Determination of the concentration of Red Dye #40 by standard addition
CHEM 314

In this lab, you are asked to measure the concentration of red dye # 40 in a complex matrix- soda. Since the best way to examine complex samples is to use the standard addition method, you will use the standard addition method. We will also be taking this opportunity to compare different UV-Vis instruments available to us in this department. Instructions for each instrument are available at the instrument as well as online on the class website.

Prelab tasks:

1. Read Standard Additions Myth and Reality (Ellison 2008).
2. Read the entire lab and be sure to plan your experiment such that you will be able to do appropriate statistical treatment of your data. Refer to Skoog 'n' Holler Ch 1 as needed.
3. Look up the lamda max and molar absorptivity of red dye #40.

Sample preparation

1. Take a preliminary UV-Vis spectrum of your sample and a stock solution.
    a. What is lamda max? What is a good baseline lamda to measure?

    b. Do your solutions need to be diluted? If yes, by how much?
    Calculate your dilution factors:

    c. Calculate the concentration of the stock solution and sample.
    Stock solution

    Sample solution

    d. Save your spectra for the report.
2. Based on your preliminary data, make standard addition samples for analysis. Make a table recording your sample preparation to include in your writeup.

Sample ID	Aliquot (mL)	Stock add (mL)	Total volume (mL)	[dye] in final solution (M)

3. Measure the same samples on the three instruments available to you. Be sure to save your spectra and record instrument parameters. Attach a summary of instrument parameters to the lab.
    a. Vernier SpectroVis plus UV-Vis spectrometer (REIC 245, mini laptop attachments)
    b. Hewlett-Packard 8452A UV-Vis spectrometer (REIC 245, benchtop)
    c. Perkin-Elmer Lamda 900 UV-Vis spectrometer (REIC 139)

Save all your spectra for your report.

4. Generate three standard addition curves using the same of λ_{max} for each sample for each of three of the different instruments. Calculate the line of best fit, r-squared value, and the concentration of red dye #40 in your ORIGINAL sample. **Attach your standard addition plots.** Be sure to include lines of best fit, error bars, formula of line of best fit, and r-squared values on graph.

5. Calculate the error (s_x) associated with each of the calculated concentration of the red dye in the unknown for each instrument using the method outlined in Chapter 1 of your book. **Attach one explicit (easy to understand) hand-written calculation**. Excel may be used to calculate the rest.

6. Create a summary table:

Instrument	Line of best fit	r-squared	[Dye] including s_x
Initial guess	--	--	
SpectroVis			
HP 8452A			
PE Lamda 900			

7. **Compare** the variation in your results from the two instruments by comparing:
    a. Visual comparison of spectra, particularly S:N,
    b. Equations describing the line of best fit and r-squared values,
    c. The concentration of red dye #40 calculated in your unknown solution, and
    d. The error (s_x) associated with the measurements.
8. Also compare the calculated dye concentrations to the initial "guess." What result would indicate a matrix effect? Are matrix effects observed in your samples?

Type a brief (less than 1 page) discussion of the points in Q7 and 8 and attach it for turning in.