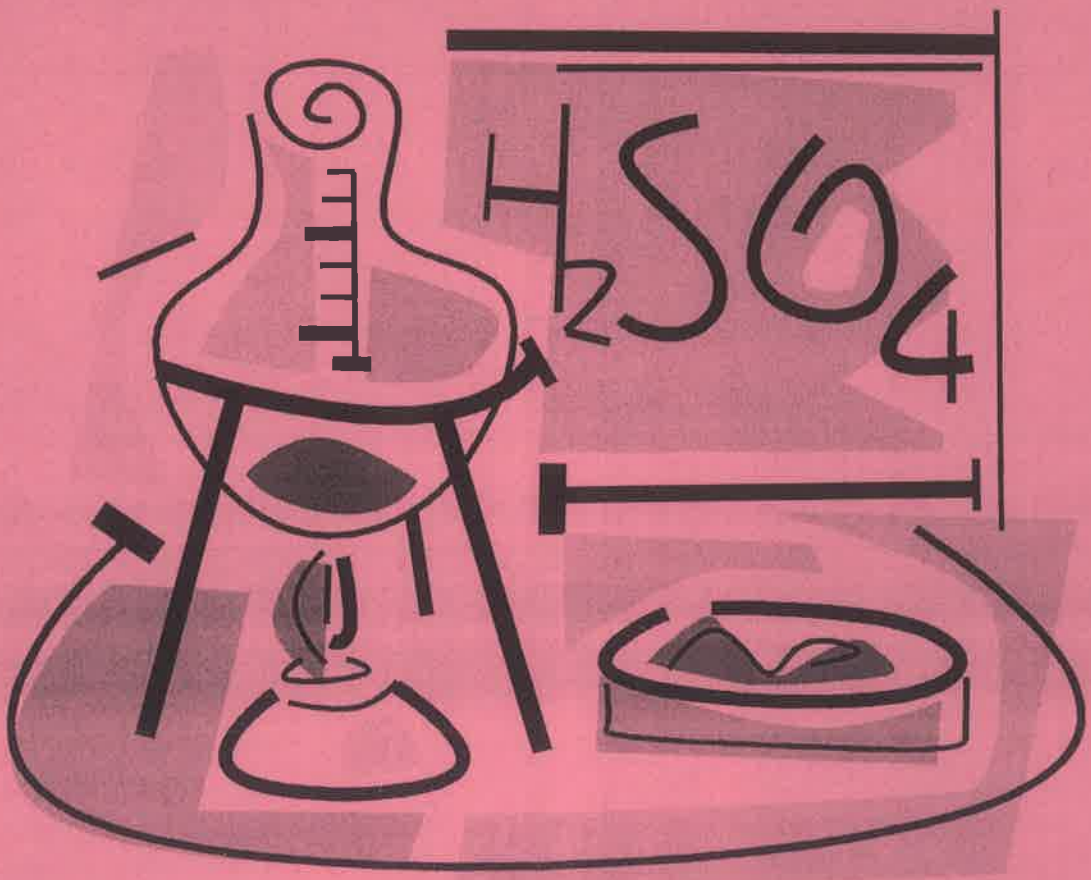
UNIT TEN:



Acids, Bases, and Salts

Name:_____ Date: _____

RED CABBAGE INDICATOR:
A STUDY OF pH AND INDICATORS

PURPOSE:

INTRODUCTION:

Natural substances can be used to determine the pH of an acid or a base. The pH scale uses numbers from 0 to 14 to indicate the level of acidity or basicity of a solution. A pH of 7 is neutral; it is neither an acid nor a base. A pH above 7 is basic; while a pH that is lower than 7 is considered acidic.

In this investigation you will observe the color change that takes place when an acid-base indicator comes in contact with an acid or a base. You will make your own indicator using the juice from a red cabbage. This is an example of a natural acid base indicator. You will make a pH- color chart using the indicator and solutions of known pH which will be used as a reference to determine the pH of an unknown substance.

SAFETY:

- Goggle and Aprons must be worn during all experimentations.
- You will be working with strong acids and bases. Acids are corrosive and bases are caustic. These solutions can burn the skin and make holes in clothing. Handle all chemical with care.
- Avoid spills and contact with skin. Wash spills with plenty of cold water.

MATERIALS:

Hot plate	Well Plate
Tongs	Droppers
Beaker	Red Cabbage

PROCEDURE:

1. Part One: Preparation of the Indicator
   a. Place a small hand full of Red Cabbage into a 250 mL beaker, add enough water to cover the cabbage and heat the solution to a boil.
   b. Continue heating the solution for about 10 minutes or until it turns a deep purple.
   c. Place the beaker on a cooling pad and allow the solution to cool for a few minutes.

2. Part Two: Testing the known pH solutions
   a. In your well plate, place a dropper full of each of the different known pH solutions into their own well.
   b. Add 10-15 drops of your indicator to each well and record the color in the data table below.

3. Part Three: Testing the unknown pH solution
   a. In your well plate, place a dropper full of the unknown pH solution in a new well.
   b. Add 10-15 drops of your indicator to the well and record the color in the data table below.
   c. Use the pH table to determine the pH of your unknown sample.
   d. Wash all solutions down the drain. Clean and dry all glassware. Clean your work area with water and sponge.

DATA AND OBSERVATIONS:

TEST TUBE pH	COLOR CHANGE
1	
3	
5	
7	
10	
14	
UNKNOWN	

QUESTIONS:

1. What is the pH range of an acid solution? What is the pH range of a basic solution?

2. According to Arrhenius, what ion does an acid yield when dissolved in solution? What about bases?

3. What was the pH of the unknown solution? It is an acid or a base? Explain your answer

4. If more hydronium ions were added to a solution, what kind of colors would the cabbage indicator turn?

5. Using Table M, what color is phenolphthalein in a solution of NH_4OH

Name:_____ Date: _____

MICROTITRATION

INTRODUCTION:

Titration is a common method of determining the amount or concentration of an unknown substance. The method is easy to use if the quantitative relationship between two reacting solutions is known. The method is particularly well-suited to acid-base reactions. Titrations are routinely used in industry to analyze products to be sold. Many manufacturers are under strict standards of quality control because their products are sold for public consumptions. These products include antacid tablets, vinegar, fruit juice and household ammonia. In this experiment we will be analyzing the concentration of acetic acid that is contained in regular household vinegar.

PURPOSE: To determine the concentration of hydrogen ions (H+ ions) in regular household vinegar.

SAFETY:

Make a list of all safety procedures related to this lab.

MATERIALS:

1.0M NaOH
Store bought vinegar
Spot plate
Phenolphthalein

PROCEDURE:

1. Obtain a spot plate, 1.0M NaOH, and vinegar
2. Complete 4 trials of the following:

    - Place 20 drops of vinegar into a well on the spot plate
    - Add 1 drop of phenolphthalein
    - Add 1.0M NaOH, drop by drop, stirring between each drop until the color persists
    - Stop when color persists

DATA TABLE:

Trial #	Drops of vinegar	Drops of 1.0M NaOH
1		
2		
3		
4		
AVERAGE		

CALCULATIONS:

Copy and complete the following questions in your lab notebook.

1. Calculate the average number of drops of vinegar used.
2. Calculate the average number of drops of 1.0M NaOH used.
3. Using the average number of drops of each, calculate the molarity of acetic acid in vinegar. Assume that each drop is the same volume. (Molarity Acid) (# drops acid) = (Molarity Base) (# drops base)

QUESTIONS:

Copy and complete the following questions in your lab notebook.

1. What is the formula for acetic acid?
2. What ions are produced when acetic acid ionizes in water?
3. Why is phenolphthalein used in this experiment? What other indicator could be used?
4. Write the balanced equation for the reaction between acetic acid and NaOH.
5. Why did you complete 4 trials as opposed to only one trial?
6. What are some sources of error in the calculation of H+ concentration?
7. How could some of these errors be eliminated?