

The Respiratory System - S2017
C23 Study Guide
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1. In physiology we recognize that the word respiration has three meanings. What are the three different meanings of the word respiration as used in physiology?
2. List seven functions performed by the respiratory system?
3. What are the principal organs of the respiratory system? Describe the patterns of flow within the lungs and list the different segments.
4. What is the difference between the conducting division and the respiratory division of the respiratory system? What is the difference between the upper and lower respiratory tract?
5. What is the histology of the cells that line the nasal cavity? What is the function and structure of the olfactory mucosa? What accessory structures associated with the nasal cavity are found in the lamina propria?
6. What is the structure of the erectile tissue associated with inferior concha and explain the function of this tissue? Why is it important?
7. What two structures define the superior and inferior margins of the pharynx? What are the three regions within the pharynx? Indicate prominent structures:
8. What happens to the larynx and epiglottis when you swallow?
9. What is the relative relationship between the vestibular folds and the vocal cords? What is the opening between the vocal cords called?
10. What is the name of the structure which separates the upper and lower respiratory system?
11. The common term used to describe the trachea is “windpipe”.
 - a. How long is the trachea?
 - b. What is the function of the hyaline “C” rings?
 - c. What is the histology of the lining of the trachea?
 - d. What is the mucociliary escalator?
12. You will study in detail the anatomy of the lung in lab. Note:
 - a. What is the hilum?
 - b. How many lobes are in the right and left lung?
 - c. What is the cardiac impression?
 - d. What is the inferior end of the trachea called?

13. List all the segments of the bronchial tree between the primary bronchi and the alveolus.
14. The bronchial tree:
 - a. In which bronchi will aspirated foreign objects more likely to lodge?
 - b. When do you see the absence of C-shaped hyaline cartilages?
 - c. What is the difference between secondary and tertiary bronchi?
 - d. How do pulmonary arteries make their way through the lungs spongy parenchyma?
 - e. What artery provides nutrients to the bronchial tree?
 - f. What is a pulmonary lobule?
 - g. How does the histology change between the terminal bronchioles and the respiratory bronchioles?
 - h. What is the relationship between an alveolar duct and alveolar sacs?
15. Each human lung is composed of 150 million alveoli which provide about 70 square meters of surface area for diffusion.
 - a. What type of cell form the walls of the alveolus?
 - b. What is pulmonary surfactant?
 - c. Where do you find alveolar macrophages?
 - d. How many alveolar macrophage die in a day and where do they end up?
 - e. What is the respiratory membrane?
16. What is the difference between the parietal and visceral pleurae?
 - a. What is the pleural cavity?
 - b. What is the function of the pleural fluid?
17. What defines a respiratory cycle?
 - a. What is the difference between quiet and forced respiration?
 - b. What do you need for pulmonary ventilation?
18. What type of muscle do we have “in the lungs”?
 - a. Where within the lungs do you find this muscle?
 - b. What is the function of this muscle?
19. What type of muscle is responsible for pulmonary ventilation?
 - a. What is the prime mover of pulmonary ventilation? Describe this muscle’s position when at rest.
 - b. What muscles are synergists to the prime mover of pulmonary ventilation?
 - c. What is the function of an accessory muscle of respiration?
 - d. What accessory muscles contract during deep inspiration? Explain their function.
 - e. What accessory muscles contract during forced expiration? Explain their function.

19. What is the Valsalva maneuver? What functions does this maneuver aid?
20. How would you describe breathing? Is it voluntary or involuntary?
21. Where is the respiratory center located?
22. How much oxygen is required during periods of rest? During strenuous exercise?
23. What are the three main components of the respiratory control center?
24. What is the function of the dorsal respiratory group? What types of local neural circuits are found in the dorsal respiratory group?
25. How many seconds is the discharge by inspiratory neurons?
26. How long is the total respiratory cycle during quiet breathing?
27. What is the function of the ventral respiratory group?
28. What is the Botzinger complex?
29. What is the function of the pontine respiratory group?
30. What type of sensory information may influence the ventral respiratory group?
31. Where are inspiratory neurons located? How long do they “discharge”?
32. Where is the pontine respiratory center located?
33. What higher brain centers synapse in the pontine respiratory center?
34. Pain, anxiety and other emotions can influence the respiratory centers. The origin of these events are said to be of a “higher” order within the brain. Where do these events originate?
35. Central and peripheral receptors monitor different types of stimuli and send this information to the brainstem respiratory centers. List four different type of receptors and explain their mechanism of action.
- 25 Where is the voluntary control of breathing located? Can you hold your breath until you die? What role does the corticospinal tract play in voluntary breathing?
- 26 What factors influence respiratory airflow? What does one atmosphere measure? What happens when intrapulmonary pressure is greater or less than the atmospheric pressure?

