CH13

I. Conjugated acid of species A will be $A + H^+ = HA^+$

Conjugated base of species HA will be $HA - H^+ = A^-$

Relative acid/base strength(4 rules):

a. most acid/base are weaker acid/base

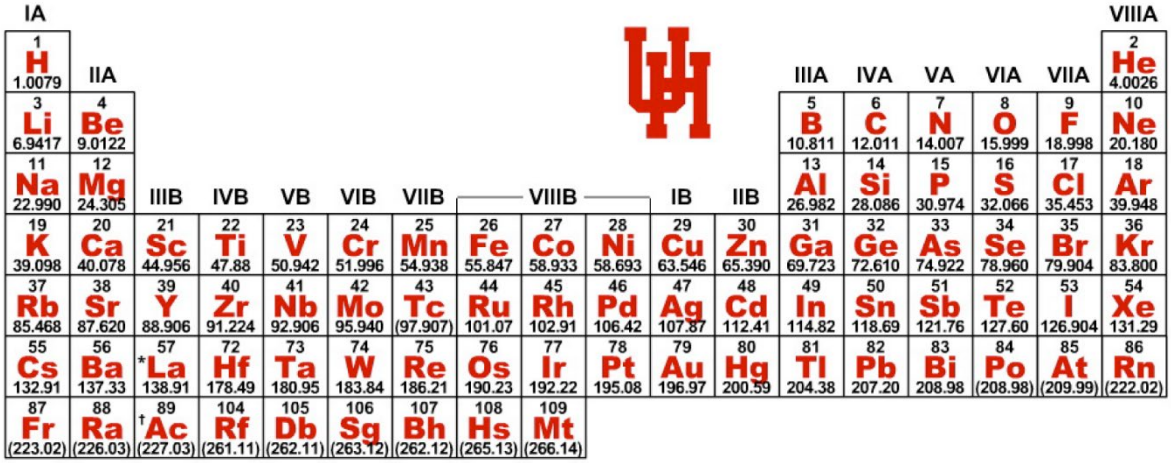
b. periodic table rules: stronger bases at the bottom left corner

stronger acids at the bottom right corner

c. strong acids: HI,HBr,$HClO_4$, HCl, $HClO_3$, H_2SO_4,HNO_3

strong bases: IA, IIA oxide (e.g., MgO) and hydroxides (NaOH)

d. oxy acid (the same central atom): larger #O-#H, more acidic



II. Acid-base properties of salt:

a. conjugated base (acid) of a **strong** acid (base): Neutral

b. conjugated base (anion) of a **weak** acid: Basic

c. conjugated acid (cation) of a **weak** base: Acidic

III. pH and % dissociation calculation of acid, base, and salt

pH calculation summary

$K_a \times K_b = K_W$

				pH	% dissociation
Strong acid	$HA + H_2O \rightarrow H_3O^+ + A^-$	$K_a = \frac{[H_3O^+][A^-]}{[HA]_0}$	$[H_3O^+] = [HA]_0$	$-\log([HA]_0)$	100%
Weak acid			$\mathbf{[H_3O^+] = \sqrt{[HA]_0 \times K_a}}$	$-\log(\sqrt{[HA]_0 \times K_a})$	$\sqrt{\frac{K_a}{[HA]_0}}$
	Biprotic acid (H_2A)	K_{a1}, K_{a2}	$[H_3O^+] = [HA^-] = \sqrt{[HA]_0 \times K_{a1}}$ $[A^{2-}] = K_{a2}$	$-\log(\sqrt{[HA]_0 \times K_a})$	$\sqrt{\frac{K_a}{[HA]_0}}$
Strong base	$BOH + H_2O \rightarrow OH^- + B^+$	$K_b = \frac{[B^+][OH^-]}{[BOH]_0}$	$[OH^-] = [BOH]_0$	$14 + \log([BOH]_0)$	100%
Weak base			$\mathbf{[OH^-] = \sqrt{[BOH]_0 \times K_b}}$	$14 + \log(\sqrt{[BOH]_0 \times K_b})$	$\sqrt{\frac{K_b}{[BOH]_0}}$
buffer	HA/A^-			$\mathbf{pH = pKa - \log(\frac{[HA]_0}{[A^-]_0})}$	
	Add in acid	$H_3O^+ + A^- \rightarrow HA$	Recal $[HA]_{new}$, $[A^-]_{new}$	$pH = pKa - \log(\frac{[HA]_{new}}{[A^-]_{new}})$	
	Add in base	$OH^- + HA \rightarrow A^-$			

CH13

13.I

1. Classify NH_3, $CH_3CH_2CH_2NH_2$, H_3AsO_4, RbOH, $HClO_4$. **WB, WB, WA, SB, SA**.

2. Consider the reaction shown. Using your knowledge of relative acid-base strengths and equilibrium, determine what you can about the size of K_c for the reaction.
   $H_3SbO_3(aq) + HTeO_3^-(aq) \rightleftharpoons H_2SbO_3^-(aq) + H_2TeO_3(aq)$ **$K_c<1$**

13.II

3. Is an aqueous solution of $NaNO_3$ acidic, basic or neutral (use A, B or N)? **N**

   Is an aqueous solution of $NaCH_3COO$ acidic, basic or neutral (use A, B or N)? **B**

   Is an aqueous solution of $C_2H_5NH_3Br$ acidic, basic or neutral (use A, B or N)? **A**

13.III

4. Calculate the pH of a 0.60 M solution of ethylamine($C_2H_5NH_2$, $K_b = 5.6 \times 10^{-4}$.) **12.26**

5. Calculate the pH of a 0.100 M solution of ascorbic acid, for which the K_a value is 1.00×10^{-5}. **3.0**

6. What is the pH of 0.269 Methylammonium chloride, $C_2H_5NH_3Cl$. The K_b of ethylamine, $C_2H_5NH_2$, is 4.3×10^{-4}.
5.6