

## PHYL 422 Review Questions

## Set 3

1. Which of the following tend to increase airway resistance?
  - a. Stimulation of the parasympathetic postganglionic fibers innervating the bronchial and bronchiolar smooth muscle
  - b. Low lung volumes
  - c. Forced expiration
  - d. Breathing through the nose instead of the mouth
  - e. Bronchoconstriction in response to an allergen
  - f. All of the above.
  
2. Which of the following statements are true about the small airways in health?
  - a. Small airways refer to airways less than 2 mm in diameter.
  - b. In health, the small airways are the major contributors to total airway resistance due to their small radii.
  - c. Alveolar elastic recoil plays a major role in determining the resistance to airflow in small airways, because alveolar septal traction opposes dynamic compression.
  - d. Airflow in small airways is usually laminar.
  - e. Small airways have cartilaginous support.
  
3. Based on the equal pressure point hypothesis, which of the following statements are correct?
  - a. During breath holding, with the airway (glottis) open, alveolar pressure exceeds intra-pleural pressure by a value equal to the lung elastic recoil.
  - b. During expiration, if intra-pleural pressure is increased the alveolar pressure will decrease.
  - c. As forced expiratory effort continues, the EPP moves upstream, from larger to smaller airways because as lung volume decreases, the elastic recoil of the lung decreases.
  - d. In health, dynamic compression of the airway can result in a closing volume at high lung volumes.
  - e. There is more dynamic compression of airways at high lung volumes than there is at low lung volumes.
  - f. Early on in forced expiration, the peak expired flow achieved is independent of expiratory muscle effort.
  - g. Throughout most of an FVC maneuver, maximal flow rate is limited because of the development of an EPP.
  - h. The pressure gradient down the upstream segment is by definition equal to the lung elastic recoil and this is the driving pressure producing the maximal expiratory flow.
  - i. The resistance in the upstream segment determines the value of maximal flow.

4. In the upright lungs, distribution of ventilation is greater in the base of the lungs relative to the apices because:
  - a. The alveoli in the base of the lung have larger initial size.
  - b. The intra-pleural pressure decreases from the top of the lungs to the base
  - c. The alveoli in the base of the lungs are operating at the steep portion of the PV curve of the lungs.
  - d. Alveolar pressure decreases from the top of the lungs to the base.
  - e. The change in volume of the alveoli in the base of the lung is greater than the change in volume in the alveoli at the apices
  
5. Determine whether the following statements are true or false.
  - a. One of the tests for measuring the uneven distribution of alveolar ventilation in the upright lung involves inhaling 100% oxygen from RV to TLC and determining the change in the nitrogen concentration over time during "phase IV" of the subsequent expiration.
  - b. Constriction of an airway, shortens its time constant and decreases its filling time.
  - c. In health, airway closure occurs at volumes close to RV and is reflected by gradual rise in nitrogen concentration during "phase III" of the Fowler's single breath oxygen test.
  - d. In emphysema, some of the airways distal to the terminal bronchioles are dilated due to destruction of their alveolar walls, these airways tend to fill slowly due to an increase in their time constants.
  - e. In old age, there is loss of alveolar elastic recoil, reducing the outward alveolar traction on neighbouring airways. For this reason, airway closure occurs at relatively high lung volumes, close to FRC.
  
6. Which of the following statements are correct?
  - a. Pulmonary vascular resistance is lowest at TLC
  - b. Extra-alveolar pulmonary vessels are relatively constricted at low lung volumes
  - c. The diameter of alveolar pulmonary vessels is relatively larger at low lung volumes
  - d. Pulmonary vascular resistance is 10 fold greater than systemic vascular resistance.
  - e. Pulmonary artery wedge pressure reflects left atrial pressure and is typically about 5mm Hg
  
7. The hydrostatic pressure differences from the apex to the base of the lung result in which of the following?
  - a. An increase in alveolar pressure from the top to the base of the lungs.
  - b. Greater alveolar pressure relative to pulmonary artery pressure at the tip of the lungs during diastole.
  - c. Greater venous pressure in zone 2 relative to alveolar and pulmonary arterial pressure.
  - d. Greatest blood flow to the base of the lungs.
  - e. A gradient in blood flow from the top to the base of the lungs larger than the gradient for regional alveolar ventilation from the top to the base of the lungs.

8. Which of the following statements are true?
- a. In an upright individual, ventilation-perfusion ratio is lowest at the base of the lungs.
  - b. In an "ideal alveolus" the partial pressure of alveolar gases and end capillary gases are equal.
  - c. An infinite V/Q ratio reflects a "shunt unit" with alveolar partial pressure of gases equivalent to that of mixed venous blood
  - d. In a sleeping bat at rest, the V/Q ratio is highest at the lung apices.
  - e. V/Q ratio for the whole lung is about 0.8-1.2.

### Answers

- 1. f
- 2. a,c,d
- 3. a,c,g,h,i
- 4. c,e
- 5. a) False, slope of phase III reflects the uneven distribution of ventilation.  
b) False: Airway constriction would result in an increase in airway resistance. The time constant is the product of resistance and compliance. An increase in resistance will increase the time constant and increase the time required to fill the airway.  
c) False: CV does occur near RV but it is indicated by the rise of nitrogen in Phase IV  
d) True  
e) True
- 6. b,c,e
- 7. b,d,e
- 8. a,b,e