

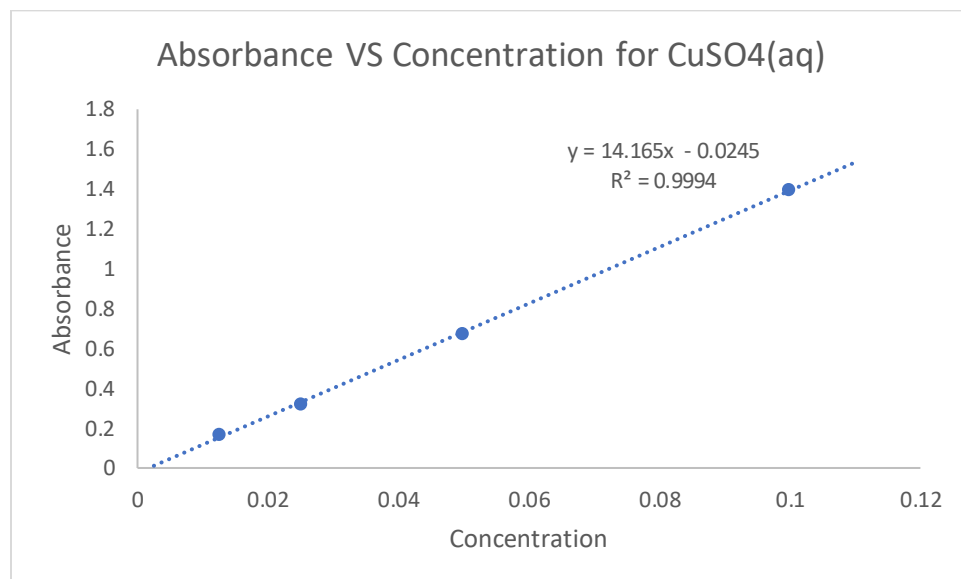
## Quantitative Reactions & Analysis Post-Lab Questions

Please include your properly formatted table and graph, and please write your answers to the following questions in paragraph form. Submit this file as a PDF to Gradescope.

- 1) Make a table of your calibration curve data below and plot your calibration curve in Excel. Paste your graph below the table. Both table and graph should have proper formatting (remember your formatting rules from Data and Graphics).

Molarity	Absorbance
0.1	1.398
0.05	0.674
0.025	0.317
0.0125	0.169
Unknown	.515

**Table 1.** Molarity and absorbance for CuSO<sub>4</sub>



**Figure 1.** Absorbance Vs Concentration for CuSO<sub>4</sub>(aq)

- 2) Compare the two calculated concentrations of unknown copper sulfate solution (calculated from the yield of the reaction vs. calculated using your Beer's Law plot). Which one is likely to be more accurate? Why is it more accurate and/or why is the other less accurate?

$$(.515 + .0245)/14.165 = .0381 \text{ molarity}$$

Beers law plot concentration calculation: .0381 molarity

Yield of reaction concentration:

$$\text{Mass of precipitate (mass of dried precipitate - mass of waiver)} = .0683 \text{ g of CuCO}_3$$

$$\text{Moles of precipitate (mass of precipitate / molar mass)} = .000553 \text{ mols of CuCO}_3$$

$$\text{Moles of sodium carbonate (molarity of solution * liters of solution)} = .0012 \text{ mols of NaCO}_3$$

Since sodium carbonate and copper sulfide both contribute to the reaction in equal amounts of moles but there are fewer mols of precipitate than reactant we can conclude that the limiting reagent in the reaction was the unknown molarity CuSO<sub>4</sub>. Thus the number of mols involved in the reaction are equal to those in the final precipitate.

$$\text{Molarity of CuSO}_4 \text{ (moles of precipitate/volume of unknown CuSO}_4) = .0369$$

The beers law plot is likely to be most accurate because it analyses the substance directly vs with the reactant measurement it assumes a lot of error. For example, measurements could have been slightly off, the scale assumes some error which is magnified in the final equations.

- 3) Should we force the trendline for the plot of absorbance vs. concentration through the origin (0,0)? Why or why not? In your answer, please consider the theoretical y-intercept based on Beer's Law.

No the trendline should not be forced through 0,0. This is because in beers law because the path length never equals Zero for one in our concentration calculations. Secondly the mathematical behavior of an equation as a constant over / 0 is certainly irregular and neglects other variables of the equation. Finally and most importantly, **there is no concentration where absorbance equals 0.**