Name: Date: Period:

**Acid-Base Reactions Worksheet**

**Acids react with bases to produce salts and water.** One mole of hydrogen ions will react with one mole of hydroxide ions to produce one mole of water. Learn which acids are strong acids (written in ionic form) and which are weak acids (written in molecular form). Check the solubility rules for the solubility of the salt produced.

*Example 1:* Hydrogen sulfide gas is bubbled through excess potassium hydroxide solution.

H2S(g) + 2KOH(aq)  K2S(aq) + 2H2O(l)

Polyprotic acids can be tricky when it comes to predicting neutralization reactions. Sulfuric acid and phosphoric acid are classic examples frequently encountered on AP examinations. If the base is in excess, all hydrogen ions will react with strong base to produce water.

*Example 2:* Dilute sulfuric acid is reacted with excess sodium hydroxide.

H2SO4(aq) + 2NaOH(aq)  Na2SO4(aq) + 2H2O(l)

If, however, the reaction above stated that equal numbers of moles of sulfuric acid and sodium hydroxide react, then the coefficients for both reactants must be one and the salt that forms is sodium hydrogen sulfate.

Predict and balance the following reactions. Use the abbreviations (s), (l), (g), and (aq) for the reactants and products. All reactants are aqueous unless otherwise stated.

1. carbon dioxide gas is bubbled through a solution of lithium hydroxide

2. sodium nitrite is reacted with hydrochloric acid

3. ammonium bromide + sodium hydroxide

4. carbon dioxide gas is reacted with solid potassium oxide

5. solid magnesium oxide is reacted with hydrochloric acid

6. equal numbers of moles of potassium hydroxide and phosphoric acid react

7. sodium fluoride reacts with dilute nitric acid

8. ammonium carbonate + potassium bromide

9. oxalic acid (0.1 M) reacts with an equal volume of cesium hydroxide (0.1 M)

10. silver nitrate + sodium chromate

**pH & pOH Calculations**

1) Determine the pH of the following solutions:

 a) A 4.5 x 10-3 M HBr solution.

 b) A 3.67 x 10-5 M KOH solution.

 c) A solution made by diluting 25 mL of 6.0 M HCl until the final volume of the solution is 1.75 L.

 d) 5 L of an aqueous solution that contains 1.0 grams of HBr and 1.0 grams of nitric acid.

2) What are the pOHs for the solutions in problem 1?

 a) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 b) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 c) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 d) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3) What is the pH of a solution that contains 25 grams of hydrochloric acid (HCl) dissolved in 1.5 liters of water?

4) What is the pH of a solution that contains 1.32 grams of nitric acid (HNO3) dissolved in 750 mL of water?

5) What is the pH of a solution that contains 1.2 moles of nitric acid (HNO3) and 1.7 moles of hydrochloric acid (HCl) dissolved in 1000 liters of water?

6) If a solution has a [H+] concentration of 4.5 x 10-7 M, is this an acidic or basic solution?

7) An acidic solution has a pH of 4. If I dilute 10 mL of this solution to a final volume of 1000 mL, what is the pH of the resulting solution?