Chapter 9. Respiratory System

Gross Structure of the respiratory system. [Figure 9.1]

- **Nasal cavity**: filters, warms, and moistens air
- **Pharynx**: passageway where pathway for air and food cross
- **Glottis**: space between the vocal chords; opening to larynx
- **Larynx**: (voice box); produces sound
- **Trachea**: (windpipe); passage of air to bronchi
- **Bronchus**: passage of air to lungs
- **Bronchioles**: passage of air to alveoli
- **Lung**: contains alveoli (air sacs); carries out gas exchange
- **Diaphragm**: skeletal muscle; functions in ventilation

Distinguish between the upper and lower parts of the respiratory system.

Structures of the upper respiratory system [Figure 9.2]:
Structures of the lower respiratory system [Figure 9.2]: Trachea and lungs lined with cilia. [Figure 9.5]
Bronchi and alveoli – Microscopic view. [Figure 9.6]

The Mechanism of Breathing. [Figure 9.7] Inspiration and expiration.
Tidal volume and vital capacity. [Figure 9.9]

Nervous and Chemical Control of Breathing.
Nervous control. [Figure 9.10]
Chemical control.
Chemoreceptors in carotid arteries and the aorta measure acidity (pH) of the blood. The acidity (CO$_2$ concentrations) of the blood is particularly important.

Gas Exchanges in the Body. [Figure 9.11]
Gas exchange in the alveoli.
Carbon dioxide passes from the blood to the alveoli.

\[
\begin{array}{c}
\text{H}^+ + \text{HCO}_3^- & \xrightarrow{\text{carbonic anhydrase}} & \text{H}_2\text{CO}_3 & \xrightarrow{\text{carbonic anhydrase}} & \text{H}_2\text{O} + \text{CO}_2 \\
\text{hydrogen ion} & & \text{bicarbonate ion} & & \text{carbonic acid} & & \text{water} & & \text{carbon dioxide}
\end{array}
\]

Oxygen passing from the alveoli to the blood.
When oxygen concentrations are high, hemoglobin absorbs the oxygen.

\[
\text{Hb} + \text{O}_2 \rightarrow \text{HbO}_2
\]
\text{deoxyhemoglobin} \quad \text{oxygen} \quad \text{oxyhemoglobin}

Oxygen passing from the blood to the tissues.
When oxygen concentrations are low, hemoglobin releases the oxygen.

\[
\text{HbO}_2 \rightarrow \text{Hb} + \text{O}_2
\]
\text{oxyhemoglobin} \quad \text{deoxyhemoglobin} \quad \text{oxygen}

Carbon dioxide passes from the alveoli to the blood.

\[
\text{CO}_2 + \text{H}_2\text{O} \xrightarrow{\text{carbonic anhydrase}} \text{H}_2\text{CO}_3 \xrightarrow{\text{carbonic anhydrase}} \text{H}^+ + \text{HCO}_3^-
\]
\text{carbon dioxide} \quad \text{water} \quad \text{carbonic acid} \quad \text{hydrogen ion} \quad \text{bicarbonate ion}

Hemoglobin and carbon monoxide (CO).
How does hemoglobin respond to carbon monoxide?