Spectrophotometry Analysis of Copper: Beer's Law

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Abstract

Solutions with known absorbance's and concentrations can be used to help accurately find the concentration of an unknown solution. In this experiment, one can find the peak wavelength of a solution to help find the absorbance and concentration levels of known solutions at that peak wavelength. Once the concentration and absorbance levels have been found one can compare the absorbance level of the unknown solution to that of the known solutions to help accurately find an unknown solution. In this lab the unknown solution had a concentration level of .2M.

Introduction

In chemistry, solutions can be easily identified by their absorbance and concentration levels. Knowing the absorbance and concentration of a solution, one can plot these points on graph and find the solution that corresponds with the absorbance and concentration levels found.

To find a solutions absorbance level one would have to use a spectrophotometer. A spectrophotometer measures how much light is being transmitted through a solution. To find a solution one needs absorbance instead of transmitted light; in order to convert transmitted light into absorbance one would use this formula.

Absorbance = log (1/%transmittance)
(https://depts.noctrl.edu/biology/resource/handbook/spec.pdf)

Once the absorbance is found of the known solutions, one can begin plotting these absorbance levels on a graph to then compare to an unknown solution. The graph used is an absorbance vs. concentration graph; this type of graph will plot out points that can then be compared to the absorbance of an unknown solution to give an accurate reading of what the unknown solution is.

Methods

Obtain .998 grams of copper (II) sulfate pentahydrate. Once obtained this solution was put into a spectrophotometer to find its peak wavelength. Make the copper (II) sulfate pentahydrate into a solution and run it through a series of dilutions. Then, find the absorbance and concentration levels of the solutions. Divide the solution into 4 separate solutions. Find the absorbance and

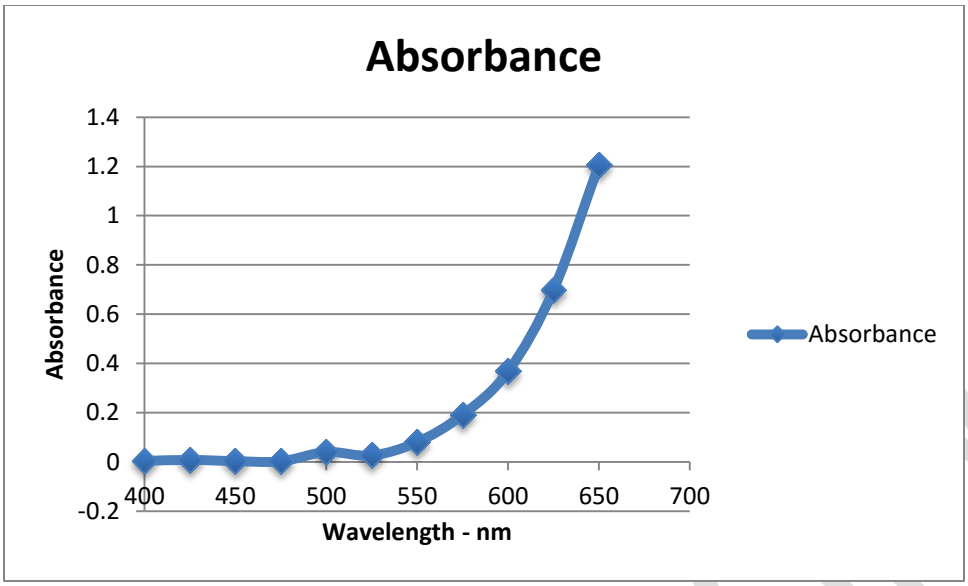
concentration for each of the 4 solutions. Do the same with the unknown solution.

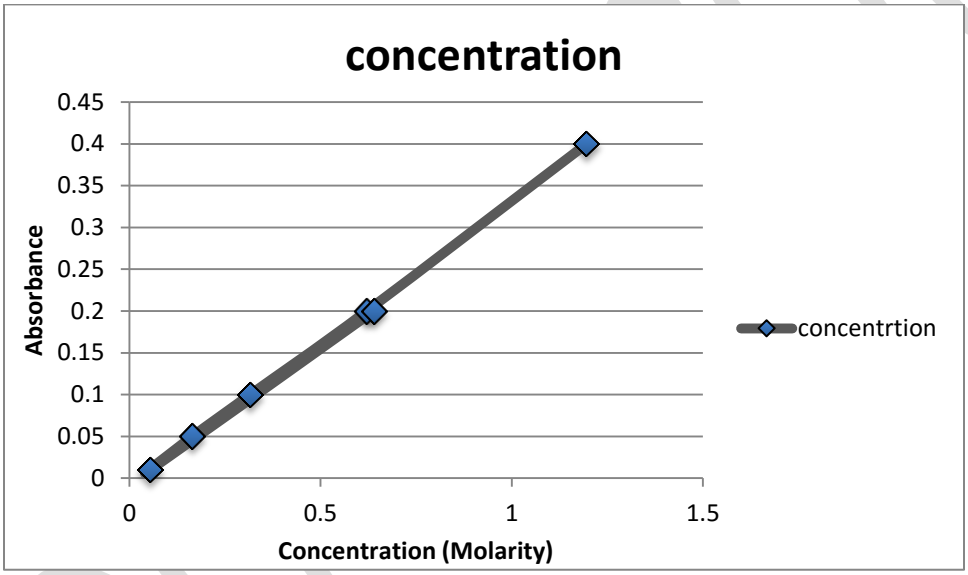
Results

Spectrophotometer Used	
Molar mass of CuSO^4 * 5H20	249.5g
mass of weighing dish	1.9g
Mass of weighing dish + CuSO^45H2O	2.898g
Mass of CuSO45H20	.998g
Number of Moles of CuSo45H20	.4M
Volume of Graduated Cylinder	10ml
concentration of stock solution in #1	.4M

Wavelength (nm)	Absorbance
400	.004
425	.008
450	.003
475	.002
500	.04
525	.026
550	.08
575	.191
600	.367
625	.698
650	1.207

Test Tube	Absorbance	Concentration
#1	1.196	.4M
#2	.621	.2M
#3	.316	.1M
#4	.165	.05M
#5	.055	.01M
#6	.639	.2M





Discussion

The results show the wavelength used on the spectrophotometer and the absorbance found for each solution. Once the absorbance was found for each solution the concentration was calculated. Once the absorbance and concentration were known, points could be plotted on an absorbance vs. concentration graph. The graph can then be used to compare the known solutions absorbance and concentration to that of the unknown solution to help determine the concentration of the unknown solution.

A few possible errors for this lab could be using the same pipet for both the distilled water and the solution. Another possible error that could occur would

be forgetting to blank the spectrophotometer and also forgetting to wipe the fingerprints off of the cuvettes.

Conclusion

By finding the absorbance and concentration levels of both the known and unknown solutions evaluated in this experiment, the unknown concentration was able to be determined. This experiment could be extended further by repeating the lab with different solutions to help identify any unknown solution.

Bibliography

https://depts.noctrl.edu/biology/resource/handbook/spec.pdf