Week 3: Determination of Sugar Content in Commercial Beverage

Dr. Turner

Overview

- Question: How much sugar is in the commercial beverage?
- We will determine this by relating the density of the beverage to the mass percentage of sugar in the beverage.

The effect of sugar on mass percent

- Question: Which is more dense: a solution of sugar and water with a low sugar mass or one with a high sugar mass?

The effect of sugar on mass percent

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The effect of sugar on mass percent

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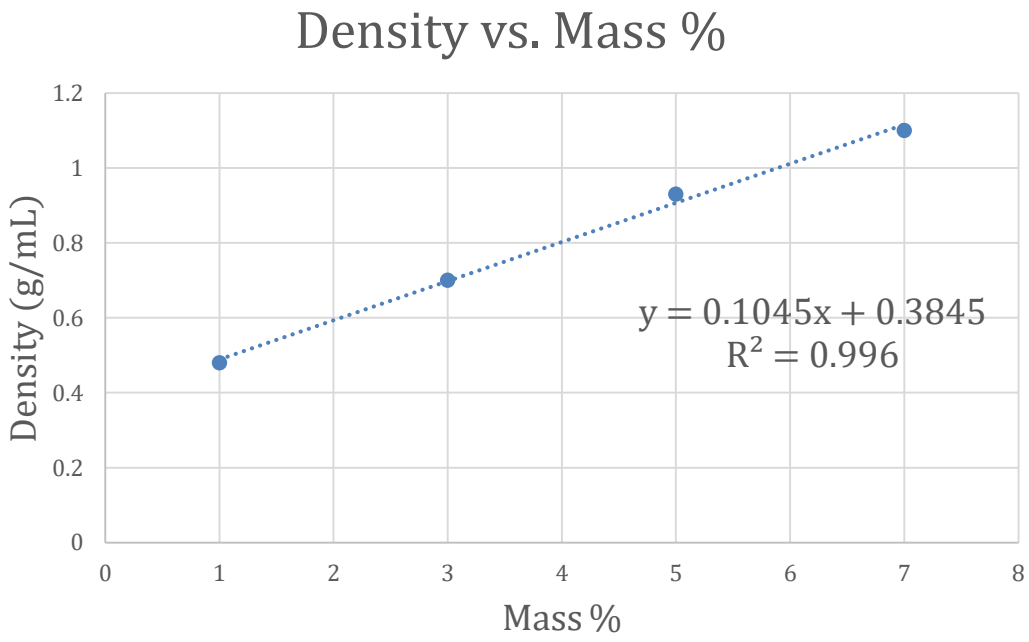
- Accordingly, as the mass percent of sugar in sugar-water solution increases, would one expect the density of the sugar-water solution to go up or down?

The effect of sugar on mass percent

- Question: Which is more dense: a solution of sugar and water with a low sugar mass or one with a high sugar mass?
  - One with a high sugar mass
- Accordingly, as the mass percent of sugar in sugar-water solution increases, would one expect the density of the sugar-water solution to go up or down?
  - An increase in the mas percent of sugar in the sugar-water solution leads to an increase in the density of the solution

Standard Curves

- A standard curve is a graph that relates two properties to one another
- To make a graph like this, one needs to determine the density of four solutions of varying mass % of sugar and graph them

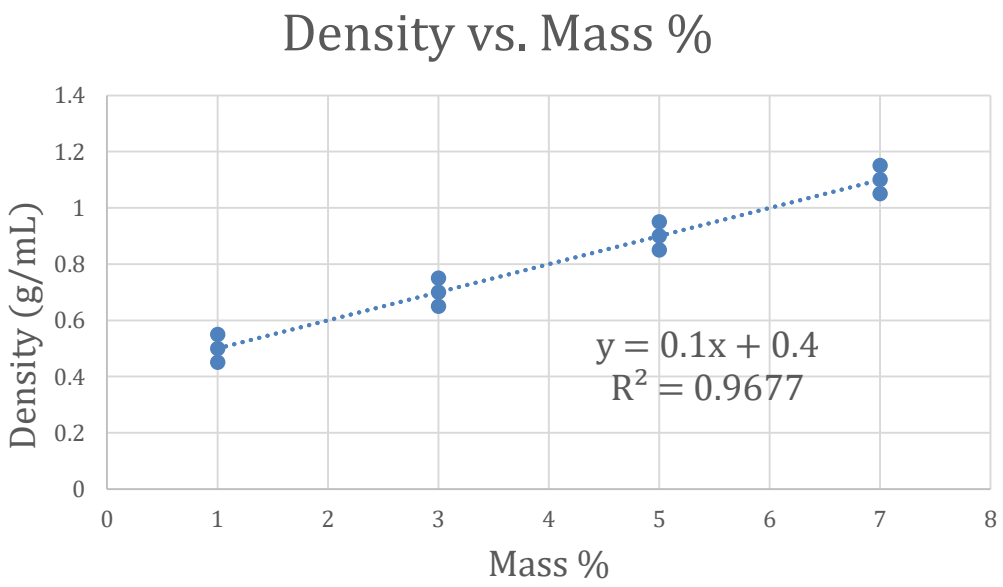


Part 1: Making the Standard Curve

- Based on your prelab calculations, your group will need to prepare 4 solutions of sugar-water with varying concentrations between 4-18%.
  - Make sure all of the sugar is dissolved in the water
  - Recalculate mass % based on actual mass of sugar
- You will then need to measure the density of three separate aliquots of each of the 4 solutions.
- Include the mass, volume, and density each measurement in a table.
- Show one sample calculation for determining the density.
- You will then graph the mass percentages with their corresponding densities in Excel

Standard Curves

- Your graph will look similar to this one because you will have three density measurements per mass percentage
- We will use the equation in this graph to find the mass percent of the beverages that you brought to class by measuring the density of your beverage and plugging that in to the equation to solve for the mass percentage of sugar



Part 2: Calculating the mass percentage of commercial drinks

1. Each group member should select a beverage
   - Try to pick a contrasting type to your group members (soft drink, juice, sports drink)
2. For each drink, do at least 3 density determinations and calculate an average density and standard deviation. This may be done on Excel.
3. Use the equation in your standard curve to calculate the mass % of sugar based on your measured average density.
4. Mark your average density on the best fit line of your graph.
5. Using your experimental results, calculate the grams of sugar per serving.
6. If the serving size is not 500. mL, you will need to use a proportion to calculate what your experimental values and label values would be for a 500. mL serving.
7. Calculate the percent error for each of your drinks.