

The visible spectra and concentration of beverages essay sample



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Purpose: The purpose of this experiment is twofold. The first part is designed to determine the origin of the color of a carbonated beverage. Be specific in your Purpose, which soda are you measuring? In the second part you will determine how much a sample of grape soda has been diluted, i. e. its concentration. Be specific, what is the sample ID for your unknown? Work as a team, but each person has their own unknown and part of the score depends on you accuracy.

Procedure: The spectrum of a carbonated beverage is obtained by measuring the absorbance of a sample of the beverage at different wavelengths using a spectrophotometer. This spectrum can then be related to the color of the beverage. In the second part, a calibration curve is prepared by measuring the absorbance of different standard concentrations of grape soda at a single wavelength. The absorbance of the unknown solution can then be measured at the same wavelength and compared to the calibration curve to determine its concentration.

Any waste in this experiment can be poured down the drain.

Part I: The Visible Spectrum of the Soda Pop.

Sample Preparation: Pour about 15-20 mL of the beverage into a beaker and stir to remove the carbonation. Dilute it to about 50% of its original concentration by pouring 10 mL into a graduated cylinder and add an equal volume of water. Stir.

Measuring the Visible Spectrum of the Carbonated Beverage:

Be sure the spectrophotometer is turned on and warms up for at least 5 minutes. Set the wavelength knob to 600 nm.

Using the zero adjust knob on the left side, set the needle to read 0% transmittance (%T) on the top of the meter. [Nothing should be in the sample compartment]. Be careful not to read the absorbance scale. Fill one cuvette with distilled water, wipe it with a tissue or paper towel, and insert it in the sample compartment with the line facing the front. Close the top. Use the 100% T adjust knob on the right hand side to set the needle to 100%T. Remove the cuvette and set it aside in a beaker without emptying it. Fill the other cuvette with your beverage solution. Wipe it with a tissue or paper towel, and insert it in the sample compartment with the line facing the front. Close the top. Read the absorbance from the bottom scale on the meter.

Record, in the Results section of your notebook, the wavelength and absorbance readings. The unit for wavelength is nanometer (nm) and there is no unit for the absorbance measurement. Be sure to indicate which sample you are using. Remove the cuvette, close the top and change the wavelength to a setting which is 20 nm lower. Reset the 0%T if it has changed (with an empty sample compartment). Insert the cuvette of distilled water and reset the 100%T.

Replace the water cuvette with your sample-containing cuvette and read the absorbance again recording your results. Repeat steps 7 through 9 until you have recorded all the wavelengths down to 360 nm. Part II. Determining the Concentration of Diluted Grape Soda.

Set the spectrophotometer wavelength to 500 nm the wavelength where all of these measurements will be made. Set the zero and 100%T on the <https://assignbuster.com/the-visible-spectra-and-concentration-of-beverages-essay-sample/>

Spectronic 20 as in Part I.

Measure the absorbance of each of the four standard solutions of grape soda provided. Record the absorbance and the grape soda solution concentration (percent given on reagent bottle) in your notebook. Measure and record the absorbance of your unknown grape soda solution. Be sure you record your sample ID Results:

Part I: Use Excel to make a graph of the spectrum of the beverage solution. Your graph should be big enough to fill one-half of a notebook page. All graphs should have a title and appropriate labels, with units, on the axes. Include the diagram indicating the wavelength regions with the corresponding colors of visible light. An example is shown below. Use this diagram and graph to explain the origin of the color of the solution in your conclusion.

Part II: Use Excel to make a graph of the absorbance of the different standard grape pop solutions versus their concentrations (as percentages). See below for an example where four open circles indicate the measurements of the four standard concentrations. Use a TRENDLINE to draw the best line through all of your points. Set the origin at zero and print the equation for the line on your graph as in the Density Experiment.

Now you can use this calibration plot to determine the concentration of your unknown grape soda solution. The equation for your line should have the form: $Y = mX$, where Y is the absorbance of your unknown and X is its concentration, the value you are measuring. Find the concentration of your unknown by determining where its absorbance crosses the calibration line

you've just put on your graph. Use the formula: $X = Y/m$. Note in the example, the student created a fifth point—the one with the square — for the unknown, which read 0.31. From m , which is 0.0124, a value of concentration of 25.0% is calculated.

Conclusion:

In your conclusion explain the origin of the color of your solution and report the concentration of your unknown solution, along with your unknown ID number