- 27 To understand inspiration and expiration you need to review the anatomy of the pleural cavity.
- What is the relationship between the visceral and parietal pleura?
 - What is between the two membranes?
 - What is the space between the two membranes called?
 - What is the space within the lung tissue called?
 - How does body temperature influence inspiration?
- 28 Relaxed expiration is a passive process. What tissue type makes relaxed expiration passive? Where do you find this tissue?
- 29 What is pneumothorax?
- 30 What is atelectasis?
- 31 Explain how resistance influences airflow:
- How do epinephrine and the sympathetic neurotransmitter (norepinephrine) influence pulmonary resistance?
 - How do histamine and parasympathetic nerves (acetylcholine) influence pulmonary resistance?
 - How do tuberculosis and black lung disease influence pulmonary resistance?
 - What role do hydrogen bonds play in pulmonary resistance?
 - What is surfactant?
- 32 What are the four different respiratory volumes?
- 33 What is the difference between respiratory volumes and respiratory capacities?
- 34 What is the alveolar ventilation rate? How do you determine AVR?
- 35 What is the difference between anatomical and physiological dead space?
- 36 What is the difference between restrictive and obstructive disorders?
- 37 What is the difference between minute respiratory volume and maximum voluntary ventilation?
- 38 Under what condition would you experience maximum voluntary ventilation?
- 39 How is a cough different than a sneeze?
- 40 What are the “four” main gases in inspired air?
- 41 What does the partial pressure of a gas indicate?

- 42 What is the difference between external (pulmonary gas exchange) respiration and internal (systemic gas exchange) respiration?
- 43 What is alveolar gas exchange and where does it occur?
- 44 What variables affect gas exchange?
- 45 Ventilation-perfusion coupling is an important concept in respiratory physiology. When an area of the lung is well ventilated, what happens to the associated capillaries?
- 46 When mucus obstructs a bronchiole and prevents an area of the lung from being ventilated, what happens to the capillaries in this area? How does this compare to hypoxia and the local control of the capillary network in the systemic circulation?
- 47 We have already studied the role that RBCs and hemoglobin play in the transport of oxygen. What percent of oxygen is transported by hemoglobin?
- 48 How many oxygen molecules can one hemoglobin molecule carry?
- 49 What is the difference between oxyhemoglobin and deoxyhemoglobin?
- 50 Why is carbon monoxide such a dangerous poison?
- 51 How is carbon dioxide transported? Be able to “rank” the three different transport methods.
- 52 How do the events associated with blood gases differ during systemic gas exchange and alveolar gas exchange? Be able to associate these terms with your explanation: (carbonic anhydrase, chloride-bicarbonate exchanger, chloride shift, venous reserve)
- 53 Ultimately, pulmonary ventilation is adjusted to maintain the pH of the brain. If hydrogen ions cannot cross the blood-brain barrier, then where does the “acid” come from that drives the chemoreceptors in the medulla oblongata?
- 54 How is acidosis and alkalosis related to hypercapnia and hypocapnia?
- 55 What are the corrective homeostatic responses to acidosis and alkalosis?
- 56 Under normal conditions, the partial pressure of oxygen has little effect on respiration. What conditions would result in the partial pressure of oxygen becoming the main driver of respiration? What is this condition called?
- 57 What is hypoxia? What is an indicator of hypoxia? Define the following terms: (hypoxemic hypoxia, ischemic hypoxia, anemic hypoxia, histotoxic hypoxia)

46 What is chronic obstructive pulmonary disease?

47 What are the three most common forms fo COPDs?

Hot List Questions: Most of these questions are included in the more comprehensive Chapter Study Guide questions. This list is designed to draw your attention to specific factorids of the respiratory system.

1. Where is carbonic anhydrase located? What is its function?
2. What is the structure of hemoglobin? How many oxygen can a hemoglobin molecule carry?
3. In the systemic circuit, what ion causes oxygen to be unloaded from hemoglobin?
4. Be able to draw a diagram to show major events which occur during gas exchange in the systemic and pulmonary circuits?
5. Explain how air is drawn into the bronchiole tree? How is this force created?
6. Is inspiration passive or active? Explain
7. Is expiration passive or active? Explain
8. How long is the respiratory cycle?
9. How long is inspiration?
10. How long is expiration?
11. How is carbon dioxide transported in blood?
12. What factors influence gas diffusion across the respiratory membrane?
13. What are the lung volumes?
14. How much air do you move into and out of the lungs while at rest? What is this volume called?
15. What is the chloride shift? Significance?
16. What is the structure of the respiratory membrane?
17. What type of cells are found in the alveoli?
18. Describe these conditions: COPD, cor pulmonale, atelectasis, emphysema, bronchitis, asthma, pneumothorach, and pneumothorax
19. How is oxygen and carbon dioxide loaded and unloaded at the respiratory membrane and in the systemic circuit?
20. What is the structure and function of the respiratory membrane?
21. What is tidal volume?
22. How much of the tidal volume reaches the alveoli? Significance?
23. What is pulmmary surfactant? Produce where? When?
24. What two forces inhibit inspiration?