INTEGRATED SCIENCE B Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Introduction to the Scientific Method**

Science is all about making observations, asking questions and then trying to find an answer. Today we are going to do some scientific reasoning. Write down what you observe happen with the following demonstrations. Then, using your current scientific knowledge, explain why you think it occurred.

Let’s start with some basic questions about things you may have experienced.

1. Why do yawns seem to be contagious?

2. Why do you get "brain freeze" when you drink something cold?

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| --- | --- | --- |
| Demonstration | Observations | Your Explanation |
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**EXPLORING THE SCIENTIFIC METHOD**

**STATION #1: MYSTERIOUS MILK**

You are going to be comparing the properties of 3 different types of milk: SKIM, 2%, and Whole Milk.

PROCEDURE:

1. Clean and dry an aluminum pan.

2. Measure 50 mL of whole milk

3. Add a few drops of food coloring to the edge of the milk. See the diagram below.

\* Drops of food coloring

\* \*

\*

4. Place a small amount of dish soap into a plastic container (this may have been done for you).

5. Dip a toothpick into the soap.

6. Place the soapy end of the toothpick into the one of the drops of food coloring in the milk. Observe.

7. Repeat step 6 with the other drops of food coloring.

8. Carefully dump the milk solution down the sink, clean and dry the aluminum pie pan, throw the used toothpick away.

9. Repeat this experiment with the two other types of milk.

OBSERVATIONS: POSSIBLE EXPLANATION:

**STATION#2: WHAT'S THE MATTER?**

You are going to be comparing the properties of 3 different white powders: Flour, Baking soda, and Corn starch.

PROCEDURE:

1. Clean and dry an aluminum pan.

2. Measure 20.0g of corn starch (place a paper cup on the scale, hit the zero button, carefully spoon powder into the cup until you have 20.0g)

3. Measure 15 mL of water.

4. Pour the powder into the aluminum pan.

5. Add the water.

6. Mix with a popsicle stick or your hands.

7. Try the following tests:

a. roll it into a ball and place the ball in the palm of your hand

b. poke the mixture with your finger

c. try to stretch the material

8. Throw the bulk of the material in the trash can and clean the pan in the sink. Dry the pan completely.

9. Repeat the same procedure with the other 2 powders.

OBSERVATIONS: POSSIBLE EXPLANATION:

Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date\_\_\_\_\_\_Lab Partner\_\_\_\_\_\_\_\_\_\_\_

Integrated Science B BAGGIE LAB

**Brainstorming:**

Write down the brainstorming ideas of what can happen when **calcium chloride**, **sodium bicarbonate**, and **universal indicator** are mixed.

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**Observations:**

Record three observations about each of the three chemicals BEFORE they are mixed.

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| **calcium chloride** | **sodium bicarbonate** | **Universal indicator** |
|  |  |  |

**Materials needed:**

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| --- | --- | --- |
| sodium bicarbonate solid  calcium chloride solid  universal indicator solution | 10 mL graduated cylinder  Small container  baggie | two spoons  two stirrers |

**Procedure:**

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| --- | --- |
| 1. Place **one** level spoonful of sodium bicarbonate into the baggie.  2. Place **two** level spoonfuls of calcium chloride into the baggie. | 3. Measure 10 mL of universal indicator solution into the small container.  4. Place small container into baggie (without spilling any liquid). Seal top of baggie.  5. Spill the universal indicator solution into baggie. Mix. |

**Observations:**

Record your observations when the phenol red solution is spilled in the baggie.

**The Big Question:**

A **chemical reaction** occurs when atoms are rearranged into new combinations.

Did this happen inside the baggie? \_\_\_\_\_\_ Justify your answer.

**Part II**

What are some questions that came up about this reaction? (Circle the question we are going to research.)

A controlled experiment is one in which only **one variable** has been changed.

What **one variable** are you going to change? 1 spoon NaHCO3, 2 spoons CaCl2, 10 mL universal sol’n?????

Your hypothesis: If \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- |
| What mixture did YOU use? | The Result(s) |
|  |  |

**Answer the research question:**

CHEMICAL REACTIONS NOTES

Indicators that a chemical reactions has occurred:

General Equation:

Two Types of NUMBERS:

**2**CaBr**2**

Counting atoms:

CaCl2 has \_\_\_\_ atoms of Ca and \_\_\_\_ atoms of Cl.

