CHEM450 Experiment #1
CALIBRATION OF AN INSTRUMENT AND QUANTITATIVE ANALYSIS OF BLUE DYE IN COMMERCIAL DRINKS

Objectives: (1) To prepare standard solutions of food dyes FD&C Blue 1 by dilution of stock solutions; (2) to generate a calibration curve from absorbance of visible light data for standard solutions using a desktop spectrometer; and (3) to apply Beer's law on the calibration data in order to determine the amount of blue dye in commercial drinks.

Materials:

1000 ppm stock solution of FD&C Blue 1
50-mL volumetric flask, 3 per group
100-mL volumetric flask, 1 per group
10-mL volumetric pipet, 1 per group
25-mL volumetric pipet, 1 per group
P1000 autopipets
Plastic cuvettes (for visible absorbance spectroscopy measurements)
Lambda XLS+ spectrometer (one per group)
Commercial drinks containing food dye FD&C Blue 1

Experimental:

A. Preparation of standard solutions of the blue dye FD&C Blue 1 by serial dilution

1. Convert 1000 ppm to the corresponding concentration in molarity. The molar mass of FD&C Blue 1 dye is 792.84 g/mol. Retain three significant digits.
2. Using a P1000 autopipet, measure 1.000 mL of the stock solution.
3. Transfer into a 100-mL volumetric flask. Add water up to the 100-mL mark. Cap and shake well.
4. Calculate the molar concentration of this newly prepared solution. This will be your stock solution which will be used for the following dilutions.
5. Prepare 3 dilutions of you stock solution (Step 4) using 25-mL or 50-mL volumetric flasks. These will be your working standards. (Your standards' absorbance should be between 0.1 to 0.8). This way your samples will fit within your calibration curve.
6. Cap and shake each dilution well.
7. Calculate the molarity of blue dye in each dilution. Enter your results in Table 1 below.

Table 1. Molar concentration of various dilutions of FD&C Blue 1 dye.

Standard number	Concentration, mol/L	Absorbance at 628 nm
1		
2		
3		

B. Preparing a calibration curve from absorbance measurements of standard solutions

1. Following the instructions on the use of Lambda XLS+ spectrometer for a "Single Wavelength" method, measure the absorbance of your working standard solutions at 628 nm.
2. Record your absorbance data in Table 1.
3. Using Excel, construct a calibration curve from your data in Table 1. DO NOT include your stock solution in the data entered.

C. Quantitative analysis of blue dye in commercial drinks

1. Measure the absorbance of your commercial drink samples at 628 nm.
2. Complete Table 2 below.

Table 2. Absorbance data for commercial drinks

Sample Number	Sample (Name)	Dilution Factor If needed	Absorbance, 628 nm	Concentration of blue dye, mol/L
QA/QC	Blind sample			

3. Using your calibration curve (don't forget to include the line equation in your graph) calculate the molar concentration of blue dye in your commercial and blind samples. Enter your results in Table 2.

4. Once Thursday lab is over, obtain the "known" concentration of your blind sample (QA/QC) from Dr. King. Calculate the % recovery (a measure of accuracy) of FD&C blue dye in your blind sample using the equation:

$$\%\ Recovery = \frac{Calculated\ concentration}{Known\ concentration} \times 100$$