

## Chapter 01: Anatomy of the Cardiovascular and Pulmonary Systems

### Hillegass: Essentials of Cardiopulmonary Physical Therapy, 4th Edition

#### MULTIPLE CHOICE

1. Which of the following chest wall structures is located level with the second costal cartilage anteriorly and thoracic vertebra T4 and T5 posteriorly?
  - a. Sternal angle
  - b. Jugular notch
  - c. Xiphoid process
  - d. Third costal cartilage

ANS: A

The sternal angle of the “angle of Louis” is level with the second costal cartilage anteriorly and thoracic vertebrae T4 and T5 posteriorly.

PTS: 1

2. Pectus excavatum is BEST described as:
  - a. deformity of the sternum caused by trauma.
  - b. caved-in appearance of the chest.
  - c. diminished rib angle anteriorly.
  - d. conical shape of the thoracic cage.

ANS: B

Pectus excavatum is a common congenital deformity of the anterior wall of the chest, in which several ribs and the sternum grow abnormally; it produces a caved-in or sunken appearance of the chest.

PTS: 1

3. The true ribs are BEST defined by which of the following statements?
  - a. Vertebrochondral ribs
  - b. Vertebrosteral ribs
  - c. Ribs 11 and 12
  - d. Ribs 8, 9, and 10

ANS: B

The first seven ribs attach via their costal cartilages to the sternum and are called the true ribs (also known as the vertebrosteral ribs).

PTS: 1

4. Which of the following interventions is MOST appropriate for a patient with lower rib fractures?
  - a. Short, shallow breaths
  - b. Pursed lip breathing
  - c. Deep breaths with splinting
  - d. Breathing with arms raised

ANS: C

It is important for all therapists to recommend breathing (deep breathing), splinting (i.e., pillow), and coughing strategies for patients with rib fractures.

PTS: 1

5. Which of the following positions facilitates greater excursion of both hemidiaphragms at rest?
- Supine position
  - Side-lying position
  - Standing position
  - Sitting position

ANS: A

In the supine position, without the effects of gravity, the level of the diaphragm in the thoracic cavity rises. This allows for a relatively greater excursion.

PTS: 1

6. Which of the following muscles help to achieve the active process of inspiration at rest in a normal, nonsmoking individual?
- Sternocleidomastoid
  - Diaphragm
  - Abdominal muscles
  - Trapezius

ANS: B

The diaphragm and internal intercostals (intercartilaginous portion) are the essential muscles to achieve the active process of inspiration at rest. Abdominal muscles assist with expiration. The sternocleidomastoid and trapezius are accessory muscles and assist with a more forceful inspiration.

PTS: 1

7. Which of the following accessory muscles of ventilation function to elevate and fix the first and second ribs?
- Sternocleidomastoid muscle
  - Serratus anterior
  - Latissimus dorsi
  - Scalene muscle

ANS: D

The scalene muscles lie deep to the sternocleidomastoid, but may be palpated in the posterior triangle of the neck. These muscles function as a unit to elevate and fix the first and second ribs. The sternocleidomastoid muscle elevates the sternum.

PTS: 1

8. When the arms and shoulders are fixed, by leaning on the elbows or grasping onto a table, this muscle can use its insertion as its origin and facilitate an increase in the A-P diameter of the thorax.
- Upper trapezius
  - Pectoralis major
  - Sternocleidomastoid

d. Serratus anterior

ANS: B

When the insertion and origin of the pectoralis muscle are reversed by leaning on a table to fix the arms, the muscle will pull on the anterior chest wall, lifting the ribs and sternum to increase the A-P diameter of the thoracic cage.

PTS: 1

9. The serous fluid within the pleural space serves to provide which of the following functions?
- Create a constant negative pressure.
  - Assist with venous return of blood to the heart.
  - Reduce friction between the lungs and thoracic wall.
  - Serve to allow separation of the pleural layers.

ANS: C

The serous fluid within the pleural space serves to hold the pleural layers together during ventilation and reduce friction between the lungs and thoracic wall. The space creates a negative pressure to maintain lung inflation, not the fluid itself.

PTS: 1

10. Irritation of the phrenic nerve supplied pleura results in which of the following pain referral patterns?
- Thoracic wall
  - Abdominal wall
  - Mediasternal region
  - Lower neck and shoulder

ANS: D

Irritation of the phrenic nerve supplied pleura can result in referred pain in the lower neck and shoulder, whereas, irritation of the intercostally innervated pleura may result in referral of pain to the thoracic or abdominal wall.

