1. Blood reaches the lungs from the heart through the  

2. Mucus is moved along the respiratory tract by  

3. An increase in the rate of contractions of the diaphragm and rib muscles would indicate  
   A. decreased hydrogen ion concentration.  
   B. decreased reduced hemoglobin in the blood.  
   C. increased concentration of bicarbonate ion in the blood.  
   D. increased concentration of oxyhemoglobin in the blood.

4. The diaphragm assists breathing by  
   A. moving the ribs up.  
   B. stimulating the lungs to absorb oxygen.  
   C. changing the volume of the thoracic cavity.  
   D. allowing the lungs to move freely in the thoracic cavity.

5. Inhalation is caused by  
   A. the diaphragm moving up and the ribs moving in.  
   B. the diaphragm moving up and the ribs moving out.  
   C. the diaphragm moving down and the ribs moving in.  
   D. the diaphragm moving down and the ribs moving out.

6. The destruction of the cilia lining the respiratory tract would result in  
   A. decreased breathing rate.  
   B. decreased mucus production.  
   C. increased debris in the airways.  
   D. increased temperature in the lungs.

7. Alveoli would **not** be characterized as  

8. Air pressure is reduced inside the thoracic cavity when  
   A. the rib muscles relax.  
   B. the diaphragm moves up.  
   C. the rib cage moves up and out.  
   D. the pleural membranes collapse.

9. Cilia in the trachea  
   A. remove debris.  B. produce mucus.  C. move by peristalsis.  D. increase the surface area.

10. The pleural membranes begin to expand and stretch when  
    A. both the diaphragm and rib muscles relax.  
    B. both the diaphragm and rib muscles contract.  
    C. the diaphragm contracts and the rib muscles relax.  
    D. the diaphragm relaxes and the rib muscles contract.

11. Cilia are found in the  

12. Which of the following is caused by the contraction of the diaphragm?  
    A. Exhalation.  
    B. Relaxation of the rib muscles.  
    C. Downward movement of the rib cage.  
    D. Increase in volume of the chest cavity.

13. The vocal chords are found in which structure?  
14. Which of the following occurs during expiration?
   A. Diaphragm and rib muscles contract.
   B. Diaphragm contracts and rib cage lifts.
   C. Diaphragm relaxes and rib muscles contract.
   D. Diaphragm relaxes and rib cage moves down.

15. **Use the following information to answer the question:**
    1. Alveoli  
    2. Bronchi  
    3. Trachea  
    4. Bronchioles
    What is the order in which air passes through these structures during inhalation?
    A. 2, 1, 3, 4  
    B. 2, 4, 1, 3  
    C. 3, 2, 4, 1  
    D. 3, 4, 2, 1

16. The correct sequence of structures through which air passes during inhalation is
   A. bronchi, bronchioles, alveoli, trachea.
   B. bronchioles, bronchi, trachea, alveoli.
   C. trachea, bronchi, alveoli, bronchioles.
   D. trachea, bronchi, bronchioles, alveoli.

17. The process of inhaling is accomplished in part by
   A. relaxation of the diaphragm.
   B. contraction of the rib muscles.
   C. a decrease in the volume of the thoracic cavity.
   D. an increase in the pressure of the thoracic cavity.

18. The vocal chords are found in which structure?
   A. Larynx.  
   B. Bronchi.  
   C. Pharynx.  
   D. Epiglottis.

19. Pleural membranes
   A. line the alveoli.
   B. surround the lungs.
   C. prevent the collapse of the trachea.
   D. collapse the lungs between breaths.

20. Alveoli are well-suited to their function because they
   A. possess cilia.
   B. have thick, muscular walls.
   C. are richly supplied with capillaries.
   D. are controlled by the autonomic nervous system.

21. The extensive capillary network which surrounds each alveolus
   A. prevents the alveoli from collapsing.
   B. produces mucus which protects the lungs.
   C. increases surface area for the exchange of gases.
   D. cools the air so diffusion of gases occurs more quickly.

