CEM 101 – Unit 10
Practice Problems

1. If 20.00 mL of H_2SO_4 are neutralized by 32.81 mL of 0.1124 M NaOH, what is the molarity of the sulfuric acid solution?

   H_2SO_4 (aq) + 2 NaOH (aq) → Na_2SO_4 (aq) + 2 HOH (l)

2. If 25.00 mL of 0.0973 M HCl are neutralized by 30.20 mL of NaOH, what is the molarity of the NaOH solution?

   HCL (aq) + NaOH (aq) → NaCl (aq) + HOH (l)

3. A student finds that 34.8 mL of 0.483 M KOH are required to neutralize a 10.0 mL sample of a certain H_3PO_4 solution. What is the molarity of the H_3PO_4 solution?

   H_3PO_4 (aq) + 3 KOH (aq) → K_3PO_4 (aq) + 3 HOH (l)

4. A student finds that 20.0 mL of 0.395 M HNO_3 are required to neutralize a 29.7 mL sample of a certain KOH solution. What is the molarity of the KOH solution?

$$HNO_3\ (aq) + KOH\ (aq) \rightarrow KNO_3\ (aq) + HOH\ (aq)$$

5. A student finds that 15.0 mL of 0.186 M H_2SO_4 are required to neutralize a 26.3 mL sample of a certain NaOH solution. What is the molarity of the NaOH solution?

$$H_2SO_4\ (aq) + 2\ NaOH\ (aq) \rightarrow 2\ H_2O\ (aq) + Na_2SO_4\ (aq)$$

6. A student finds that 46.1 mL of 0.244 M NaOH are required to neutralize a 25.0 mL sample of a certain $H_2C_2O_4$ solution. What is the molarity of the $H_2C_2O_4$ solution?

$$H_2C_2O_4\ (aq) + 2\ NaOH\ (aq) \rightarrow 2\ HOH\ (l) + Na_2C_2O_4\ (aq)$$

7. Identify the conjugate acid and base pairs in each of the following:

a. $HCN + H_2O \leftrightarrow H_3O^+ + CN^-$

b. $H_2CO_3 + H_2O \leftrightarrow H_3O^+ + HCO_3^-$

c. $OH^- + HSO_4^- \leftrightarrow SO_4^{2-} + H_2O$

d. $HCO_3^- + H_2PO_4^- \leftrightarrow H_2CO^3 + HPO_4^{2-}$

8. Fill in the following table:

Conjugate Acid	Conjugate Base
HI	
	ClO^-
HS^-	
$HC_3H_5O_2$	
	$C_2O_4^{2-}$
	NH_3

9. a. If $HClO_4$ is a strong acid, is ClO_4^- a weak or strong base?

   b. If HF is a weak acid, is F^- a weak or strong base?

10. Given the pH values, classify each of the following solutions as acidic, basic or neutral:

a.	pH = 8.69	b.	pH = 3.27
c.	pH = 7.00	d.	pH = 5.41
e.	pH = 11.38	f.	pH = 13.24

11. Which solution is more acidic, pH = 2.58 or pH = 4.95?

12. Which solution is more basic (less acidic), pH = 8.62 or pH = 12.85?

13. Match the following terms and definitions:

a. _____ proton donor
b. _____ produces H_3O^+ in solution
c. _____ acid formed when base
d. _____ base formed when acid loses hydrogen ion
e. _____ proton acceptor
f. _____ measure of relative acidity
g. _____ produces OH^- in solution
h. _____ pH meter
i. _____ indicators (pH paper)
j. _____ pH of a solution

A. Bronsted–Lowry Base B. Bronsted–Lowry Acid C. pH Scale

D. Arrhenius Base E. Arrhenius Acid F. Method of determining pH

G. Conjugate Base H. Conjugate Acid

I. Determined by H^+ concentration