Respiratory System Questions

1. Which of the following bones does NOT contain a paranasal sinus?
   a. Sphenoid
   b. Maxillary
   c. Ethmoid
   d. Nasal
   e. Frontal

2. Which of the following muscles contracts during quiet expiration?
   a. Diaphragm
   b. Internal intercostals
   c. External intercostals
   d. Pectoralis minor
   e. None of the above

3. Pulmonary surfactant:
   a. Prevents alveolar collapse
   b. Reduces alveolar surface tension
   c. Increases lung compliance
   d. Is secreted by type II alveolar cells
   e. All of the above

4. Which of the following factors decreases airway resistance?
   a. Increased parasympathetic nervous activity
   b. Epinephrine
   c. Histamine
   d. Accumulation of mucus within bronchioles
   e. None of the above

5. The smallest airways in the conducting zone are the:
   a. Pharynxes
   b. Alveolar ducts
   c. Pulmonary capillaries
   d. Bronchi
   e. Terminal bronchioles

6. Which of the following is NOT a function of the conducting zone of the respiratory system?
   a. Humidifying air
   b. Warming air
   c. Gas exchange
   d. Mucus secretion
   e. Filtration

7. Which of the following is a component of pulmonary gas exchange?
   a. Ventilation
   b. O₂ transport
   c. Diffusion of N₂ from alveoli to blood
   d. Diffusion of CO₂ from tissues to blood
   e. Production of ATP within cellular mitochondria
Respiratory System Questions

8. A rise in blood $P_{CO_2}$ causes all of the following EXCEPT:
   a. An increase in the $H^+$ concentration
   b. A rise in bicarbonate concentration
   c. A rise in the concentration of carbaminohemoglobin
   d. A decrease in pH
   e. An increase in the affinity of hemoglobin for oxygen

9. During hyperventilation, which of the following would be expected to happen?
   a. An increase in the $P_{O_2}$ of arterial blood
   b. An increase in the $P_{CO_2}$ of arterial blood
   c. An increase in the acidity of arterial blood
   d. An increase in the bicarbonate concentration of arterial blood
   e. All of the above

10. Which of the following exerts the most control of respiratory rate?
    a. Ventral medulla oblongata
    b. Dorsal medulla oblongata
    c. Pons
    d. Midbrain
    e. Tectum

11. Which of the following is NOT a potential cause of metabolic acidosis?
    a. Severe vomiting
    b. Severe diarrhea
    c. Starvation
    d. Diabetic crisis
    e. Kidney disease

12. Which of the following is the most potent respiratory stimulus?
    a. Low plasma pH
    b. High plasma pH
    c. Low CSF pH
    d. Low CSF $P_{O_2}$
    e. High plasma $P_{CO_2}$

13. During inspiration, pressure will be lowest in which of the following?
    a. Alveolar duct
    b. Trachea
    c. Secondary bronchus
    d. Laryngopharynx
    e. Nasal cavity

14. In which of the following will the partial pressure of oxygen be the highest?
    a. Right atrium
    b. Inferior vena cava
    c. Pulmonary artery
    d. Femoral artery
    e. Mitochondria
Respiratory System Questions

15. Which of the following is TRUE?
   a. The space just superior to the epiglottis is known as the glottis.
   b. The anterior portion of the hard palate is made of the horizontal plates of the ethmoid bone.
   c. The entire pharynx is lined by respiratory epithelium
   d. The nasopharynx contains the palatine tonsil.
   e. None of the above

16. Which of the following reactions occur(s) in the pulmonary capillaries?
   a. \( \text{HHb} + \text{O}_2 \rightarrow \text{HbCO}_2 + \text{H}^+ \)
   b. \( \text{HCO}_3^- + \text{H}^+ \rightarrow \text{H}_2\text{CO}_3 \)
   c. \( \text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{H}_2\text{CO}_3 \)
   d. \( \text{HCO}_3^- + \text{Hb} \rightarrow \text{HbO}_2 \)
   e. More than one of the above

17. Which of the following is the most SUPERIOR?
   a. Lung hilus
   b. Sigmoid colon
   c. Esophageal hiatus
   d. Gastric pits
   e. Inferior trachea