22. Oxygen-poor blood becomes oxygen-rich blood at the
   A. alveoli.  
   B. trachea.  
   C. bronchi.  
   D. bronchioles.

23. A puncture of the pleural membranes could lead to
   A. increased thoracic cavity pressure.
   B. decreased stimulation of carotid bodies.
   C. decreased contractions of the diaphragm.
   D. increased concentration of oxyhemoglobin (HbO₂) in the blood.

24. As the blood becomes more acidic in muscle tissues, hemoglobin will carry less
   A. oxygen.  
   B. hydrogen ion.  
   C. carbon dioxide.  
   D. bicarbonate ion.

25. Which of the following is **not** carried by hemoglobin?
   A. Oxygen.  
   B. Sodium ions.  
   C. Hydrogen ions.  
   D. Carbon dioxide.
26. Hemoglobin releases oxygen at the tissues if
   A. temperature decreases and the blood is more acidic.
   B. temperature decreases and the blood is more basic.
   C. temperature increases and the blood is more acidic.
   D. temperature increases and the blood is more basic.

27. The function of the cilia lining the trachea is to
   A. secrete mucus.
   B. move air in and out of the lungs.
   C. move mucus away from the lungs.
   D. increase the surface area for gas exchange.

28. The level of CO$_2$ in the blood is monitored by the

29. Which of the following is a controlling factor in increasing breathing rate?
   A. High pH at the medulla oblongata.
   B. High levels of CO$_2$ in the carotid artery.
   C. Low levels of glucose in the coronary vein.
   D. Low concentration of bicarbonate ions HCO$_3^-$ in the aorta.

30. Increased concentrations of which gas are sensed by the brain and result in increased rate and depth of breathing?

31. Where does oxygen diffuse into the blood?
   A. alveoli  B. trachea  C. bronchioles  D. pleural membranes

32. The exchange of oxygen and carbon dioxide in external respiration occurs by

33. The product of the reaction between Hb and O$_2$ is

34. Which of the following is the site of external respiration?

35. Which of the following reactions would be considered a part of external respiration?
   A. O$_2$ + Hb → HbO$_2$
   B. CO$_2$ + Hb → HbCO$_2$
   C. O$_2$ +H$_2$O →H$_2$O$_2$
   D. CO$_2$ + H$_2$O →H$_2$CO$_3$

36. Which of the following is an example of internal respiration?
   A. H$^+$ + HCO$_3^-$$\rightarrow$H$_2$CO$_3$$\rightarrow$H$_2$O + CO$_2$
   B. C$_6$H$_{12}$O$_6$ + 6O$_2$ → 6H$_2$O +6CO$_2$ +38 ATP.
   C. Diffusion of oxygen from the alveoli to the pulmonary vein.
   D. Diffusion of carbon dioxide from the nephron to the renal capillary.

37. The cilia lining the trachea function to
   A. keep the tract open.
   B. move air down the tract.
   C. stop food from entering the tract.
   D. sweep debris and mucus from the tract.

