Chemistry 212

QUANTITATIVE MEASUREMENT AND DENSITY

LEARNING OBJECTIVES

The objectives of this experiment are to . . .

- investigate the relationship between solution composition and density.

- use density of a cola product to determine sugar content.

How much sugar is in that can of cola? You will experimentally determine the mass of sugar in a can of cola by using the physical property – density.

SAFETY PROCEDURES

There are no special hazards associated with this experiment. As always, safety goggles must be worn at all times in the laboratory.

Quantitative Analysis of Sugar Content in Cola

1. **Equipment:** Top loading balance, 50 mL Volumetric Flask, Sugar

2. **Objective:** Experimentally determine the amount of sugar (in grams) in 50 mL of cola. Measuring the density of the cola and comparing to the density of known sugar solutions can accomplish this. We are assuming sugar is the only ingredient of significant mass in the cola. What type of error might this assumption lead to?

3. Make a series of sugar solutions (six, ranging from zero grams to ten grams of sugar added) of known composition and determine the density of each. You will need to make enough solutions to a: define the curve and b: bracket the sugar concentration in the cola (read the label on the bottle to determine the theoretical sugar concentration – how many grams of sugar are in 50 mL of cola based on the ingredient list). Make a graph based on the sugar solutions with density on the y-axis and grams of sugar per 50 mL and the x-axis. This is called a standard curve and will be used to experimentally determine the grams of sugar in 50 mL of cola. *All sugar must be completely dissolved (no solid left on the bottom of the flask) in order to determine solution density*.

4. The graph will give you information on precision in the experiment with regards to your ability to make solutions of a know concentration. Comment on this in your report.

5. Measure the density of the cola and then using the equation for the line generated from your standard curve calculate the grams of sugar in 50 mL of the cola. Calculate the experimental and theoretical grams of sugar in 12 oz. (355 mL) of cola. Calculate the percent difference. Include this information in your report and use to discuss accuracy.

6. Write your experimental result for the grams of sugar in a can (12 oz.) of cola on the board. Make a table of the class results and discuss the precision and accuracy of the class results in your report. Include a calculation of the percent error on the class average.

7. There is an inherent systematic (determinant) error in this experiment. We make the assumption that only sugar and water determine the density of the cola. Comment on this assumption based on yours and the class's results in your report. Is this error apparent when looking at the class results? How? To what magnitude?