Acids and Bases Worksheet 1

1. Finish the following reactions when acids are added to water.
   a. $H_2SO_4 + H_2O \rightarrow$
   b. $HCl + OH^- \rightarrow$
   c. $NH_3 + H_2O \rightarrow$
   d. $HCl + NH_3 \rightarrow$

2. What are the conjugate bases of these acids?

original acid	conjugate base
HNO_3	
H_2O	
H_3O^+	
H_2SO_4	
HBr	
HCO_3^-	

3. What are the conjugate acids of these bases?

original base	conjugate acid
OH^-	
H_2O	
HCO_3^-	
SO_4^{2-}	
ClO_4^-	

4. Which of the following represent conjugate acid-base pairs?
   a. H_2O, H_3O^+
   b. OH^-, HNO_3
   c. H_2SO_4, SO_4^{-2}
   d. $HC_2H_3O_2$, $C_2H_3O_2^-$

5. Calculate the $[H^+]$ in a solution in which $[OH^-] = 2.0 \times 10^{-2}$ M. Is this solution acidic, neutral, or basic?

6. Calculate the $[OH^-]$ in a solution in which $[H^+] = 3.99 \times 10^{-5}$ M. Is this solution acidic, neutral, or basic?

7. Convert each of the following into pH. Identify each as an acidic, neutral, or basic.

a. 0.0015 M H^+

b. 5.0×10^{-9} M H^+

c. 3.27×10^{-4} M OH^-

d. 1.00×10^{-12} M OH^-

8. Convert each of the following into pOH. Identify each as an acidic, neutral, or basic.

a. 0.783 M OH^-

b. 6.87×10^{-12} M OH^-

c. 1.1×10^{-9} M H^+

d. 0.0032 M H^+

9. What is the pH, pOH, $[H^+]$, or $[OH^-]$ for a 0.156 molar solution of hydrochloric acid?

10. What is the pH, pOH, $[H^+]$, or $[OH^-]$ for a 3.2 molar solution of sodium hydroxide?

11. What is the pH, pOH, $[H^+]$, or $[OH^-]$ for a 0.92 molar solution of sulfuric acid?

12. Calculate the volume of 0.300 M HCl needed to titrate 75.00 mL of 0.1500 M KOH.

13. A 100mL sample of 0.50M HCl is titrated with 0.10M NaOH. What volume of the NaOH solution is required to reach the endpoint of the titration?

14. Titration reveals that 11.6 mL of 3.0 M sulfuric acid are required to neutralize the sodium hydroxide in 25.00 mL of NaOH solution. What is the molarity of the NaOH solution?

15. When 34.2 mL of a 1.02 M NaOH solution is added from a buret to 25.00 mL of a phosphoric acid solution that contains phenolphthalein, the solution changes from colorless to pink. What is the molarity of the phosphoric acid?