Skills Challenges – CH1020
Stoichiometry – Post Lab Submission

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Zinc iodide:

Equipment/device(s) used:

Hot plate and stirrer
Scale

Reason for using each measuring device:

Both serve to accelerate the reaction between the zinc metal and elemental iodine
The scale massed the initial reactants and the unreacted reactant left behind

Limitations of each measuring device used:

The scale can only accurately measure to a certain degree of significance. Any issues with the scale itself will cause systematic error that will likely be consistent throughout the trials as long as the same scale is used. If multiple different scales are used, the error will be less predictable and could affect RSD negatively.

Procedure (*Be concise and comprehensive, use grammatically correct complete sentences):*

1. Mass a dried 125 mL erlenmeyer flask as accurately as possible
2. Mass about 2 grams of zinc powder and record the mass. Add zinc to erlenmeyer flask
3. Mass about 2 grams of iodine and record the mass. Add iodine to erlenmeyer flask
4. Fill flask with about 25 mL of ethanol or isopropanol and place flask on hot plate.
5. Gently stir and bring alcohol to a gentle boil until the brown color of the iodine disappears and you are left with a colorless solution and unreacted zinc.
6. Mass a washed and dried 250 mL beaker while the solution boils
7. Once solution becomes colorless, wait for it to cool and decant liquid above the zinc without removing any zinc from the erlenmeyer flask.
8. Add about 5 mL of alcohol, swirl in erlenmeyer flask and decant into beaker again. Repeat this zinc washing twice.

9. After washing, place erlenmeyer flask back onto hot plate and boil off remaining alcohol
10. Mass erlenmeyer flask with unreacted zinc and calculate mass of unreacted zinc
11. Place 250 mL beaker on hot plate and boil off alcohol until there is none left in beaker
12. Mass 250 mL beaker to obtain mass of product

Results (multiple trials if requested):

Trial	Mass of unreacted zinc	%Zn in zinc iodide	%I in zinc iodide	Mole ratio I:Zn in zinc iodide
1	1.2959g	26.1	73.8	1.3754
2	1.3169g	25.5	74.4	1.3344
3	1.3970g	23.2	76.7	1.17

Copper/amino acid complex:

Equipment/device(s) used:

Spectrophotometer

Reason for using each measuring device:

The spectrophotometer measures the solution's relative absorbance of a certain wavelength. Using this, we can determine the relative amount of a given compound (or complex) by assuming when more of the complex is present, the solution's absorbance will be higher

Limitations of each measuring device used:

Using the wrong wavelength or standardizing with the wrong solution can affect the relative absorbance of the each subsequent data point which will affect the peak of the curve.

Procedure (*Be concise and comprehensive, use grammatically correct complete sentences):*

1. In a 100mL volumetric flask, combine 1.256 grams of copper (i) nitrate and fill to the line with deionized water water. This should result in a .1M solution of $CuNO_3$
2. In another 100 mL volumetric flask add .7507 grams glycine and fill to the line with deionized water
3. Using a sample of only the .1M solution of glycine, calibrate the spectrophotometer and record this as the baseline "0" relative absorbance
4. In a 10 mL graduated cylinder, add 1 mL of $CuNO_3$ and 9 mL of glycine.
5. Pour in beaker and swirl for about 3 minutes.
6. Take sample and place in spectrophotometer and record relative absorbance
7. Repeat steps 4-6 for samples of 2 mL of the $CuNO_3$ solution through 10 mL of the $CuNO_3$ solution in 1 mL increments, and adding the remainder of the 10 mL in each solution with the glycine solution
8. Using the data points, plot the relative absorbance against the volume of $CuNO_3$ used in each sample to create the Job plot.

Results (multiple trials if requested):

Show your Job's Method plot below; include separate trendlines for your increasing and decreasing absorbance points.

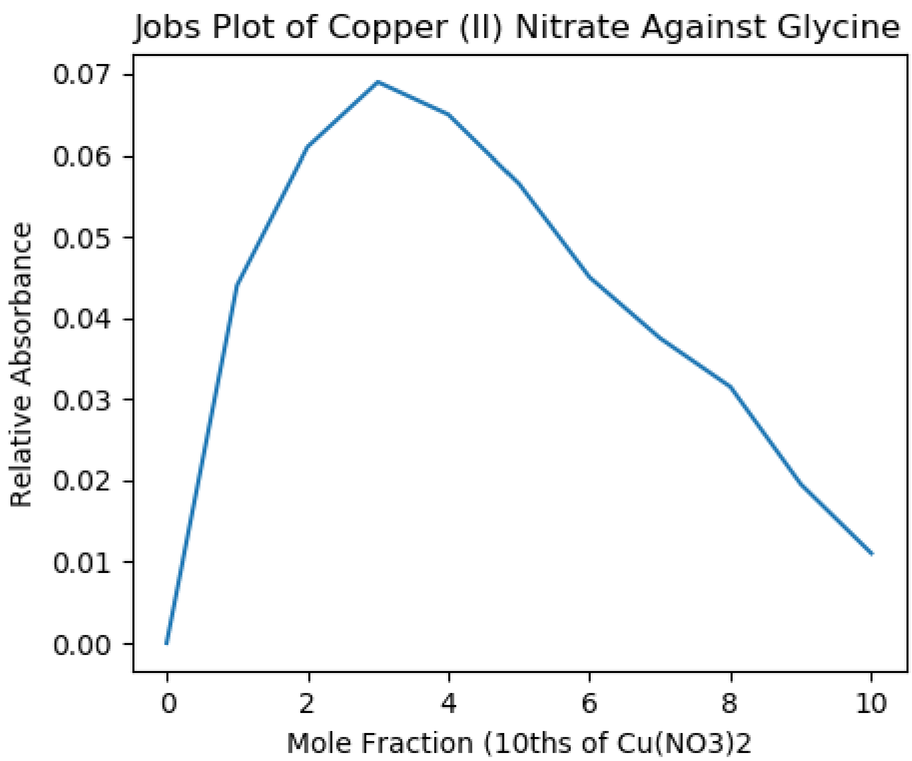

Fig 1: A graph of the relative absorbance against the mole fraction of copper (II) nitrate solution used. As indicated by the graph, the absorbance peaks at about 3:7 ratio, implying that the stoichiometric ratio between glycine and copper (ii) is the same.

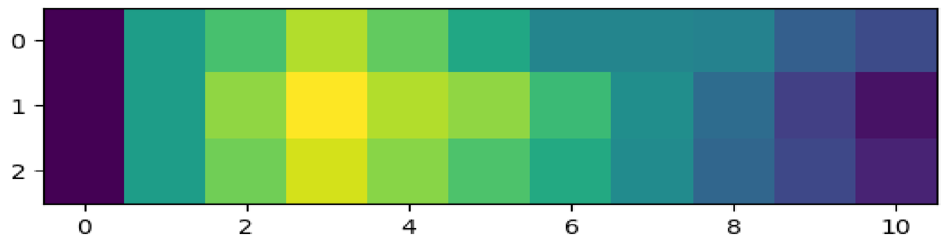

Fig 2: Heat map indicating relative absorbance between three trials (y axis), comparing volume in mL of copper solution used. Yellower colors indicate higher absorbance and darker blue colors indicate lower absorbance.

Based on the plot you obtained, write a balanced reaction between copper ions and the amino acid you used for your experiment.

$3Cu^{2+}{}_{(aq)} + 7C_2H_5NO_2 \rightarrow Cu_3(C_2H_5NO_2)_7$