30.2 Respiration and Gas Exchange

**KEY CONCEPT**

The respiratory system exchanges oxygen and carbon dioxide.
Functions of the respiratory system

- picks up $O_2$ from inhaled air
- expels $CO_2$ and water
- where gas exchange takes place
37.3 The Respiratory System

- Structures of the Respiratory System

- Nasal cavity
- Pharynx
- Larynx
- Esophagus
- Trachea
- Right lung
- Left lung
- Bronchus
- Bronchiole
- Diaphragm
- Heart

[Diagram of the respiratory system with labeled structures]
30.2 Respiration and Gas Exchange

Pathway of Air

1) Nasal Cavity (*nose*)
   - mucus warms and moistens air to prevent damage to lungs
   - cilia filter air and trap particles

2) Pharynx
   - directs air into respiratory tract and food into digestive tract

3) Larynx (*voicebox*)
   - sound is produced when air is forced through vocal cords
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Pathway of Air

4) **Trachea** *(windpipe)*
   - located in the center of chest cavity
   - tube made of rings of cartilage

5) **Bronchi/Bronchioles**
   - trachea branches into left and right bronchus
   - each bronchus branches off into smaller bronchioles

6) **Alveoli**
   - tiny air sacs at the end of bronchioles
   - capillaries surround alveoli for gas exchange *(CO₂/O₂)*
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Pathway of Air

7) Lungs
- right lung has 3 lobes; left lung has 2 lobes
- located inside thoracic (chest) cavity
- entire cavity is enclosed by the pleura
  = double membranes that secrete mucus to reduced friction during breathing
Gas exchange occurs in the alveoli of the lungs.

- Oxygen and carbon dioxide are carried by the blood to and from the alveoli.
  - oxygen diffuses from alveoli into capillary
  - oxygen binds to hemoglobin in red blood cells
  - carbon dioxide diffuses from capillary into alveoli
Gas exchange occurs in the alveoli of the lungs.

- Breathing is regulated by the brain stem.
Mechanisms of breathing

- Breathing involves the **diaphragm and muscles of the rib cage**.
- **diaphragm** = a layer of muscle tissue beneath the lungs that contract or relax to help in breathing.

**Inhalation**
- Air inhaled.
- Muscles contract and rib cage expands.
- Diaphragm flattens and moves downward.

**Exhalation**
- Air exhaled.
- Muscles and rib cage relax.
- Diaphragm relaxes and rises.
Respiratory diseases interfere with gas exchange.

- Smoking is the leading cause of lung diseases.

- Lung diseases reduce airflow and oxygen absorption.
  - **Emphysema** destroys alveoli.
  - **Asthma** constricts airways.
  - **Cystic fibrosis** produces sticky mucus.