

Introduction:

Isopropyl alcohol is the medically active component of rubbing alcohol. Rubbing alcohol is commonly used to sterilize surgical equipment and prepare the surface of the skin for an injection.

In this experiment, the density of isopropyl alcohol will be determined by measuring the mass of a series of different volumes. A graph will be constructed to show the relationship between the mass and volume. From the slope of the graph, the density can be determined and compared to the actual density of isopropyl alcohol.

Procedure:

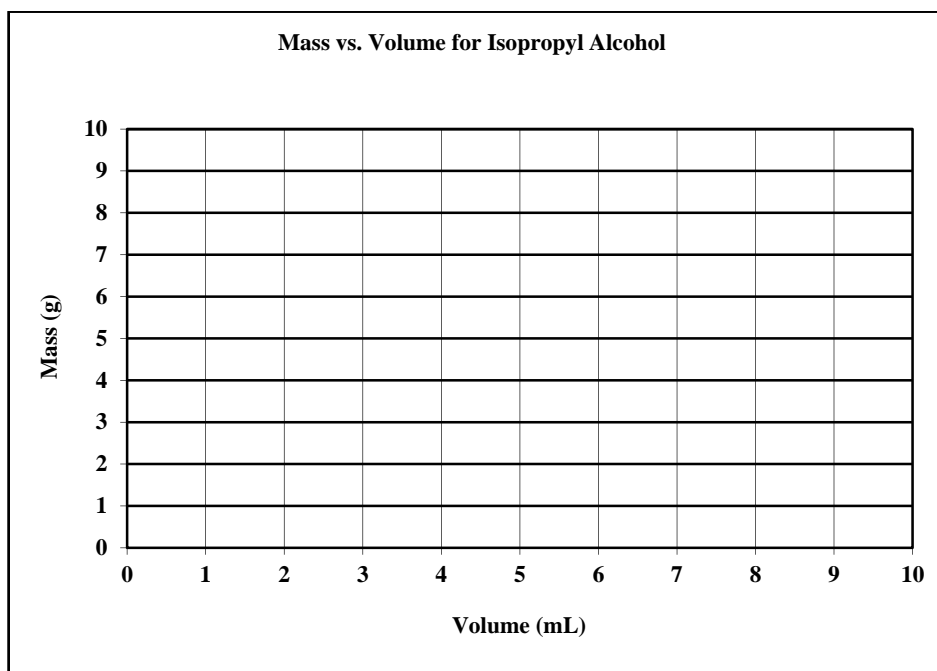
- (1) Determine the mass of an empty graduated cylinder.
- (2) Obtain approximately 15 mL of isopropyl alcohol. Using an eyedropper, add approximately 1 mL of the isopropyl alcohol to the graduated cylinder. Record the *exact* volume. Determine the mass of the graduated cylinder and isopropyl alcohol. Record the mass.
- (3) Repeat measurements by increasing the volume by 1 mL up to a total volume of 10 mL (the final measurement will need to be slightly less than 10 mL of determine an accurate volume).
- (4) Return all the isopropyl alcohol to the container.

Data:

Volume of Isopropyl Alcohol (mL)	Mass of graduated cylinder + isopropyl alcohol (g)	Mass of isopropyl alcohol (g)
0		0

Questions and Calculations:

- (1) Construct a graph by plotting the mass vs. volume of isopropyl alcohol. Draw a line of best fit through the data points.



- (2) Determine the slope of the line of best fit and give the answer with the appropriate units. What is the slope equivalent to?
- (3) Using your determined density, what would be the mass of 15.0 mL of isopropyl alcohol? (Give an equation and answer with appropriate units and significant figures)
- (4) Using your determined density, what would be the volume of 20.0 g of isopropyl alcohol? (Give an equation and answer with appropriate units and significant figures)
- (5) What is the advantage to determining density from the slope of the graph rather than from the mass of only one volume of liquid?
- (6) Convert your experimentally determined density to the following units: kg/m^3 .

Conclusion:

State your result for density of isopropyl alcohol.

Error Analysis:

Determine the percent error for your result.

Consider the following laboratory situations and specifically explain how each would change the calculated density.

- (1) Students weighed a graduated cylinder and recorded the mass. They then rinsed the graduated cylinder with water and did not thoroughly dry it such that a small amount of water was present in the graduated cylinder before the isopropyl alcohol was added and the mass determined (note: the density of water is 1.00 g/mL).
- (2) For several of the measurements, students measured the volume of the isopropyl alcohol and then left the graduated cylinder on the lab bench for an extended period of time so that some of the isopropyl alcohol evaporated before the mass could be determined.

(Your discussion of error should specifically state if the experimentally calculated density would increase or decrease and explain WHY)

Principle of Method:

Copy and complete. Underline the added words.

In this lab, the _____ for isopropyl alcohol will be determined experimentally. The _____ of _____ mL volume increments will be measured and recorded. From the data, a _____ will be created showing _____ vs. _____ and a line of best fit will be drawn through the points. The _____ will be equal to the slope of the line, which will have units of _____. The experimental density will be compared to the _____ density for isopropyl alcohol.