Name : Date: Period

Objective: SWBAT use observations from a chemical indicator to classify substances as an acid or base.

**pH Indicator Lab**

**INTRODUCTION**

Red cabbage juice contains a natural pH indicator that changes colors according to the acidity of the solution. Red cabbage contains a pigment molecule called flavin (an anthocyanin). This water-soluble pigment is also found in apple skin, plums, poppies, cornflowers, and grapes. Very acidic solutions will turn anthocyanin a red color. Neutral solutions result in a purplish color. Basic solutions appear in greenish-yellow. Therefore, it is possible to determine the pH of a solution based on the color it turns the anthocyanin pigments in red cabbage juice.



Right: Anthocyanin molecule. This is a compound found in plant tissue

**Purpose:** The purpose of the lab is to categorize substances as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ by observing their reaction with the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ indicator.

**PRELAB QUESTIONS**

1. **What is a pH indicator?**
2. **In this lab, what is the molecule that is used as a pH indicator?**
3. **Describe the properties of an acid.**
4. **Describe the properties of a base.**

|  |  |
| --- | --- |
| **Independent Variable**  | **Dependent Variable**  |
|  |  |
| **Hypothesis: (If… then… because…. )**  |
|  |

**Materials:**

* beakers -pipettes -sample solutions
* plate with wells -cabbage juice - lab goggles

**Procedures:**

1. Observe the different substances that you will be testing today.
2. Use your **qualitative observations** to predict whether the substance will be and acid or base. Record your prediction in the data table.
3. Using the pipette, put \_\_\_\_\_\_ drops of cabbage juice into well #1.
4. Use a different pipette to put \_\_\_\_\_\_\_ drops of substance #1 into well #1.
5. Note the color change and record it in the table below.
6. Use the color of the indicator to label whether the substance is an acid or a base.
7. Repeat step 2 - 5 for the rest of the substances.

**Before you begin, complete the chart below.**

|  |  |  |
| --- | --- | --- |
| **pH**  | **Category** | **Color of Indicator** |
| 0-6.99 |  |  |
|  | neutral |  |
| 7.01-14 |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Name of substance** | **Observations and Prediction** | **Color it turns cabbage juice indicator** | **Acid, base, or neutral?**  |
| **Ex.) Grapefruit Juice**  | **Sour tasting – Acid**  | **Pink** | **ACID!**  |
| 1.)  |  |  |  |
| 2.)  |  |  |  |
| 3.)  |  |  |  |
| 4.)  |  |  |  |
| 5.)  |  |  |  |
| 6.)  |  |  |  |
| 7.)  |  |  |  |
| 8.)  |  |  |  |
| 9.)  |  |  |  |

**Post lab questions:**

1. What were the acidic solutions that you tested? **How did you know**?
2. What were the basic solutions that you tested? **How did you know**?
3. What were the neutral solutions in this lab? **How did you know?**
4. Which substance had the **MOST HYDRONIUM IONS?** How did you know?

(Hint: What kind of substance contains H+ ions? If it had the most H+ ions, would it be strong or weak? What would the pH be?)

1. Which substance had the **MOST *HYDROXIDE* IONS?** How did you know?

(Hint: What kind of substance contains OH- ions? If it had the most OH- ions, would it be strong or weak? What would the pH be?)

1. Suppose you have a sample of a **weak acid**. What do you think would happen if we continued to add a ***strong base*** to the sample? **Describe** how the color of the cabbage juice would change.
2. Now suppose you have a sample of a **weak base**. What do you think would happen if we continued to add a ***strong acid*** to the sample? **Describe** how the color of the cabbage juice would change.

Place your samples (put the NAME) on the pH scale below. Make sure you organize it according to the observations you made.

 **acidic** **basic**

# **Conclusion**- You must include RERUN: \* **R**epeat the procedure briefly \* **E**xplain what you did \* **R**esults (what did your data say) \* **U**ncertainties (state anything that went wrong in your lab) \***N**ew (state 2 new things you learned). ***This section should be a paragraph at least 5 sentences long.***

Your conclusion should include:

 **Compare** and **contrast** acids and bases.

 Define **pH indicators** and the **purpose** of the lab.

 Restate your **hypothesis**.

 Explain what you did.

 Use your **data** to summarize and explain your results.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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| --- | --- | --- | --- | --- | --- |
| Points | Scientific Accuracy |  Reasoning  | Communication and Explanation | Collaboration | Clean up |
| 4 Excellent | Measurements and answers are very accurate | Investigation was very well designed and implemented | Team discussed ideas completely and fully answered all questions with clear concise answer | Team members worked very effectively to design their experiment  | Lab area was left clean, neat, and better than before lab started.  |
| 3Good | Measurements and answers are accurate  | Investigation was well designed and implemented | Team discussed ideas answered most questions with clear concise answer | Team members worked effectively to design their experiment  | Lab area was left clean and neat. |
| 2 Fair | Measurements and answers are fairly accurate  | Investigation was fairly well designed and implemented | Team discussed ideas answered some questions with clear concise answer | Team members worked in an average way to design their experiment  | Lab area was left somewhat clean. |
| 1Poor  | Measurements and answers are not accurate  | Investigation was not well designed and implemented | Team discussed ideas and did not answer questions with clear concise answer | Team members did not work in an effective way to design their experiment  | Lab area was not left in clean and neat.  |
|  |  |  |  |  | Total\_\_\_\_\_ of 20 |