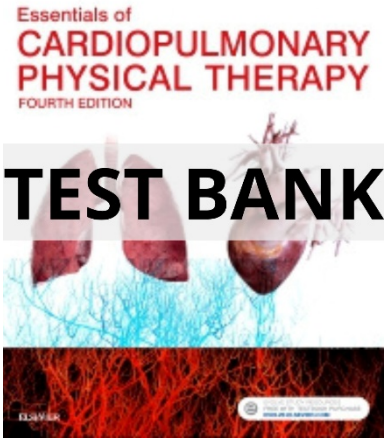
Chapter 01: Anatomy of the Cardiovascular and Pulmonary Systems
Hillegass: Essentials of Cardiopulmonary Physical Therapy, 4th Edition

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. Vertebrosternal 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 vertebrosternal 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?
   a. Supine position
   b. Side-lying position
   c. Standing position
   d. 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?
   a. Sternocleidomastoid
   b. Diaphragm
   c. Abdominal muscles
   d. 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?
   a. Sternocleidomastoid muscle
   b. Serratus anterior
   c. Latissimus dorsi
   d. 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.
   a. Upper trapezius
   b. Pectoralis major

c. 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?
a. Create a constant negative pressure.
b. Assist with venous return of blood to the heart.
c. Reduce friction between the lungs and thoracic wall.
d. 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?
a. Thoracic wall
b. Abdominal wall
c. Mediasternal region
d. 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?
a. Infection with a resultant inflammatory response within the pleura
b. A buildup of fluid in the pleural space following cardiothoracic surgery
c. The presence of blood in the pleural space
d. 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?

a. An elicited parasympathetic response
b. The catheter is inserted to the carina level
c. A cough is stimulated
d. 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. A left mainstem angle of 40 to 60 degrees from the trachea
b. A right mainstem angle of 25 degrees from the trachea
c. A length of 2 inches from the trachea to the lung
d. 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?
a. Goblet cells
b. Ciliated cells
c. Mucous cells
d. 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?
a. Forms a continuous lining with the tissue of the valves.
b. Minimizes friction during cardiac contraction.
c. Provides a tough fibrous layer of dense irregular connective tissue.
d. 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.

PTS: 1

20. The atrial kick created by the contractile ability of the pectinate muscles in the atria account for what percent of the cardiac output?
    a. 15% to 20%
    b. 5% to 10%
    c. 25%
    d. Less than 5%

    ANS: A
    The effective contraction of the pectinate muscles of the atria accounts for approximately 15% to 20% of cardiac output—the atrial kick.

    PTS: 1

21. Regurgitation or insufficiency of the mitral valve causes blood to accumulate in which of the following heart chambers?
    a. Right ventricle
    b. Left ventricle
    c. Right atrium
    d. Left atrium

    ANS: D
    The mitral valve allows blood to be ejected from the left atrium to the left ventricle. If regurgitation of the mitral valve develops, blood will accumulate in the left atrium and elevate left atrial pressures.

    PTS: 1

22. Which of the following BEST describes the vagus nerve function in the heart?
    a. Creates the impulses that pace the heart.
    b. Creates an inhibitory effect decreasing the heart rate.
    c. Stimulates the release of catecholamines.
    d. Provides an excitatory effect on the heart for fight or flight.

    ANS: B
    The vagus nerve provides parasympathetic stimulation and is cardio inhibitory or slows the heart rate and contractility.

    PTS: 1

23. Occlusion of the circumflex artery MOST likely causes an infarction in which of the following regions within the heart?
    a. SA node in the right atrium
    b. Lateral aspect of the left ventricle
    c. Anterior aspect of the left ventricle
    d. Inferior portion of the left ventricle

    ANS: B
    The circumflex artery supplies blood to the lateral aspect of the left ventricle.

    PTS: 1

24. Which of the following veins empties into the left atrium?
    a. Superior vena cava

b. Inferior vena cava
c. Pulmonary vein
d. Coronary sinus vein

ANS: C
The pulmonary veins, unlike the systemic veins, have no valves. They originate in the capillary networks and join together to ultimately form two veins—a superior and an inferior pulmonary vein—from each lung, which open separately into the left atrium.

PTS: 1

25. Which of the following statements is true when describing characteristics of veins?
a. Veins have thin walls and small diameters.
b. Veins contain valves with bidirectional flow.
c. Venous elasticity promotes recoil of the wall.
d. Muscle pump activity has a milking effect on veins.

ANS: D
Veins have thin walls and large diameters, contain valves that create a unidirectional flow, and have less elastic tissue; venous blood flow back to the heart is facilitated by the milking effect of muscle pump activity.

PTS: 1

26. Which of the following factors affecting the diaphragm MOST likely will cause an automatic firing of the accessory muscles to trigger inspiration?
a. Stomach fullness
b. Flat and rigid diaphragm
c. Obesity with the presence of pannus
d. Ascites due to liver disease

ANS: B
Patients with COPD tend to develop a flattening of the diaphragm due to the presence of hyperinflated lungs. A flat and rigid diaphragm cannot be strengthened and will cause an automatic firing of the accessory muscles to trigger inspiration. The other factors may affect normal excursion of the diaphragm, but still allow for the diaphragm to function.

PTS: 1

27. The point at which the nerves, vessels, and primary bronchi penetrate the parenchyma of each lung is termed the:
a. root.
b. fissure.
c. hilus.
d. segment.

ANS: C
The point at which the nerves, vessels, and primary bronchi penetrate the parenchyma of each lung is termed the hilus.

PTS: 1

28. The right upper lobe bronchus divides into which of the following?

a. Lateral and medial segment
b. Superior segment to the upper portion
c. Apical, posterior, and anterior segments
d. Lower lobe bronchus to the medial basal segment

ANS: C
The right upper lobe bronchus divides into three segmental bronchi: apical segmental bronchus, posterior segmental bronchus, and anterior segmental bronchus.

PTS: 1

29. Which of the following cells are involved in the production of surfactant?
a. Granular pneumocytes
b. Squamous pneumocytes
c. Endothelial cells
d. Serous cells

ANS: A
Granular pneumocyte (Type II) cells are thick, cuboidal shaped, cover 7% of the alveolar wall, and are involved in the production of surfactant.

PTS: 1

30. Which of the following anatomical landmarks coincides with the apex of the heart?
a. Left side at the third intercostal space
b. Left fifth intercostal space at the midclavicular line
c. Second intercostal space
d. Right fifth intercostal space at the midclavicular line

ANS: B
The apex of the heart is defined as the tip of the left ventricle and it projects into the fifth intercostal space on the left at the midclavicular line.

PTS: 1

Chapter 02: Physiology of the Cardiovascular and Pulmonary Systems
Hillegass: Essentials of Cardiopulmonary Physical Therapy, 4th Edition

MULTIPLE CHOICE

1. The primary function of the pulmonary system is which of the following?
a. Regulating acid–base balance and maintaining normal blood pH
b. Filtering and metabolizing toxic substances
c. Achieving temperature homeostasis through evaporative heat loss
d. Exchange of oxygen and carbon dioxide between environment, blood, and tissue

ANS: D
According to the author, the most important function of the pulmonary system is to exchange oxygen and carbon dioxide between the environment, blood, and tissue.

PTS: 1

2. The total volume of air that is inhaled or exhaled in 1 minute is termed: