

Name _____ Date _____

Lab #10 Writing and Balancing Chemical Equations

Purpose: _____

Introduction: Chemical changes are those that produce a permanent change in the properties and or composition of a substance. The rusting of iron is an example of such a change. All chemical changes (or reactions) have equations that can be written for them. The balancing of such equations is a very important skill in chemistry. In this investigation, you will examine some common chemical changes and will write and balance the equations for some of them.

Procedures:

1. Simple Synthesis Reaction: In this reaction or change, two elements combine to form a binary compound.

Heat a piece of magnesium ribbon about 4 or 5 cm long in your Bunsen burner flame. Use your crucible tongs to hold the magnesium. CAUTION: Do not look directly at the burning magnesium!

a. Observations:

b. With what element does the magnesium combine? _____

c. Write a word equation for this reaction:

d. Write the balanced chemical equation for this reaction. The final product involves a one to one ratio between the two elements.

2. Simple Decomposition Reaction: This reaction is the reverse of simple synthesis. In this reaction, a ternary compound is decomposed into its two compounds.

Place a small amount of hydrogen carbonate (club soda), H_2CO_3 , into a clean, dry 150mm test tube. Shake the test tube, after corking, and record results.

a. Observations:

b. What is the gas that was produced? _____

What substance is left over? _____

c. Write a word equation for this reaction.

d. Write the balanced equation for this reaction.

3. Double Displacement Reaction: This type of reaction almost always takes place in solution. It involves two salts reacting with each other to form two other salts. There are also some other variations of this reaction. NOTE: Another name for this reaction is “ionic”.

In a 150mm test tube, mix equal amounts of NaCl and AgNO₃:

a. Observations:

b. Complete and balance the following equation:



4. Single Displacement Reaction: This type of reaction also usually occurs in solution and involves either one metal replacing another from a compound (metallic replacement) or a nonmetal replacing another nonmetal from a compound (nonmetallic replacement). It should be noted that in a single displacement reaction, metals always replace metals and nonmetals always replace nonmetals.

I. Metallic Displacement: Obtain a few pieces of copper wire. Obtain a 100mm test tube and fill it half way with the silver nitrate solution. Insert the copper wire into the test tube using a glass stirring rod. Place the test tube, upright, in the test tube holder. Then observe the changes that have occurred.

a. Observations:

b. What is the copper replacing? (What’s on the wire?) _____

c. Write a word equation for this reaction.

d. Write the balanced chemical equation for this reaction. (Copper combines with the nitrate ion in a 1:2 ratio)

(When you finish this part of the reaction, discard the entire contents of the test tube into the beaker set aside for that purpose.)

II. Nonmetallic Displacement: Place some potassium iodide solution ($KI_{(aq)}$) in a 150mm test tube and then add three times as much chlorine water ($Cl_{2(aq)}$). Stopper the test tube, shake vigorously and allow the contents to settle.

a. Observations:

b. What is now present in solution? (What has the chlorine replaced)? _____
A bottle of iodine water is available for comparison.

c. Write a word equation for this reaction

d. Write the balanced chemical equation for this reaction.

5. Neutralization Reactions: This type of reaction is a special case of a double replacement reaction. It involves an acid and a base (alkali and hydroxide) reacting with one another. Obtain your evaporating dish. Be certain that it is clean and dry. Now add 5mL of 1 Molar hydrochloric acid (HCl) to the dish followed by 5mL of 1 Molar sodium hydroxide (NaOH). Place the dish on your ring stand and heat it with a moderate flame to evaporate all of the liquid. Avoid spattering. Heat until no water remains.

a. Moisten the tip of your finger and touch it to the material in the dish. Describe its taste:

b. What is the compound that you tasted? _____

c. Write its formula. _____

d. What is always the other product in a neutralization reaction? _____

e. Write a word equation for this reaction.

f. Write the balanced equation for this reaction.

g. The products of a neutralization reaction are a _____ and _____.

6. Miscellaneous reactions

I. Obtain 5 pieces of litmus paper from the vials available.

a. Using your stirring rod, touch a drop of dilute HCl from the reagent bottle at your lab to the paper. Describe the results.

b. Rinse your stirring rod and test a small amount of NaOH to the litmus paper. Describe the results.

II. **Keeping the previous observations in mind**, place a small amount of MgO in some water in a small beaker. Stir with your stirring rod. Test this solution with the litmus paper.

a. Describe the results.

b. Repeat using CaO instead of MgO (use fresh water). Describe the results.

c. From these results, what type of compound is apparently produced when metallic oxides react with water? (acid or base)

III. Obtain a soda straw or clean pipette. Place some distilled water in a 125 ml Erlenmeyer flask. Blow through the pipette or straw into the distilled water. Do this for two minutes.

Now test the solution with litmus paper.

a. Describe the results.

b. What gas are you introducing to the water? _____

c. Is this a metallic or nonmetallic oxide?

d. What type of compound was formed here based on the litmus test?
(acid or base)