



PART ONE STANDARD SOLUTION

PREPARATION BY DILUTION

Copy and paste Table 1 (Solution concentrations for production of a calibration plot) into the answer field below and complete the column for the volume of $\text{Cu}(\text{NO}_3)_2$ for each solution. Show an example of your calculations for solution 1.

Volumetric flask label	Volume 0.25M $\text{Cu}(\text{NO}_3)_2$ (mL)	Concentration (mol/L)
	0	0
1		0.05
2		0.1
3		0.15
4		0.20
Stock		0.25

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Question 3

1 pts

Beer's Law shows that the absorbance measured for a species in solution is directly proportional to (directly related to) its concentration in that solution. If there are any large sources of error present or you are not thorough and careful whilst preparing your solutions, would you expect this to show up in your calibration plot? Explain.

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Question 4

1 pts

The solution of copper ions appears to be a bright blue-green colour.

What colour light must copper ions therefore be absorbing?

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Question 5

1 pts

What colour(s) must the copper ions be transmitting (allowing to pass through, unabsorbed)?

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Question 6

1 pts

CALIBRATION PLOT MEASUREMENTS

- i) By considering the visible spectrum of $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ (shown below) which wavelength, if you could choose any, would you choose for maximum sensitivity?
- ii) Unfortunately, the device only measures 660nm (red), 610nm (orange), 565nm (green) or 468nm (blue). Of these four wavelengths, which would be the best one to use and why?

Ex 3F spectra

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Table 2 (Absorbance recorded at the wavelength of interest for calibration curve solutions). Copy and paste the table below in your response and complete the absorbance column for each solution.

Solution	Concentration of $\{\text{Cu}(\text{H}_2\text{O})_6\}^{2+}$, mol/L	Absorbance, A
deionised water	0.00	
1	0.05	
2	0.10	
3	0.15	
4	0.20	
Stock	0.25	

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Question 8

1 pts

Why did you not use a wavelength in the blue region (430 – 480nm) to analyse your samples? Explain your answer with respect to the colour of the solutions and the spectrum of the absorbing species, $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$.

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Question 9

1 pts

What would you expect your absorbance values would have been if you had used a wavelength in the blue region?

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1 pts

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Question 10

1 pts

With reference to Beer's Law, does the trend of your absorbance values agree with the increasing concentrations of the sample solutions? (Remember, molar absorptivity and path length are constant for all your readings.)

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Question 11

1 pts

Based purely on Beer's Law (not your experimental results), what absorbance reading would you expect for the deionised water sample? Why?

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Question 12

1 pts

The stock solution is five times more concentrated than the solution #1 that you prepared. Using Beer's Law (not your experimental results), what would you expect the absorbance reading of the stock solution to be, compared to that of solution 1? Why?

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Question 13

1 pts

Are your absorbance results expected given what you can predict from Beer's Law?

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Question 14

2 pts

INTERPRETING THE CALIBRATION PLOT

As it is difficult to create a graph online, a plot has been provided below. A “line of best fit” has been provided for you. A line of best fit is a line that passes through as many of the points as possible that fall within the trend. There are different types of lines of best fit depending on how the variables relate to each other. This one is a straight line as the absorbing species has obeyed Beer's Law because the law states that the absorbance is directly proportional to the concentration.

Ex 3F calibration plot

Copy and paste the table below in your



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Ex 3F calibration plot

Copy and paste the table below in your response to add the relevant information for the plot.

Title	
x axis label	
y axis label	

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Question 15

1 pts

Does this calibration plot confirm that Beer's Law was obeyed? Explain why or why not.

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Question 16

1 pts

Are there any points that do not appear close to the line of best fit? Suggest why this is.

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Question 17

1 pts

DETERMINING THE CONCENTRATION OF AN UNKNOWN

Using the plot given in question 14, state the absorbance of unknown A and hence the concentration of the unknown to 2 significant figures.

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