AN INVESTIGATORY PROJECT ON

Comparison of the Citric Acid concentration in three different samples of fruit juices.

Submitted by Group IV

In-Service Course for PGT Chemistry, 2nd Spell

Venue: KV No1 AFS Jodhpur

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Theory

Volumetric analysis is the quantitative analysis of components of a reaction. Measured volumes of the 2 solutions are made to react so that the reaction is just complete. One of the solutions is of a known concentration and is called primary standard solution. In the balanced chemical reaction, stoichiometric ratios are involved, therefore, if the reacting volume and strength of one of the reactants is known then it is possible to calculate the concentration of the other.

What is citric acid?

Citric acid is a weak organic acid. It is a natural preservative/conservative and is also used to add an acidic or sour taste to foods and soft drinks.

Experiment No 1

Aim: Preparation of a non-standard solution of NaOH of approximate molarity of 0.1M for titration against juice samples.

Procedure:

- 2 grams of NaOH pellets are weighed with the help of an electronic balance.
- They are dissolved in a small amount of distilled water taken in a 500mL measuring cylinder with the help of a glass rod.
- Distilled water is added till 500ML mark in the measuring cylinder.

Molecular mass of NaOH = 40g

Grams in 500ML of 0.1M solution = 2g

Result:

An approximate 0.1M solution is prepared.

Experiment no. 2

Aim: To standardize the prepared NaOH solution by titrating it against 0.1M solution of oxalic acid.

Procedure:

- First prepare 0.1M oxalic acid.
- Weigh 3.15g of oxalic acid with the help of an electronic balance.
- Transfer the oxalic acid to the 250mL measuring cylinder and dissolve in small amount of distilled water.
- Fill the measuring cylinder till the required 250mL mark.
- Titrate this solution with the one obtained in Experiment no. 1 (a).

REACTION BETWEEN NaOH AND OXALIC ACID:

$H_2C_2O_4 + 2NaOH$ ------> $Na_2C_2O_4 + 2H_2O$

Molarity of oxalic acid = M_1

Volume of oxalic acid = V_1

Let no. of moles of oxalic acid be n_1

Molarity of NaOH = M_2

Volume of NaOH = V_2

Let no. of moles of NaOH be n_2

Then,

$M_1 V_1/n_1 = M_2 V_2/n_2$

Volume of NaOH used: 20.6 Ml

Hence, calculating molarity, we get M2= 0.097 M

Result: Molarity of NaOH solution is 0.097 M

Experiment no. 3

Aim: To evaluate the concentrations of citric acid by volume in three different samples of fruit juice.

(*Sample Of Real Orange Juice)*

Procedure:

• Rinse all the apparatus and dry them before use.

• Take a conical flask and pour the juice sample into the burette till the 0mL mark.

• With the help of a pipette pour 10mL of the 0.097M solution of NaOH into a beaker

• Note down the initial readings of the burette

• Now add a few drops of phenolphthalein indicator in the titrating beaker.

• Release the burette knob and let the juice sample fall in the beaker without touching the beaker walls.

• Perform this procedure till the colour of the titrating substance changes from light pink to transparent.

• Close the knob and note the end point in the burette.

• Perform this experiment with 3 readings

Using formula:

M1 V1/n1=M2 V2/n2

M= 10 X 0.097/3 X 10.4 = 0.032

We get molarity of real orange juice as 0.032

Hence, in 1L 6.144g citric acid is present

Sample Of Real Pineapple Juice

Procedure:

• Rinse all the apparatus and dry them before use

• Take a conical flask and pour the juice sample into the burette till the 0mL mark.

• Take a beaker and pipette out 10mL OF 0.097M of NaOH into the beaker.

• Now add a few drops of the phenolphthalein indicator in the titrating beaker.

• Perform this procedure till the colour of the titrating substance changes from light pink to transparent.

• Close the knob and note the end point in the burette.

• Take 3 readings

Sample Of Freshly Squeezed Mausambhi Juice (Sweet Lime)

Procedure:

• Rinse all the apparatus and dry them before use

• Take a conical flask and pour 0.097M NaOH solution into the burette till the 0mL mark.

• Take a graduated pipette and pour out 10mL of the juice sample into it

• Note the initial readings

• Now add a few drops of the phenolphthalein indicator in the titrating beaker.

• Release the burette knob and let NaOH fall in the beaker without touching the walls of the beaker.

• Perform this procedure till the colour of the titrating substance changes from transparent to light pink

• Close the knob and note the end point in the burette.

• Take 3 readings

Precautions:

• Use clean and dry apparatus.

• Turn the fans off while performing the experiment.

• Perform the experiment in one sitting only.

• Use freshly prepared chemicals.

• Handle the equipment with care and caution.

Sources of Error:

o Readings may not be accurate.

o It may not be a completely standard solution.

o The apparatus may not be well graduated.

o The apparatus may not be clean.

o The chemical may not be fresh.

Conclusion:

• Hence, we conclude that the fresh mausambhi juice has the highest citric acid content.

Order of citric acid content is:

1. Freshly squeezed mausambhi juice :

2. Real orange juice :

3. Real pineapple juice: :

Bibliography

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