38. Which of the following would cause a decrease in the pH of the blood during internal respiration?
   A. running for ten minutes
   B. digestion of an acidic food
   C. taking in several deep breaths
   D. prolonged period of inactivity
<table>
<thead>
<tr>
<th>Question</th>
<th>Correct Answer</th>
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<tbody>
<tr>
<td>39.</td>
<td>D. oxygen and carbon dioxide between the blood and tissue fluid.</td>
</tr>
<tr>
<td>40.</td>
<td>B. internal respiration.</td>
</tr>
<tr>
<td>41.</td>
<td>C. exchange of gases between blood and tissues.</td>
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<tr>
<td>42.</td>
<td>C. diffusion.</td>
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<td>43.</td>
<td>A. bicarbonate ions.</td>
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<td>44.</td>
<td>A. an iliac vein</td>
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<td>45.</td>
<td>D. carbonic anhydrase.</td>
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<tr>
<td>46.</td>
<td>D. capillaries.</td>
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<td>47.</td>
<td>C. water + carbon dioxide.</td>
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<tr>
<td>48.</td>
<td>D. carbon dioxide (CO₂) to form carbonic acid (H₂CO₃).</td>
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<tr>
<td>49.</td>
<td>C. a blockage of excitatory transmitters.</td>
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<tr>
<td>50.</td>
<td>B. Bicarbonate ions.</td>
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<td>51.</td>
<td>A. Alveoli.</td>
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<tr>
<td>52.</td>
<td>A. increased rate of breathing.</td>
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<tr>
<td>53.</td>
<td>D. carbaminohemoglobin.</td>
</tr>
</tbody>
</table>
54. What is the correct sequence of structures through which an oxygen molecule passes from the nostrils to the alveolus?
A. larynx, right bronchus, trachea, bronchioles
B. right bronchus, larynx, bronchioles, trachea
C. larynx, trachea, right bronchus, bronchioles
D. trachea, larynx, bronchioles, right bronchus

55. Blood entering the systemic circulation carries high concentrations of

56. Which of the following reactions occurs in a capillary of the leg?
A. Hb + H⁺ = HHb
B. HbCO₂ = Hb + CO₂
C. Hb + oxygen = HbO₂
D. H⁺ + HCO₃⁻ = H₂CO₃

57. Carbaminohemoglobin is formed in the
A. large intestine by E. Coli.
B. alveolus when excess oxygen is present.
C. capillary for the transport of carbon dioxide.
D. nephron from the breakdown of amino acids.

58. Most hemoglobin becomes reduced inside a(n)

59. Which of the following would occur if there were a decreased level of hemoglobin in the blood?
A. Breathing rate would decline.
B. Tissues would become more acidic.
C. Carbonic anhydrase would be more effective.
D. Carbaminohemoglobin levels would increase.

60. The cilia found in the respiratory system function to
A. bring air into the lungs.
B. force air out of the lungs.
C. initiate the coughing reflex.
D. move mucus towards the glottis.

61. The pleural membranes function to
A. strengthen the thoracic cavity.
B. stimulate the medulla oblongata.
C. increase the surface area of the lungs.
D. maintain negative pressure in the thoracic cavity.

62. Which of the following is not a hydrolytic enzyme?

63. Internal respiration is defined as
A. exchange of gases between blood and air.
B. production of ATP, CO₂ and HO₂ in cells.
C. exchange of gases between blood and tissues.
D. entrance and exit of air into and out of the lungs.

64. Oxygen-poor blood becomes oxygen-rich blood at the

65. A build-up of fluid in the lungs will result in a reduced amount of oxygen in the blood returning to the heart from the lungs because
A. the bronchioles have dilated.
B. there is less hemoglobin in the blood.
C. the surface area for external respiration has been reduced.
D. the permeability of the lung capillaries has been increased.
66. A puncture of the pleural membranes could lead to
A. increased thoracic cavity pressure.
B. decreased stimulation of carotid bodies.
C. decreased contractions of the diaphragm.
D. increased concentration of oxyhemoglobin (HbO$_2$) in the blood.

67. Which of the following is a controlling factor in increasing breathing rate?
A. High pH at the medulla oblongata.
B. High levels of CO$_2$ in the carotid artery.
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ANSWERS:

**RESPIRATORY SYSTEM**

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<thead>
<tr>
<th>Number</th>
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<th>Answer</th>
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<td>1.</td>
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<tr>
<td>2.</td>
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<tr>
<td>3.</td>
<td>C</td>
<td>24. A</td>
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<td>5.</td>
<td>D</td>
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<td>6.</td>
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<td>8.</td>
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<td>9.</td>
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<td>13.</td>
<td>A</td>
<td>34. A</td>
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<td>16.</td>
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