

# DOUGHERTY VALLEY HS CHEMISTRY EQUATIONS AND CONSTANTS

## EQUILIBRIUM and ACID BASE

$$K_C = \frac{[C]^C [D]^D}{[A]^A [B]^B} \quad K_p = \frac{(P_C)^C (P_D)^D}{(P_A)^A (P_B)^B}$$

$$K_a = \frac{[H^+][A^-]}{[HA]}; \quad K_b = \frac{[OH^-][HB^+]}{[B]}$$

$$K_w = [H^+][OH^-] \quad K_w = K_a \times K_b$$

$$pH = -\log[H^+], \quad pOH = -\log[OH^-]$$

$$14 = pH + pOH \quad (\text{at } 25^\circ\text{C})$$

### Equilibrium Constant:

$$K_w = 1.0 \times 10^{-14} \text{ at } 25^\circ\text{C}$$

## THERMOCHEMISTRY

**No Phase Change:**  $q = mc\Delta T$

**Phase Change:**  $q = m \times \Delta H_{fus}$  (or  $q = mL_{fus}$ )  
 $q = m \times \Delta H_{vap}$  (or  $q = mL_{vap}$ )

**Calorimetry:**  $q_{object\ 1} = -q_{object\ 2}$

### Specific Heats:

$$\text{Water} = 4.184 \frac{J}{g^\circ C}$$

$$\text{Steam} = 1.87 \frac{J}{g^\circ C}$$

$$\text{Ice} = 2.09 \frac{J}{g^\circ C}$$

### Latent Heats:

$$\text{Fusion} = 334 \frac{J}{g}$$

$$\text{Vaporization} = 2260 \frac{J}{g}$$

### Energy Conversion:

$$1 \text{ cal} = 4.184 \text{ J}$$

## GASES

**Ideal Gas Law:**  $PV = nRT$

**Combined Gas Law:**  $\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

**Dalton's Law:**  $P_{total} = P_A \times P_B \times P_C \dots$

**Molar Mass:**  $M = \frac{mRT}{PV}$      $n = \frac{m}{M}$

**Gas Density:**  $D = \frac{MP}{RT}$

**Kinetic Energy:**  $KE = \frac{1}{2}mv^2$

**Temperature Conversion:**  $Kelvin = ^\circ C + 273K$

**Volume of Ideal Gas at STP:**  $22.42 \frac{L}{mol}$

### Ideal Gas Constants:

$$= 8.314 \frac{L \cdot kPa}{K \cdot mol}$$

$$= 0.0821 \frac{L \cdot atm}{K \cdot mol}$$

$$= 62.4 \frac{L \cdot mmHg}{K \cdot mol}$$

### Pressure Conversions:

$$1 \text{ atm} = 760 \text{ mm Hg}$$

$$= 760 \text{ torr}$$

$$= 101,325 \text{ Pa}$$

$$= 101.3 \text{ kPa}$$

$$= 14.7 \frac{lbs}{in^2}$$

## SOLUTIONS

**Molarity:**  $M = \frac{\text{mole solute}}{\text{Liters of solution}}$

**Mass Percent:**  $\% = \frac{\text{mass solute}}{\text{mass solute} + \text{mass solvent}}$

**Mole Fraction:**  $\chi_A = \frac{\text{mol}_A \text{ solute}}{\text{mol}_A \text{ solute} + \text{mol solvent}}$

## ENTHALPY

$$\Delta H_{Bonds} = \Sigma Bonds_{Broken} - \Sigma Bonds_{Formed}$$

$$\Delta H_{Rxn} = \Sigma \Delta H_{f \text{ Products}} - \Sigma \Delta H_{f \text{ Reactants}}$$