

Part I
Multiple Choice:

- 1) Which of the following is the strongest base?
 - a) CH_3NH_2
 - b) LiOH
 - c) $\text{B}(\text{OH})_3$
 - d) $\text{Al}(\text{OH})_3$

- 2) What is the pH of a 0.050 M $\text{Sr}(\text{OH})_2$ solution?
 - a) 1.30
 - b) 13.00
 - c) 1.00
 - d) 12.70

- 3) According to Bronsted-Lowry acid/base theory, which one of the following is not an acid/conjugate base pair?
 - a) $\text{H}_3\text{O}^+ / \text{OH}^-$
 - b) $\text{CH}_3\text{OH}_2^+ / \text{CH}_3\text{OH}$
 - c) HI / I^-
 - d) $\text{HSO}_4^- / \text{SO}_4^{2-}$
 - e) $\text{H}_2\text{CO}_3 / \text{HCO}_3^-$

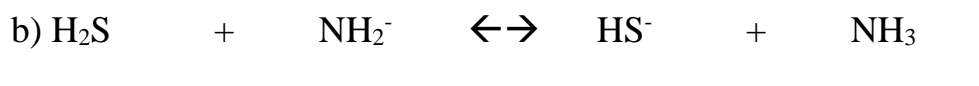
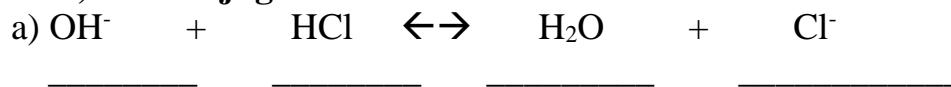
- 4) The substance Na_2SO_3 is considered:
 - a) a strong Bronsted-Lowry acid
 - b) a strong Bronsted-Lowry base
 - c) a weak Bronsted-Lowry acid
 - d) a weak Bronsted-Lowry base
 - e) neutral and has no effect on pH

- 5) Which of the following possesses the greatest concentration of hydronium ion?
 - a) a solution with a pH of 3.00
 - b) a 1×10^{-3} M solution of HNO_3
 - c) a solution with a pOH of 12.2
 - d) pure liquid water

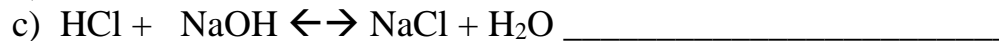
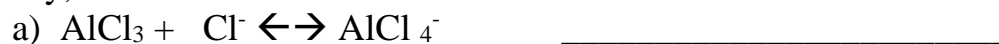
- 6) Which of the following is the strongest acid?
- a) HNO_2 ($K_a = 4.5 \times 10^{-4}$)
 - b) HCN ($K_a = 4.9 \times 10^{-10}$)
 - c) HClO ($K_a = 3.0 \times 10^{-8}$)
 - d) HF ($K_a = 6.8 \times 10^{-4}$)
- 7) According to the Lewis definition, an acid is a species
- a) having a hydrogen ion
 - b) donating a pair of electrons
 - c) accepting a pair of electrons
 - d) accepting a hydrogen ion
- 8) All of the following are potential Bronsted bases **except**
- a) NH_3
 - b) H_2O
 - c) CH_4
 - d) CN^-
- 9) Which metal oxide is most basic under conditions of equal molar concentration in water?
- a) Al_2O_3
 - b) BaO
 - c) K_2O
 - d) ZnO
 - e) Ag_2O
- 10) Which element in Group 15 (5A) forms the most basic oxide?
- a) N
 - b) P
 - c) As
 - d) Sb
 - e) Bi

Part II

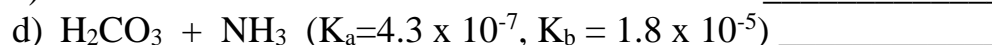
1) In the following acid/base reactions, label the **acid, base, conjugate acid, and conjugate base.**



2) Designate the following Acid/base reactions as Arrhenius, Bronsted-Lowry, or Lewis:



3) Tell whether the following reactions will yield a **neutral, acidic, or basic solution** at equivalency.



4) What is the pH of a solution of 0.035 M NaOH?

5) What are the pH and pOH of a solution with $[\text{H}_3\text{O}^+]$ of 3.08×10^{-4} M?

6) What is the $[\text{H}_3\text{O}^+]$ of a solution with a pH of 11.12?

7) What is the $[\text{OH}^-]$ of a solution with a pH of 8.52 ?

8) What are the $[\text{H}_3\text{O}^+]$, $[\text{OH}^-]$, pH, and pOH of a 0.080 M solution of HNO_3 ?

9) Acetic acid has a K_a of 1.80×10^{-5} . Determine the following quantities in a 1.15 M acetic acid solution.

a) $[\text{H}_3\text{O}^+]$ _____

b) pH _____

c) $[\text{OH}^-]$ _____

d) $[\text{C}_2\text{H}_3\text{O}_2^-]$ _____

e) $[\text{HC}_2\text{H}_3\text{O}_2]$ _____

10) Calculate the pH of a 0.0500 M solution of $\text{NaC}_7\text{H}_5\text{O}_2$.
 K_a of $\text{HC}_7\text{H}_5\text{O}_2$ is 6.3×10^{-5} .

11) Calculate the percent ionization of 1.5 M benzoic acid ($\text{HC}_7\text{H}_5\text{O}_2$).
 $K_a = 6.3 \times 10^{-5}$

12) Calculate the K_a for an acid if its percent ionization is 2.8 % in a 0.10 M solution.

13) Methylamine (CH_3NH_2), a weak base, ionizes by the reaction $\text{CH}_3\text{NH}_2 + \text{H}_2\text{O} \rightarrow \text{CH}_3\text{NH}_3^+ + \text{OH}^-$ with a $K_b = 4.2 \times 10^{-4}$. The pH of the aqueous solution is 10.65. What is the concentration of the base?