Lab - Sugar in Soft Drinks

Introduction: Around 100 years ago, the average American consumed about 40 lb. of sugar per year. By 1986 Americans were averaging a third of a pound of sugar per person (including children) per day, which comes to about 127 lb. per person per year. A quarter of this sugar intake came from soft drinks. Soft drink consumption in the U. S. rose from 1.6 drinks per person per year in 1850 to 620 drinks per person per year in 1981. By 1998, the average American sugar consumption had risen to 148 lb. per person per year, which is over 1/3 lb. or 600 Cal per day! In this experiment, we will analyze a number of types of soft drinks to see how much sugar they contain.

Purpose: To determine the amount of sugar in certain sodas by extrapolating from graphical data. The data we will graph is the density of various concentrations of sucrose solutions.

Activity/Procedure:

Part 1: Finding the Density of Sugar Solutions

1) Mass a clean, dry 25.0 mL graduated cylinder. Record this mass in your data table.
2) Measure out about 25 mL of the 4 pph sugar solution. Record the exact volume, to the nearest tenth.
3) Determine the mass of the graduated cylinder and solution. Find the mass of the solution.
4) Determine the density of the solution by using the formula d = m/v (density equals mass divided by volume) and record this density in your data table.
7) Return the solution to the appropriate container. Then, repeat steps 1–6 three more times using 8, 20, & 32 pph solutions of sugar. Be sure to rinse and dry your graduated cylinder out thoroughly each time you pour a solution down the drain.
8) For each solution, calculate the amount of sugar in the 25 mL sample. You can find the pph equation on your equation sheet. Record these values in your data table.

Part 2: Finding the Density of Soda

1) Fill a 250 mL beaker with roughly 100 mL of water and bring it to a rolling boil.
2) Fill either 2 large or 3 small test tubes about three quarters of the way full with your soda.
3) Once the water begins to boil, place your test tubes into the warm water bath for 10 minutes.
4) While warming the test tubes, fill your 400 mL beaker two thirds of the way with ice.
5) After 10 minutes use your test tube holder to remove the test tubes from the hot water bath and then place them into the ice bath. Place a thermometer in one of the test tubes. Allow them to cool to 25 °C.
6) Find the mass of a clean, dry 25.0 mL graduated cylinder and record this mass in your data table.
7) Fill your 25.0 mL graduated cylinder with degassed soda. Find the mass of the flask and soda. Record this value in your data table also. Record the exact volume.
8) Subtract the dry mass of the volumetric flask. from the mass of the flask and soda to determine the mass of just the soda.
9) Determine the density of your soda using the formula d = m/v and record it in your data table.

Data:

Trial	Mass of Graduated. Cylinder (g)	Volume of Solution (mL)	Mass of Solution and Cylinder (g)	Mass of Solution (g)	Density of Solution (g/mL)	Mass of Sugar in 25 mL
4 pph						
8 pph						
20 pph						
32 pph						
Soda						XXXXX

Questions:

1) Using graph paper, graph your results by plotting the density of the solution (y–axis) vs. pph (x–axis). Add a best fit line and determine the slope of the graph.

2) Using the graph and the equation, what is the pph by mass of your soda?

3) Using your answer from above and the mass of your 25.0 mL of soda, calculate how many grams of sugar are in 25.0 mL of soda.

4) A serving of soda is 240 mL. Using your data, calculate the amount of sugar in 240 mL of soda.

5) Look at the actual mass of sugars per serving off the side of the soda bottle. Find the percent error between the experimental and actual values. The equation for percent error is on your equation sheet.

6a) In 2014, the average American drank 53 gallons of soda in a year. Approximately how much sugar is this according to your data obtained here? There are 3.6 liters in 1 gallon.

b) Using your answer from 6a, calculate the amount of sugar the average American consumes in 1 day.

Conclusion: