Chemistry 534
Take Home Lab

Purpose: To use software that simulates a spectrophotometer*. The data obtained will allow you to construct a graph of *absorbance versus concentration*. From this graph you will be able to obtain the concentration of an unknown solution.

Theory: Coloured solutions of low concentrations allow more light to pass through them than solutions of higher concentrations. A spectrophotometer* is an instrument that measures exactly how much light is transmitted. The following formula allows transmittance readings to be converted into absorbance readings:

A = log(100/T),
where T = percentage in non-decimal form (so if transmittance is 45%, you enter 45, not 0.45);
A = absorbance (there is no unit for this quantity)

When absorbance is plotted on the y axis and concentration on the x axis, a straight line relationship is obtained. This allows you to obtain unknown concentrations for a measured transmittance.

Procedure:

1. Go to http://www.chm.davidson.edu/ChemistryApplets/spectrophotometry/EffectOfConcentration.html

2. Scroll down to the green area. This represents the spectrophotometer—the instrument you'll be using.

3. Your first concentration is already set at 0.00100 mole/ L. This will later be your first x-value. Finding the corresponding y-value(absorbance) will involve three steps:
   i. running the experiment to get the intensity of detected light
   ii obtaining %transmittance by dividing intensity of detected light by 110(original intensity) and multiplying by 100,
   iii. and then using the formula I mentioned to convert to absorbance.

4. Press the ***start*** button and wait for the number of light photons going through the solution to be approximately 1000. Don't panic if you're over by a hundred or so. Then press ***stop***.

5. Record the "*Intensity of Detected Light*" in the data table on the back side of this paper next to the appropriate concentration. (the intensity appears right above the stop button).

6. Fill the first row of the analysis table by recopying the Intensity value and working out the two formulas.

7. Scroll down, if necessary, to the "Plot point" area. Enter the *c*, T and A values.(not I!) Press "add point". A red point in each graph should appear.

8. Now repeat the whole procedure after switching to 0.00200 moles/L.

9. Continue until you apply the procedure to all five concentrations.

10. Once the graphs are complete, print them, draw a curve and straight line through the data points and paste them into your report.

Data:

Concentration of solution (moles/L) = *c*	*Intensity of Detected Light= I*
0.00100	
0.00200	
0.00300	
0.00400	
0.00500	

Analysis:

Concentration of solution (moles/L)=*c*	*Intensity of Detected Light (photons/s) = I*	% Transmission = T = (I/110)*100	Absorbance= **A = log(100/T)**,
0.00100			
0.00200			
0.00300			
0.00400			
0.00500			

Paste Graphs here:

1. Light was passed through an unknown solution of the same type, and only 34.785 photons/second came through. What was the concentration of the solution?

Conclusion: