GAS LAWS AND THE BEHAVIOR OF GASES:

STP: Standard Temperature and Pressure is defined as **760 Torr = 1 atm @ 0^{O}C**.

MEASUREMENT OF PRESSURE: Remember, 101.3kPa(kilopascals) = 1013 mbar = 760 mm of Hg = 760 **Torr**.(Torr is named after Torricelli.) Also, 1000 mbar = 750 mm of Hg. Also, 1 atmosphere(atm) = 760 Torr.

MODIFIED AVOGADRO'S PRINCIPLE: One mole of any gas will occupy **22.4** Liters (22400 cm^3) at STP. In fact, if the temperature and pressure of a gas are fixed, one mole of any gas will occupy the same volume.

BOYLE'S LAW: $PV = k$ where **P** = pressure, **V** = volume, and **k** = constant.

(The temperature of the gas must be constant.)

CHARLES' LAW: $\frac{V}{T} = k$ where **T** = temperature(K°) and **k** = constant.

(The pressure of the gas must be constant.)

GAY-LUSSAC'S LAW: $\frac{P}{T} = k$ where **P** = pressure, **T** = temperature(K°), and **k** = constant. (The volume of the gas must be constant.)

COMBINED CHARLES' AND BOYLE'S LAW: $\frac{PV}{T} = k$

DALTON'S LAW: In a closed container, the total pressure of two or more gases mixed together is the sum of the pressures of each gas.

IDEAL GAS EQUATIONS: $PV = nRT$ where n = the number of moles of gas and R = a special constant = **.0821 L·atm/mol·K°, 83.1 cm^3·bar/mol·K°,** or **8.31 L·kPa/mol·K°**. Also note that $PV = \frac{mRT}{M}$ where m = mass of the gas and M = molecular weight of the gas.

GRAHAM'S LAW: $\frac{V_1}{V_2} = \sqrt{\frac{m_2}{m_1}} = \text{rate of diffusion}$ where the temperature and pressures of the two gases are the same. The kinetic energies of the gases are the same. **V** = velocity. Note that kinetic energy is energy of motion; i.e., if something is moving, then that object has kinetic energy. The above equation comes from an equation in physics which states that kinetic energy = **½mv^2**.