Beer's Law calculations

This is a review of the steps used in solution calculations and using Beer's Law to analyze a K_2CrO_4 solution of unknown molarity. First one prepares a series of standard K_2CrO_4 solutions.

1. Preparation of 50.00 mL of 0.400 M K_2CrO_4 solution.

(0.400mol salt/L)(0.0500 L)(194g salt/mol) = 3.88 g K_2CrO_4 needed.

Add 3.88 g of the salt to a 50.00 mL volumetric flask, add enough water to dissolve it and then dilute to the calibration mark with water. Mix well.

2. Prepare 50.00 mL of 0.300 M solution of the salt from the 0.400 M solution.

Use the dilution formula: $M_1V_1 = M_2V_2$

(O.400M)(V_1) = (0.300M) (50.00mL)

V_1 = 37.5 mL (the volume of the 0.400M salt which must be diluted to 50.00 mL to give a 0.300M solution. 37.5 mL of the 0.400M solution is added to a 50.00 mL volumetric flask and water added to the calibration mark.

3. Preparation of a calibration curve.

Using the techniques in steps 1 and 2 above a series of different concentrations of the salt are made and their absorbance measured to give the following data.

$[K_2CrO_4]$, M	Absorbance, A
0.000	0.000
0.100	0.145
0.200	0.255
0.300	0.415
0.400	0.525

A graph of Absorbance (y-axis) versus concentration (x-axis) is then plotted and its slope, $\Delta y/\Delta x$, is evaluated. See **Using Graphical Analysis 3.1.1** or **Graphing in Excel** references for plotting the graph. Graphs using these two programs are shown on pages 2 and 3.

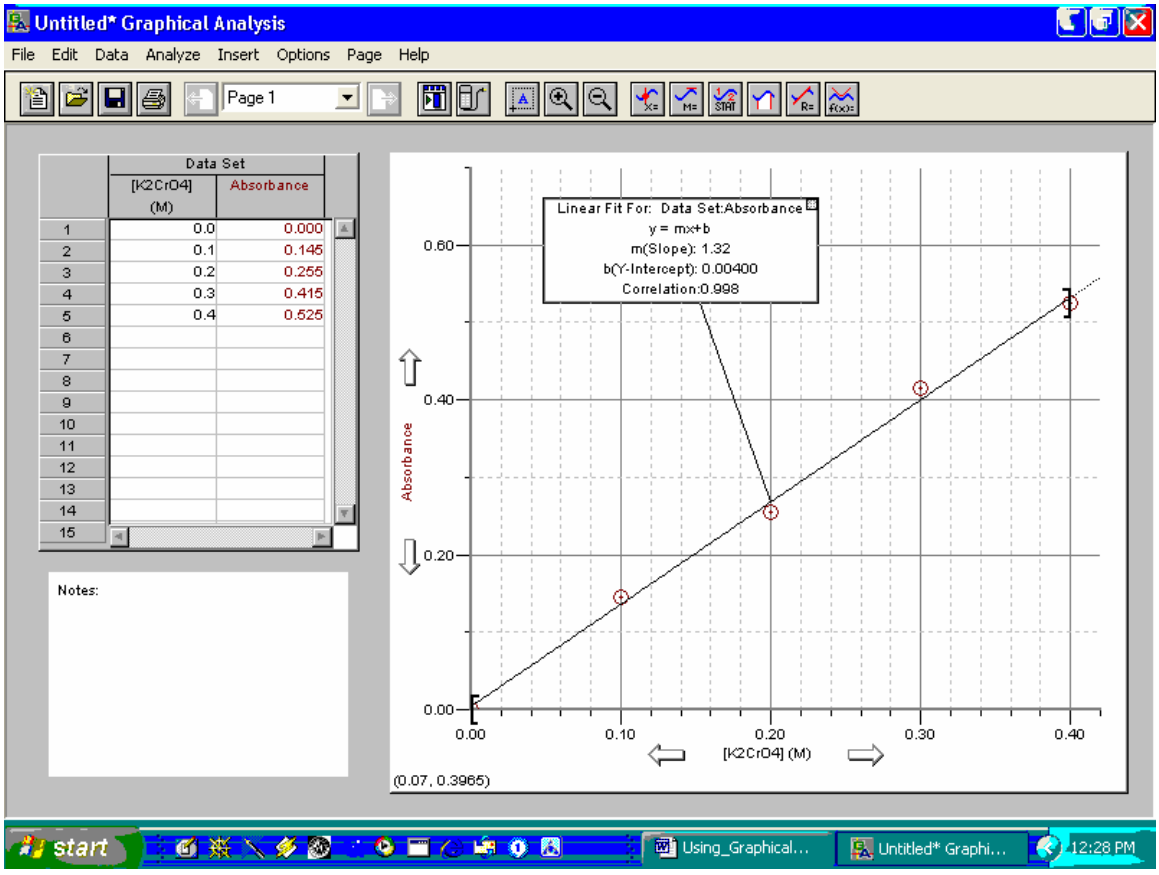
4. Evaluation of the molarity of an unknown K_2CrO_4 solution.

The absorbance of the unknown solution is measured under the same conditions as the standard solutions. Its absorbance is 0.250. Since slope (m) = Absorbance / concentration, $[K_2CrO_4]$ = absorbance/slope = 0.250/1.32/M = 0.189M

A more accurate method is using the y = mx + b formula obtained from the plotted graph where y is absorbance and x is the concentration.

Thus 0.250 = 1.32x + 0.004 and x is 0.186 M.

Beer's Law Using Graphical Analysis 3.1.1



Beer's Law Using Excel