The Respiratory System
Study Guide Questions - C23
Tortora and Derrickson

Note: "> questions" are the hot list questions /// you must know these questions for exam /// however, if you are an advanced student then it would behoove you to know all the study guide questions!

1. In physiology, respiration has different meanings. What are some of the different meanings associated with the term "respiration"?

2. What are the functions of the respiratory system?

3. What is the pathway traveled by air between the nasal cavity and alveoli?

4. How is external respiration differ from internal respirstion? (Fig 23-1)

5. > What is the difference between the upper and lower respiratory tract? Where is the division between the two tracts? (the nares to the larynx is the URT designed to warm, add moisture, and remove dust-bacteria before air enters the LRT // LRT start at glottis of larynx and LRT transports air to the alveoli – LRT also warms, moistens, and removes dust-bacteria as air moves towards alveoli)

6. >What is the difference between the conducting division and the respiratory division of the respiratory system? (Fig 23-8) (respiratory division allows for gas exchange and conducting division simple moves are to gas exchange areas)

7. What type of cells line the nasal cavity? What is the function and structure of the olfactory mucosa? What accessory structures of the nasal cavity are found in the lamina propria?

8. What is the function of the erectile tissue of the inferior choncha? Function? Why is it important?

9. What are the three divisions of the pharynx?

10. What happens to the larynx and epiglottis when you swallow?

11. What is the relationship between the vestibular folds and the vocal cords? What is the opening between the vocal cords called?

12. The common term used to describe the trachea is "windpipe". How long is the trachea?

13. What is the function of the hyaline “C” rings in the tracea and the plates of hyaline around the bronchi tree?

14. What type of cells cover the interior surface of the trachea? Why is it called the mucociliary escalator?

15. How many lobes are in the right and left lungs?

16. What is the cardiac impression? If you swallow food into the trachea which bronchi is it likely to pass into? Why?

17. What is the inferior end of the trachea called?

18. List all the segments of the bronchial tree between the primary bronchi and the alveolus.

19. What is the difference between pulmonary arteries and bronchiole arteries? What is the origin of each artery?

20. Where do the C-shaped hyaline cartilate in the bronchiole tree stop?

21. What changes occur between the bronchioles, terminal bronchioles, and respiratory bronchioles? Significance?

22. >What is the structure of an alveolus? What type of cells are in the alveolus? Their functions? (Fig 23-11 // Fig 23-12) (simple squamous epithelial cell that shares basement membrane with pulmonary endothelial cell /// three cell types – squamous alveolar cells – great alveolr cells - dust cell)

23. >What is the function of the dust cells? Another name for dust cells? (alveolar macrophage // remove dust and bacteria from bronchiole air passageways)

24. >What is the respiratory membrane? Structure and function? (alveolar cells and pulmonary endothelial cells sharing a common basement membrane)

25. What is the intra-pleural cavity (pleural cavity)? Location and function?

26. What type of muscle is in the walls of the bronchiole tree and pulmonary blood vessels of the lungs? Function?

27. What is the Valsalva maneuver? Significance?

28. >Where is the respiratory center located? (medulla oblongata)

29. >What is the respiratory cycle? What are the two phases called? Length of each? Passive or active? (one complete inspiration and expiration // inspiration 2 seconds

and expiration 3 seconds // inspiration is active by diaphram and expiration is passive due to elastic recoil)

30. >When at rest (i.e. quiet breathing), how much air is moved into the lungs? What is this volume called? (tidal volume = 500 ml)

31. Where is the location of the ventral respiratory center, dorsal respiratory center, and the pontine respiratory center? What is the function of the respiratory center in quiet and forced respiration? (Fig 23.24)

32. What is the role of the medullary respiratory center in controlling normal quiet breathing and forceful breathing? (Fig 23-25)

33. What type of receptors send signals to the respiratory control center? Where are these sensors located? (Fig 23-27)

34. >What is the primary stimulus that activates both the central and peripheral chemorectors? (Fig 23-27) (carbon dioxide)

35. How may pain, anxiety, and other emotions influence the respiratoy cycle?

36. >What chemoreceptors are stimulated by low oxygen? When? (peripheral chemoreceptors within normal O2 ranges – between 100 and 50 mmHg – respond to low range by increasing inspiration // however, extremely low O2 also depresses central chemoreceptors and DRG do not respond to any stimulus setting up positive feedback loop which stops respiration – fatal results)

37. >Under what condition may oxygen inhibit the central chemoreceptors? The danger? (during hypoxic drive // high oxygen may inhibit DRG and stop inspiration)

38. >What are the characteristics of the following type of respiration: apnea, dyspnea, tachypnea, and bradypenea. (temporary interuption of breathing // difficulty in breathing // rapid respiratory cycle // slow respiratory cycle)

39. What must happen to the intrapulmonary pressure for air to move into the lungs? How is this accomplished? Which skeletal muscles contract during quiet respiration? Forced respiration?

40. What is pneumothorax?

41. What is atelectasis?

42. >How will epinephrine from the adrenal gland and norepinephrine from sympathetic fibers influence air flow in the bronchiole tree? (dialate broncioles)

43. >How will histamine released from WBC or acetylycholine from parasympathetic neurons influence air flow in the bronchiole tree? (constric broncioles)

44. How does tuberculosis and black lung disease affect pulmonary function? Explain.

45. >How do hydrogen bonds affect lung function? What is surfactant? When is surfactant produced? Significance? (water tension must be overcome to expand lungs // surfactant reduces water tension // makes it easier to inspire air // surfactant produced at end of third trimester of pregnancy // premature delivery no surfact which may result in respiratory failure of newborn)

46. >What are the four respiratory volumes? You should be able to draw and label a chart to show these volumes. (Fig 23-16) (tidal volume / inspiratory reserve volume / expiratory reserve volume / vital capicity)

47. What is the difference between respiratory volumes and respiratory capacities? Define total lung capacity and vital capacity.

