

How Sweet It Is

Introduction: Nutritionists are concerned about the high sugar content of many popular soft drinks, juices, and sports drinks. Do you know how much sugar you are drinking?

Concepts: Density, Solutions, Percentages, Concentration

Skills: Observations, making measurements, using lab equipment, data collection, predicting, extrapolating data

Safety: *Although the materials in this activity are considered nonhazardous, follow all normal laboratory safety guidelines. Any food-grade items that have been brought into the lab are considered laboratory chemicals and are for lab use only. Do not taste or ingest any materials in the laboratory, and do not remove any food items from the lab after use. Wear safety glasses or chemical splash goggles whenever working with chemicals, heat, or glassware in the lab. Wash hands thoroughly with soap and water before leaving the lab.*

Preparation: Prior to the activity the teacher should prepare 250mL each of 5 standard sugar solutions at the following concentrations: 1%, 5%, 10%, 15% and 20%.

Prepare 25mL samples (including a control sample of distilled water with no sugar) by adding food coloring according to the following chart: (combine red and blue to make purple)

DO NOT LABEL THE SAMPLES ACCORDING TO THEIR PERCENTAGES

	Control	1%	5%	10%	15%	20%
Group 1	red	yellow	green	blue	no color	purple
Group 2	green	blue	no color	purple	red	yellow
Group 3	purple	no color	blue	green	yellow	red
Group 4	blue	red	yellow	no color	purple	green
Group 5	yellow	green	purple	red	blue	no color

Task 1: In task 1 students are to determine the density of each solution. Students are to brainstorm the best procedure for determining the density in g/mL.

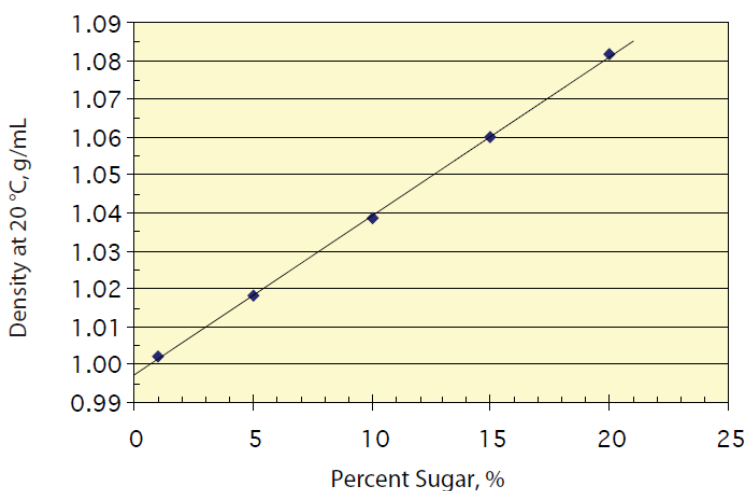
Task 2: In task 2 students are to arrange their six samples in order of percentages: 0, 1%, , 5%, 10%, 15% and 20% based on the calculated densities.

Task 3: In task 3 students are to plot the density vs percentage sugar curve with density as the y axis and percentage sugar as the x axis. Then students arrive at a best fit line between the points.

Task 4: In task 4 students are to obtain 10 mL samples of several popular drinks (e.g., soda, sports drink, juice). Students are to determine the density of each drink using the same procedure they used in task 1.

Task 5: In task 5 students are to use the calibration curve created in task 3 to determine an approximate percentage of sugar in each beverage. Students should then compare this approximate percentage of sugar to a calculated value determined by looking at the nutritional label for each beverage. (e.g, a soft drink reporting a sugar content of 40g in a 240mL can will have a sugar concentration of 15.7%.)

Sample Calibration Curve



Sample Results

Beverage	Density	Percent Sugar (Experimental)	Nutrition Label	Percent Sugar (Calculated)	Percent Error
Grape Juice	1.06 g/mL	15.0	40 g/240 mL	15.7	4.5%
Cola	1.04 g/mL	10.2	42 g/355 mL	11.4	10.7%
Powerade®	1.03 g/mL	7.8	15 g/240 mL	6.1	28%

Adapted from an activity “Sugar Content in Beverages Density Analysis’ By Flinn Scientific