

1. During quiet inhalation, air enters the lungs primarily because:
  - A. Thoracic pressure exceeds alveolar pressure
  - B. Alveolar pressure drops below atmospheric pressure
  - C. Atmospheric pressure decreases below thoracic pressure
  - D. Elastic recoil actively pulls air inward
  
2. According to Boyle's law, increasing lung volume during inspiration directly results in:
  - A. Increased intrapulmonic pressure
  - B. No change in intrapulmonic pressure
  - C. Decreased intrapulmonic pressure
  - D. Increased airway resistance
  
3. Which factor contributes MOST to elastic recoil of the lungs during normal exhalation?
  - A. Smooth muscle contraction in bronchioles
  - B. Surface tension of alveolar fluid
  - C. Active contraction of abdominal muscles
  - D. Increased surfactant secretion
  
4. In premature infants with surfactant deficiency, alveolar collapse occurs mainly because of:
  - A. Increased lung compliance
  - B. Reduced elastic fibers
  - C. Increased surface tension
  - D. Decreased airway resistance
  
5. Lung compliance is decreased in all of the following conditions EXCEPT:
  - A. Pulmonary edema
  - B. Tuberculosis
  - C. Paralysis of intercostal muscles
  - D. Increased surfactant production
  
6. During forced inspiration, which muscle becomes functionally significant but not during quiet breathing?
  - A. Internal intercostals
  - B. Diaphragm
  - C. Sternocleidomastoid
  - D. Abdominal muscles
  
7. Airway resistance is lowest when bronchioles are:

- A. Narrowed during exhalation
- B. Surrounded by contracted smooth muscle
- C. Expanded during inhalation
- D. Filled with fluid

8. Sympathetic stimulation of airway smooth muscle results in:

- A. Bronchoconstriction and increased resistance
- B. Bronchodilation and decreased resistance
- C. No change in airway diameter
- D. Increased surface tension

9. Which statement best explains why CO<sub>2</sub> diffuses faster than O<sub>2</sub> across the respiratory membrane?

- A. CO<sub>2</sub> has a lower molecular weight
- B. CO<sub>2</sub> has a higher partial pressure gradient
- C. CO<sub>2</sub> is more soluble in body fluids
- D. CO<sub>2</sub> binds more strongly to hemoglobin

10. Minute ventilation (MV) is calculated as:

- A. Tidal volume ÷ respiratory rate
- B. Inspiratory reserve volume × expiratory reserve volume
- C. Respiratory rate × tidal volume
- D. Vital capacity ÷ residual volume

11. Alveolar ventilation rate differs from minute ventilation because it:

- A. Includes residual volume
- B. Excludes dead space air
- C. Includes expiratory reserve volume
- D. Depends only on lung compliance

12. Which lung volume cannot be measured directly using spirometry?

- A. Tidal volume
- B. Inspiratory reserve volume
- C. Residual volume
- D. Vital capacity

13. Functional residual capacity is the sum of:

- A. Tidal volume + inspiratory reserve volume

- B. Inspiratory reserve volume + residual volume
- C. Expiratory reserve volume + residual volume
- D. Vital capacity + residual volume

14. In COPD patients, FE<sub>1</sub> is reduced primarily due to:

- A. Increased lung compliance
- B. Increased airway resistance
- C. Reduced alveolar surface area
- D. Decreased hemoglobin affinity for O<sub>2</sub>

15. According to Dalton's law, partial pressure of a gas depends on:

- A. Its solubility in plasma
- B. Total pressure and gas percentage
- C. Temperature only
- D. Respiratory membrane thickness

16. Alveolar air compared to atmospheric air contains:

- A. More O<sub>2</sub> and less CO<sub>2</sub>
- B. Less O<sub>2</sub> and more CO<sub>2</sub>
- C. Equal O<sub>2</sub> and CO<sub>2</sub>
- D. Less nitrogen only

17. Henry's law explains gas diffusion based primarily on:

- A. Molecular weight only
- B. Partial pressure and solubility
- C. Temperature and pressure
- D. Alveolar surface area

18. External respiration refers to gas exchange between:

- A. Blood and tissue cells
- B. Blood and mitochondria
- C. Alveoli and pulmonary capillaries
- D. Systemic capillaries and tissues

19. During exercise, incomplete equilibration of blood gases may occur mainly because of:

- A. Reduced alveolar ventilation
- B. Shortened pulmonary capillary transit time

- C. Decreased alveolar surface area
- D. Increased surfactant secretion

20. The driving force for oxygen diffusion into tissue cells at rest is primarily the difference between:

- A. Alveolar  $PO_2$  and blood  $PO_2$
- B. Blood  $PO_2$  and tissue cell  $PO_2$
- C. Blood  $PCO_2$  and tissue  $PCO_2$
- D. Alveolar  $PO_2$  and tissue  $PO_2$

