Full Name_____Class_____Date_____

Mystery Powder & Mystery Liquids Labs

Powder 1 Experiment - You will be mixing baking soda and vinegar together in a container and looking for signs of a chemical change.

Hypothesis – What do you think the outcome of the investigation will be?

If baking soda is mixed with vinegar, then _____

_____

Experiment

1. Go to the central area and place 1 spoonful (about 10 grams) of baking soda into one of your baggies.

2. Add 50 mL of vinegar to an empty paper cup found at your station.

3. Observations before you experiment

Baking soda **white, solid, powder**

Vinegar **clear, liquid, strong smell**

4. FOLLOW THESE STEPS CAREFULLY!

a. Tilt the baggie to the side so that the baking soda is in one corner.
b. One partner holds the baggie (with the powder tilted toward one side) while the other partner carefully places the cup with the vinegar into the baggie WITHOUT TIPPING THE CUP OVER!
c. Then hold the cup upright from the outside of the baggie while the other partner gently squeezes as much air as possible out of the baggie and COMPLETELY SEALS the bag shut. **It is important that the baggie is completely sealed**.
d. Turn the baggie upside down so that the powder and the vinegar mix together.
e. Both partners should **feel the baggie** where the reaction is taking place and make other observations during this chemical change.
f. CAUTION: If the baggie is filling up and is in danger of bursting, place it in the sink and open one corner to relieve the pressure.

5. Observations AFTER experiment

Baking soda **dissolved**

Vinegar **clear, liquid, strong smell**

6. Check the signs that a chemical change occurred

✓ gas is produces (bubbles)
_____ light is released
_____ a precipitate forms
_____ color change
✓temperature change
(circle one) hotter or **colder**

7. Clean up this experiment by pouring the liquid mixture down the drain and throwing away the baggie and cup.

Powder 2 Experiment - You will be mixing a mystery powder and vinegar together in a container and looking for signs of a chemical change.

Hypothesis – What do you think the outcome of the investigation will be?

If the mystery powder (not baking soda) is mixed with vinegar, then _____

_____

Experiment

1. Go to the central area and place 1 spoonful (about 10 grams) of mystery powder into one of your baggies.

2. Add 50 mL of vinegar to an empty paper cup found at your station.

3. Observations before you experiment

Mystery Powder **white, solid, granules (larger pieces than baking soda)**

Vinegar **clear, liquid, strong smell**

4. FOLLOW THESE STEPS CAREFULLY!

a. Tilt the baggie to the side so that the mystery powder is in one corner.
b. One partner holds the baggie (with the powder tilted toward one side) while the other partner carefully places the cup with the vinegar into the baggie WITHOUT TIPPING THE CUP OVER!
c. Then hold the cup upright from the outside of the baggie while the other partner gently squeezes as much air as possible out of the baggie and COMPLETELY SEALS the bag shut. **It is important that the baggie is completely sealed**.
d. Turn the baggie upside down so that the powder and the vinegar mix together.
e. Both partners should **feel the baggie** where the reaction is taking place and make other observations during this chemical change.
f. CAUTION: If the baggie is filling up and is in danger of bursting, place it in the sink and open one corner to relieve the pressure.

5. Observations AFTER experiment

Mystery Powder **did not dissolve, solid, white, larger granules than baking soda**

Vinegar **clear, liquid, strong smell**

6. Check the signs that a chemical change occurred

✓gas is produces (bubbles)
_____ light is released
_____ a precipitate forms

_____ color change
✓temperature change
(circle one) **hotter** or colder

7. Clean up this experiment by pouring the liquid mixture down the drain and throwing away the baggie and cup.

8. Go to the teacher and get 2 cups and 2 baggies to replenish the box at your station.

Experiment 3 – You will be mixing two clear liquids (instead of a liquid and a powder) in a container and looking for signs of a chemical change.

The liquids are NOT water, so please do not smell or taste them!

Hypothesis: What do you think the outcome of this investigation will be?

If I mix two clear liquids together, then _____

Experiment:

1. Pick up Liquid A, Liquid B, a small graduated cylinder, and a small cup from the teacher.

2. Using the pipette, measure 10 mL of Liquid A into the small graduated cylinder and pour it into the small, clear cup.

3. Thoroughly rinse out the graduated cylinder!

4. Using the pipette, measure 5 mL of Liquid B into the small graduated cylinder. The reaction happens instantly so watch carefully as you pour Liquid B directly into the small cup that has Liquid A already in it.

5. Write your observations of what happened when the two clear liquids mixed.

A white precipitate forms.

6. Clean Up:
a. Pour the liquid mixture down the drain.
b. Thoroughly rinse out the graduated cylinder & thoroughly rinse out AND DRY the small cup.
c. Return the two liquids with pipettes, the graduated cylinder and the small cup to the teacher.

Go back to your seat and complete the rest by yourself.

Analysis:

1. After analyzing the results from the first two experiments, was the powder in Experiment 2 the same powder as in Experiment 1? **No**

2. Explain why or why not. **In Experiment #1 the chemical reaction was cold. In Experiment #2 the chemical reaction was hot.**

3. Which signs of a chemical change did both experiments share?

✓gas is produces (bubbles) ✓temperature change
_____ light is released _____ color change
_____ a precipitate forms

From Experiment 1

4. The gas that was produced in Experiment 1 is also produced when baking soda is heated to a high temperature. Baking soda is often used to smother fires. *(This is why it is important to have baking soda near your stove as you are cooking. To quickly put out a grease fire, you can smother the fire with backing soda!*) What can you infer about the gas produced by the reaction of baking and vinegar and how it relates to fire?

Circle all that apply.

a. The gas that is produced in this reaction is oxygen.
b. The gas that is produced in this reaction is carbon dioxide
c. The gas that is produced in this reaction starts fires.
d. The gas that is produced in this reaction puts out fires.

5. The chemical formula for baking soda is $NaHCO_3$. This means that each molecule of baking soda is composed of 1 atom of sodium (Na), 1 atom of hydrogen (H), 1 atom of carbon (C), and 3 atoms of oxygen (O).

Look at the chemical equation below. The left side of the equation shows the substance you mixed in the bag (vinegar and baking soda). The right side of the equation shows the new substances that were formed. (Sodium acetate and two others.)

Look at the chemical formulas for the other two substances that were made. Using your previous knowledge, write what you think the other two new substances are in the blanks.

Vinegar	+	Baking soda	→	Sodium Acetate	+	**water**	+	**carbon dioxide**
CH_3COOH		$NaHCO_3$		CH_3COONa		**H_2O**		**CO_2**

From Experiment 3

6. The two liquids mixed together and formed a solid. This solid is called a **precipitate.** The white powder you observed is called magnesium carbonate. It is most often referred to as "chalk" and is used as a drying agent for hands in rock climbing, gymnastics, and weight lifting.

Magnesium carbonate is also used in taxidermy for whitening the bones. It can be mixed with hydrogen peroxide to create a paste which is then spread on the bones to give them a whiter color.

$MgCO_3$ 7. Using your iPad, look up the chemical formula for magnesium carbonate.