# CHEM 160 EQUATION SHEET

**Ch. 3**

- Percent Yield = [ (Actual yield) / (Theoretical yield) ] x 100
- Stoichiometry: (What we have) x [(What we want)/(What we know)]
- Initial – consumed = remaining
- (Moles of what we have) x (MW of what we have) = (Grams of what we have)
- (Grams of what we have) / (MW of what we have) = (Moles of what we have)
- $M_1V_1=M_2V_2$ $mol_1=mol_2$ *Dilutions and one to one ratio problems
- M=mol/L
- mol = M x L

**Ch. 13**

- $K_c$ = (Products/Reactants)
- aA + bB → cC + dD
  - $K_c = ([C]^c[D]^d)/([A]^a[B]^b)$
- $K_p=K_c(RT)^{\Delta n}$
- $K_c=K_f/K_r$

**Ch. 14**

- $K_w=[H_3O^+][OH^-] = K_aK_b = 1.0 \times 10^{-14}$
  - $K_a = K_w/K_b$
  - pH + pOH = 14
  - $pH = -\log[H_3O^+]$
  - $[H_3O^+] = 10^{-pH}$
- Acidic conditions
  - $HA(aq) + H_2O (l) \rightarrow H_3O^+(aq) + A^-(aq)$
  - $K_a=[H_3O^+][A^-]/[HA]$
  - $pK_a=-\log(K_a)$
- Basic Conditions
  - $A^-(aq) + H_2O(l) \rightarrow OH^-(aq) + HA (aq)$
  - $K_b= [OH^-][HA]/[A^-]$
  - $pK_b=-\log(K_b)$
- Percent Dissociation = $([HA]_{dissociated} / [HA]_{initial}) \times 100$

**Ch. 15**

- Henderson-Hasselbach:
  $pH = pK_a + \log([A^-]/[HA])$
- Solubility
  $M_mX_x(s) \rightarrow mM^{n+} (aq) + xX^{y-}(aq)$
  $K_{sp} = [M^{n+}]^m[X^{y-}]^x$
  $K_{net} = K_{sp}K_f$

**Ch. 16**

- Enthalpy

  - $\Delta H = \Delta E + P\Delta V$
  - $\Delta H° = [\Sigma \Delta H° n(\text{products})] - [\Sigma \Delta H° n(\text{reactants})]$
  - ΔH°- [KJ/mol]
- Entropy
  - $\Delta S = S_{final} - S_{initial}$
  - $S = k * \ln W$
  - $\Delta S° = [\Sigma \Delta S° n(\text{products})] - [\Sigma \Delta S° n(\text{reactants})]$
  - $\Delta S_{total} = \Delta S_{system} + \Delta S_{surroundings}$
  - $\Delta S_{surroundings} = -\Delta H/T$
  - ΔS – [J/K]
- Gibbs
  - $\Delta G = \Delta H - T\Delta S$
  - $\Delta G° = \Delta H° - T\Delta S°$
  - $\Delta G° = [\Sigma \Delta G° n(\text{products})] - [\Sigma \Delta G° n(\text{reactants})]$
  - $\Delta G = \Delta G° + RT\ln Q$

**Ch. 17**

- Gibbs
  - $\Delta G = -nFE$
  - $\Delta G° = -nFE°$
- Energy
  - $E°_{cell} = E°_{red} + E°_{oxid}$
  - $E = E° - (RT/nF)\ln Q$
  - $E = E° - (0.0592/n) \log Q$ *at 25°C