18. Which of the following refers to the exchange of carbon dioxide and oxygen between systemic tissues and systemic capillaries?
   a. Pulmonary ventilation
   b. External respiration
   c. Internal respiration
   d. Cellular respiration
   e. Acellular respiration

19. All of the following are functions of the respiratory system EXCEPT:
   a. Regulation of plasma pH
   b. Regulation of plasma \([\text{H}^+]\)
   c. Regulation of plasma \(\text{PCO}_2\)
   d. Regulation of plasma \(\text{PO}_2\)
   e. None of the above

20. Which of the following is TRUE?
   a. Anaerobic respiration involves the production of \(\text{CO}_2\) and utilization of \(\text{O}_2\)
   b. Alveoli are found in both the conducting zone and the respiratory zone.
   c. 4 of the nasal conchae are part of the ethmoid bone.
   d. The maxillary sinuses are superior to the frontal sinus.
   e. The entire pharynx is lined by stratified squamous epithelium.

21. The nasal cavity is lined by:
   a. Simple stratified ciliated epithelium with goblet cells.
   b. Pseudostratified cuboidal epithelium without goblet cells.
   c. Pseudociliated columnar epithelium with goblet cells
   d. Semistratified columnar epithelium with cilia.
   e. Pseudostratified ciliated columnar epithelium with goblet cells.
Respiratory System Questions

22. Which of the following is the most INFERIOR?
   a. Epiglottis
   b. Cricoid cartilage
   c. Glottis
   d. False vocal cords
   e. True vocal cords

23. All of the following occur in the conducting zone EXCEPT:
   a. Exchange of oxygen and carbon dioxide
   b. Filtration of particles from inspired air
   c. Filtration of pathogens from inspired air
   d. Humidification of inspired air
   e. 2 of the above

24. Which of the following is TRUE?
   a. The last tracheal cartilage is referred to as the carina.
   b. There are more secondary bronchi on the left than on the right.
   c. The last bronchioles without alveoli are known as respiratory bronchioles.
   d. The anterior portion of the hard palate is composed of the horizontal plates of the palatine bones.
   e. The inferior portion of the nasal septum is referred to as the perpendicular plate of the ethmoid bone.

25. Which of the following is NOT TRUE?
   a. The Eustachian tubes link the nasopharynx and the middle ear cavities.
   b. During swallowing the uvula and soft palate prevent food and drink from entering the oropharynx.
   c. The number of alveolar ducts in the lungs is less than the number of alveoli in the lungs.
   d. The apex of the right lung is deep to the right clavicle.
   e. The lungs are lined by the visceral pleura.

26. Of which of the following is the respiratory membrane composed?
   1. Pulmonary capillary endothelium
   2. Type 1 alveolar cell membrane
   3. Respiratory epithelium

   a. 1, 2, and 3
   b. 1 and 2
   c. 2 and 3
   d. 1 and 3
   e. 3 only

27. Which of the following is ALWAYS TRUE?
   a. Intrapulmonary pressure > Atmospheric pressure
   b. Atmospheric pressure > Intrapulmonary pressure
   c. Intrapulmonary pressure > Intrapleural pressure
   d. Intrapleural pressure > Intrapulmonary pressure
   e. Intrapleural pressure > Atmospheric pressure

28. Surfactant is produced by ________________ and acts to ________________ alveolar surface tension.
   a. Type I alveolar cells – increase
Respiratory System Questions

b. Type II alveolar cells – decrease
c. Dust cells – increase
d. Hepatic cells – decrease
e. Carbonic anhydrase - decrease

29. Which of the following is TRUE?
   a. The elastic recoil of the lungs assists quiet expiration.
   b. Plasma levels of chloride will be higher in systemic veins than in systemic arteries.
   c. Approximately 20% of the oxygen in the bloodstream is dissolved in plasma.
   d. Approximately 80% of the carbon dioxide in the bloodstream is bound to hemoglobin and referred to as carbaminohemoglobin.
   e. An inability to generate carbonic anhydrase is the cause of infant respiratory distress syndrome.

