Ch. 6 Gases

Properties of Gases

- Gases consist of small particles (atoms or molecules) that move randomly with high velocities
- They spread out and occupy their container
- When they hit the wall of their container, they exert pressure
  - The gas particles of the air (O_2 and N) exert pressure on us which is called atmospheric pressure
  - Atmospheric pressure can be measured by a barometer
  - Pressures exerted by gases are measured in atmosphere (atm) and millimeters of mercury (mmHg)
  - One atm is defined as exactly 760mmHg

Volume and Temperature of Gases

- The volume of gas equals the size of the container in which the gas is placed
- Volume is measured in liters (L) and milliliters (mL)
- The temperature of a gas is related to its kinetic energy which is related to the pressure it exerts
  - A gas heated to 400 K will have twice the kinetic energy and will exert twice the pressure as the same gas heated to 200 K in the same container

Volume and Pressure – Boyle's law

- There is an inverse relationship between volume of a gas and pressure it exerts
  - As volume decreases, pressure increases
  - This inverse relationship is called Boyle's law

Pressure-Volume Relationship in Breathing

- Pg 223

Combined Gas Law

- Combined gas law
  - The combined gas law explains the relationship of pressure (P), volume (V), and temperature (K) of a gas when the amount (n) stays constant
  - This states the following:
    - There is an inverse relationship between V and P of a gas (as volume decreases, pressure increases). This is Boyle's law
    - There is a direct relationship between K and V of a gas (as temperature increases, volume increases). This is Charles's law.
    - There is a direct relationship between K and P of a gas (as temperature increases, pressure increases). This is Gay-Lussac's Law
  - All of these laws assume the amount of a gas does not change

Partial Pressure (Dalton's Law)

- Many gas samples are a mixture of gases
  - Ex) air – oxygen and nitrogen mixture
- Therefore the total pressure is a mixture of the gases.
- In a gas mixture, each gas exerts a partial pressure
- Dalton's law states that the total pressure of a gas mixture is the sum of the partial pressure of gases in the mixture

Blood Gases

- Partial Pressure of Oxygen and Carbon Dioxide in Blood and Tissues
  - O2 – Oxygenated blood 100 mmHg, Deoxygenated blood 40 mmHg, Tissues 30 or less mmHg
  - CO2 - Oxygenated blood 40mmHg, Deoxygenated blood 46 mmHg, Tissues 50 or less mmHg