21. Only a small percentage of oxygen is transported dissolved in plasma because:

- A. Oxygen has high molecular weight
- B. Oxygen has low solubility in water
- C. Hemoglobin saturation is low
- D. Partial pressure is insufficient

22. Hemoglobin is considered 50% saturated when:

- A. Two  $O_2$  molecules are bound per Hb
- B. Half of RBCs carry oxygen
- C.  $PO_2$  is 50 mmHg
- D. Plasma oxygen is 50% dissolved

23. The Bohr effect describes the relationship between hemoglobin affinity for  $O_2$  and:

- A. Temperature only
- B.  $PCO_2$  only
- C. pH and hydrogen ion concentration
- D. Bicarbonate levels only

24. Increased  $PCO_2$  in tissues promotes oxygen unloading from hemoglobin mainly by:

- A. Increasing blood temperature
- B. Decreasing blood pH
- C. Increasing  $PO_2$
- D. Increasing hemoglobin saturation

25. During hypothermia, oxygen delivery to tissues is reduced because:

- A. Hemoglobin releases more  $O_2$
- B. Metabolic demand increases
- C. Hemoglobin holds  $O_2$  more tightly
- D.  $CO_2$  solubility decreases

26. The largest fraction of CO<sub>2</sub> in blood is transported as:

- A. Dissolved CO<sub>2</sub>
- B. Carbaminohemoglobin
- C. Carbonic acid
- D. Bicarbonate ions

27. The chloride shift occurs to:

- A. Maintain osmotic balance
- B. Facilitate oxygen binding
- C. Maintain electrical neutrality
- D. Increase CO<sub>2</sub> solubility

28. The Haldane effect describes the relationship between:

- A. CO<sub>2</sub> solubility and temperature
- B. Oxygen saturation and CO<sub>2</sub> transport
- C. Hemoglobin concentration and pH
- D. Alveolar ventilation and diffusion

29. At rest, average oxygen consumption by body cells is approximately:

- A. 50 mL/min
- B. 100 mL/min
- C. 200 mL/min
- D. 500 mL/min

30. The basic rhythm of breathing is generated primarily by neurons located in the:

- A. Pontine respiratory group
- B. Ventral respiratory group
- C. Dorsal respiratory group
- D. Cerebral cortex

31. The ventral respiratory group becomes especially active during:

- A. Quiet breathing
- B. Sleep
- C. Forced breathing
- D. Hypothermia

32. The pontine respiratory group influences breathing mainly by:

- A. Initiating inspiration
- B. Stopping expiration
- C. Modifying breathing rhythm
- D. Activating chemoreceptors

33. Central chemoreceptors respond primarily to changes in:

- A. Blood  $PCO_2$
- B. Blood  $PCCO_2$
- C. CSF hydrogen ion concentration
- D. Plasma bicarbonate

34. Peripheral chemoreceptors are most sensitive to changes in:

- A. CSF pH only
- B. Blood  $PCO_2$ ,  $PCCO_2$ , and pH
- C. Alveolar ventilation
- D. Lung compliance

35. The inflation reflex functions mainly to:

- A. Increase depth of breathing
- B. Prevent lung overinflation
- C. Stimulate forced exhalation
- D. Increase surfactant release

36. Stretch receptors involved in the inflation reflex are located in the:

- A. Alveoli
- B. Pulmonary capillaries
- C. Bronchi and bronchioles
- D. Pleural membranes

37. Stimulation of the limbic system affects breathing by:

- A. Inhibiting the VRG
- B. Increasing DRG activity
- C. Decreasing tidal volume
- D. Reducing respiratory rate

38. Pain typically affects breathing by:

- A. Decreasing respiratory depth
- B. Increasing respiratory rate

- C. Inhibiting chemoreceptors
- D. Activating the inflation reflex

39. Irritation of the larynx initially causes:

- A. Hyperventilation
- B. Immediate apnea followed by coughing
- C. Bronchodilation
- D. Increased surfactant secretion

40. Which factor does NOT directly influence the rate of pulmonary gas exchange?

- A. Diffusion distance
- B. Surface area
- C. Molecular weight of gases
- D. Heart rate

Answers:

1. B

2. C

3. B

4. C

5. D

6. C

7. C

8. B

9. C

10. C

11. B

12. C

13. C

14. B

15. B

16. B

17. B

18. C

19. B

20. B

21. B

22. A

23. C

24. B

25. C

26. D

27. C

28. B

29. C

30. C

31. C

32. C

33. C

34. B

35. B

36. C

37. B

38. B

39. B

40. D