Name: KEY Period: _____ /53

K_a and K_b Calculations Worksheet

When a strong acid or base is placed in water, they completely ionize. This means that approximately 100% of the acid or base forms products (or the arrow in the chemical equation points one direction). In the case of a weak acid or base, the substance only partially ionizes. This means equilibrium is established in an aqueous solution of a weak acid or base. Using your understanding of acid/base chemistry, complete the following problems.

1. Write chemical equations which represent the dissociation of each of these acids or bases in aqueous solution. Use a single arrow in the case of a strong acid or base, and a double arrow to represent the equilibrium condition that exists in the solution of a weak acid or base.

a. HCl	$HCl_{(aq)} \rightarrow H^+_{(aq)} + Cl^-_{(aq)}$
b. NaOH	$NaOH_{(aq)} \rightarrow Na^+_{(aq)} + OH^-_{(aq)}$
c. H_2SO_4	$H_2SO_{4(aq)} \rightarrow H^+_{(aq)} + HSO_4^-{}_{(aq)}$ $HSO_4^-{}_{(aq)} \rightarrow H^+_{(aq)} + SO_4^{2-}{}_{(aq)}$
d. KOH	$KOH_{(aq)} \rightarrow K^+_{(aq)} + OH^-_{(aq)}$
e. $HC_2H_3O_2$	$HC_2H_3O_{2(aq)} \rightleftharpoons H^+_{(aq)} + C_2H_3O_2^-{}_{(aq)}$
f. HCN	$HCN_{(aq)} \rightleftharpoons H^+_{(aq)} + CN^-_{(aq)}$
g. $Cu(OH)_2$	$Cu(OH)_{2(aq)} \rightleftharpoons Cu^{2+}_{(aq)} + 2OH^-_{(aq)}$
h. NH_4OH	$NH_4OH_{(aq)} \rightleftharpoons NH_4^+{}_{(aq)} + OH^-_{(aq)}$

2. Calculate the $[H^+]$ and $[OH^-]$ of a 1.0×10^{-3} M solution of HCl, a strong acid. $HCl \rightarrow H^+ + Cl^-$

$[H^+][OH^-] = 1.0 \times 10^{-14}$

$[H^+] = 1.0 \times 10^{-3}$ mol/L

$[OH^-] = \frac{1.0 \times 10^{-14}}{1.0 \times 10^{-3}}$

$= 1.0 \times 10^{-11}$ mol/L

3. Calculate the $[OH^-]$ and the $[H^+]$ of a 0.0020 M solution of NaOH, a strong base. $NaOH \rightarrow Na^+ + OH^-$

$[H^+][OH^-] = 1.0 \times 10^{-14}$

$[OH^-] = 2.0 \times 10^{-3}$ mol/L

$[H^+] = \frac{1.0 \times 10^{-14}}{[0.0020]}$

$= 5.0 \times 10^{-12}$ mol/L