

ACID CONTENT OF FRUIT JUICE

Introduction:

Fruit juices are often used as examples of weak acids. As a weak acid, more of the acid will exist in molecular form than in ionic form. To determine the amount of acid in ionic form, a pH meter will be used to determine the amount of H_3O^+ present. In order to find the total amount of acid present, the acid must be titrated with a base. From these values, the degree of ionization can be determined. In general, weak acids are those acids that are less than 10 % ionized.

Purpose:

The purpose of this experiment is to determine the amount of apparent and total acid in a fruit juice.

Materials/Equipment:

natural fruit juices	0.10 M NaOH solution
250 mL beakers	pH meter
buffer solution	distilled water
pipet	magnetic stirrer and stirring bar (optional)

Safety:

- An apron and goggles must be worn in the lab.
- Report any NaOH spills so they can be cleaned up as soon as possible.

Procedure:

1. The procedure for standardizing pH meters varies from instrument to instrument. Follow your instructor's directions for this procedure.
2. Pipet 25.0 mL of a fruit juice into a beaker. Measure the pH of the juice and record the value. After the pH is measured, distilled water may be added so that the bulb of the pipet is covered. If a stirring bar is used, make sure that the electrode will not be hit.
3. Slowly add the sodium hydroxide in small increments. After each increment of NaOH is added, record the total volume added and the pH at that point. Continue to add the NaOH until the pH is above 7 **AND** the pH values have leveled off.
4. Repeat with the same type of juice two more times.
5. Plot pH (y-axis) as a function of the volume of NaOH added (x-axis). Determine the equivalence point from the graph and determine the mL of base required to react with the acid. Average the three trials.

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Data:

Type of Juice Tested _____

pH of Juice Sample _____

Concentration of NaOH Solution _____

Trial 1

mL base pH

Trial 2

mL base pH

Trial 3

mL base pH

Calculations:

1. Calculate the $[\text{H}_3\text{O}^+]$ of the juice from the pH value.

2. Calculate the total acid content of the juice from the titration data.

Trial 1

Trial 2

Trial 3

Average acid content of the fruit juice _____

3. Compare the values for # 1 and # 2 above. What percent of the acid was ionized?

Questions:

1. Complete the chart using data from other groups.

Juice	pH	[H ⁺] from pH	Total Acid Content	% Ionized

2. Why were the [H₃O⁺] values from the pH reading and the titration calculation different?
3. Of the fruit juices tested, which was the most acidic? least acidic?
4. Why wouldn't a titration with phenolphthalein be appropriate for a grape juice or tomato juice determination?

