Name: _____   Due: _____

Unit 10 Academic Chemistry Study Guide

Goals & Standards

- I can describe the properties of acid, bases, and neutral substances.
- I can define substances using the Arrhenius & Bronsted Lowry definitions.
- I can differentiate between strong and weak acids and bases.
- I can write a neutralization reaction.
- I can determine the conjugate acid and conjugate base in a chemical reaction.
- I can calculate pH, pOH, [H+], [OH-] for strong acids and bases.
- I can safely set up a titration and determine an unknown concentration.
- I can use indicators to determine the equivalence point of a reaction.

Practice Problems
1) List the equations that are used for pH calculations.

2) Use those equations to find the missing information in the following chart.

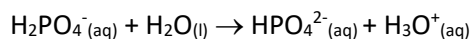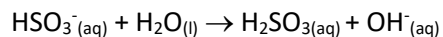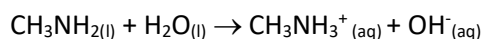| [Solution]	$[H^+]$	pH	pOH	$[OH^-]$	Acidic/Basic?
0.5 M HCl					
_____M HCl		4.5			
_____M NaOH			5.4		
0.0015 M NaOH					

3) What is the Arrhenius definition?
   a) Acid

   b) Base

4) What is the Brönstead-Lowry definition?
   a) Acid

   b) Base

5) Identify the Acid, Base, Conjugate Acid, and Conjugate Base.

$$CH_3NH_{2(l)} + H_2O_{(l)} \rightarrow CH_3NH_3^+{}_{(aq)} + OH^-{}_{(aq)}$$

$$HSO_3^-{}_{(aq)} + H_2O_{(l)} \rightarrow H_2SO_{3(aq)} + OH^-{}_{(aq)}$$

$$H_2PO_4^-{}_{(aq)} + H_2O_{(l)} \rightarrow HPO_4^{2-}{}_{(aq)} + H_3O^+{}_{(aq)}$$

6) Explain which will have a lower pH, a 1.0 M solution of HCl or a 1.0 M solution of $HC_2H_3O_2$.

7) Shown to the right is a titration curve.
   a) Was the starting solution a strong/weak acid or a strong/weak base?

   b) Was the solution added to it during the titration a strong/weak acid or a strong/weak base?
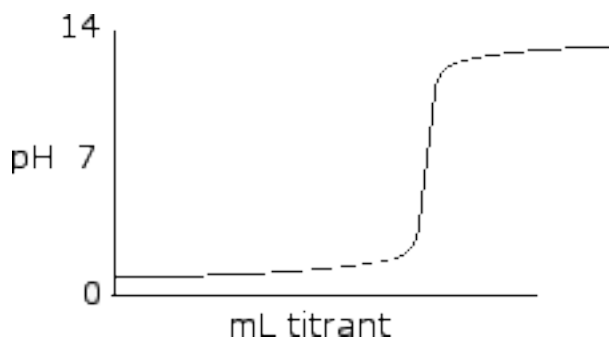
8) Shown to the right is a titration curve.
   a) Was the starting solution a strong/weak acid or a strong/weak base?

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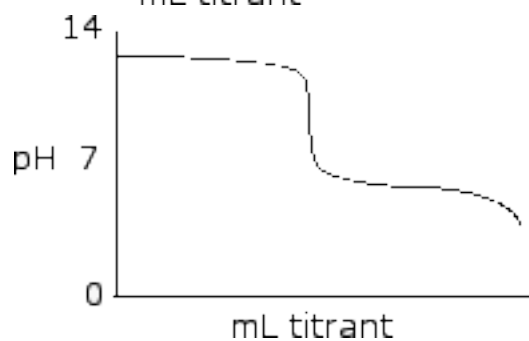
9) Mark the equivalence point of each of the titration curves in questions 8 and 9.
   Explain why the equivalence point should be above seven, below seven, or equal to seven?

10) Identify and name each of the following compounds.
a) HNO_2	strong acid	weak acid	strong base	weak base	neutral
b) NaCl	strong acid	weak acid	strong base	weak base	neutral
c) $Ca(OH)_2$	strong acid	weak acid	strong base	weak base	neutral
d) HI	strong acid	weak acid	strong base	weak base	neutral

11) 50 mL of a solution of HBr is added to a flask along with a few drops of phenolphthalein indicator. When 30 mL of 0.50 M NaOH are added, the solution turns pink.
   a) What is the chemical reaction?

   b) How many moles of NaOH were added?

   b) How many moles of HBr must have been present originally?

   c) What was the concentration of the original HBr solution?

   d) Should the pH at the equivalence point be above, below, or equal to seven?

NCFE Multiple Choice Practice

1) A student conducts an experiment to identify the pH of some common household substances. The data is recorded in this table.

Which substance would be classified as containing the highest concentration of hydroxide ions?
   a.   Ammonia
   b.   Drain Cleaner
   c.   Lemon Juice
   d.   Vinegar

Substance	pH
Ammonia	11.9
Drain Cleaner	13.5
Hand Soap	10.1
Lemon Juice	2.3
Vinegar	3.0
Water	6.8

2) Why is KOH considered to be an Arrhenius base?
   a   It produces OH+ ions in solution.
   b   It produces H+ ions in solution.
   c   It produces H– ions in solution.
   d   It produces OH– ions in solution.

3) Based on the hydroxide ion concentration, which unknown substance would be an acid?
   a.   Substance A, $[OH^-]$ = 1.0 x 10^{-2}M
   b.   Substance B, $[OH^-]$ = 1.0 x 10^{-4}M
   c.   Substance C, $[OH^-]$ = 1.0 x 10^{-6}M
   d.   Substance D, $[OH^-]$ = 1.0 x 10^{-8}M

4) A student describes a liquid as feeling slippery. The student places red litmus paper into the liquid, and the paper turns blue. What can the student conclude from these observations?
   a.   The substance is likely a nonmetal.
   b.   The substance is likely a metal.
   c.   The substance is likely a base.
   d.   The substance is likely an acid.