Types of Reactions Lab Name_____

INTRODUCTION Period _____ Date_____

Matter can undergo both physical and chemical changes. Chemical changes result in the formation of new materials. Observable signs of chemical reactions include the release of a gas, a change in color, the formation of a solid, and the production of heat and light.

Chemical reactions can be classified in many ways. One classification system involves five general types of reactions: synthesis, decomposition, single displacement, double displacement, and combustion. In this lab you will perform several reactions and classify them as one or more of the five general types.

MATERIALS

Water trough	250 mL Erlenmeyer Flask	Rubber tubing	Stoppers	
Bunsen Burner	Tongs	Mossy Zinc	Hydrogen Peroxide	$Pb(NO_3)_2$ solution
Test Tube Rack	2 Wooden Splints	6M Hydrochloric acid	Mg metal	Test tube holder
5 test tubes	Striker	KI solution	Phenolphthalein	Scoopula

SAFETY

When heating a test tube, aim the mouth of the test tube AWAY from yourself and others. Hydrochloric acid can cause burns to the skin and damage the eyes.

PROCEDURE

Reaction A

1. Add about 5 drops (1 mL, approximately the width of your pinky finger) of lead(II) nitrate solution, $Pb(NO_3)_2$, to a clean test tube. Next, add about 5 drops of potassium iodide solution, KI, to the same test tube. Record your observations.

Reaction B

2. Stand a clean test tube in the test tube rack and add 1-2 mL of hydrochloric acid. Caution: HCL can cause burns! Carefully drop a few pieces of zinc into the test tube.
3. While the reaction is still occurring, use a test tube holder to hold an empty test tube over the top of the first test tube for approximately 30 seconds. Meanwhile, another group member should light the burner and use it to ignite a wood splint (use a match if the Bunsen burner is not available). At the end of 30 seconds, hold the inverted test tube (keeping it inverted) while the other group member places the burning wood splint into the mouth of the inverted test tube to test for the presence of hydrogen gas (a loud "whoop!" should be heard).
4. Record your observations, including the results of the hydrogen test.

Reaction C

1. Place on very small spatula tip full of manganese dioxide, MnO_2 , in a clean Erlenmeyer Flask. Measure approximately 50 mL of hydrogen peroxide in the same Erlenmeyer flask and stopper the solution.
2. Fill a water trough with water so that it is approximately ½ full. Attach the rubber tube that is attached to the stopper to the bottom of the water trough.
3. Place a test tube inside your water trough and fill it with water. Invert the test tube over the hole in the water trough and watch for bubbles.
4. After a couple of minutes you should observe that the water is being displaced by the oxygen gas produced from the reaction. Wait for the reaction to complete and until your test tube fills with oxygen.
5. Then, have another partner from you group light a wooden splint using the Bunsen Burner.
6. Place the lit splint in the test tube filled with oxygen. You should notice that your splint glows brightly. Record your observations, for the test of oxygen.

7. Reaction D

1. Gather approximately 10.0 mL of H_2O in a test tube. Place 2-3 drops of phenolphthalein (this is an indicator that turns pink when a solution is a basic) in the test tube, record your observations.

2. Using tongs, hold a small piece of magnesium metal in the hot flame of the Bunsen burner. Burn the metal until the metal ignites and only ashes are left. DO NOT LOOK DIRECTLY AT THE WHITE LIGHT. Record your observations and use the product of this reaction for reaction E.

3. Reaction E

1. Place the burnt magnesium strip from reaction D, into the test tube that contains water and phenolphthalein. Record your observations before and after you add the ashes.

DATA & OBSERVATIONS

Record the appearance of the reactants before and the products after each reaction takes place.

Reaction	Before Reaction	After Reaction
A.		
B.		
C.		
D. (1) (2)		
E.		

DATA ANALYSIS

The following word equations represent each actual reaction that occurred for **Reactions A, B, C** and **D**. First write the BALANCED chemical equation for each. Then CLASSIFY the reaction as one (or more) of the five general types of reactions- synthesis, decomposition, single displacement, double displacement, or combustion.

A. Lead (II) nitrate reacts with potassium iodide to produce lead (II) iodide and potassium nitrate.
B. Zinc reacts with hydrochloric acid to produce zinc chloride and hydrogen gas.
C. Hydrogen peroxide decomposes when manganese dioxide is used as a catalyst to produce water and oxygen gas.
D. Magnesium reacts with oxygen to produce magnesium oxide.
E. Magnesium oxide when dissolved in water will produce magnesium hydroxide.

CONCLUSION QUESTIONS: Answer the following questions based on the results of your lab:

What signs did you observe that indicated a chemical reaction was taking place? Be specific.

a. If any single replacement reactions occurred, please explain which substance was displaced and why?
b. In reaction D, what is the purpose of the phenolphthalein? Was it necessary for the reaction to occur?

A combustion reaction will take place each time you use a Bunsen burner to burn methane gas, CH_4. If a Bunsen burner were used instead of a match, write a balanced chemical equation of the combustion of methane:

***HINT**: All hydrocarbons (for example methane) combustion reactions need oxygen as a reactant and form the same two products (carbon dioxide and water).

Overall, reflect on how difficult it was for you to classify the reaction you observed and why?