PTS: 1

11. An abnormal pleural friction rub on auscultation BEST indicates which of the following?
- Infection with a resultant inflammatory response within the pleura
  - A buildup of fluid in the pleural space following cardiothoracic surgery
  - The presence of blood in the pleural space
  - A bacterial infection with resultant pus in the pleural space

ANS: A

Infection with a resultant inflammatory response within the pleura is termed pleuritis or pleurisy and is best appreciated through the presence of pleural chest pain and an abnormal pleural friction rub on auscultation. A buildup of fluid, blood, or air in the space would result in diminished or absent breath sounds in the area.

PTS: 1

12. The presence of four segments (anterior basal, superior basal, lateral basal, and posterior basal) BEST describes which of the following lobes?

- a. Right upper lobe
- b. Left upper lobe
- c. Right middle lobe
- d. Right lower lobe

ANS: D

The lowermost lobe, the right lower lobe, consist of four segments (anterior basal, superior basal, lateral basal, and posterior basal).

PTS: 1

13. The physical therapist performs auscultation of the lateral portion of right middle lobe. Which of the following stethoscope locations BEST identifies this lung segment?
- a. Adjacent to the fifth rib lateral right chest wall
  - b. Adjacent to third to fifth rib posterior right chest wall
  - c. Adjacent to the fourth rib lateral right chest wall
  - d. Adjacent to the eighth thoracic vertebra lateral chest wall

ANS: A

The right middle lobe is subdivided into the lateral and medial lobes. This lobe is the smallest of the three lobes. Its inferior border is adjacent to the fifth rib laterally and sixth rib medially.

PTS: 1

14. The BEST reason why a physical therapist should acquire an understanding of the various lobes and segments and their anatomical orientation is which of the following?
- a. Provide tactile feedback for segmental breathing.
  - b. Placement of a stethoscope for auscultation.
  - c. Perform appropriate positioning during pulmonary hygiene.
  - d. Educate patients on best positioning during coughing.

ANS: C

An understanding of the various lobes and segments and their anatomical orientation is important for placement of a stethoscope during auscultation, but is more essential when the therapist is using positions to facilitate removal of secretions from various aspects of the lung during bronchopulmonary hygiene intervention.

PTS: 1

15. Which of the following upper respiratory structures provide humidification?
- a. Nasopharynx
  - b. Pharynx
  - c. Larynx
  - d. Nasal cavity

ANS: D

The primary respiratory functions of the nasal cavity include air conduction, filtration, humidification, and temperature control.

PTS: 1

16. During the administration of suctioning procedures, which of the following may cause an adverse response in the patient?
- An elicited parasympathetic response
  - The catheter is inserted to the carina level
  - A cough is stimulated
  - The use of a nasal trumpet during suctioning

ANS: A

During suctioning procedures, the catheter is inserted to the level of the carina. When the catheter is in contact with the carina, a cough is ensued along with a strong parasympathetic response. The parasympathetic response may cause a decrease in heart rate and oxygen levels.

PTS: 1

17. Which of the following lung architecture characteristics creates an increased susceptibility for aspiration in the lung?
- A left mainstem angle of 40 to 60 degrees from the trachea
  - A right mainstem angle of 25 degrees from the trachea
  - A length of 2 inches from the trachea to the lung
  - A length of 1 inch from the trachea to the lung

ANS: B

The 25-degree angle of the right mainstem from the trachea predisposes foreign objects, food, and fluids to enter the right lung. Thus aspiration is relatively more common in the right lung as compared to the left lung.

PTS: 1

18. Smoking specifically diminishes the function of which type of cells in the bronchial epithelium?
- Goblet cells
  - Ciliated cells
  - Mucous cells
  - Serous cells

ANS: B

Smoking paralyzes ciliated epithelial cells. These cilia will be paralyzed for 1 to 3 hours after smoking a cigarette, or in chronic smokers will be permanently paralyzed.

PTS: 1

19. Which of the following functions does the myocardium layer of the heart serve?
- Forms a continuous lining with the tissue of the valves.
  - Minimizes friction during cardiac contraction.
  - Provides a tough fibrous layer of dense irregular connective tissue.
  - Facilitates the pumping action of the heart.

ANS: D

The middle layer of the heart of myocardium facilitates the pumping action of the heart due to the presence of contractile elements. Myocardial cells are housed in this layer and are categorized as mechanical cells for conduction and conductive cells for electrical conduction.