AR Chemistry Review Notes 3

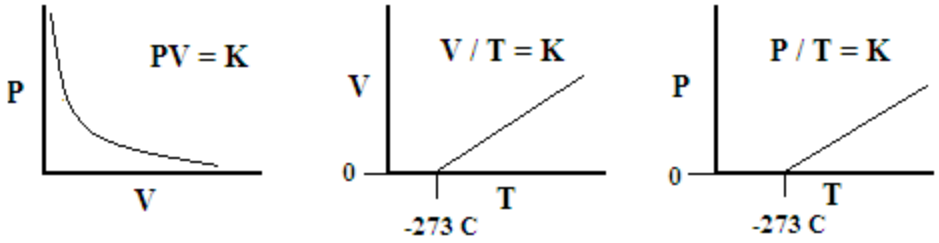
Gas Laws:

Pressure = Force / Area Gas pressure caused by collisions of molecules with surfaces
Gases move randomly, with different speeds (Temp = avg KE)

Diffusion: Spreading of gas throughout a container, or throughout other gases

Ideal Gases: Have NO VOLUME and NO IMA
Real gases approximate IDEAL GASES at room temperatures

STP: **Standard Pressure = 1 atm = 14.7 lbs/in^2 = 760. mm Hg = 101.3 kPa**
Standard Temperature = 0 ^oC = 273 K {K = ^oC + 273}
1 mole of ANY GAS = 22.4 L @ STP



Ideal Gas Law: PV = n R T n = moles R = 0.0821 L atm / mol K or 8.31 L kPa / mol K

Avogadro's Law of Combined Gases: Equal Volumes of Gas at the same conditions
contain EQUAL NUMBERS OF MOLECULES

$2\ X_{(g)} + 3\ Y_{(g)} \rightarrow 1\ X_2Y_{3\,(g)}$
2 moles 3 moles 1 mole
2 Liters 3 Liters 1 Liter (at same conditions)

Dalton's Law of Partial Pressures: $P_{Total} = P_{gas\ A} + P_{gas\ B} + P_{gas\ C} + \ldots$

Solutions:

Evenly mixed at the molecular level (Homogeneous)
Any physical states (solid Cu and solid Au, solid salt in water, air: Oxygen in Nitrogen (2 gases))

Solvent: The material doing the dissolving--same states, the most abundant, eg. Nitrogen is air's solvent
Solute: The material being dissolved

Water Solutions: Water uses polarity to dissolve substances, process is called solvation or hydration
Ionic Compounds: Most dissolve into IONS
Covalent Compounds: Most are insoluble or slightly soluble
Exceptions: Acids (ionize), Sugars (OH groups), Alcohols (OH groups)
ionize dissolve whole dissolve whole

Changes	Solubility (Max Conc. at given Temp)		Rate of Dissolving	
	Solid	Gas	Solid	Gas
Temperature Increase	Increases	Decreases	Increases	Increases
Pressure Increase	-----	Increases	------	Increases
Surface Area Increase	-------	-------	Increases	-------

Concentrations:

Molarity: M = mol / L (moles solute / Liters of solution) "Add enough water"

% Mass % = [mass solute / total mass] x 100 total mass = (mass solute + mass solvent)

g / L grams solute per Liter of solution

ppm parts per million = [mass solute / total mass] x 1,000,000

Ionization / Dissolution: Ionic compounds and Acids ionize, other molecular compounds dissolve whole
Ionization: The "naming break" is the "break apart break"

$HCl \xrightarrow{---H_2O--} H^{+1}_{(aq)} + Cl^{-1}_{(aq)}$ $CaCl_2 \xrightarrow{---H_2O--} Ca^{+2}_{(aq)} + 2\ Cl^{-1}_{(aq)}$

$C_6H_{12}O_6 \xrightarrow{---H_2O--} C_6H_{12}O_{6\,(aq)}$ $CH_3OH \xrightarrow{---H_2O--} CH_3OH_{\,(aq)}$

<u>Thermodynamics:</u> 1 calorie = 1 gram water 1 degree Celsius. 1 calorie = 4.18 Joules

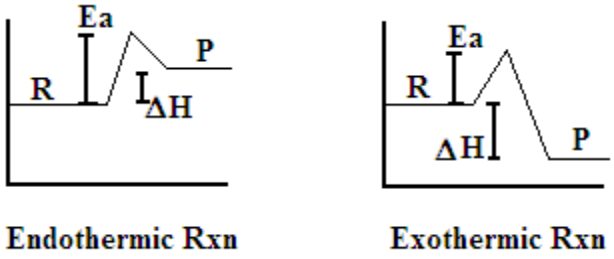
Exothermic: Releases Heat $\Delta H = -$ Energy is a PRODUCT – right side of equation

$3\ N_2 + H_2 \leftrightarrows 2\ NH_3 + \text{heat}$ $\Delta H = -$

Endothermic: Absorbs Heat $\Delta H = +$ Energy is a REACTANT – left side of equation

$\text{heat} + MgSO_4{*}7H_2O \rightarrow MgSO_4 + 7\ H_2O$ $\Delta H = +$

Heat Content Diagrams

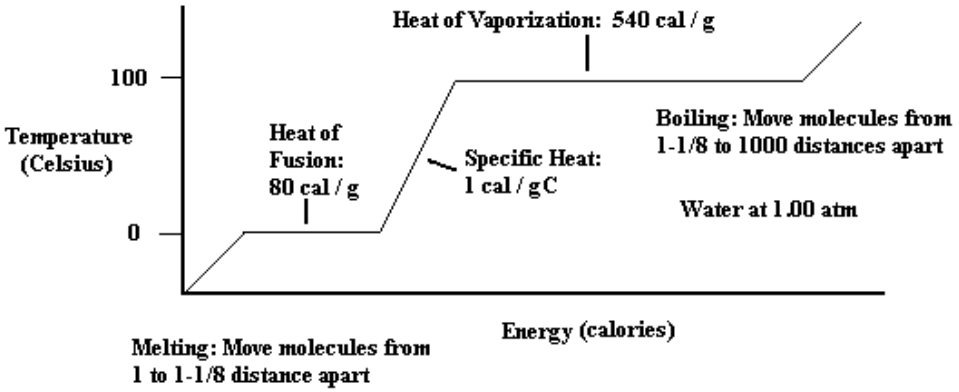


Endothermic Rxn Exothermic Rxn

Endothermic: melt, warm, boil, break apart Exothermic: freeze, cool, condense, form, combust

Heating Curve: Adding or Removing Heat to a Substance

c = specific heat h_{fusion} = heat to melt / freeze $h_{vaporization}$ = heat to boil / condense



Energy to turn 20 g ice at –40 C to steam at 160 C?

Q = Q warm ice + Q melt ice + Q warm water + Q boil water + Q warm steam

$Q = c\ m\ \Delta t + m\ h_{fus} + c\ m\ \Delta t + m\ h_{vap} + c\ m\ \Delta t$