30. Which of the following reactions is more likely to occur in pulmonary capillaries than in systemic capillaries?
   a. $\text{HHb} + \text{O}_2 \rightarrow \text{HbO}_2 + \text{H}^+$
   b. $\text{H}^+ + \text{HbO}_2 \rightarrow \text{HHb} + \text{O}_2$
   c. $\text{HHb} + \text{CO}_2 \rightarrow \text{HbCO}_2 + \text{H}^+$
   d. $\text{HbCO}_2 \rightarrow \text{HCO}_3^- + \text{H}^+$

31. The ancient Greeks referred to the trachea as the *trachea arteria*, which translates as “rough airpipe.”
   The roughness is due to the ___________ which function(s) by ____________________.
   a. Serosa; increasing the surface area for exchange
   b. Adventitia; increasing the surface area for exchange
   c. Trachealis; producing mucus
   d. Cartilaginous rings; preventing collapse.
   e. Goblet cells; phagocytosing bacteria

32. All of the following muscles would contract while trying to blow out a candle EXCEPT:
   a. Internal intercostals
   b. Rectus abdominus
   c. Transverse abdominus
   d. Latissimus dorsi
   e. Diaphragm

33. During which of the following activities would the stomach experience the greatest downward force?
   a. Quiet inspiration
   b. Forced inspiration
   c. Quiet expiration
   d. Forced expiration

34. Forced inspiration would require the involvement of the:
   I. Phrenic nerve
   II. Diaphragm
   III. Ventral respiratory group
   a. I, II, and III
   b. I and II
   c. I and III
   d. II and III
   e. I only
Respiratory System Questions

Use the following answers for the next 4 questions:

a. Thyroid cartilage
b. Epiglottis
c. Laryngopharynx
d. True vocal cords
e. None of the above

35. Elastic cartilage
36. Forms the Adam’s apple
37. Covers the glottis during swallowing
38. Necessary for sound production

39. The transverse thoracis is a muscle that depresses ribs 2-6 when it contracts. Thus this muscle will most likely contract during:
   a. Forced inspiration
   b. Quiet inspiration
   c. Forced expiration
   d. Quiet expiration

40. Why is it more difficult to breathe in when the stomach is full?
   a. Because the full stomach impedes the downward motion of the contracting diaphragm.
   b. Because the full stomach impedes the downward motion of the relaxing diaphragm.
   c. Because the full stomach prompts a decrease in gastric juice secretion.
   d. Because the full stomach prompts an increase in gastric juice secretion.
   e. Because the full stomach stimulates increased activity in the ventral respiratory group.

43. Which of the following could cause an increase in respiratory rate?
   a. Increased plasma \( P_b \)
   b. Increased plasma pH
   c. Increased plasma \([H^+]\)
   d. All of the above
   e. 2 of the above

41. As a result of the movement of air into the alveoli, alveolar pressure will:
   a. Increase
   b. Decrease
   c. Not change

42. In respiratory acidosis, plasma pH will:
   a. Increase
   b. Decrease
   c. Not change

43. A person that is hyperventilating will have a plasma pH that is __________ the plasma pH of a person who is hypoventilating.
   a. Greater than
   b. Less than
   c. The same as

44. Intrapleural pressure is normally __________ intrapulmonary pressure.
   a. More than
   b. Less than
   c. The same as
**Respiratory System Questions**

45. Epinephrine will __________ bronchioles causing resistance to _______ and airflow to __________.
   a. Dilate – decrease – increase
   b. Constrict – increase – decrease
   c. Dilate – increase – decrease
   d. Constrict – decrease - increase

46. Resistance to airflow in a bronchiole is __________________ resistance to airflow in the trachea.
   a. More than
   b. Less than
   c. The same as

47. The majority of CO₂ is transported in the blood stream...
   a. As carbon monoxide
   b. Attached to the outer surface of RBCs
   c. Attached to the inner surface of RBCs
   d. Attached to hemoglobin
   e. As bicarbonate

48. The number of lobes in the right lung is ______________ the number of lobes in the left lung.
   a. Greater than
   b. Less than
   c. The same as

49. The percentage of atmospheric gas composed of nitrogen is __________ the percentage of atmospheric gas composed of oxygen.
   a. Greater than
   b. Less than
   c. The same as

50. The diameter of a bronchus is ______________ the diameter of a bronchiole.
   a. Greater than
   b. Less than
   c. The same as

