Medical chemistry

Experiment 5 :

DETERMINATION OF ACETIC ACID IN VINEGAR

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DETERMINATION OF ACETIC ACID IN VINEGAR

INTRODUCTION:

Vinegar is essentially a solution of acetic acid (CH_3COOH) in water, systematically named ethanoic acid is an acidic, colourless liquid and organic compound .Acetic acid is the second simplest carboxylic acid (after formic acid). It is an important chemical reagent and industrial chemical, the acetyl group, derived from acetic acid, is fundamental to all forms of life. It is central to the metabolism of carbohydrates and fats.

The concentration of acetic acid in vinegar may be expressed as a molarity (in mol/L):

$$\text{Molarity} = \frac{\text{Moles of Acetic Acid}}{\text{Volume of Vinegar (in L)}}$$

In this experiment, a technique known as a titration will be used to determine the concentration of acetic acid in vinegar. A titration involves performing a controlled reaction between a solution of known concentration (the titrant) and a solution of unknown concentration (the analyte) .

The titrant is an aqueous solution of ~0.1 M sodium hydroxide (NaOH) and the analyte is vinegar

When mixed, a neutralization reaction occurs between sodium hydroxide and the acetic acid in vinegar:

$$HC_2H_3O_2\ (aq) + NaOH\ (aq) \rightarrow H_2O\ (l) + NaC_2H_3O_2\ (aq)$$

The sodium hydroxide will be gradually added to the vinegar in small amounts from a burette. The NaOH will be added to the vinegar sample until all the acetic acid in the vinegar has been exactly consumed (reacted away).

At this point the reaction is completed, and no more NaOH is required. This is called the equivalence point of the titration. In order to know when the equivalence point is reached, an indicator solution called phenolphthalein is added to the vinegar at the beginning of the Titration.

Chemicals and equipment :

-Burette - Graduated Cylinder - ~ 0.1 M NaOH (aq) - vinegar
- phenolphthalein - Erlenmeyer flasks - distilled water - funnel

Safety

Be especially careful when handling the sodium hydroxide base (NaOH), as it is corrosive and can cause chemical burns to the skin. If any NaOH spills on you, rinse immediately under running water for up to 15 minutes .

Titration Procedure:

Setting up the burette and preparing the NaOH:

- Record the exact molarity of the NaOH (aq), which is labeled on the stock bottle.
- Rinse the inside of the burette with distilled water.
- Now rinse the burette with a small amount of NaOH (aq).

- Fill the burette with NaOH (aq) up to the top,now measure the volume at the level of the NaOH precisely, and record it as the "Initial Burette Reading on your report.

Preparing the vinegar sample:

- Rinse the inside of the graduated cylinder with distilled water**.**
- Rinse but this time use vinegar.
- Now use the graduated cylinder to transfer 5.00-mL of vinegar into a clean Erlenmeyer flask .Record this volume of vinegar (precise to two decimal places) on your report.
- Add about 20-mL of distilled water and 5 drops of phenolphthalein to this Erlenmeyer flask

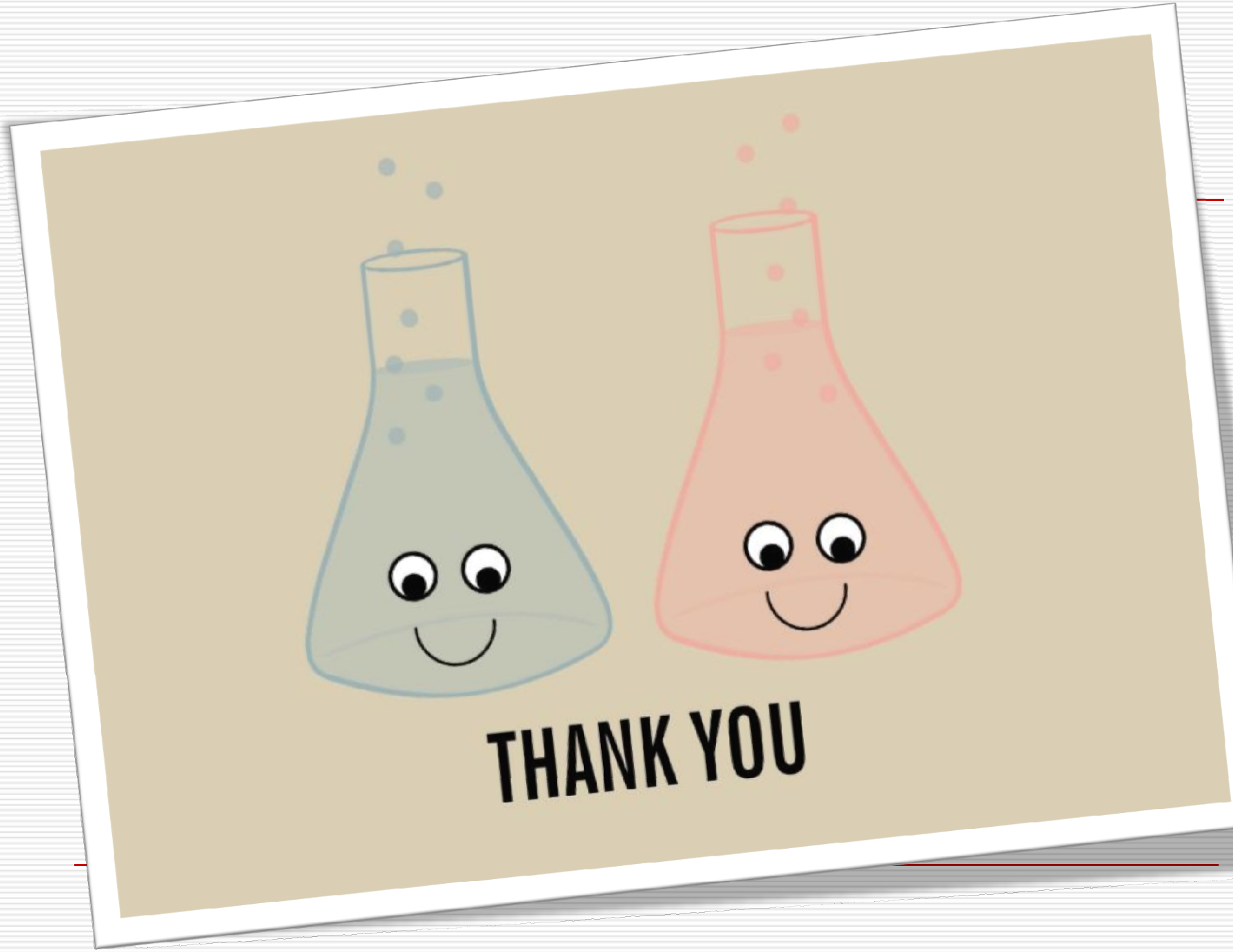
Performing the titration:

- Begin the titration by slowly adding NaOH (aq) from the burette to the vinegar in the Erlenmeyer flask. Swirl Erlenmeyer flask as you add the base in order to efficiently mix the chemicals.
- Eventually will turn the solution in the Erlenmeyer flask a pale pink color that does not disappear when swirled. This indicates that the equivalence point has been reached.
- Do not add any more NaOH (aq) at this point. Measure this volume of NaOH (aq) precisely, and record it as the "Final Burette Reading" on your report.

Calculations

1. Write the balanced chemical equation for the neutraisation reaction
2. Concentrations are usually given in M or mol/L you will need convert the mL to L (ml/1000) for consistency.
3. Calculate the moles of NaOH (aq) moles = concentration M x volume of (NaOH)--- n=c xv
4. Use the stoichiometric (mole)ratio to calculate the moles of acetic acid 1mole of NaOH neutralises 1mole CH3COOH
5. From the volume of vinegar (acetic acid solution) and the moles of acetic acid .Calculate its concentration of Acetic Acid in M (m/L)

$$\text{Molarity} = \frac{\text{Moles of Acetic Acid}}{\text{Volume of Vinegar (in L)}}$$


THANK YOU