

**LAB: TESTING MYSTERY SUBSTANCES**

**OBJECTIVE:** Determine the acidic or basic property of 12 unknown Mystery Substances with 3 lab partners using 3 organic indicators.

**LEARNING GOAL:** Students will compare and record the results as they test the pH of various substances. Through their lab group observation and discussion they will determine the significance of color change in relation to pH. Demonstrate knowledge related to pH by completing post lab questions.

**PROTOCOL:**

- 1) Three activities will be taking place at the same time due to using 3 indicators: paper, gel, juice.
- 2) Each student will test each Mystery Substance with his/her assigned indicator according to procedures listed below. Carefully match numbers.
- 3) Must share dropper bottles with lab partners and other groups.
- 4) Compare observations with lab partners. Fill in all columns of data table.
- 5) Third column is for fun F.Y.I. The identities of the mystery substances could be determined as an added interest.
- 6) Following clean-up, complete Post-lab Questions.

**STUDENT ROLES AND PROCEDURES:****STUDENT #1:**

- 1) Trace, number, and cut 12 strips of cabbage paper from  $\frac{1}{4}$  paper towel. Number each on as shown below:

1	2
3	4
5	6
7	8
9	10
11	12

- 2) Place one drop from numbered dropper bottles Mystery Substances on corresponding number of cabbage indicator paper. Edge of paper will serve as unchanged control.
- 3) Record observation on Data Table.
- 4) Clean-up: Place all paper items into waste container.

**STUDENT #2:**

- 1) Number 1-12 on paper plates using a marker, as in a clock face.
- 2) Cut 12 small pieces of cabbage gel;  $\frac{1}{4}$  or less cm each (smaller is better)
- 3) Place gel pieces on clock face near each number.  
Place 13th gel in clock center; save as untouched control.
- 4) Place several drops of each Mystery Substance on corresponding number of gel. Use equal number of drops per gel.
- 5) Needs to sit for a short time.
- 6) Record observation on Data Table
- 7) Clean-up: Place paper plate with gels into waste container.

**STUDENT #3: (#4 also if you have one)**

- 1) Set up & number 12 test tubes in 1 rack; 13<sup>th</sup> tube can be a control.
- 2) Pour 1/3 C of cabbage juice into small pitcher; return to lab station
- 3) Measure 10 ml cabbage juice, using a graduated cylinder, into each test tube.
- 4) Add 5 drops of each Mystery Substance to the corresponding number of each test tube. (Concentrated strength of juice will determine the number of drops needed. Use equal number of drops per tube.)
- 5) Record observation on Data Table.
- 6) Clean-up: Pour juice down drain; flush with water.  
Rinse & brush/scrub tubes; place upside down in rack.

**POST LAB QUESTIONS:**

- 1) What color changes were observed in this lab?
  - a)
  - b)
- 2) Each color change was an “indication” of ?
  - a)
  - b)
- 3) Explain possible reasons for no color change in a Mystery Substance test.
- 4) What would the pH number be in a substance lacking a color change? \_\_\_\_\_
- 5) Did the pH color test of your group’s three indicators (paper, gel, juice) generally match? \_\_\_\_\_ Explain why or why not.
- 6) How many acids did your lab group discover today? \_\_\_\_\_ Bases? \_\_\_\_\_
- 7) Why was it a good plan to have three students performing similar lab tests?

**Refer to class discussion, activity, and text book.**

- 8) Red and blue litmus paper appeared \_\_\_\_\_ when indicating a base, and \_\_\_\_\_ when indicating an acid.
- 9) The gold wide range indicator paper color appeared as \_\_\_\_\_ when indicating a base, and \_\_\_\_\_ when indicating an acid.
- 10) On a pH scale which numbers indicate bases? \_\_\_\_\_ Acids? \_\_\_\_\_
- 11) Where can you find most common acids and bases?
- 12) Name two acids and list their pH numbers:
  - a)
  - b)
- 13) Name two bases and list their pH numbers:
  - a)
  - b)

- 14) What numbers on the pH scale indicate a dangerous base? \_\_\_\_\_  
A dangerous base? \_\_\_\_\_  
What is more dangerous, an acid or a base? \_\_\_\_\_
- 15) A pH solution is measured on a logarithmic scale, so changing one number reflects a \_\_\_\_\_ change.
- 16) What does pH stand for? \_\_\_\_\_ of \_\_\_\_\_
- 17) The symbol and charge for the hydrogen ion is \_\_\_\_\_, and the symbol and charge for the hydroxide ion is \_\_\_\_\_.
- 18) When a water molecule separates forming the ions of hydrogen and hydroxide, what process was used? \_\_\_\_\_
- 19) How could an acid or a base be neutralized?
- 20) The most common neutral substance is \_\_\_\_\_ having a pH of \_\_\_\_\_.  
It contains equal amounts of \_\_\_\_\_ and \_\_\_\_\_.
- 21) A synonym for "basic" is \_\_\_\_\_.
- 22) Commercial soap is produced by reacting a base with a \_\_\_\_\_.
- 23) Some acids such as ascorbic acid are important to your health. Ascorbic acid is found in what vitamin? \_\_\_\_\_
- 24) Hydrochloric acid, another important acid, is necessary for digestion. It is found in the \_\_\_\_\_ and functions best at a pH of \_\_\_\_\_.
- 25) Most human cells function best (optimum) at a pH near \_\_\_\_\_.
- 26) Controlling a healthy pH balance in a living organism is important in maintaining h\_\_\_\_\_.  
\_\_\_\_\_.

## MYSTERY SUBSTANCES LAB DATA TABLE

<b>Mystery Substances</b>	<b>Paper Color</b>	<b>Gel Color</b>	<b>Juice Color</b>	<b>Base or Acid</b>	<b>Guess the Identity</b>
#1					
#2					
#3					
#4					
#5					
#6					
#7					
#8					
#9					
#10					
#11					
#12					