51. The percentage of oxygen dissolved in plasma is __________ the percentage of oxygen transported as oxyhemoglobin.
   a. Greater than
   b. Less than
   c. The same as

52. When the diaphragm contracts, the pressure in the abdominal cavity will:
   a. Increase
   b. Decrease
   c. Not change

53. In order for inspiration to occur, atmospheric pressure must be __________ intrapulmonary pressure.
   a. Greater than
   b. Less than
   c. The same as
Respiratory System Questions

54. The rate at which $O_2$ detaches from hemoglobin when temperature is high is ____________ the rate at which $O_2$ detaches from hemoglobin when temperature is low.
   a. Faster than
   b. Slower than
   c. The same as

55. Which of the following is NOT a GROSS structure of the lung?
   a. Apex
   b. Alveolus
   c. Base
   d. Root
   e. Hilus

56. Which of the following is NOT composed of hyaline cartilage?
   a. Thyroid portion of the larynx
   b. Cricoid portion of the larynx
   c. Vestibular fold of the larynx
   d. Anterior nasal septum
   e. C-shaped rings of the trachea

57. Which of the following muscles is LEAST involved in respiration?
   a. Diaphragm
   b. Pectoralis major
   c. External intercostals
   d. Internal intercostals
   e. Sternocleidomastoids

58. Which of the following is produced in greater amounts in the pulmonary capillaries than in systemic capillaries?
   a. Reduced hemoglobin
   b. Bicarbonate
   c. Carbaminohemoglobin
   d. Oxyhemoglobin
   e. Deoxyhemoglobin

59. All of the following are TRUE of the trachea EXCEPT:
   a. It’s lined by pseudostratified ciliated epithelium.
   b. It contains a muscle known as the trachealis.
   c. It’s posterior to the esophagus and anterior to the vertebral column.
   d. It divides into the 2 main bronchi in the mediastinum.
   e. It is inferior to the hyoid bone.

60. All of the following are TRUE EXCEPT:
   a. The posterior nasal septum is composed of the perpendicular plate of the ethmoid bone and the vomer.
   b. The maxillary sinuses produce mucus.
   c. The conchae increase the turbulence of airflow.
   d. The auditory tubes connect the nasal cavity to the inner ear cavities.
   e. The nasopharynx contains the pharyngeal tonsil.
Respiratory System Questions

61. During exercise, hemoglobin in systemic venous blood is likely to be ____ with oxygen.
   a. 25% saturated
   b. 75% saturated
   c. 100% saturated
   d. 150% saturated

62. Which of the following is the primary respiratory control center?
   a. Dorsal respiratory group
   b. Pontine respiratory group
   c. Apneustic center
   d. Ventral respiratory group
   e. Basal ganglia

63. All of the following are causes of metabolic acidosis EXCEPT:
   a. Diarrhea
   b. Vomiting
   c. Diabetes mellitus
   d. Starvation
   e. Renal disease

64. Which of the following nerves stimulates the diaphragm to contract?
   a. Glossopharyngeal nerve
   b. Intercostal nerve
   c. Inferior diaphragmatic nerve
   d. Phrenic nerve
   e. Sciatic nerve

Use the following answer choices for items 65-105:
   a. increase
   b. decrease
   c. stay the same

65. If ventilation decreases, plasma Pco₂ will:

66. If ventilation decreases, plasma pH will:

67. If ventilation increases, plasma HCO₃⁻ will:

68. As blood travels from a pulmonary artery to a pulmonary vein, its plasma levels of bicarbonate will:

69. As blood travels from the right ventricle all the way to the left atrium, the saturation level of hemoglobin will:

70. Relaxation of the diaphragm causes thoracic volume to:

71. Severe constipation will cause plasma pH to:

72. To compensate for a rise in plasma pH, respiratory rate will:

73. An inability to produce surfactant will cause lung compliance to:

74. As CSF pH decreases, the rate and depth of breathing will:
Respiratory System Questions

75. As blood flows from the inferior vena cava all the way to the ascending aorta, its bicarbonate levels will:

76. As lung volume decreases, lung pressure will:

77. As you travel from the large bronchi to the bronchioles, the number of goblet cells will:

78. As air travels from the alveoli to the nares during expiration, its water content will:

79. As blood moves from the pulmonary trunk to the pulmonary veins, the partial pressure of carbon dioxide in that blood will:

