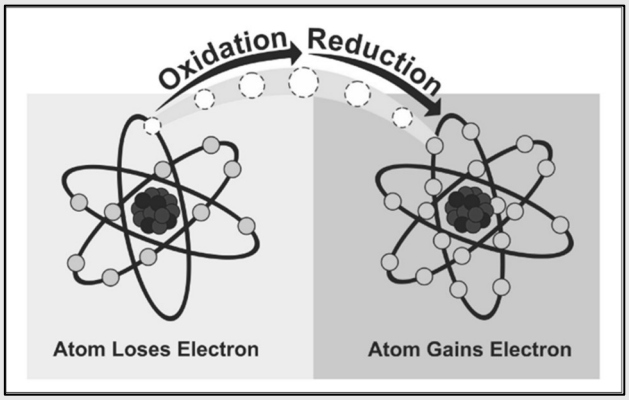
Redox Lab

40 minutes

name

Objective: to observe a redox reaction between copper (II) chloride solution and aluminum, and then to dissect the half reactions out of it.



This is a goggles on lab. Put approximately 50 mL of 0.25 M $CuCl_{2(AQ)}$ into a beaker. Add $60cm^2$ of aluminum foil ripped into pieces the size of your thumbnail. Stir with a glass stirring rod. Set up a ring stand with a funnel and filter paper (as shown) and filter out ALL the solids from the beaker. Flush the beaker out with deionized water until it is empty.

Make sure to "catch" the solution under the funnel into another beaker.

Make observations and draw what you see on page 2 of the lab, using COLORED PENCILS.

Label the beaker and the funnel diagrams on the next page, with chemical formulas of what is present in them.

Write out the balanced single replacement reaction

____(S) + _____(AQ) → _____(AQ) + ____(S)

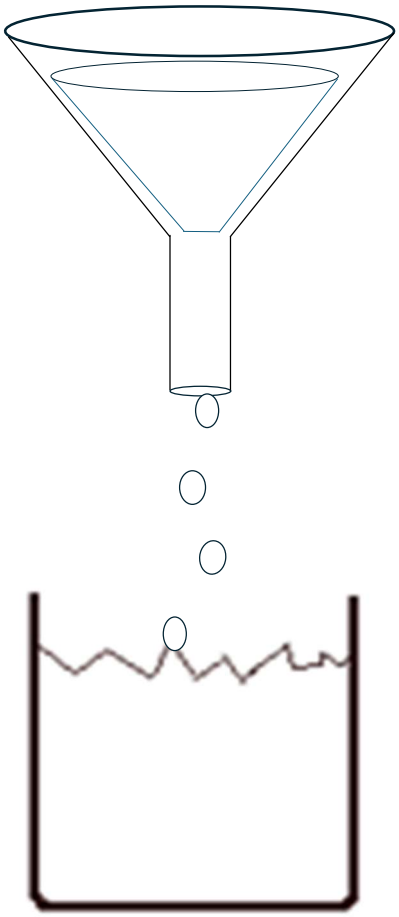
Rewrite out the balanced single replacement reaction with oxidation numbers

_____ + _____ → _____ + _____

Write the $^1/_2$ Reactions + the Net Ionic Equation for this redox reaction

$^1/_2$ OX	
$^1/_2$ RED	
Net Ionic Equation	

Using color pencils, draw what you see during this experiment in each beaker. Write the symbols of the products under the last beaker.		
		
$CuCl_{2(AQ)}$ alone	$CuCl_{2(AQ)} + Al_{(S)}$	→



← What gets "stuck" in the filter paper?

Write the chemical symbols _____

← What (exactly) ends up in the beaker?

Write the chemical symbols _____

There are 3 things that could happen with this reaction:

1. You could eyeball the measure perfectly, putting in exactly enough aluminum to completely react with the $CuCl_{2(AQ)}$ without any leftover Al or $CuCl_{2(AQ)}$. (this is possible, but unlikely)

2. You could add too little aluminum to completely react with the solution you made.

3. You could add too much aluminum to react completely with the $CuCl_{2(AQ)}$.

Which of these things happened to you? _____

Imagine each of these chemical possibilities. What would be stuck in the filter paper in the funnel, and what would be in your catch beaker, for each scenario?
Choose ONE choice in each of the six boxes.

aluminum is added to the $CuCl_{2(AQ)}$	What is in your funnel with the filter paper? check one	What is in your catch beaker under your filter paper and funnel?
You add a perfect amount of aluminum to react with the $CuCl_{2(AQ)}$	Cu only ☐ Al only ☐ Cu + Al ☐	$CuCl_{2(AQ)}$ only ☐ $AlCl_{3(AQ)}$ ☐ $CuCl_{2(AQ)} + AlCl_{3(AQ)}$ ☐
You add too little aluminum to react with the $CuCl_{2(AQ)}$	Cu only ☐ Al only ☐ Cu + Al ☐	$CuCl_{2(AQ)}$ only ☐ $AlCl_{3(AQ)}$ ☐ $CuCl_{2(AQ)} + AlCl_{3(AQ)}$ ☐
You add too much aluminum to react with the $CuCl_{2(AQ)}$	Cu only ☐ Al only ☐ Cu + Al ☐	$CuCl_{2(AQ)}$ only ☐ $AlCl_{3(AQ)}$ ☐ $CuCl_{2(AQ)} + AlCl_{3(AQ)}$ ☐

Lab questions 10 x 2 points each on WHITE PAPER, do not squeeze them below.

1. Write the balanced chemical equation with phase symbols and oxidation numbers for zinc metal added to the hydrochloric acid solution.

2. Write ½OX and the ½RED and the net ionic equation for this single replacement reaction

3. Write the balanced chemical equation of the nitric acid being neutralized with potassium hydroxide. Add oxidation numbers to all reactants and products.

4. Is the acid base neutralization reaction also redox? Why do you think it is, or is not?

5. Write the balanced equation for when an iron nail is put into $NaCl_{(AQ)}$. Is this an example of a redox reaction? Explain. (Use table J, don't guess)

6. When lithium metal is put into a solution of copper (II) sulfate, tell which species is oxidized, which species is reduced and which species is the spectator ion. (Say specifically Cu° atom or Cu^{+2} cation, do not just say "copper").

7. Write a balanced chemical equation for the decomposition of liquid water into hydrogen & oxygen gases. Put in the relative oxidation numbers for each of the 3 species.

8. Is the decomposition of H_2O redox? If no explain why not.
If yes, write the half reactions and net ionic equation for the hydrolysis of water.

9. In one sentence explain the chemistry of a voltaic cell.

10. In one sentence explain the chemistry of an electrolytic cell.

11. Using table F, write out a balanced equation for a double replacement reaction, be sure to include phase symbols. Add in the oxidation numbers to PROVE why it is (or is not) redox.

12. Same as #11, write out a synthesis reaction with oxidation numbers and PROVE why it is (or is not) redox.

This lab	requires	for these points
Cover	Title, single sentence objective.	1
Lab handout	Balanced equation, half reactions, net ionic equation	5
Drawings	colors, labels, symbols	5
3 scenarios	fill in boxes	2
Page 3	12 questions on a separate sheet of paper	12
due date		25