

This lesson is from [7: Titration of Fruit Juices - Chemistry LibreTexts](#).

Some citrus fruits taste more sour, and therefore are more acidic, than others. It is the purpose of this experiment to determine the total acidity of orange, lemon, grapefruit, white grape or lime juice. This procedure can be used to determine the total acidity of most natural fruit juices without further preparation.

Citric acid is the acid primarily responsible for the sour taste in citrus fruits. Citric acid is a polyprotic acid in which three ionizable hydrogens may be neutralized by a strong base.

Pre-Lab Assignment:

- 1) Look up the Lewis structure of citric acid and draw it in your laboratory notebook. Remember to cite your source.
- 2) On your structure, circle the ionizable hydrogens for each acid group.
- 3) Write a balanced reaction of the titration of citric acid with NaOH.
- 4) Watch the [Pre-lab video](#)

Materials (per group)

- 10mL graduated cylinder
- Access to fruit juice
- Access to distilled water
- 250mL flask
- Phenolphthalein indicator
- Standardized NaOH solution
- Titration burette set-up
- Calculator
- Periodic Table
- Access to sink for rinsing materials

Procedure

- 1) Using your 10 mL graduated cylinder, measure out 5.00 mL of juice into the flask. If the juice is highly colored, measure a smaller volume of (1.00 - 2.00 mL) sample.
- 2) Dilute the juice to approximately 100 mL with distilled water.
- 3) Add 5 drops of phenolphthalein indicator.
- 4) Record the initial volume of standardized NaOH solution to the nearest 0.01 mL.
- 5) Titrate the prepared juice solution to the phenolphthalein endpoint.
- 6) With colored juice, the endpoint is not as clear and may occur over 3-4 drops of titrant.
- 7) Record the final burette reading to the nearest 0.01 mL.
- 8) Repeat the experiment at least once or until the percent difference is within 5%. Obtain a sample of a different juice and perform at least 2 titration trials until they agree within 5%.

Data

First Fruit Juice- Juice Identity _____				
Data	Trial 1	Trial 2	Trial 3	(Trial 4)*

Volume of Juice				
Initial NaOH buret reading:				
Final NaOH buret reading:				
Volume of NaOH used:				

Calculations Procedures

- 1) Calculate the volume of NaOH
- 2) Calculate the moles of NaOH.
- 3) Calculated the number of moles of citric acid.
- 4) Calculate the mg of citric acid.
- 5) Calculate the mg of citric acid per mL of juice.
- 6) Determine if your result of concentration for citric acid after two titrations is within the tolerance. Calculate the percent difference of two titrations.

$$\% \text{ difference} = \frac{|M_1 - M_2|}{M_2} \times 100$$

Calculations	Trial 1	Trial 2	Trial 3	(Trial 4)*
Moles of NaOH used:				
Moles of citric acid titrated:				
mg of citric acid:				
mg of citric acid/mL of juice:				