

# Chemistry 30S/PGL Stoichiometry Lab

## Objective

1. Examine stoichiometric ratios and determine the oxidation number of a copper ion product in the reaction between copper and silver nitrate solution.

## Chemicals

- 30 cm piece of coiled copper wire
- 125 mL of 0.10 M silver nitrate solution
- Acetone for rinsing
- Distilled water for rinsing

## Equipment

- 250 mL beaker
- Plastic wash bottle with distilled water
- Watch glass
- Medium sized test tube
- Glass stir rod

## Safety

1. All solutions are toxic. Observe proper precautions.
2. Silver nitrate stains skin and clothing black.
3. Rinse affected areas with copious quantities of water.
4. Wear safety goggles over your eyes for protection.

## Procedure

Day 1.

1. Obtain a 30 cm piece of copper wire. Wrap the wire around the test tube 3 to 4 times to make a coil. Attach one end of the wire to the rim of the beaker and fit most of the wire below the 125 mL calibration mark. Have your handywork inspected by your instructor.
  2. Remove the wire, record its mass in the data table, and set aside.
  3. Mark a clean, dry 250 mL beaker with your group's number. Record the mass of the empty beaker.
  4. Put your goggles over your eyes and obtain 125 mL of silver nitrate solution in the beaker. Return to your station.
  5. Gently insert the copper wire into the solution of silver nitrate, cover with the watchglass as instructed by your teacher and record your observations in the space provided.
  6. Carefully place your covered beaker and its contents in the bottom cupboard of your lab station.
  7. Write the two balanced chemical equations and complete part a sample calculations 1 and 2.
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Day 2.

8. Remove your covered beaker and place on the counter. Record relevant observations in the appropriate section of your lab.
  9. Remove the watch glass, rinse and put it away.
  10. Gently remove the solid fuzz from the copper wire as directed by your instructor.
  11. First rinse the copper wire with small amounts of distilled water, then rinse in acetone as directed by your instructor.
  12. Wait until the copper wire is completely dry and record its mass in the data table provided.
  13. Obtain a glass stir rod.
  14. Drain the liquid into the sink being careful not to lose any solids.
  15. Rinse with several aliquots of distilled water as directed by your instructor.
  16. Place on tray to be dried.
  17. Clean and put all remaining glassware away.
  18. Complete part b calculations 1 and 2.
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Day 3.

19. Obtain mass of beaker and dried solid product.
20. Place your massed product in the container supplied by instructor, clean, dry and put your beaker away.
21. Complete calculations 3.

## Data

1. Mass of clean, dry beaker	__ . __ g
2. Initial mass of copper wire	__ . __ g
3. Final mass of copper wire	__ . __ g
4. Mass of reacted copper	__ . __ g
5. Mass of beaker and dried product	__ . __ g
6. Mass of dried product	__ . __ g

## Interesting or Necessary Observations

Record observations that will help you understand your results and draw appropriate conclusions.

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## **2 Balanced Chemical Equations**

Record the two possible balanced chemical equations for the reaction when copper wire reacts with aqueous silver nitrate solution.

1.

2.

## **Calculations**

1. Calculate the moles of reacted copper...

a. Sample Calculation ...if 2.0 g of copper reacts	b. Experimental Results ...from the difference between data points 3 and 2.
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2. Calculate the two expected masses of solid product...

a. Sample Calculation	
...for the first possible copper ion product	...for the second possible copper ion product
b. Experimental Results	
...for the first possible copper ion product	...for the second possible copper ion product

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3. Calculate the experimental error between the expected mass of solid product and the actual mass of solid product obtained...

...for the first possible copper ion product	...for the second possible copper ion product
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4. Calculate the mole ratio of solid product to solid copper.

Experimental Results	
...for the first possible copper ion product	...for the second possible copper ion product

## **Conclusion**

Refer to the stoichiometry lab rubric. Clarify or summarize the objective, state your results and the associated error. Explain your results by demonstrating that you comprehend the lab process. Finally, draw your conclusion and state how it satisfies the objective. Write your conclusion in paragraph format on a separate sheet of paper.

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NAME:

LAB GROUP

NO.:

## Pre Lab and Calculations Rubric (4 marks)

Criteria	Novice	Intermediate	Expert
<b>Prelab</b>	Prelab has no additions from the lab outline (0) or contains less than 3 of the expert level criteria (1)	Prelab contains 3 of 4 expert level criteria (1.5)	Prelab contains all recorded masses, a minimum of 3 relevant observations, and two correctly balanced chemical equations (2)
<b>Calculations</b>	No calculations submitted (0) or section contains 1 or 2 criteria from expert level (1)	Calculations section contains a minimum of 3 of five criteria from expert level (1.5)	Correct answers to all 4 calculations submitted on a separate page, follow a correct mathematical sequence, showing all units (2)

## Lab Report Conclusion Rubric (4 marks)

Criteria	Novice	Intermediate	Expert
<b>Conclusion is original (no other criteria are evaluated if this criteria is assessed at the Novice level)</b>	Aspects of the conclusion are the same as those of another student or the entire conclusion is the same as that of another student	Intermediate level does not apply to this assessment criteria	Conclusion is written in the student's own words
<b>Objectives summarized</b>	Objectives are not summarized or clarified (0)	Not all objectives are summarized, or objectives are simply recopied using the same wording as the stated objective(s) (0.5)	Objective(s) is/are summarized or clarified in the student's own words (1)
<b>Objectives answered by referencing results</b>	No conclusion present (0) or conclusion is missing more than two of the expert level criteria (0.5)	Conclusion contains all but two of the expert level criteria (1.5)	Each objective is correctly and concisely answered in paragraph format using results that are correct, including units and associated percent experimental error, and reference appropriate calculations, procedures, and/or graphs (2)
<b>Discrepancies between the experimental results and the expected results are explained</b>	No explanation of the difference(s) between expected and experimental results (0)	Conclusion contains an explanation of the difference(s) between expected and experimental results or a statement of explanation as to improvements to the lab design that would not yield better results (0.5)	Conclusion contains an explanation of the difference(s) between expected and experimental results or a statement of explanation as to improvements to the lab design which demonstrates a self-reflection of the lab process and/or a deeper understanding of the concept examined (1)