Chemistry **Name _____**

Chemical Reactions Lab **Date_____ Period ___**

Introduction

In this lab activity you will observe some chemical reactions and then write chemical equations that represent those reactions. You will also determine what type of reaction has occurred.

Safety Precautions

-As always, you will need to wear lab goggles and lab aprons.
-Iron III nitrate solution, and copper (II) carbonate are toxic, so be sure to wash your hands with soap and water before you leave the lab.
-Hydrochloric acid is corrosive to skin and tissue. If you get some HCl on your skin, wash it off immediately with plenty of soap and water.

Materials

2 large test tubes
3 small test tubes
1 crucible
1 ring stand
1 test tube clamp
1 Bunsen burner
1 1-hole rubber stopper to fit large test tubes
1 utility clamp
1 iron ring
1 clay triangle
1 evaporating dish
90° glass tubing elbow
135° glass tubing elbow
1 wash bottle with distilled H_20
1 pair of crucible tongs
1 disposable pipet
2 wood splints

Procedure

Part A: Double Replacement Reaction

1. Place about 2 mL (40 drops) of sodium carbonate solution into a small test tube.

2. Take one of the small dropper bottles of iron (III) nitrate solution back to your table and put 6-8 drops of iron (III) nitrate solution into the sodium carbonate solution. Write down your observations.

4. Allow the mixture to sit for a few minutes and observe.

5. Bring the test tube to the front table and dump the contents into the WASTE beaker. Be sure to clean and rinse the test tube. Secure the lid on the dropper bottle and return it to the front table.

A. What color is the precipitate that forms? _____

B. What is the name and formula of the precipitate? _____

C. Write the molecular equation for this reaction (with state symbols)

D. Write the complete ionic equation for this reaction (with state symbols)

E. Write the net ionic equation for this reaction.(with state symbols)

Part B: Single Replacement

1. Put 5 mL of 3M HCl into a large test tube and get a piece of mossy zinc that will fit down into your test tube

2. Put the utility clamp on the ring stand and clamp the test tube into it so that it sits at a 45° angle.

3. Place the 135° glass tubing into the rubber stopper. Slide a small test tube over the other end of the glass tubing.

4. In one swift motion, drop the zinc down into the HCl and quickly place the stopper into the large test tube so that the glass tubing is pointing up and the small test tube is upside down over the end of the glass tubing.

5. After you have collected plenty of gas, light a wood splint. Grab the small test tube with the test tube holder and bring it over the top of the flame, being careful to keep the test tube upside down so that any gas collected in it does not escape. After this second reaction, observe the test tube in which the gas was collected for any residue.

6. Dump out the HCl and zinc into the ACID WASTE beaker and rinse the medium and small test tubes.

F. What happens when you bring the gas to the flame?_____

G. What gas is produced by this reaction of zinc and HCl? _____

H. Write the equation for this reaction

I. What forms on the inside of the small test tube after you light the gas?_____

J. Write the balanced equation for this second reaction.

K. What type of reaction is this? _____

Part C: Synthesis

1. Cut a piece of magnesium ribbon 10 cm long and fold it up into a small bundle.

2. Attach the iron ring to the ring stand and adjust the height so that the Bunsen burner will fit under it. Place the clay triangle on the iron ring and set the crucible into the middle of the clay triangle.

3. Place the magnesium into the crucible and light the burner.

4. Heat the magnesium in the crucible until it begins to glow with an orange color and then shut the burner off immediately. **You do not want the magnesium to glow with a bright white color.**

5. Allow the reaction to finish and then allow the crucible cool in the clay triangle for a minute or two.

6. Use the tongs to dump the contents of the crucible onto the watch glass.

7. With the wash bottle, spray the contents of the watch glass with a small amount of deionized water. You should notice a very recognizable odor. If you do not, wave your hand over the dish to bring the odor to your nose. **You should <u>never</u> stick your nose near the odor and breathe deeply. This could be dangerous. Always bring the odor to your nose.** Test the contents of the evaporating dish with litmus paper.

8. Dump the contents of the watch glass and the crucible into the trash can and clean them both.

In the last experiment, you saw the bright white synthesis reaction between magnesium and oxygen. The glowing orange synthesis reaction in this experiment is between magnesium and nitrogen.

L. Write the formula of the product of this synthesis reaction. _____

M. Write the balanced equation for this synthesis reaction

After water was added to the synthesis product, a 2nd reaction occurs that produces an odorous gas and another product.

N. Write the common name of this gas _____and its formula _____

O. What was the result of the litmus test on the other product of this 2nd reaction?_____

P. Compounds with H^{+1} ions are acids and compounds with OH^{-1} ions are bases. Based on this information, what is the name and formula of the product tested with litmus?

name _____ formula _____

Q. Write the balance equation for the reaction between the synthesis product and water. The products of this reaction are your answers for N and P.

<u>Part D: Decomposition</u>

1. Place a small scoop of copper (II) carbonate into a large test tube and take it back to your table.

2. Put the 90° glass tubing into a 1-hole stopper and put the stopper into the test tube.

3. Attach the utility clamp to the ring stand and clamp the test tube so that it sits at about a 45° angle and the glass tubing is angled downward.

4. Fill a small test tube about 2/3 with lime water from the front table.

5. Light the Bunsen burner and **adjust the air and gas so that the flame is small and not very hot.**

6. Hold the limewater so that the end of the glass tubing is below the water line. Place the burner under the copper (II) carbonate and begin to heat it gently.

7. When you notice a change in the limewater, remove it from the glass tubing. Continue to gently heat until a change in the copper (II) carbonate is obvious then shut off the burner.

8. Dispose of the limewater in the ACID WASTE beaker and dump the contents of the large test tube into the trash after allowing it to cool for a few minutes.

Questions

Q. What change did you see in the limewater? _____

R. This change in the water indicates the gas product is what? _____

S. What change did you notice in the copper II carbonate? _____

T. Write the chemical equation for the decomposition reaction of copper (II) carbonate.
(Hint: does the substance left in the large test tube look like copper?)

U. Write the name _____and formula _____of the precipitate formed in the limewater?

name _____ formula _____

V. Write the chemical equation for the reaction that changes the limewater. (Hint: limewater is an aqueous solution of calcium hydroxide and the reaction produces water and a precipitate.)

Part E: More Decomposition

1. Put about 6 mL of 3% hydrogen peroxide into a medium test tube. Put a small spatula tip of manganese (IV) oxide into the test tube and take it back to your table. The reaction will begin immediately and only react vigorously for about a minute, so you must move to steps 2-4 quickly.

2. Light your Bunsen burner and use it to light a wood splint.

3. Blow out the wood splint and put the glowing ember into the mouth of the test tube and observe

4. Run some water over the end of the wood splint to make sure that it is extinguished and place it in the trash. Dump the contents of the test tube into the waste beaker on the front table and rinse it out a few times.

W. If this is a decomposition reaction, what role does MnO_2 play? _____

X. What is the gas that is given off by this reaction? _____

Y. How do you know what the gas is? _____

Z. Write the balanced equation for this reaction.