TYPES OF CHEMICAL REACTIONS LAB

BACKGROUND:

The most effective way to represent a chemical reaction is to write an equation. The most accurate way to determine the products of a chemical reaction is to perform the chemical reaction in a lab.

In this lab you will first observe examples of four major types of chemical reactions. You will then analyze these reactions in written equations.

Pre-lab:

1. Write the general form for each of the five types of reactions.
2. What are five evidence of a chemical reaction?
3. Why is it necessary to avoid contact with silver nitrate solution?
4. Why is the remaining copper metal collected at the end of the experiment?

PURPOSE: The purpose of this lab is to observe chemical reactions and equations.

MATERIALS:

test tube rack

6 test tubes

droppers

test tube holder

wood splints

candle

lab burner

striker

porcelain mat

crucible tongs

spatula

cobalt chloride paper

lime water

silver nitrate solution

copper metal strip

6M hydrochloric acid

zinc metal strip

magnesium metal strip

copper(II) carbonate salt

lead(II) nitrate solution

potassium iodide solution

SAFETY:

• You must wear goggles and an apron at all times.

• Pants and shoes that cover your feet are required.

• Long hair or bangs must be pinned back.

• Use caution with all solutions and chemicals. Silver nitrate stains. • Acids cause burns. Hot materials will burn. Use tongs to move materials that have been heated. Do not smell any product directly.

PROCEDURE:

Reaction A; Silver nitrate and Copper

* 1. Describe the silver nitrate solution and the copper strip on the data table at the end of this lab.
  2. Pour about 1 mL (1/2 inch) of silver nitrate solution into a large test tube. Drop into the solution a strip of copper metal approximately 0.5 cm x 3 cm. CAUTION: Silver nitrate solution will stain clothes permanently and will stain skin for a while.
  3. Note whether changes occur immediately. Set this test tube aside. Observe it at least 2 more times throughout the period. Record all observations. Be sure to record both changes in the liquid solution and in the solid. \*\*\*Do NOT throw away your copper strip, copper will not decompose with water and will stopper the drains. Wash it off and return it DRY to the stock.

Reaction B; Hydrochloric acid and Zinc

* 1. Describe the hydrochloric acid and the zinc on the data table at the end of this lab.
  2. Stand a clean, dry large test tube in the test tube rack. Add about 2 mL (1 inch) of 6M hydrochloric acid to the test tube. CAUTION: Handle acids with care. They can cause painful burns! Do not hold test tube in your hand.
  3. Carefully drop a small piece of zinc into the acid in the test tube. Observe and record what happens.
  4. Using a test tube holder, QUICKLY invert a second test tube over the mouth of the test tube in which the reaction is taking place. Hold it in this position for *at least* 30 seconds.
  5. Light a wooden splint in your burner.
  6. QUICKLY remove the inverted test tube from the one in the rack, but KEEP IT UPSIDE DOWN!!!! And QUICKLY insert a burning wood splint into the mouth of the tube. A pop indicates the presence of hydrogen gas.

\*This would be a good time to check your first test tube again and record your observations.

Reaction C; Magnesium and Oxygen

1. Obtain a strip of magnesium ribbon about 4 cm in length. Note its physical properties in the data table at the end of this lab.
2. Light your burner. Hold the magnesium ribbon by one end with your crucible tongs. Place the magnesium ribbon in the flame until it starts to burn (ignites), then hold it with the tongs until all of the reaction has stopped. **CAUTION: Do NOT stare at the flame**; this reaction is a very intense light source and will hurt or damage your eyes.
3. Note the physical properties of the product. Record these observations in the data table. Compare these observations with those of the reactant magnesium.

Reaction D; Copper (II) carbonate

1. Place 1 heaping spatula of copper(II) carbonate in a clean dry test tube (about 2.5 cm). Note the appearance of the sample in the data table.
2. Using a test tube holder, hold the test tube at an *angle* pointed away from you and everyone else and heat the copper(II) carbonate strongly in a burner flame for about 2 minutes.
3. Insert a burning wood splint in the test tube to test for the presence of carbon dioxide gas (CO2 will put the flame out). Note any changes in the appearance of the reactant in the data table.

\*This would be a good time to check your first test tube for a 3rd time and record your observations. Clean the copper strip and return it. Dispose of the solution as instructed by your teacher.

Reaction E; Silver nitrate and sodium hydroxide

1. Note the appearance of each solution in the dropper bottles and record your observations in the data table. Do not touch the liquids with the droppers, this will cause contamination.
2. Put 2 drops of silver nitrate solution in a well plate, add 2 drops of sodium hydroxide solution. Record your observations in the data table. Products can be placed down the drain.

Reaction F; Candle wax and oxygen

1. Light the candle. Invert a 1000mL beaker over the burning candle. Record the time required to extinguish the flame. Note the bottom of the beaker for any moisture.
2. Test any liquid on the bottom of beaker using the cobalt chloride test paper. Cobalt chloride test paper is used to test for water. The paper will lose its blue color in the presence of water.
3. Relight the candle and repeat step 2 using the 600mL beaker.
4. Obtain about 10 mL of lime water in a graduated cylinder. Invert the 250 mL Erlenmeyer flask over the burning candle until the flame is extinguished. Remove the flask, turn it upright and add the limewater to the flask. Stopper the flask, shake the solution and watch for a change in the solution. (Carbon dioxide gas causes limewater to turn cloudy.)

CLEAN-UP:

• Wash all glassware thoroughly, dry it and put it away.

• Wipe all hardware off and put it where you found it.

**• \*\*\*Don’t forget proper disposal for copper strip.**

DATA:

|  |  |
| --- | --- |
| **SUBSTANCE** | **OBSERVATIONS** |
| Silver nitrate  FORMULA: \_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Copper strip  FORMULA: \_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Silver nitrate and copper strip | 1st observation:  2nd observation:  3rd observation: |
| Hydrochloric acid  FORMULA: \_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Zinc metal  FORMULA: \_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Hydrochloric acid and zinc metal | Result of flame test:  Observations of product(s): |
| Magnesium ribbon  FORMULA: \_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Product after burning magnesium ribbon |  |
| Copper(II) carbonate  FORMULA: \_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Product after heating the copper (II) carbonate | Result of flame test:  Observations of product(s): |
| Silver nitrate  FORMULA: \_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Sodium hydroxide  FORMULA: \_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Silver nitrate and sodium hydroxide |  |
| Paraffin wax  FORMULA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Oxygen  FORMULA \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  |
| Paraffin wax and oxygen reaction |  |

CALCULATIONS:

Predict the product for each of the reactions below. **Balance** these equations and **identify the type** of reaction.

1. AgNO3 + Cu 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. HCl + Zn 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Mg + O2 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. CuCO3 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. AgNO3 + NaOH 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. C22H44O11 + O2 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

CONCLUSIONS:

1. What method was used in this lab to test for the presence of carbon dioxide gas? Describe a positive test and how to conduct it.
2. What method was used in this lab to test for the presence of hydrogen gas? Describe a positive test and how to conduct it.
3. Describe a positive test for oxygen gas and how to conduct it.
4. .List at least 5 different evidences of chemical reactions you observed in this lab. Be specific in your descriptions.
5. List the symbols and names of the metal ions involved in the reactions in this lab.
6. List the symbols and names of the nonmetallic ions involved in the reactions in this lab.
7. Why did you return the copper to your teacher?

Pre-lab:

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