80. As the thickness of the respiratory membrane increases, the rate at which O$_2$ molecules diffuse from alveolar air into capillary blood will:

81. As the diaphragm and external intercostals relax, intrapulmonary pressure will:

82. As exercise proceeds, the saturation of hemoglobin in the venous blood will:

83. The serratus posterior superior is a muscle that attaches to ribs 2-5 and elevates them when it contracts. Thus, contraction of the serratus posterior superior will cause intrathoracic pressure to...

84. If ventilation increases, plasma H+ will:

85. Forced inhalation will cause the pressure in the thoracic venae cavae to:

86. A lack of functioning type II alveolar cells would cause alveolar surface tension to:

87. In response to metabolic acidosis, respiratory rate will:

88. As lung volume decreases, lung pressure will:

89. As lung fibrosis increases, the efficiency of ventilation will:

90. As plasma [epinephrine] increases, resistance to airflow in the bronchioles will:

91. As volume increases, pressure will:

92. As carbon monoxide intake increases, cellular ATP production will:

93. As plasma partial pressure of CO$_2$ increases, hemoglobin’s affinity for oxygen will:

94. As core body temperature decreases, hemoglobin’s affinity for oxygen will:

95. As lung compliance decreases, the plasma [HCO$_3^-$] of the pulmonary veins will:

96. As surfactant production decreases, alveolar surface tension will:

97. As blood flows from the radial artery to the radial vein, the partial pressure of oxygen in that blood will:

98. As plasma [histamine] increases, bronchiole diameter will:

99. As plasma P$_{CO_2}$ increases, plasma pH will:
Respiratory System Questions

100. As the activity of the ventral respiratory group in the medulla oblongata increases, the amount of air inspired and expired per unit time will:

101. Contraction of the diaphragm will cause intrapleural pressure to:

102. A hole in the wall of an alveolar sac in the left lung would cause the size of the left lung to:

103. As a red blood cell travels from the pulmonary trunk to the pulmonary veins, its chloride content will:

104. As blood travels from the pulmonary trunk to the pulmonary veins, its $[\text{HCO}_3^-]$ will:

105. During an asthma attack, airway resistance will:

Short Answer Questions

1. Write out the equation for the formation of bicarbonate and hydrogen ions. What enzyme catalyzes this reaction? Where does this reaction occur primarily?

2. What are the components of the respiratory membrane? What event occurs there? How does its structure match its function?

3. What are 3 functions of respiratory epithelium? Why are the 3 functions necessary?

4. Explain why each of these persons has trouble supplying oxygen to their cells.
   - Someone without surfactant
   - Someone whose phrenic nerve is cut
   - Someone who has inactive bone marrow due to chemotherapy
   - Someone who has disseminated intravascular clotting in the pulmonary arterioles
   - Someone who has fluid in the alveoli due to pneumonia
   - Someone who has a malformed epiglottis due to a birth defect
   - Someone who has a stab wound perforating the body wall between the 5th and 6th ribs
   - Someone who has had both kidneys removed
   - Someone who has reduced lung compliance
   - Someone who has reduced lung elasticity

5. What effect will each of the following have on oxygen delivery to tissues? Why?
   a. Alkalosis
   b. Lack of iron in the diet
   c. Hemoglobin with an increased O2 affinity
   d. Acid injected into the cerebrospinal fluid

6. Which of the following does NOT belong?
   a. Terminal bronchiole
   b. Respiratory bronchiole
   c. Trachea
   d. Larynx

   Why? Remember it must be anatomical or physiological characteristic shared by the other 3.

7. What would an inability to produce surfactant do to the surface tension in the lungs? Why is that bad?

8. What is metabolic acidosis? What is a possible cause? How would respiration change in response?
Respiratory System Questions

9. Explain in detail how a rise in plasma CO₂ would result in an increase in respiratory rate and depth. Be sure to include all body fluids, receptors, brain regions, chemical equations and enzymes that would play a role in this reflex.

10. Write out the equation for oxyhemoglobin formation within the pulmonary capillaries.