Chem 1515
Problem Set #11
Fall 2001

Name_____
TA Name _____
Lab Section #_____

ALL work must be shown to receive full credit. **Due at the beginning of lecture on Friday, November 2, 2001.**

PS11.1. For aqueous solutions of the following substances, write the dissociation reaction and indicate whether the substance behaves as an Arrhenius acid or base.

a) $HF_{(aq)}$

b) $HC_6H_5O_{(aq)}$

c) $Ba(OH)_{2(aq)}$

d) $LiOH_{(aq)}$

e) $H_2O_{(aq)}$

f) $H_2CO_{3(aq)}$

PS11.2. Calculate the pH and pOH in each of the following aqueous solutions. In each case, indicate whether the solution is acidic or basic.

a) $[H^+] = 3.89 \times 10^{-5}$ M

b) $[OH^-] = 8.34 \times 10^{-2}$ M

c) $[OH^-] = 1.50 \times 10^{-7}$ M ($[OH^-]$ in milk)

d) $[H^+] = 9.39 \times 10^{-10}$ M

e) $[H^+] = 4.0$ M

f) $[OH^-] = 10.1$ M

PS11.3. Calculate the $[H^+]$ and $[OH^-]$ in each of the following aqueous solutions.

a) pH = 3.40 (pH of orange juice)

b) pH = 6.7 (pH of silva)

c) pH = 4.4 (pH of beer)

d) pOH = 2.15

e) pOH = 12.4

f) pH = -0.650

PS11.4. For each of the following acids, write the formula for the conjugate base.

a) HPO_4^{2-} c) H_2O e) OH^-

b) $HClO_3$ d) $CH_3CH_2NH_3^+$ f) NH_4^+

PS11.5. For each of the following bases, write the formula for the conjugate acid.

a) OH^- c) HCO_3^{2-} e) CH_3NH_2

b) Cl^- d) H_2O f) $(CH_3)_3N$

PS11.6. For the following compounds, write the reaction with water and indicate the Brø nsted acid, base, the conjugate acid and conjugate base.

a) $HBr_{(g)}$

b) $NH_{3(g)}$

c) $HCN_{(g)}$

d) $HC_7H_5O_{2(s)}$

e) $CH_3NH_{2(l)}$

PS11.7. For each of the following compounds, write two Brø nsted-Lowry equations, one showing how the substance behaves as an acid, the second showing how the substance behaves as a base.

a) $HCO_3^-{}_{(aq)}$

b) $NH_{3(aq)}$

c) $HPO_4{}^{2-}{}_{(g)}$

d) $HSO_4^-{}_{(s)}$

PS11.8. Determine the equilibrium constant for the following solutions. (Show your work clearly!)

a) 0.250 M HF whose pH = 1.89.

b) 0.235 M NH_3 whose pH = 11.31.

c) 0.500 M B whose pH = 9.34.

d) 0.302 M HA whose pH = 4.80.

PS11.9. Given the following substances and their initial concentration:

a)	0.200 M HNO_3	e)	55.5 M H_2O	i)	0.200 M HC_6H_5O
b)	0.200 M HF	f)	0.200 M HNO_2	j)	0.200 M $Ba(OH)_2$
c)	0.200 M NaOH	g)	0.200 M CH_3NH_2	k)	0.003501 M HF
d)	0.200 M C_5H_5N	h)	0.200 M $C_2H_5NH_2$	l)	0.200 M HOCl

Answer the following,

i) identify each as an acid, base or neutral substance.
ii) list the K_a value for each acid and K_b value for each base.
iii) identify each substance as strong or weak.
iv) calculate the $[H^+]$ and the pH of each of the solutions. {Show calculation for a, c, d, e, h, j, and k.}
v) determine the percent ionization for each acid and base.
vi) rank all substances from strongest acid...weakest acid...neutrals.. ...weakest base...strongest base.

PS11.9. (Continued)

PS11.9 (Continued)