

## Lab #1: Sugar Content in Beverages

### Objectives:

1. To design a practical experiment for the determination of the amount of sugar content in various beverages.
2. To evaluate and critically analyze the experimental results versus theoretical values indicated in the food labels.

### Introduction:

Most commercial beverages listed the amount of sugar per serving (different for different size drink containers) on the nutrition label as required by law. To test for the accuracy of these labels, you are tasked to come up with a method to determine the actual amount of sugar per serving size as indicated on the label. Afterwards, you will compare your results with the nutrition labels on the beverage containers.

### Experimental Designs:

In order to properly design an experiment, we need to first to decide on what to measure. In this lab of determining sugar content, we have to decide if we are going to measure the physical or the chemical property of a sugar solution or both. This has to do with the nature of the sugar solution, is it reactive (chemical) or is it easier if we don't alter the chemical composition while we do the measurements (physical). In our previous chemistry course, we learned that solutions have different physical properties than that of pure substances. You may use what you have learned and come up with a list of potential properties. Once you decide to test and measure a particular property, a practical consideration has to be made on what type of equipment and ease of the procedural steps you have to follow to minimize errors. Sometimes, an obvious choice might not be the most practical choice.

In many occasions, we can infer concentrations of solutions by these properties. For example, we can measure boiling point elevation and calculate back the molality and subsequently determine the amount of solute in a given mass of solvent. Other times, a reference table of measured property values versus known concentrations and a calibration graph are needed for these quick conversions. For example, chemists often use the amount of absorbance or transmission of different wavelengths of light (intensity of colours in the visible spectrum or another part of the electromagnetic spectrum) to determine the concentrations of solutions. A reference table and a calibration graph of % absorbance versus known concentrations are drawn so the concentration of a sample solution can be determined by this calibration graph. This technique is commonly known as spectrophotometry.

Discuss as a whole class or with your lab partner(s) and decide on a way to test and measure the sugar content of various sample beverages. Make sure you understand what to measure and the subsequent calculations and potential graph(s) needed to determine the amount of sugar per serving size. Come up with a procedure that is simple to do with the equipment available in the lab (consult with your teacher for what we have and have your draft procedure approve before conducting the experiment).

### Lab Report Write-up:

In the introduction of your lab report, explain why you choose this property. When you write up the lab report, list the material and equipment you used after the introduction section. Describe what you did in the procedure section (can be in point form or paragraph form). Present your observations in a clear and organize fashion (tables are always good). Do all your necessary calculations (with proper units and significant digits) and any graphing in the analysis section. Your goal is to determine the amount of sugar per serving of various sample beverages. Calculate the %Error using your results and the sugar content per serving indicated on the label. If the beverage sample is from a dispenser and no label is available, you can ignore this section. In the conclusion section, comment on the effectiveness of your procedure based on your %errors. What are some of the sources of errors and are they inherent in the type of beverage you tested with the property your measured? Suggest some ways to remedy or minimize these errors.



Above: Coca Cola  
 Middle: Rockstar Energy Drink  
 Top Right: Arizona Ice Tea  
 Below: Gatorade (Frost)  
 Bottom Right: Purity Organic Juice

