Science 10: LG 3 Types of Chemical Reactions Lab

Name: _____

Title of Investigation: **Analyzing Different Types of Chemical Reactions**

Purpose: To carry out four different chemical reactions to determine whether the reactions are:

a) Exothermic or endothermic

b) Synthesis, Decomposition, Single Replacement, Double Replacement, Acid-Base Neutralization or Combustion

Observations: Summarize the results of the experiments in the table below.

	Experiment	Observations
1	Lead (II) Nitrate + Potassium Iodide $Pb(NO_3)_2 + KI$	Observation of reaction:
2	Aluminum + Copper (II) Chloride $Al + CuCl_2$	Observation of reaction: Did temperature increase or decrease?
3	Hydrogen Peroxide (with a catalyst added to it)	Observation of reaction: Did temperature increase or decrease?
4	Burning a candle	Observation of reaction: Did temperature increase or decrease?
5	Dissolving Ammonium Nitrate in Water	Observation of reaction: Did temperature increase or decrease?

1) Lead (II) Nitrate mixed with Potassium Iodide

Introduction:

This experiment gives an interesting look at what happens when two clear liquids are mixed together.

Hypothesis: Of the 6 different types of reactions, what type of reaction do you think this one will be? Why?

Materials:

- Two 100 mL beakers
- Gloves, goggles, and a lab apron
- Two 10 ml graduated cylinder
- Premixed solution of Lead (II) Nitrate (0.1 M)
- Premixed solution of Potassium Iodide (0.1 M)

Procedure:

1) Put on your safety equipment; gloves, goggles, and apron.
2) Pour 10 mL of the premixed Lead (II) nitrate solution into a 10 ml graduated cylinder.
3) Pour 10 mL of the premixed Potassium Iodide solution into another 10 ml graduated cylinder.
4) Pour both solutions from the graduated cylinders into a 100 mL beaker.
5) Take observations of the solution after it has mixed and allow the mixture to settle for 10 minutes and make observations of the change in the beaker.
6) CLEAN UP YOUR WORK AREA, **DO NOT TOUCH THE CHEMICALS,** PUT THEM ASIDE TO RETURN TO THE SCI KISOSK AT THE END OF YOUR LAB, FOR DISPOSAL.

2) Aluminum mixed with Copper (II) Chloride

Introduction:

This experiment gives an interesting look at what happens when a solid (aluminum) is added to a solution of Copper (II) Chloride.

Hypothesis: Of the 6 different types of reactions, what type of reaction do you think this one will be? Why?

Materials:

- One 100 mL beaker
- One 3cm X 3 cm piece of aluminum foil
- A 50 ml graduated cylinder
- Gloves, goggles, and a lab apron
- Premixed solution of Copper (II) Chloride (2 M)

Procedure:

NOTE: Please carry this experiment out in the fume hood. Make sure the fan in the fume hood is turned on before starting. If you are unsure of what to do, or how to use the fume hood, please ask a teacher in the Science Great Hall for help.

1) Put on your safety equipment; gloves, goggles, and apron.
2) Pour 20 mL of the Copper (II) Chloride solution into a 100 mL beaker.
3) Crumple up one piece of 3cm x 3cm aluminum foil into a ball and place in the beaker with the Copper (II) Chloride solution.
4) Allow the reaction to proceed and make observations. Once the reaction has settled down, gently touch the beaker to detect how the temperature changed.
5) Using tweezers, gently remove the crumpled up ball and

place it on a folded up piece of paper towel to let it dry. Make observations. *(Hint: What might the chemical be that you are seeing on the surface of the crumpled up ball?)* When you are done making observations, you can place the crumpled up ball and the paper towel in the garbage.

6) CLEAN UP YOUR WORK AREA, **DO NOT TOUCH THE SOLUTION OR POUR IT DOWN THE DRAW,** PUT IT ASIDE TO RETURN TO THE SCI KISOSK AT THE END OF YOUR LAB, FOR DISPOSAL.

