contracts.
- _____ 3. Relaxed expiration is a passive process, requiring little if any muscular contraction.
- _____ 4. Dyspnea is thoracic pain accompanying pleurisy.
- _____ 5. The expiratory reserve volume is the amount of air that can be exhaled during forced breathing in addition to the tidal volume.
- _____ 6. A hiccup is a spasmodic contraction of the diaphragm while the glottis is closed, producing a sharp inspiratory sound.

V. Regulation of Breathing

☞ *Concept:* The rhythm of breathing is controlled by centers in the brain stem. These centers are influenced by higher brain function and regulated by sensory input that makes breathing responsive to the changing respiratory needs of the body.

A. Multiple Choice Questions

- _____ 1. The principal respiratory center that directly controls breathing is located in
 (a) the cerebrum. (d) the medulla oblongata.
 (b) the hypothalamus. (e) the cerebellum.
 (c) the lung.
- _____ 2. The diaphragm is innervated by
 (a) the inspiratory nerves. (c) the vagus nerves.
 (b) the phrenic nerves. (d) the intercostal nerves.
- _____ 3. Which of the following does (do) *not* contain respiratory chemoreceptors?
 (a) aortic arch (c) lungs
 (b) carotid arteries (d) medulla oblongata
- _____ 4. The two cranial nerves that transmit sensory information to the brain from the peripheral, respiratory chemoreceptors are
 (a) the facial and vagus nerves.
 (b) the facial and glossopharyngeal nerves.
 (c) the glossopharyngeal and hypoglossal nerves.
 (d) the hypoglossal and vagus nerves.
 (e) the glossopharyngeal and vagus nerves.

B. True–False Questions

- ___ 1. When the inspiratory portion of the brain is stimulated, the expiratory portion is inhibited.
- ___ 2. The pneumotaxic and apneustic centers of the pons promote the activity of the inspiratory neurons of the medulla oblongata.
- ___ 3. The brain stem respiratory centers must be externally stimulated in order to function.
- ___ 4. The aortic and carotid bodies are pressure receptors that respond to increased arterial pressure.

VI. Developmental Exposition of the Respiratory System

A. Multiple Choice Questions

- ___ 1. During embryonic development, the olfactory placode becomes
 - (a) the nasal cavity.
 - (b) the larynx.
 - (c) the trachea.
 - (d) the lung.
 - (e) the bronchial tree.
- ___ 2. Which statement is *true* concerning the laryngotracheal bud?
 - (a) It forms from endoderm.
 - (b) It forms during the fourth week of development.
 - (c) It gives rise to the trachea.
 - (d) It gives rise to the pulmonary alveoli.
 - (e) All of the above are true.

B. True–False Questions

- ___ 1. Except for the derivatives of the olfactory placode, the entire respiratory system develops from endoderm.
- ___ 2. A cleft palate forms when the vertical plate fails to fuse to the hard palate during embryonic development.
- ___ 3. The respiratory system is fully developed by the end of the embryonic period (9 weeks).

VII. Clinical Considerations

A. Multiple Choice Questions

- ___ 1. Which of the following conditions does *not* apply directly to the lungs?
 - (a) pneumonia
 - (b) asthma
 - (c) emphysema
 - (d) tuberculosis
 - (e) influenza
- ___ 2. Which of the following conditions could *not* result from trauma?
 - (a) epistaxis
 - (b) pneumothorax
 - (c) eupnea
 - (d) collapsed lung
 - (e) dyspnea
- ___ 3. The disease that causes breakdown of the pulmonary alveoli, thus increasing the size of the air spaces and decreasing the surface area, is called
 - (a) emphysema.
 - (b) asthma.
 - (c) tuberculosis.
 - (d) pneumonia.
 - (e) pleurisy.

B. True–False Questions

- ___ 1. Eupnea is a temporary failure of breathing that may occur during shock or following hyperventilation.
- ___ 2. The effectiveness of the abdominal thrust maneuver lies in the fact that forcefully causing the residual air to rush from the lungs may free a lodged object from the air passageway.
- ___ 3. Cyanosis is a disease of the respiratory system that causes a blue discoloration of the skin.

C. Matching Questions

Set 1: Match each breathing pattern with its description.

- | | |
|------------------|---|
| ___ 1. dyspnea | (a) normal, relaxed breathing |
| ___ 2. hyperpnea | (b) labored breathing |
| ___ 3. tachypnea | (c) abnormally deep breathing |
| ___ 4. apnea | (d) rapid, shallow breathing |
| ___ 5. eupnea | (e) temporary cessation of breathing |
| ___ 6. orthopnea | (f) inability to breathe comfortably while lying down |

Set 2: Match each respiratory condition with its symptom.

- | | |
|---------------------------------|---|
| ___ 1. pleurisy | (a) inadequately oxygenated blood |
| ___ 2. emphysema | (b) inflammation of the larynx |
| ___ 3. pneumonia | (c) inflammatory condition of the upper respiratory tract |
| ___ 4. bronchitis | (d) infection of the bronchi |
| ___ 5. laryngitis | (e) infection and inflammation of the lungs |
| ___ 6. influenza | (f) inflammation of the pleura |
| ___ 7. cyanosis | (g) breakdown of the alveoli |
| ___ 8. epistaxis | (h) lack of sufficient surfactant |
| ___ 9. hyaline membrane disease | (i) nosebleed |

VIII. Chapter Review

A. Completion Questions

1. The nasal septum divides the nasal cavity into two lateral halves, each referred to as a _____.
2. Air passages between the conchae in the nasal cavity are referred to as _____.
3. The pendulous _____ hangs from the middle lower border of the soft palate, where it closes the nasopharynx during swallowing.
4. The pharyngeal tonsils are also known as _____.

5. Mucus-secreting _____ cells occur throughout most of the upper respiratory tract.
6. A _____ is the process of surgically opening the trachea and a _____ is the procedure of inserting a tube into the trachea to permit breathing.
7. Thin-walled _____ permit gas exchange between the respiratory and circulatory systems.
8. _____, produced by type II alveolar cells, reduces alveolar surface tension.
9. The _____ is the area between the lungs.
10. The _____ is a depression on the medial surface of the left lung to accommodate the heart.
11. The _____ is a serous membrane that adheres to the outer surface of the lung.
12. Ventilation is directly controlled by the rhythmicity center in the _____.
13. The _____ is composed of a series of respiratory tubes that branch into progressively narrower tubes as they extend into the lungs.
14. The _____ is the principal muscle of inspiration.
15. The lungs are not fully functional until about week _____ of development.