Acid-Base Review Worksheet - CHEMISTRY Name: KEY Per: ____

Complete the following. Show all of your work for any calculations. Box or circle your answer.

1. Compare and contrast the following:

   a. Acid properties and base properties

   Acid:
   - tastes sour
   - reacts w/ metals
   - H^+ as cation
   - pH < 7

   Base
   - tastes bitter
   - slippery
   - OH^- as anion
   - pH > 7

   b. Arrhenius acid and base.

   Arrhenius acid: H^+ as cation
   Arrhenius base: OH^- as anion

   c. Bronsted-Lowry acid and base

   Bronsted-Lowry acid: H^+ donor
   Bronsted-Lowry base: H^+ acceptor

   d. Conjugate acid and conjugate base

   Conj. acid: reverse rxn H^+ donor
   Conj. base: reverse rxn H^+ acceptor

   e. Monoprotic acid and polyprotic acid

   monoprotic acid: has 1 H^+
   polyprotic acid: has more than 1 H^+

   f. Binary acid and ternary acid

   binary acid - 2 elements in acid
   ternary acid - more than 2 elements in acid

   g. Strong acid and weak acid (Include a list of strong acids)

   Strong acids completely ionize, weak acids do not
   HCl, HBr, HI, H_2SO_4, HNO_3, $HClO_4$

   h. Strong base and weak base (include a list of strong bases)

   Strong bases completely ionize, weak bases do not
   LiOH, NaOH, KOH, RbOH, $Ca(OH)_2$, $Sr(OH)_2$, $Ba(OH)_2$

6. **Identify the acid/base pairs (use BA, BB, ca and cb):**

   a. $CH_3COOH + H_2O \leftrightarrow H_3O^+ + CH_3COO^-$

   BA BB CA CB

   b. $H_2O + CO_3^{2-} \leftrightarrow HCO_3^- + OH^-$

   BA BB CA CB

7. **What are the pH values for the following? Determine if the solution is acidic or basic.**

   a. $[H^+] = 2.4 \times 10^{-6}$ M

   $pH = -\log[H^+] = -\log(2.4 \times 10^{-6})$

   $= 5.62$

   b. 9.1×10^{-9} M HCl

   $pH = -\log[H^+] = -\log(9.1 \times 10^{-9})$

   $= 8.04$

8. **Calculate the $[H^+]$ for the following.**

   a. pH = 13.20

   $[H^+] = 10^{-pH} = 10^{-13.20}$

   $= 6.31 \times 10^{-14}$ M

   b. pH = 6.45

   $[H^+] = 10^{-pH} = 10^{-6.45}$

   $= 3.55 \times 10^{-7}$ M

9. **Calculate the molarity for each of substance specified in the following problems.**

a. 25.5 mL of 0.75 M hydrochloric acid is used to titrate 10.0 mL of calcium hydroxide. What is the concentration (M) of the base? **$2HCl + Ca(OH)_2 \rightarrow CaCl_2 + 2H_2O$**

25.5mL .75M HCl, 10mL XM $Ca(OH)_2$

$$25.5mL \times \frac{1L}{1000mL} \times \frac{.75mol\ HCl}{1L} \times \frac{1mol\ Ca(OH)_2}{2mol\ HCl} = \frac{.00956mol}{.010L} = .956M\ Ca(OH)_2$$

b. Determine the concentration (M) of 15 mL of nitric acid (HNO_3) that is titrated with 10.5 mL of 2.5 M NaOH.

$HNO_3 + NaOH \rightarrow NaNO_3 + H_2O$

15mL XM HNO_3, 10.5mL 2.5M NaOH

$$10.5mL \times \frac{1L}{1000mL} \times \frac{2.5mol\ NaOH}{1L} \times \frac{1mol\ HNO_3}{1mol\ NaOH} = \frac{.0263mol\ HNO_3}{.015L} = 1.75M\ HNO_3$$

10. What would you expect the pH to be at the equivalence point for the following titrations:

a. strong acid-strong base 7 b. strong acid-weak base <7 c. weak acid-strong base >7

11. Complete the following statements.

a. The process used to determine the concentration of an unknown solution is called titration.

b. A reaction where an acid and a base react to form salt and water is called a neutralization reaction.

c. A substance that can act as both an acid and a base is called a(n) amphoteric substance.

d. A hydrogen ion and a water molecule form a hydronium ion. The formula is H_3O^+.

e. The equilibrium (ion product) constant of water has a symbol of Kw and a value of $1 \times 10^{-14}\ M$

f. The pH scale has values of 0-14 and tells us whether a substance is an acid or a base.

g. The equivalence point is reached when the moles of H^+ and moles of OH^- are equal.

h. The end point is reached when the indicator changes color during a titration.