3) Hydrogen Peroxide (plus a catalyst)

Introduction:

This experiment gives an interesting look at what happens when a catalyst (manganese dioxide) is added to hydrogen peroxide. (HINT: The manganese dioxide is a catalyst. It doesn't take part in the chemical reaction. Instead, it simply speeds up the chemical reaction that would normally otherwise take place very slowly.) You will also be carrying out a "flame test" to try and determine which type of gas is produced. (NOTE: If the splint goes out, the gas is likely carbon dioxide. If the splint makes a popping sound, the gas is likely hydrogen. If the splint re-lights, the gas is likely oxygen.)

Hypothesis: Of the 6 different types of reactions, what type of reaction do you think this one will be? Why?

Materials:

- Manganese Dioxide (catalyst)
- Wooden Splint
- Lighter/Matches
- A 10 ml graduated cylinder
- Gloves, goggles, and a lab apron
- Hydrogen Peroxide (3 %)
- One test tube

Procedure:

1) Measure 2 ml of hydrogen peroxide into a 10 ml graduated cylinder.
2) Pour the 2 ml of hydrogen peroxide into a test tube.
3) Feel the test tube to get a sense of the initial temperature.
4) Put a 1/4 scoop of the manganese dioxide into the test tube. Mentally take note of the observations of the reaction, **and quickly move on to step 5.**
5) Light a wooden splint with the lighter.
6) Let the splint burn for 5 seconds or so and then blow it out so there is a red hot ember on the end.
7) Put the wooden splint in the test tube (be sure not to dip the splint in the liquid or else it will go out) and record your observations of what happens.
8) Feel the test tube to get a sense of the final temperature. Did it increase or decrease?
9) Return all materials to the science kiosk for disposal.
10) CLEAN UP YOUR WORK AREA and return ALL materials and chemical to the science kiosk for disposal. DO NOT TOUCH the chemicals.

4) Burning a candle

Introduction:

This experiment is pretty simple – you're going to light a candle and watch it burn! A candle is made up of a hydrocarbon called paraffin ($C_{31}H_{64}$). It is the paraffin that burns that makes the candle glow.

Hypothesis: Of the 6 different types of reactions, what type of reaction do you think this one will be? Why?

Materials:

- candle
- Lighter/Matches

Procedure:

1) Light the candle and watch it burn for a minute or so. Record your observations.

5) Dissolving Ammonium Nitrate in Water

Introduction:

This reaction is a bit different. It's actually not a chemical reaction at all! When you add ammonium nitrate to water, it dissolves, which is a physical change. So your job here is not to determine which type of chemical reaction it is, but instead to determine if it is an exothermic or endothermic physical change.

Materials:

-weighing boat
-ammonium nitrate
-one plastic bag
-one 10mL graduated cylinder
-gloves, goggles, apron
-balance
-scupula

Procedure:

1) Put on your safety equipment; gloves, goggles, and apron.
2) Fill the 10 mL graduated cylinder with around 5 ml of tap water.
3) Pour the 5 ml of tap water into the plastic bag.
4) Make an initial observation and feel the bag to get a sense of the temperature of the water.
5) Weigh around 3 grams of Ammonium Nitrate in a weighing boat.
6) Dump the Ammonium Nitrate into the plastic bag with the water…seal the bag after and turn the bag upside down to mix it.
7) Make an observation as the Ammonium Nitrate dissolves in the water.
8) Feel the bag. Did the temperature increase or decrease?
9) Dispose of the solution down the sink and throw the plastic bag in the garbage.
10) Return ALL other materials and chemicals (as well as ones from the previous experiments) to the science kiosk at the end of the lab.

Analysis:

Predict the products to complete the chemical equations below and then balance the equations. Then, classify each of the above experiments as: synthesis, decomposition, single replacement, double replacement, combustion, or acid-base neutralization and for parts 2-4 also state whether it was exothermic or endothermic.

1) $Pb(NO_3)_2$ + KI → _____ + _____ _____

2) Al + $CuCl_2$ → _____ + _____ _____

_____

3) H_2O_2 → _____ + _____ _____

_____

4) $C_{31}H_{64}$ + _____ →_____ + _____ _____

_____

5) When ammonium nitrate dissolved in water was it endothermic or exothermic?

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