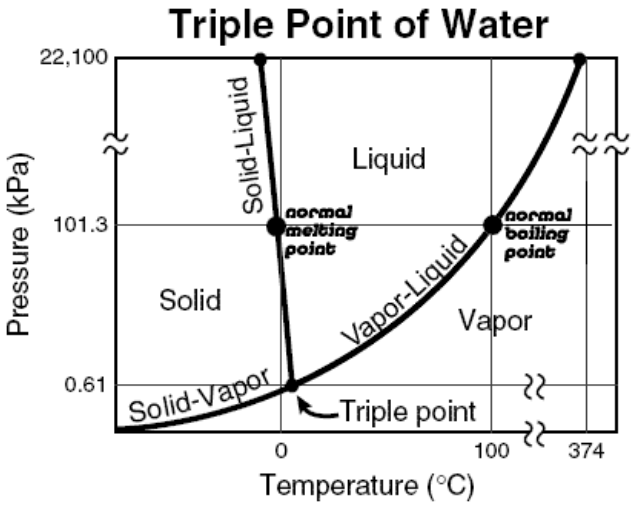
Gas Laws Review

- The Kinetic Molecular Theory (KMT) is a model that attempts to explain the properties of an ideal gas.
- The KMT states:
  - The particles of an ideal gas are so small compared with the distances between them that **the volume of individual particles can be assumed to be negligible (zero).**
  - The particles of an ideal gas are in **constant motion.** The collisions of the particles with the walls of the container are the cause of the pressure exerted by the gas.
  - The **particles of an ideal gas are assumed to exert no forces on each other; no attraction or repulsion between particles.**
  - The **average kinetic energy** of gas particles of an ideal gas is assumed to be **directly proportional to the Kelvin temperature of the gas**.

Gas Law Formulas	
$P_{total} = P_1 + P_2 + P_3 \ldots$	Dalton's Law of Partial Pressure
$X_1 = n_1/n_{total} = P_1/P_{total}$	Mole Fraction
$P_1V_1 = P_2V_2$	Boyle's Law
$V_1/T_1 = V_2/T_2$	Charles' Law
$V_1/n_1 = V_2/n_2$	Avogadro's Law
$P_1/T_1 = P_2/T_2$	Gay-Lussac's Law
$P_1V_1/T_1 = P_2V_2/T_2$	Combined Gas Law
$\frac{Rate_B}{Rate_A} = \frac{\sqrt{MM_A}}{\sqrt{MM_B}}$	Graham's Law
PV = nRT R = 8.3145 L kPa/mol K or R= 0.08206 L atm/mol K	Ideal Gas Law
(mm) P = dRT mm = molar mass d = density R= 0.08206 L atm/mol K	Gas Density/Molar Mass
$\upsilon_{rms} = \sqrt{(3RT/M)}$ M = molar mass in kg / mol R = 8.3145 J/mol K	Root Mean Square Velocity
Standard Atmospheric Pressure: 1 atm = 760 torr = 760 mm Hg = 101.3 kPa = 14.7 psi	

- **Real gases deviate** from ideal behavior **at high pressures and low temperatures**. "Real Gases" do have a volume and do have attractive or repulsive forces between them.
- The "Gas Laws" only apply to "Ideal Gases" but since the deviation is minimal they are used anyway.
- **Temperature is always in Kelvin when using the gas laws.**
- At the triple point, solid liquid and gas states all exist.
- If you increase the pressure on a liquid you will raise its boiling point. If you reduce the pressure on a liquid, you will lower its boiling point.
- Vapor pressure increases as a substance nears its boiling point.



- At a substance's boiling point vapor pressure is equal to the atmospheric pressure.
- Atmospheric pressure is measured using a barometer.
- Vapor pressure is measured using a manometer.