



DON'T BE DENSE ABOUT DENSITY



Part One

Density without Mass

Grape Expectations

Market research conducted by Polar Beverages of Worcester Massachusetts has revealed that consumers are highly interested in a new beverage, the Grape Float. This refreshing and fictitious, sweet drink will feature an actual grape suspended in the liquid. These consumers are somewhat calorie conscience but want no artificial sweeteners.

We know density is the basic problem faced by the food scientists at Polar. Also an added constraint is **you may NOT mass the grapes**. They must simply float the grapes based upon the density of the solution they create which must be homogenous, except for the grape! You must calculate the density of the grape after you float the grape and therefore learn the density of the grape which is suspended mid-solution after shaking.

What is your proposed solution starting with 60 ml of water? Be careful to record needed data. Remember it is better to have too many pieces of data then to wish you had just that one additional piece. Explain your results in detail after solving this problem and why they are the best results.

The vast majority of carbohydrates in fruits come from sugars and practically all of the mass in fruits come from the carbohydrates and water. Fruits vary somewhat in the their individual quantities / proportional distribution of carbohydrate and water they contain. **What is the percentage of water in your grape? What is the density of your grape?**

Interesting Data:

density of water at 25° C and 1 atmosphere is 0.997 g / cm³

density of sugar is 1.59 g /

Part Two

Density without Volume

You will be using a device called a pycnometer, a glass bulb fitted with a stopper with a capillary bore. *It is delicate and expensive.*

- Be sure the bulb and the stopper have the same number on them.
- The pycnometer must be clean and dry before your initial reading.
- Fill the pycnometer about half way up its neck using a pipet then insert the stopper. There should be no air bubbles in this. Dry the outside completely and **carefully**.
- You will need to mass this and find its volume using the density of water,
- Uncover the pycnometer and add a small sample of metal which you have massed and remass the system.
- Calculate the mass and volume of the missing water and the density of the solid.

You may not use a graduate cylinder in the part of the lab!

The general formula for density is $\text{Density} = \text{Mass} / \text{Volume}$

At the end of lab please submit your data and your results for both activities.