NaC2H3O2 has \_\_\_\_\_\_atoms of Na\_\_\_\_\_ atoms of H, \_\_\_\_\_ atoms of C, and \_\_\_\_\_ atoms of O.

Al2(Cr2O7)3 has \_\_\_\_\_ atoms of Al, \_\_\_\_\_ atoms of Cr, and \_\_\_\_\_ atoms of O.

Na3PO4 has \_\_\_\_\_ atoms of Na, \_\_\_\_\_ atoms of P, and \_\_\_\_\_ atoms of O.

LAW of CONSERVATION OF MASS/MATTER:

Examples:

H2  + O2 🡪 H2O Al2O3  🡪 Al + O2

More Examples:

SO3 🡪 SO2 + O2 FeCl3 + Pb(NO3)2 🡪 Fe(NO3)3 + PbCl2

TRY THESE:

1. \_\_\_\_\_ P4  + \_\_\_\_\_\_ O2 🡪 \_\_\_\_\_\_ P4O10

1. \_\_\_\_ C2H2 + \_\_\_\_\_ O2 🡪 \_\_\_\_\_ CO2 + \_\_\_\_\_\_ H2O
2. \_\_\_\_\_\_N2O3 + \_\_\_\_\_\_\_H2O 🡪 \_\_\_\_\_\_\_HNO2
3. \_\_\_\_\_Mg + \_\_\_\_\_\_TiCl4 🡪 \_\_\_\_\_\_MgCl2 + \_\_\_\_\_Ti

1. \_\_\_\_\_Na2O2 + \_\_\_\_\_\_ H2O 🡪 \_\_\_\_\_\_ O2 + \_\_\_\_\_\_\_NaOH
2. \_\_\_\_\_ C3H8 + \_\_\_\_\_\_\_O2 🡪 \_\_\_\_\_\_\_ CO2  + \_\_\_\_\_\_\_O2
3. \_\_\_\_\_NaI + \_\_\_\_\_\_\_H3PO4 🡪 \_\_\_\_\_\_HI + \_\_\_\_\_\_ Na3PO4
4. \_\_\_\_\_\_As + \_\_\_\_\_\_\_NaOH 🡪 \_\_\_\_\_\_\_Na3AsO3  + \_\_\_\_\_\_H2
5. \_\_\_\_\_\_ H2SO4 🡪 \_\_\_\_\_H2O + \_\_\_\_\_\_\_O2 + \_\_\_\_\_\_\_ SO2
6. \_\_\_\_\_\_B + \_\_\_\_\_\_ F2 🡪 \_\_\_\_\_\_\_BF3
7. \_\_\_\_\_\_Sn + \_\_\_\_\_\_KOH 🡪 \_\_\_\_\_\_K2SnO2 + \_\_\_\_\_\_H2
8. \_\_\_\_\_\_ CO2 + \_\_\_\_\_\_\_KO2 🡪 \_\_\_\_\_\_ K2CO3 + \_\_\_\_\_\_ O2

INTEGRATED SCIENCE B Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Lab Partner(s)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**EXPLORING THE LAW OF CONSERVATION OF MASS**

**PRE LAB DISCUSSION:**

Today we will be using a closed system. A closed system does not permit matter to enter or exit the apparatus. Lavoisier's classic 12-day experiment which led to the discovery of oxygen and an understanding of *burning,* was conducted in a closed system. The system we will be using is closed to matter, but it is not closed to

energy. If the system becomes warmer, energy is being released by the reaction. This is called an *exothermic reaction.* If the system becomes cooler, energy is being used by the reaction. This is called an *endothermic*

*reaction.* Most laboratory thermometers will not fit inside a closed flask, but you can determine temperature changes by just touching the bottom of the flask before and after the reaction.

**OBJECTIVE:**

To determine what observable factors are changed in a chemical reaction and what factors remain constant.

**CHEMICALS/EQUIPMENT:**

2-250 ml flasks, 3 balloons, electronic balance, acetic acid, 3M hydrochloric acid, sodium bicarbonate, zinc, steel wool, 250 mL beaker, timer

**PROCEDURE:**

***PART 1***

1. Tear off a quarter-size piece of steel wool. Form it into a loose ball.

2. Obtain 30 mL of acetic acid.

3. Place the piece of steel wool in a clean 250 mL BEAKER and add the acetic acid to the steel wool.

4. Allow the steel wool to soak in the acetic acid for 6 minutes (use the timer provided).

5. Remove the steel wool from the acetic acid and squeeze out any excess acetic acid.

6. Place the steel wool into a clean, dry 250 mL flask and immediately cover the opening of the flask with a balloon.

7. Mass the flask, balloon, and steel wool. Record the mass.

8. Record initial observations including the temperature of the flask by feeling the bottom.

9. Allow the flask to sit untouched for 30 minutes.

10. After 30 minutes observe the contents of the flask and record the final mass (do not remove the balloon until after you have recorded the mass).

