Chemical Reactions

Equipment

You will need at least 6 clean test tubes. Wash the test tubes out with D.I. after each reaction. You will need a Bunsen burner, an evaporating dish, an Erlenmeyer flask, and a wood splint.

Chemicals

You will need about 4 mL of 0.1M $CaCl_2$, 2 mL of 0.1M Na_3PO_4, 3 mL of 0.1M $ZnSO_4$, a piece of copper wire, 3 mL of 0.1M $CuSO_4$, 2 pieces of zinc metal, 0.25 g of $Cu(OH)_2$, 2 g of $CuSO_4 \cdot 5H_2O$, 0.5 g of anhydrous $CuSO_4$, 2 mL of 0.1M $NaNO_3$, 5 mL of 6M HCl, 8 mL of 3M NaOH, 2 mL of 3M H_2SO_4, 2 mL of 3M HCl, 2 mL of 0.1M Na_2CO_3, 10 mL of C_2H_5OH, 7 g of $Sr(OH)_2 \cdot 8H_2O$, 3 g of NH_4Cl, 3 mL of 3% H_2O_2, 0.1 g of KI.

Introduction

In this experiment you will mix a series of different chemicals. For each set of chemicals that you mix you will decide whether or not a chemical change occurs. If any one of the following are observed, it is likely a chemical change (reaction) occurred:

1.) Formation of a precipitate (a solid).

2.) Formation of a gas (bubbles or fumes).

3.) A color change.

4.) Thermal energy is produced or absorbed (the container gets noticeably warmer or cooler).

5.) Light is emitted (you see a glow or flame).

Based on whether or not any of these phenomenon are observed, you will decide if a chemical change (reaction) has occurred for each of the mixtures.

For each mixture that produces a chemical reaction you will determine which category the chemical reaction belongs in. The possibilities are:

1.) Combination

Two reactants combine to form one product.

2.) Decomposition

One reactant breaks apart into two or more products.

3.) Single Replacement (these are also one type of redox reactions)

A metal reacts with an ionic compound or an acid

or

A halogen reacts with an ionic compound or an acid

4.) Double Replacement (there are two main types of double replacement reactions, listed below)

a.) Precipitation reactions

Two ionic compounds react with each other

b.) Acid-Base (neutralization) reactions

An acid and a base (a metal hydroxide) react with each other.

5.) Combustion (this is another type of redox reaction)

A hydrocarbon reacts with oxygen gas

To determine which category a reaction belongs in look at the reactants.

Once you know which category a reaction belongs in you can write the products and balance the equation.

Procedure

MAKE SURE ALL GLASSWARE YOU WILL USE IS CLEAN BEFORE STARTING!

For each of the following steps (which do not have to be done in any particular order) determine whether a chemical reaction occurs or not.

If it does, in the space provided write your observations and which category the reactions belongs to.

Then, write the balanced equation for that reaction.

If a reaction does not occur, write "NO REACTION".

NONE OF THESE VOLUMES OR MASSES ARE EXACT, JUST ESTIMATE.

1.) Combine about 2 mL of 0.1 M calcium chloride with about 2 mL of 0.1 M sodium phosphate.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

2.) Add about 3 mL of 0.1M zinc sulfate to a test tube. Drop a small piece of copper into the test tube.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

3.) Add about 3 mL of 0.1M copper(II) sulfate to a test tube. Drop a small piece of zinc into the test tube.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

4.) Add about a half of a gram of copper (II) hydroxide to a test tube. Heat the test tube over a Bunsen burner.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

5.) Add about 2 grams of copper(II) sulfate pentahydrate to a test tube. Heat the test tube over a Bunsen burner.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

6.) Add about a half gram of anhydrous copper(II) sulfate to a test tube. Add about 5 – 10 drops of D.I. water to the test tube. **CAUTION! ANHYDROUS COPPER (II) SULFATE IS CORROSIVE!. DO NOT GET IT ON YOUR SKIN! IF IT DOES GET ON YOUR SKIN WASH IT OFF WITH ALOT OF WATER!**

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

7.) Add about 2 mL of 0.1M calcium chloride to a test tube. Next add about 2 mL of 0.1 M sodium carbonate to the same test tube.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

8.) Add about 2 mL of 0.1 M calcium chloride to a test tube. Next add about 2 mL of 0.1M sodium nitrate to the same test tube.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

9.) Combine about 2 mL of 6M hydrochloric acid with about 4 mL of 3 M sodium hydroxide.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

10.) Add about 4 mL of 3M sodium hydroxide to a test tube. Next add about 2 mL of 3M sulfuric acid to the same test tube.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

11.) Add about 2 mL of 1M sodium carbonate to a test tube. Next add about 2 mL of 3M hydrochloric acid to the same test tube. Two reactions occur, one immediately after the other.

OBSERVATIONS:_____

CATEGORY:_____ **and** _____

Balanced Equations

12.) Add about 3 mL of 6M hydrochloric acid to a test tube. Next, add a small piece of zinc metal to the test tube. IMMEDIATEDLY GO TO REACTION 13.) WITH THIS SAME TEST TUBE.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

13.) Using the test tube from reaction 12.) with the reaction still occurring, point the test tube away from you and anyone else. Put a lighted wood splint into the test tube. You should hear a sound.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

14.) In the hood, add about 10 mL of ethanol (C_2H_5OH) to an evaporating dish. Ignite the liquid with a match. Once you see the reaction, blow out the flame.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

15.) Add about 7 grams of strontium hydroxide to an Erlenmeyer flask. In the hood, add about 3 grams of ammonium chloride to the same flask. Swirl the flask for a few minutes. Be careful to not bring the flask close to your face. Two reactions occur, one immediately after the other.

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

16.) Add about 3 mL of 3% hydrogen peroxide to a test tube. Next add a little potassium iodide to the test tube. Potassium iodide acts as a catalyst here. A catalyst makes a reaction happen faster, but is not involved directly in the reaction (it does not appear as a reactant of product).

OBSERVATIONS:_____

CATEGORY:_____

Balanced Equation

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