Food Explorations Lab:
Exploring Acids & Bases

STUDENT LAB INVESTIGATIONS

Name: _____

Lab Overview

In this investigation, you will use cabbage juice indicator to determine if two unknown samples are acids or bases. Based on your results, you will determine if other household substances are acidic, basic, or neutral and the identity of the unknown samples.

Lab Objectives

In this lab, you will learn how to…

1. Use cabbage juice (pH indicator) to determine if substances are acidic, basic, or neutral.
2. Determine the identity of unknown substances.
3. Identify acids as substances that lose a hydrogen ion and bases as substances that gain a hydrogen ion.

Lab Safety: Before beginning ANY investigation you should put on your safety goggles and apron. It is important to avoid getting chemicals on your hands. Always wash your hands following completion of an investigation. When handling food, you should also wash your hands prior to beginning an investigation.

PART A: Identification of Unknown Substances

MATERIALS

Powder sample A
Powder sample B
200 mL red cabbage juice (pH indicator)
250 mL jar or beaker
2 plastic spoons
1- 100 mL graduated cylinder or metric measuring cup
pH Color Chart
safety goggles
aprons (optional)

PROCEDURE

1. Obtain unknown sample A and B from the teacher.

2. Obtain 200 mL red cabbage juice (pH indicator) from the teacher in a jar or beaker.

3. Describe your visual observations of each unknown sample in Table A.

4. What do you think will happen upon mixing the pH indicator with each sample?

Prediction for Sample A: _____

Prediction for Sample B: _____

1. Measure and pour 100 mL of the pH indicator into Sample A and stir with a plastic spoon.

2. Measure and pour 100 mL of the pH indicator into Sample B and stir with a different plastic spoon.

3. Record your observations in Table A. Use the pH color chart to identify if each sample is an acid or a base.

4. Set aside the cups of Sample A and B to allow for comparison of samples in Part B of this lab investigation.

Table A. Unknown Sample Testing

Sample	*Before* mixing with pH Indicator	*After* mixing with pH Indicator	Acid or Base?
Sample A	White Powdery	Blueish-green	ACID **(BASE)**
Sample B	Clear Liquid	Pinkish-red	**(ACID)** BASE

Conclusion:

1. Explain how your original responses compared to the actual results.

Student responses will vary.

2. Including both physical and chemical changes, compare and contrast the reactions.

Both changed colors. Sample A bubbled, and Sample B did not. End colors were also different.

3. Using the *pH Color Chart* provided and your observations, determine if Samples A and B are acids or bases. (Circle your answer in Table A.)

4. Based on the reading *Cooking with Chemistry*, describe the reactions observed in Sample A and Sample B in terms of hydrogen ions present in the solutions.

Sample A gained a hydrogen ion and Sample B lost a hydrogen ion.

PART B: Identifying the Unknown Substances

Lab Question

Which of the following household substances are acids, which are bases, and which are neutral?

Cream of Tartar Acid

Baking Soda Base

Salt Neutral

Vinegar Acid

Table B: Predictions: (Fill in the following chart to record your predictions)

Substance	Predicted color change when mixed with pH indicator	Predicted pH - Acid, Base, or Neutral?
Cream of Tartar	Pink	Acid
Baking Soda	Green	Base
Salt	Blue	Neutral
Vinegar	Red	Acid

Two of the household substances from above are identical to unknown substances A and B. Based on your observations, predict what Sample A and Sample B are.

Sample A (prediction) = Baking Soda

Sample B (prediction) = Vinegar

MATERIALS

Unknown Sample A (from Part A)
Unknown Sample B (from Part A)
4 Pre-labeled clear containers with pre-mixed solutions
pH Color Chart

PROCEDURE

1. Obtain the 4 containers from the teacher. Each container should have one of the following substances mixed with red cabbage juice (pH indicator).
   - 100 mL pH Indicator and 1 tsp. Cream of Tartar
   - 100 mL pH Indicator and 1 tsp. Baking Soda
   - 100 mL pH Indicator and 1 tsp. Salt
   - 100 mL pH Indicator and 100 ml Vinegar
2. Using the pH color chart, order each substance by color (red to yellow) and determine if it is an acid or a base.

Table C: Testing pH of Substances

	Substance	Color	pH	Acid, Base, or Neutral
1	Vinegar	Red	0	Acid
2	Cream of Tartar	Pink	4	Acid
3	Salt	Purple	6	Neutral
4	Baking Soda	Green	12	Base

Conclusion

1. Using your data, explain if your original responses were correct.

Student responses will vary.

2. Compare and contrast the chemical reactions that occurred in this activity.

Vinegar and cream of tartar turned the indicator a similar color, but vinegar was more transparent than cream of tartar. The other solutions created very different colors.

3. Based on your observations, what is each sample?

Sample A: Baking Soda **Sample B:** Vinegar

4. Complete Table D:

Table D: Other substances

Substance	Hydrogen ion (Gain, Lose or None)	Acid, Base or Neutral	Color
Rain water	Lose	Acid	Pink
Lemon juice	Lose	Acid	Red
Soap	None	Neutral	Blue
Ammonia cleaner	Gain	Base	Green