Ch. 12 Red
p.1

Gases

- Expand (to fill vol. of container)
- Diffuse
- Exert Pressure
- Compressible

Kinetic Molecular Theory - describes the behavior of matter in terms of particles in motion. The model makes several assumptions about the size, motion, + E of gas particles.

Ideal Gas - imaginary gas that perfectly fits all the assumptions of the kinetic molecular theory.

* Most gases behave ideally most of the time! *

Assumptions of the K. M. Theory

1. Gases consist of a large # of tiny particles that are farther apart relative to their size.
   - most volume is empty space
   - lower density than other states of matter
   - 1000x greater in vol. than liquid or solid

2. Collisions between gas particles and container walls are elastic. (no KE lost)
   - total KE stays the same IF the temp. remains the same

3. Gas particles are in constant, random motion

4. No forces of attraction or repulsion between gas particles (polarity is NOT a factor)

⑤ Average K.E. depends on the T of the gas.

$KE = \frac{1}{2}mv^2$ m = mass v = velocity

* In a sample of a single gas, all particles have the same mass, but do <u>not</u> have the same velocity.

<u>temperature</u> - a measure of the avg. K.E. of the particles in a sample of matter.

<u>Diffusion & Effusion</u>

<u>Diffusion</u> - The term used to describe the movement of one material through another. (fried chicken through house)

<u>Effusion</u> - when a gas escapes through a tiny opening

Thomas Graham experiments (1846) - effused gases into a vacuum and found:

<u>Graham's Law of Effusion</u> - The rate of effusion for a gas is inversely proportional to the square root of its molar mass

$$\text{Rate of Effusion} \propto \frac{1}{\sqrt{\text{molar mass}}}$$

- lighter particles diffuse more rapidly than heavier ones

- To compare samples: $\frac{Rate_A}{R.B.} = \sqrt{\frac{mm_B}{mm_A}}$

Practice Problems, p. 405

① Rate of effusion for N_2 + Ne

$$\frac{\text{Rate } N_2}{\text{Rate Ne}} = \sqrt{\frac{20.18}{28.02}} = .8486$$

② CO + CO_2

$$\frac{\text{Rate CO}}{\text{Rate } CO_2} = \sqrt{\frac{44.01}{28.01}} = 1.253$$

③ $= \sqrt{}$

Pressure - force per unit area
- Gas particles exert pressure when they collide with the walls of their container
  - little mass / less pressure
  - lower T / fewer collisions / less pressure

Measuring Pressure
- Evangelista Torricelli - Italian physist (1608-1647)
  - Could only pump water 10m.
  - Hg could pump - $\frac{1}{14}$ of that (14 X more dense)

White book

760 mm = 1 atm = 101.3 kPa
760 torr

pascal = force of one Newton per sq. meter ($\frac{N}{m^2}$)

barometer - name of Torricelli's instrument for measuring atmospheric pressure

manometer - pic. p. 407