**Beverage Density Lab**

**Background:**

The beverage are Powerade, Diet Pepsi, Apple Juice, Pepsi,and Lemonade. To find the density you will need to know the density of 0%, 5%, 10%,15%, and 20% sugar.To get the density you need to divide mass over volume. You are going to get the mass, the mass of the item need to be measured directly using a balance. The volume of any liquid is measured special laboratory glassware like graduated, cylinder, pipet, or a buret. The concentration depends on the density. When you are going to find the percent you will need to calculate the percent of sugar. And you will need the nutrition label of your liquids.

**Hypothesis:**

If you do not know how to find the density, then your percent error is not going to be corrit and you are not going to know the percent of sugar in the beverage.

**Procedure:**

The purpose of this experiment is to determine the percent sugar content in

beverages. The density of five sugar “reference” solutions will be measured in

Part A. The reference solutions contain known amounts of sugar (0-20%) and

have been dyed with food coloring to make it easier to tell them apart. Their densities will be plotted on a graph to obtain a calibration curve of density versus

percent sugar concentration. In Part B, the densities of four beverages and an unknown will also be determined and the calibration curve used to find how much sugar they contain.The results will be compared again the information provided on the nutrition labels for these beverages.

**Results:**

 **Data Table A: *Density of Reference Solutions***

|  |  |  |  |
| --- | --- | --- | --- |
| **Solution** | **Mass, g** | **Sample Volume, mL** | **Density, g/mL** |
| **0% Sugar** |  **9.19** | **10.00** |  **0.919** |
| **5% Sugar** |  **9.61** | **10.00** |  **0.961** |
| **10% Sugar** |  **9.48** | **10.00** |  **0.948** |
| **15% Sugar** |  **9.94** | **10.00** |  **0.994** |
| **20% Sugar** |  **10.3** | **10.00** |  **1.037**  |

**Data Table B: *Beverage Densities***

|  |  |  |  |
| --- | --- | --- | --- |
| **Beverage** | **Mass, g** | **Sample Volume, mL** | **Density, g/mL** |
|  **Powerade** |  **9.46** | **10.00** |  **0.947** |
|  **Pepsi** |  **9.63** | **10.00** |  **0.963** |
| **Diet Pepsi**  |  **9.08** | **10.00**  |  **0.908** |
|  **Apple Juice** |  **9.54** | **10.00** |  **0.954** |
|  **Lemonade** |  **9.56** | **10.00** |  **0.956** |
|  **Unknown \_\_\_\_\_** |  **10.11**  | **10.00** |  **1.011** |

**Results Table:**

|  |  |
| --- | --- |
| **Beverage** | **Experimental % sugar** |
|  **Powerade**  |  **5%** |
|  **Diet Pepsi** |  **0%** |

|  |  |
| --- | --- |
|  **Apple Juice** |  **6%** |
|  **Pepis** |  **7.5%** |
|  **Lemonade** |  **6.4%** |

**Post-Lab: Results Table**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Beverage** | **Measured density, g/mL** | **Percent sugar (experimental)** | **Amount of sugar****(Nutrition label)** | **Percent sugar****(calculated from Nutrition label)** | **Percent error** |
|  **Powerade** |  **0.947** |  **5%**  |  **21g/360mL**  |  **0.16g/m** |  **6%**  |
| **pepsi** |  **0.908** |  **0%** |  **0g/241mL** |  **0g/m** |  **0%** |
| **Apple Juice** |  **0.954** |  **6%**  |  **27g/240mL** |  **1.125g/m** |  **10%** |
| **Diet pepsi** |  **0.963** | **7.5%**  |  **41g/355mL** |  **0.12g/m** |  **9%** |
| **Lemonade** |  **0.956** | **6.4%** |  **31g/24mL** |  **1.29g/m** |  **100%** |

**Analysis:**

 **1.** If the following mass and volume data are used to calculate the density of solution, how many significant figures are allowed in the calculated density?

Mass of solution = 12.53 g; volume of solution = 8.27 mL.

= 3 significant

**2**. Calculate the density of the solution described in Question #1.

= 1.52g/m

**3.** According to its nutrition label, orange soda contains 49 g of sugar per 355-mL serving. If the density of the beverage is 1.043 g/mL, what is the percent

sugar concentration in orange soda? Hint: This is a 2 step problem. First, use

the density to convert the 355-mL serving size to grams. Then calculate

percent sugar in the beverage.

= 13%

 **4.**What was your measured density for pure water (0% sugar solution)? The density of water is usually quoted as 1.0 g/mL, but the precise value is for 4oC. Comment on why your measured density might be higher or lower than 1.00 g/mL.

 = My measured density might be higher or lower than 1.00g/mL because it is 0% of sugar that mean that it does not have any sugar and it do not touch the line so you can not till when to go down but the it is 1.00g/mL.

 **5.**This lab looks at the relationship between the density of a beverage and its sugar content. What assumption is made concerning the other ingredients in the beverage and their effect on the density of the solution? Do you think this is a valid assumption?

 = I think this is a valid assumption because each beverage has different amount of sugar.

 **6.**When plotting data such as that obtained in this experiment, why is it not appropriate to “connect the dots?” If you were to repeat the lab, do you think you would get exactly the same results? Comment on the sources of error in this experiment and their likely effect on the results.

 = It is not appropriate not to connect the dots because you need a straight line and your dots might be all over the place. If I were to repeat the lab I would get the exactly the same results. The thing that would affect the results is that if you do not take away the lb of the cut by it selfe from the liquids.

 **Conclusion:**

To do this lab you will need a balance, small beaker, 5 sugar solutions, graduated cylinder, 4 beverages plus unknown, goggles, glass breakage,and spills . Construct a graph of sugar content versus density for the 5 solutions, and determine the sugar content of 4 beverages and an unknown using graphical analysis.