

Show your work with units and the correct number of significant figures. **Beer's Law:** $A = \epsilon Lc$, where A is absorbance, ϵ is the absorption coefficient ($\text{M}^{-1}\text{cm}^{-1}$), L is the path length (cm), and c is concentration (M).

Part A: Concepts

1. Define **transmittance** and **absorbance**. When the absorbance of a sample goes up, what happens to its transmittance?

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2. Why must you "blank" the spectrophotometer before measuring samples? What goes in the blank cuvette?

Part B: Calculations

3. A copper(II) sulfate solution in a 1.00 cm cuvette has an absorbance of 0.506 at 635 nm. The absorption coefficient of CuSO_4 at this wavelength is $2.81 \text{ M}^{-1}\text{cm}^{-1}$. What is the concentration of the solution?
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4. A 0.150 M solution has an absorbance of 0.420. Using the same cuvette and wavelength, a second solution of the same substance has an absorbance of 0.700. What is the concentration of the second solution?

Part C: Standard Curve

A student ran the cobalt chloride lab at 500 nm using 1.00 cm cuvettes and collected the data below.

5. Plot the data on the grid. Title the graph, label both axes with units, use an appropriate scale, and draw a best-fit line.

Concentration (M)	Absorbance
0.000 (blank)	0.000
0.030	0.146
0.060	0.287
0.090	0.433
0.120	0.575
Unknown	0.312



6. Calculate the slope of your best-fit line. Include units.

7. Use your slope and the absorbance of the unknown to calculate its concentration. Include units and the correct number of significant figures.

8. Describe the trend in the data and explain the relationship between absorbance and concentration.

9. A student rinses the unknown's cuvette with distilled water but leaves drops of water inside before adding the unknown. How does this affect the measured absorbance and the calculated concentration? Justify your answer.