

## The Basics

### Combined Gas Law

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$P_1, P_2$  - Pressure, any units;  $V_1, V_2$  - Volume, any units;  $T_1, T_2$  - Temp, °K

### Ideal Gas Law

$$PV = nRT$$

$P$  - Pressure;  $V$  - Volume;  $n$  - number of moles;  
 $R$  - Ideal gas constant, see sidebar;  $T$  - Temp, °K

#### Ideal Gas Constant, $R$

The ideal gas constant,  $R$ , has different values, depending on your units for pressure and volume; the two most common are:

- $R = 0.0821 \text{ L}\cdot\text{atm}/\text{mole}\cdot\text{K}$
- $R = 62.36 \text{ L}\cdot\text{torr}/\text{mole}\cdot\text{K}$

## Less Basic

### Graham's Law

$$\frac{v_1}{v_2} = \sqrt{\frac{m_2}{m_1}}$$

$v_1, v_2$  - Diffusion rate;  $m_1, m_2$  - molar mass

### Molecular RMS Velocity

$$v_{\text{rms}} = \sqrt{\frac{3RT}{m}}$$

$v_{\text{rms}}$  - velocity, m/s;  $R$  - Ideal gas constant, 8.3145 J/mole•K;  $T$  - Temp, °K;  $m$  - molecular mass in kg/mole

You need to use this value for  $R$  so that the velocity will come out in m/s.

Note the unusual units here. This will be 1,000 times what we usually think of as molar mass.