

Predicting and Testing Hypothesis Lab

Chemistry

Name: _____ Date: _____ Per. _____

Background:

We innately explore, observe, question, and experiment to understand our environment. Children demonstrate this propensity at an early age by asking endless “why” and “how” questions—the genesis of a systematic process of thought and investigation referred to as the scientific method. In this simple activity, you will learn the steps of the scientific method as you investigate the endothermic reaction of effervescent tablets dissolving in water. The steps of the scientific method are outlined in a flowchart below. Note the pathway for revisiting the hypothesis and creating a new one if the first one is not supported by the experiment.

Procedure Part I:

- Place 50 mL of water from the same source in each of 4 cups or beakers. Stir the water in each with the thermometer and ensure that the water in each cup or beaker is at the same temperature. Record this as the temperature with zero chloride salt.
- Place a thermometer in the water of the first container, zero a weighing boat and add one table. Record the mass (g) of one one-fourth teaspoon of chloride salt. Add one one-fourth teaspoon of chloride salt, and stir until the solution temperature remains constant.
- Record the temperature (°C) with one one-fourth teaspoon of chloride salt.
- Following the process you used with one one-fourth teaspoon of chloride salt in the first container, you will add one one-fourth teaspoon of chloride salt to a container, stir while measuring the temperature until it remains constant, and then record the reading.
 1. First, verify that the temperature of your remaining 3 water samples has not changed.
 2. Zero and weighing boat to determine the mass of two one-fourth teaspoons of chloride salts. Record the mass in your data table. Add two one-fourth teaspoons of chloride salts to the second container, stir, monitor the temperature until it stabilizes, and then record it.
 3. Likewise, determine and record the mass of three one-fourth teaspoons of chloride salts. Add three one-fourth teaspoon of chloride salts to the third container and follow the steps outlined above.
 4. Determine and record the mass of four one-fourth teaspoons of chloride salts. Add four one-fourth teaspoon of chloride salts to the last container and follow the steps outlined above.

Procedure Part II: Get more chloride salt and have students test another variable. For example, the independent variable might be volume of water and the dependent variable, temperature. A controlled variable would be the number of one-fourth teaspoons of chloride salts (1 per trial).

- Place 25 mL of water from the same source in one beaker. Stir the water in with the thermometer and ensure that the water in the beaker is at the same temperature. Record this as the temperature with zero one-fourth teaspoon of chloride salts.
- Place a thermometer in the water of the first container, zero an empty weighing boat and determine the mass of one one-fourth teaspoon of chloride salt. Add one one-fourth teaspoon of chloride salt, and stir until the solution temperature remains constant.
- Record the temperature with 25 ml of water.
- Following the process you used with one one-fourth teaspoon of chloride salt in the first container, you will add 25 ml increments of water to each container, stir while measuring the temperature until it remains constant, and then record the reading

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- a. First, verify that the temperature of your remaining 3 water samples has not changed (50, 75, 100 ml)
 - b. Add one one-fourth teaspoon of chloride salt to the second container, stir, monitor the temperature until it stabilizes, and then record it.
 - c. Likewise, add one one-fourth teaspoon of chloride salt to the third container and follow the steps.
 - d. Add one one-fourth teaspoon of chloride salt each to the last container and follow the steps.
- Clean your work areas and wash your hands.

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Introduction:

Purpose:

Hypothesis:

Variables:

IV:

DV:

Control:

Materials:

Safety:

Summary of Procedure:

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Pre Lab Assignment: Answer the following questions in complete sentences, using the information from the readings and diagram to support your answer. All math questions must show work and include appropriate units and significant figures.

Read the paragraph, then determine and answer the following questions.

A student decided to conduct an experiment to investigate one of the factors involved in plant growth. She randomly selected twenty plants of the same species from the local plant nursery and placed them all in identical pots with the same type of soil. She gave them all the same amount of water and fertilizer, but she placed ten of the plants by a window and ten of the plants in a dark closet. She observed the plants and measured their growth daily for three weeks.

1. What is the independent variable? _____
2. What is the dependent variable? _____
3. What are the constants? _____
4. What typically happens to the dependent variable at the end of an experiment?
5. In a data table, which variable is in the **left** column? _____
6. In a data table, which variable is in the **right** column? _____
7. Where have you seen this rule before? _____
8. What does a ***hypothesis*** predict? _____
9. How else can the hypothesis be viewed?

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Data Table: Constant Volume of water

Volume of Water used (ml)		
Amount of Salt ($\frac{1}{4}$ tsp)	Mass of salt (g)	Temperature ($^{\circ}\text{C}$)
Observations:		

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Post-laboratory Analysis: On a separate piece of paper!!! Answer the following questions in complete sentences, using the data from the lab to support your answers.

1. Use **EXCEL** to make a graph of the relationship between the amount of one-fourth teaspoon of chloride salts (x-axis) and the temperature (y-axis) of the solution. (See Google Classroom)
2. Use the internet to research your chloride salt. What information did your research provide about the heat changes your chloride one-fourth teaspoon of chloride salt undergoes in water?
3. If you were to do research, you would find that dissolving certain substances in water may release heat or absorb heat. What indicates the release or absorption of heat energy in a reaction?
4. What happened to the temperature of the water when the one-fourth teaspoon of chloride salts were added? Based on your research, what type of reaction is this?
5. Based upon your research above, revise/create a hypothesis statement on what you predict will happen to the temperature of a set amount of water when additional one-fourth teaspoon of chloride salts are added to water.
6. Does your graph support your hypothesis, use your data to explain your answer.
7. Compare your result to that of your classmates. Are there any significant discrepancies? If so, discuss possible reasons.
8. What is the independent variable? Explain
9. What is the dependent variable? Explain
10. What is the controlled variable (s) in this experiment? Explain
11. How did the dependent variable respond to the independent variable? Explain
12. Based upon the trend of your graph, what would you predict as the final temperature if ten one-fourth teaspoons of chloride salts were dissolved in 50.0 mL of water at room temperature?
13. Find the slope of the temperature-versus-one-fourth teaspoon of chloride salts graph to quantify the temperature change in degrees per one-fourth teaspoon of chloride salt.