Types of Chemical Reactions Lab
Chemistry

Name _____

Purpose

Observe some chemical reactions and identify reactants and products of those reactions. Classify the reactions and write balanced equations.

Equipment

burner
crucible tongs
microspatula
test tubes, 15×180-mm (7)
test tube holder
test tube rack
wood splints
sandpaper, fine
evaporating dish
safety goggles
lab apron or coat

Materials

zinc, mossy (Zn)
copper wire, 10 cm (Cu)
magnesium ribbon, 5 cm (Mg)
copper(II) carbonate ($CuCO_3$)
6 *M* hydrochloric acid (HCl)
1 *M* copper(II) sulfate ($CuSO_4$)
0.1 *M* zinc acetate ($Zn(C_2H_3O_2)_2$)
0.1 *M* sodium phosphate (Na_3PO_4)
1 *M* sodium sulfite (Na_2SO_3)

Safety

In this investigation you will be working with open flames, heating chemicals, handling acids, and producing gaseous products. You should review the safety procedures for these activities given on pages ix–x.

Burning magnesium produces a very bright, hot flame. Make sure you hold the burning metal at arm's length and do not look directly at it.

Remember never to smell a chemical directly. Review the accepted method of wafting gases toward your nose as illustrated on page xi.

Pay special attention to the safety symbols beside certain steps in the procedure. Refer to page xi to review the special precautions associated with each symbol.

Wear safety goggles and protective clothing at all times when working in the lab.

Procedure

PART A SYNTHESIS

1. Use fine sandpaper to clean a piece of copper wire until the wire is shiny. Note the appearance of the wire.
2. Using crucible tongs, hold the wire in the hottest part of a burner flame for 1–2 minutes. Examine the wire and note any change in its appearance caused by heating.
3. Place an evaporating dish near the base of the burner. Examine a piece of magnesium ribbon. Using crucible tongs, hold the sample in the burner flame until the magnesium starts to burn. DO NOT LOOK DIRECTLY AT THE FLAME. HOLD THE BURNING MAGNESIUM AWAY FROM YOU AND DIRECTLY OVER THE EVAPORATING DISH. When the ribbon stops burning, put the remains in the evaporating dish. Examine this product carefully.

PART B DECOMPOSITION

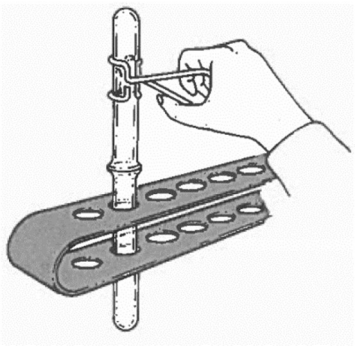
4. Place 2 heaping microspatulas of copper(II) carbonate ($CuCO_3$) in a clean, dry test tube. Note the appearance of the sample.

5. Using a test tube holder, heat the $CuCO_3$ strongly for about 3 minutes. Extinguish the flame and then insert a *burning* wood splint into the test tube. If carbon dioxide gas (CO_2) is present, it will put the flame out. Note any change in the appearance of the residue in the test tube.

PART C SINGLE REPLACEMENT

6. Stand a clean, dry test tube in the test tube rack. Add about 5 mL of 6 *M* hydrochloric acid (HCl) to the tube. **CAUTION.** *Handle acids with care. They can cause painful burns. Do not inhale any HCl fumes.* Now carefully drop a small piece of zinc metal (Zn) into the acid in the test tube. Observe and record what happens.

7. Using a test tube holder, invert a second test tube over the mouth of the test tube in which the reaction is taking place. See Figure 14-1. Remove the inverted tube after about 30 seconds and quickly insert a burning wood splint into the mouth of the tube. (A "pop" indicates the presence of hydrogen gas.) Note the appearance of the substance in the reaction test tube.



8. Add about 5 mL of 1 *M* copper(II) sulfate ($CuSO_4$) solution to a clean, dry test tube. Place a small amount of zinc metal in the solution. Note the appearance of the solution and the zinc before and after the reaction.

PART D DOUBLE REPLACEMENT

9. Add about 2 mL of 0.1 *M* zinc acetate ($Zn(C_2H_3O_2)_2$) to a clean, dry test tube. Next, add about 2 mL of 0.1 *M* sodium phosphate tribasic (Na_3PO_4) solution to the test tube. Observe what happens and note any changes in the mixture.

10. Add about 5 mL of 1 *M* sodium sulfite (Na_2SO_3) solution to a clean, dry test tube. To this solution, add about 1 mL of 6 *M* HCl. Note the odor given off by *wafting some of the gas toward your nose.* DO NOT SMELL THE GAS DIRECTLY.

Reactions Lab
Chemistry

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Conclusions and Questions

1. In this experiment, what method was used to test for the presence of CO_2 gas? What is another test for CO_2 gas? Write a balanced equation for this test.

2. What test was used to identify hydrogen gas? Write a balanced equation to represent this test.

3. Balance the equations below and identify the type of reaction represented by each equation.

a. $AgNO_3(aq) + Cu(s) \rightarrow Cu(NO_3)_2(aq) + Ag(s)\downarrow$

b. $BaCl_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s)\downarrow + NaCl(aq)$

c. $Cl_2(g) + NaBr(aq) \rightarrow NaCl(aq) + Br_2(l)$

d. $KClO_3(s) \rightarrow KCl(s) + O_2(g)\uparrow$

e. $AlCl_3(aq) + NH_4OH(aq) \rightarrow NH_4Cl(aq) + Al(OH)_3(s)\downarrow$

f. $H_2(g) + O_2(g) \rightarrow H_2O(g)$

Equations

Balance each of the equations by inserting the proper coefficients where needed. Write the names of the reactant(s) and product(s) below the molecular equation for each reaction.

PART A SYNTHESIS

1. $Cu(s) + O_2(g) \rightarrow CuO(s)$

2. $Mg(s) + O_2(g) \rightarrow MgO(s)$

PART B DECOMPOSITION

3. $CuCO_3(s) \rightarrow CuO(s) + CO_2(g)$

PART C SINGLE REPLACEMENT

4. $Zn(s) + HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)\uparrow$

5. $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$

PART D DOUBLE REPLACEMENT

6. $Zn(C_2H_3O_2)_2(aq) + Na_3PO_4(aq) \rightarrow NaC_2H_3O_2(aq) + Zn_3(PO_4)_2(s)$

7. $Na_2SO_3(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l) + SO_2(g)\uparrow$

DATA TABLE

Sample	Before reaction	During reaction	After reaction
A. Synthesis 1. Cu 2. Mg			
B. Decomposition 3. $CuCO_3$			
C. Single Replacement 4. Zn + HCl 5. Zn + $CuSO_4$			
D. Double Replacement 6. $Zn(C_2H_3O_2)_2 + Na_3PO_4$ 7. Na_2SO_3 +HCl			