11. Record final observations including the temperature of the flask by feeling the bottom.

12. Remove the balloon and throw it away in the trash can. Remove and throw away the piece of steel wool. Clean the flask completely with soap and water.

***PART II***

1. Place 50 mL hydrochloric acid in a clean 250 ml FLASK and mass of the flask and acid.

2. Using a weigh boat, obtain 8 grams of Zn

3. Place the Zn into the balloon by pinching the sides of the weigh boat and mass the balloon and the zinc.

4. Place the balloon on to the mouth of the flask with out dropping the contents of the balloon into the flask.

5. Mass the flask, balloon, hydrochloric acid, and zinc.

6. Record your initial observations including the temperature by feeling the bottom of the flask.

7. After answering the question and recording your initial observations, hold the balloon up so that the zinc in the balloon falls into the flask. Carefully observe the reaction and carefully and fully record all your observations [temperature, colors, changes in the acid/zinc/or balloon, volume of the substances, etc.].

8. After the reaction has reached completion, determine the total mass of the system. DO NOT REMOVE THE BALLOON. The balloon and gases produced by the reaction must be weighed.

9. Remove the balloon and throw it away in the trash can. Dump the contents of the flask down the sink and clean the flask with soap and water.

***PART III***

1. Place 50 mL of acetic acid in a clean 250 ml flask and mass the flask and acid.

2. Using a weigh boat, obtain 15 grams of sodium bicarbonate.

3. Place the 15 grams of sodium bicarbonate in a balloon by pinching the sides of the weigh boat and mass the balloon and sodium bicarbonate.

4. Place the balloon on to the mouth of the flask with out dropping the contents of the balloon into the flask.

5. Mass the flask, balloon, acetic acid, and sodium bicarbonate

6. Record your initial observations including the temperature by feeling the bottom of the flask.

7. After answering the question and recording your initial observations, hold the balloon up so that the sodium bicarbonate in the balloon falls into the flask. Carefully observe the reaction and carefully and fully record all your observations [temperature, colors, changes in the acid/sodium bicarbonate/or balloon, volume of the substances, etc.].

8. After the reaction has reached completion, determine the total mass of the system. DO NOT REMOVE THE BALLOON. The balloon and gases produced by the reaction must be weighed.

9. Remove the balloon and throw it away in the trash can. Dump the contents of the flask down the sink and clean the flask with soap and water.

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***DATA***

**PART I**

|  |  |  |  |
| --- | --- | --- | --- |
| Initial Mass of Flask, Steel Wool, and Balloon | Initial Observations | Final Mass of Flask, Steel Wool, and Balloon | Final Observations |
|  |  |  |  |

**PART II**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mass of Flask and Acid | Mass of Balloon and Zinc | Initial Mass of Balloon, Zinc, Flask and Acid | Initial Observations | Final Observations | Final Mass |
|  |  |  |  |  |  |

**PART III**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mass of Flask and Acid | Mass of Balloon and Sodium bicarbonate | Initial Mass of Balloon, Sodium Bicarbonate, Flask and Acid | Initial Observations | Final Observations | Final Mass |
|  |  |  |  |  |  |

**THINKING SCIENTIFICALLY**

1. Is there any **significant difference** in the mass before the reaction and after the reaction in PART I, PART II, and PART III?

Why or why not?

2. In each part, which had a greater volume, the reactants or the products? Explain how this was determined. (think about the size of the balloon - did it get bigger, smaller, or no change)

PART I :

PART II:

PART III:

3. Did the color of the liquid change ? \_\_\_\_\_\_\_\_

If so, tell what color it was before, during, and after the reaction.

4. Did the color of the solids change? \_\_\_\_\_\_\_\_\_\_

If so, tell the color before and after the reaction.

5. Based on each of the experiments state what the "law of the conservation of mass" is:

6. How was the "law of the conservation of mass" applied in this experiment?