48. >If you breath in 500 ml of air, how much of this air actually reaches the alveoli? (350 ml)

49. What is the alveolar ventilation rate? How do you determine AVR?

50. >What is the difference between anatomical dead space and physiologic dead space? (anatomical dead space is the air conduction part of the lungs // if you destroy parts of the gas exchange lung tissue then this loss is added to anatomical dead space to find physiologic dead space)

51. What is the difference between obstructive and resistant lung diseases?

52. What is the significance of Dalton's law? What are the main four gasses in air? What is partial pressure?

53. > How many oxygen molecules may one Hb carry? After it passes a systemic capillary? (4 /// 3 – unloads only one oxygen molecule)

54. >What is the concentration gradient for oxygen and carbon dioxide between the plumonary and systemic environments (external vs tissue)? (Fig 23-17) (oxygen = 159 mmHg atmosphere and 40 mmHg venous blood /// carbon dioxide = 0.3 mmHg atmosphere and 45 mmHg venous blood)

55. > How is carbon dioxide and oxygen transported in the blood? (Fig 23-18) (oxygen 98.5% bound to hemoglobin /// CO2 70% bicarbonate ion – 23% attached as carbamino – 7% dissolved in plasma)

56. >What is the difference between pulmonary gas exchange and systemic gass exchange? What are the major events associated with the transport of oxygen and carbon dioxide between the pulmonary and systemic enviroment? (Fig 23-23) (pulmnary gas exchange are events occuring in lung tissue – CO2 diffuses across respiratory membrane into atmosphere and oxygen diffuses from alveoli into blood /// systemic gas exchange occur in tissues of your body where CO2 diffuses away from mitochondria and oxygen diffuses from Hb-O2 of RBC to the mitochondria // note role of proton, cloride shift, and carbonic anhydrase)

57. >What happens to gasses during systemic and alveolar gas exchange? Be able to associate these terms with your explanation: (carbonic anhydrase, chloride shift, protons, bicarbonate, venous reserve) - (carbonic anhydrase is inside RBC required to convert water and CO2 into bicarbonate and proton – reverible reaction // chloride enters RBC as bicarbonate leaves // proton created inside RBC attaches to hemoglobin to displace O2 from hemoglobin – i.e. refer to as unloading oxygen // venous reserve on first pass through capillary is 75% because on 25% of the oxygen is released when blood passes through a systemic capillary)

58. >Where is carbonic anhydrase located? What is its function? (RBC / catalyse water and CO2 – reversible – must know complete formula!)

59. >What cation causes oxygen to be unloaded from hemoglobin? (proton)

60. >What is the significance of the cloride shift? (cloride has negative charge // comes into RBC to replace lost negative charge of bicarbonate as it leaves RBC and goes into blood)

61. >What varibles affect gas exchange? Which way will the oxygen dissociation curve move for varibles that cause more oxygen to be released from hemoglobin? (anything that increases distance across respiratory membrane will reduce gass exchange or anything that distroys amount of respiratory membrane will have negative affect on gas exchange /// things that reduce gas exchange shifts dissociation curve to the right)

62. >What is ventilation? What is perfusion? What is the significance of the ventilation- perfusion coupling mechanism? (ventilation refers to the air flow in lungs and perfusion refers to the blood flow in the lungs // these two varibles are autoregulated to only areas in lungs ventilated will be perfused and only areas in the lung perfused will be ventilated)

63. If mucous blocks a bronchiole, what will happen to blood flow in this area?

64. How many oxygen molecules may be carried by one hemoglobin molecule? How many oxygens would you expect to see in the pulmonary artery? How many oxygens would you expect to see in the pulmonary vein?

65. Why is carbon monoxide a dangerous poison?

66. How is acidosis and alkalosis related to hypercapnia and hypocapnia?

67. What are the corrective homeostatic responses to acidosis and alkalosis?

68. > Under normal conditions, the partial pressure of oxygen has little effect on respiration. However, in emphysema carbon dioxide concentration become so high that the central chemorecptors no longer respond to carbon dioxide and respiration is now stimulated by low oxygen levels. What is this condition called? What is the danger of giving a person in this condition oxygen? (hypoxic drive // under hypoxic drive regulation giving oxygen may stop respiration)

69. >What is hypoxia? Define the following terms : (ischemic hypoxia, anemic hypoxia, histotoxic hypoxia) --- (hypoxia is low oxygen concentration in the tissue space // ischemia is a reduced blood flow which may cause hypoxia // anemic hypoxia is low oxygen concentration due to either not enough RBC or RBC without enough hemoglobin // histotoxic hypoxia is caused by poison that interfers with oxygen transport)

70. What is chronic obstructive pulmonary disease?

71. >What is the difference between bronchitis and asthma? Which condition is reversible? (both condition result in an increase in mucous production and narrowing of the bronchiles // asthma is reversible but each inflammatory episode causes addition of more scar tissue from fibroblast activity – after many episodes condition is not reversible and this is then known as bronchitis)

72. >What is the Hering-Breuer Reflex? (if lung tissue over inflated a reflex stops inspiration)

73. >What is the irritant reflex? (if you breath in particulate then a reflex stops inspiration)

74. > What is the significance of ventilation and perfusion regulation within the lung? (match the incoming air at the alveoli with blood from the pulmonary artery capillaries)

75. >What causes emphysema? Result to lung tissue? Result to blood gasses? Which causes what type of "drive"? What hormone increases because of this diseasse? (smoking // loss of respiratory membrane surface area - abnormally large but fewer alveoli // lower O2 concentrations and higher CO2 concentration in blood // hypoxic drive // erythropoeitin)