

The Sugar Content of Soft Drinks

Background: Read “The Great Soda Sellout”, p.4 in the October 2004 *ChemMatters*

Purpose: To determine the sugar content of some of the beverages you drink.

Overview: Sugar contributes more than any other solute to the density of soft drinks. In this lab you will determine the densities of standard sucrose solutions. (Since sucrose and fructose are both sugars and have very similar aqueous densities, these standard sucrose solutions can be used as an indicator of the % sugar in various soft drinks.) From these densities you can make a standard calibration curve of density vs. % sugar. Then you will determine the densities of various soft drinks. Using your standard calibration curve you will find the % sugar of these soft drinks and then calculate the number of grams of sugar in these drinks.

Procedure:

1. Determine the densities of the standard sugar solutions by pipeting 10.00 mL of each standard solution (0%, 5.00%, 10.00%, 15.00%, 20.00%) into a tared container and weighing. Rinse the pipet after each solution. Record your data below.
2. Determine the densities of the soft drinks by pipeting 10.00 mL of each soda into a tared container and weighing. Rinse the pipet after each solution. Record your data below.

Calculations:

1. From the mass and the volume calculate the density of each standard solution.
2. Graph density vs. % sugar. Draw the best straight line that “fits” these points. Your instructor may request that you use a computer graphing program to graph these points and determine the best straight line “fit” equation. Finding the best line “fit” for a series of points is called linear regression or least squares analysis.
3. Using your calibration graph of the standard solutions, determine the % sugar in each of the soft drinks you tested. You may be instructed to use your graph to estimate the % sugar or your instructor may request that you use your best “fit” equation to calculate a better value for the % sugar in the soft drinks.
4. From the % sugar values calculate the number of grams of sugar in a 12 oz (355 ml) soda. The percent standard solutions are on a mass/volume basis (g/100 mL of solution) and not a mass/mass basis (g/100 g of solution). This makes it easy to calculate the total sugar content.

Results:

Standard solution	Mass of 10.00 mL	Density (g/mL)
0.00% sugar		
5.00% sugar		
10.00% sugar		
15.00% sugar		
20.00% sugar		

Show a sample calculation for 0.00% sugar solution

Soft drink	Mass of 10.00 mL	Density (g/mL)

Show sample calculation for one of the soft drinks. Indicate which drink.

Soft Drink	% Sugar content	Mass of sugar in 12 oz (355 mL)

Attach a copy of your graph and if requested your best “fit” line. If you used an equation to determine your % sugar content in your soft drinks, show a sample calculation below. If you just estimated from your graph, show your points on the graph.

Show a sample calculation for the mass of sugar in 12 oz for one of the soft drinks. Indicate which drink.

Questions for further study

1. How well do your results match the numbers on the cans of soda? You may want to attach a chart of your values and the can values.

2. The sodas should be “flat” in order to achieve the most accurate results. What is the problem with using non-flat sodas? If you used freshly opened sodas, would your % sugar values be high or low and why?