





33.3 The Respiratory System

-  Identify the structures of the respiratory system and describe their functions.
-  Describe gas exchange.
-  Describe how breathing is controlled.
-  Describe the effects of smoking on the respiratory system.

Lesson Summary

Structures of the Respiratory System For organisms, *respiration* means the process of gas exchange between a body and the environment. The human respiratory system picks up oxygen from the air we inhale and releases carbon dioxide into the air we exhale. The structures of the respiratory system include the

- ▶ nose, where air is filtered, moistened, and warmed.
- ▶ **pharynx**, or throat, which serves as a passageway for both air and food.
- ▶ **trachea**, or windpipe, and the **larynx**, or vocal cords.
- ▶ **bronchi**, two large tubes that lead to the lungs. Each bronchus branches into smaller passageways called bronchioles that end in tiny air sacs called **alveoli** within the lungs.

Gas Exchange and Transport Oxygen and carbon dioxide are exchanged across the walls of alveoli and capillaries. Chemical properties of blood and red blood cells allow for efficient transport of gases throughout the body.

- ▶ Carbon dioxide and oxygen are exchanged across capillary and alveolus walls.
- ▶ Hemoglobin binds with and transports oxygen that diffuses from alveoli to capillaries. It also increases the efficiency of gas exchange.
- ▶ Carbon dioxide is transported in the blood in three ways. Most combines with water and forms carbonic acid. Some dissolves in plasma. Some binds to hemoglobin and proteins in plasma.

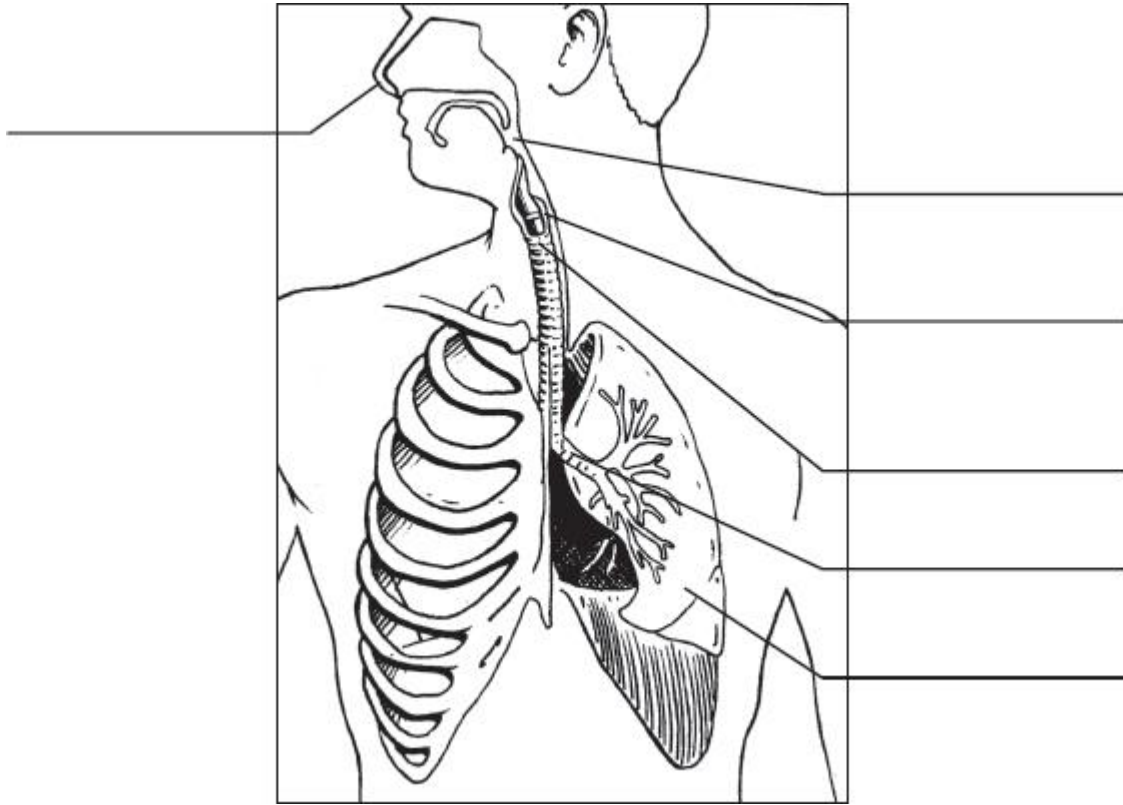
Breathing Movements of the diaphragm and rib cage change air pressure in the chest cavity during inhalation and exhalation.

- ▶ The dome-shaped muscle at the bottom of the chest cavity is the **diaphragm**. During inhalation, contraction of the diaphragm and rib muscles increases chest volume and air rushes in. In exhalation, these muscles relax and air rushes out.
- ▶ The nervous system has final control of the breathing muscles. Breathing does not require conscious control.

Smoking and the Respiratory System Chemicals in tobacco smoke damage structures throughout the respiratory system and have other negative health effects. Smoking causes a number of diseases, including chronic bronchitis, emphysema, and lung cancer

Structures of the Respiratory System

1. Label each of the structures indicated in this drawing of the human respiratory system.



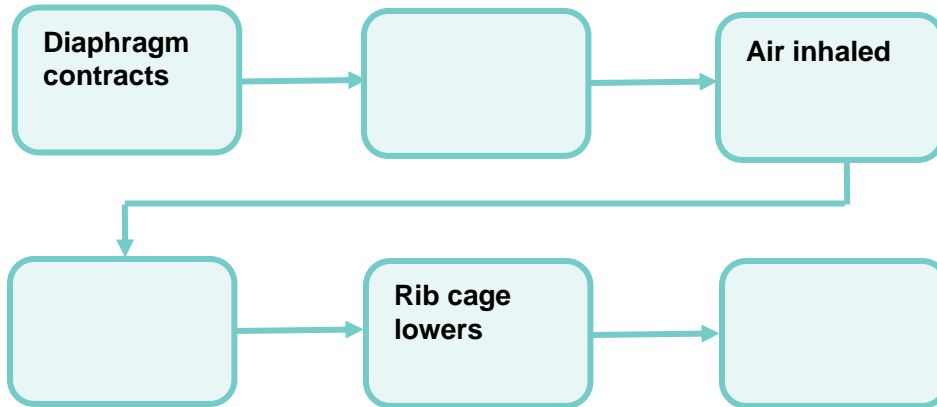
Gas Exchange and Transport

For Questions 2–7, complete each statement by writing the correct word or words.

2. The surface area for gas exchange in the lungs is provided by the _____.
3. The gases exchanged in the lungs are carbon dioxide and _____.
4. The process that exchanges gases across the walls of capillaries is _____.
5. Oxygen diffuses from an area of _____ concentration to an area of lesser concentration.
6. _____ binds with oxygen and increases the blood's oxygen-carrying capacity.
7. Most carbon dioxide combines with _____ in the blood, forming carbonic acid.

Breathing

8. Complete the flowchart to show how breathing works.



Smoking and the Respiratory System

9. Complete the table to describe the health effects of three substances in tobacco smoke.

Substance	Effect
Nicotine	
Carbon monoxide	
Tar	

10. What causes smoker's cough?

11. Smoking even a few cigarettes on a regular basis can lead to chronic bronchitis. What happens to people with this disease?

Apply the Big idea

12. Smoking and secondhand smoke damage both the respiratory system and the circulatory system. Explain how the close structural relationship of these two systems accounts for the effect of smoke on both systems.
