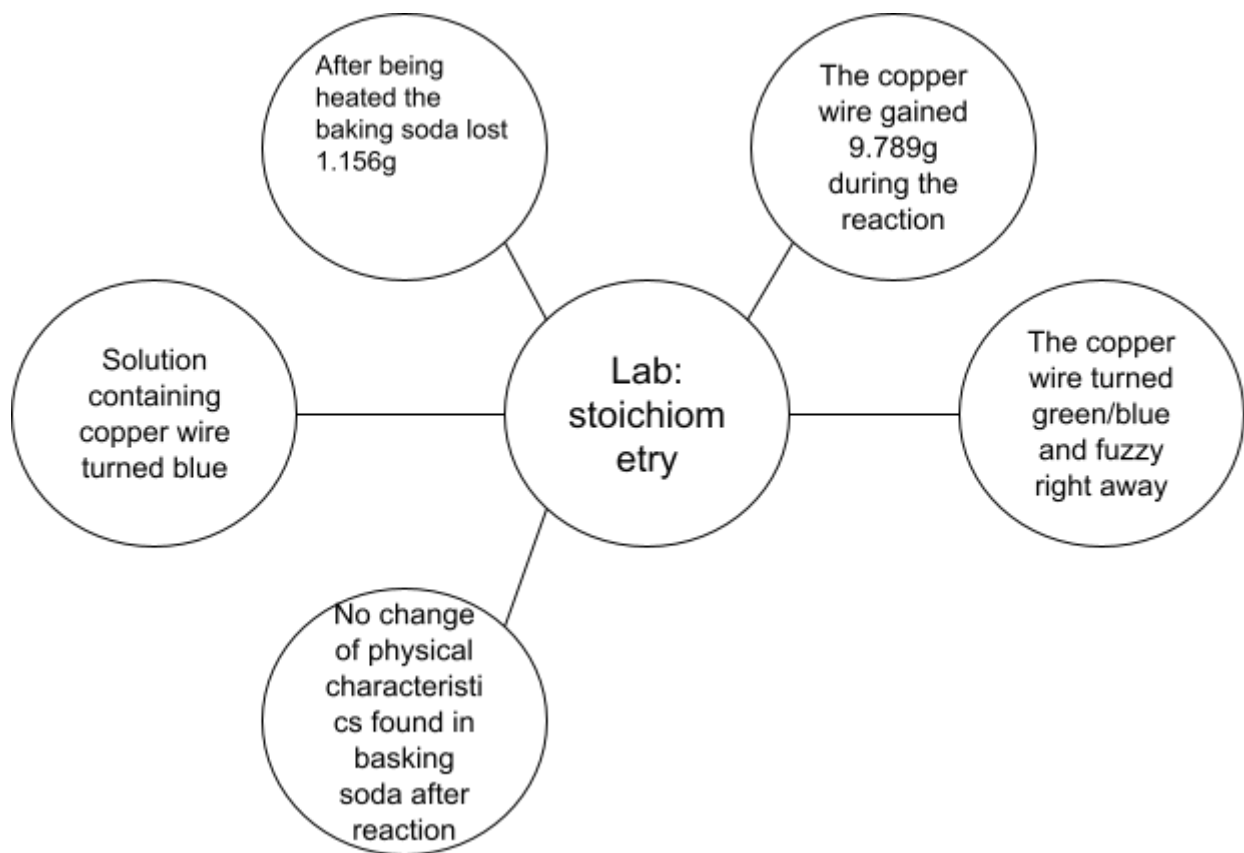


Brainstorm what you experienced in the lab to select a Main Claim:

### Bubble Map

**Double click** on the map below and fill in experiences/observations from the lab



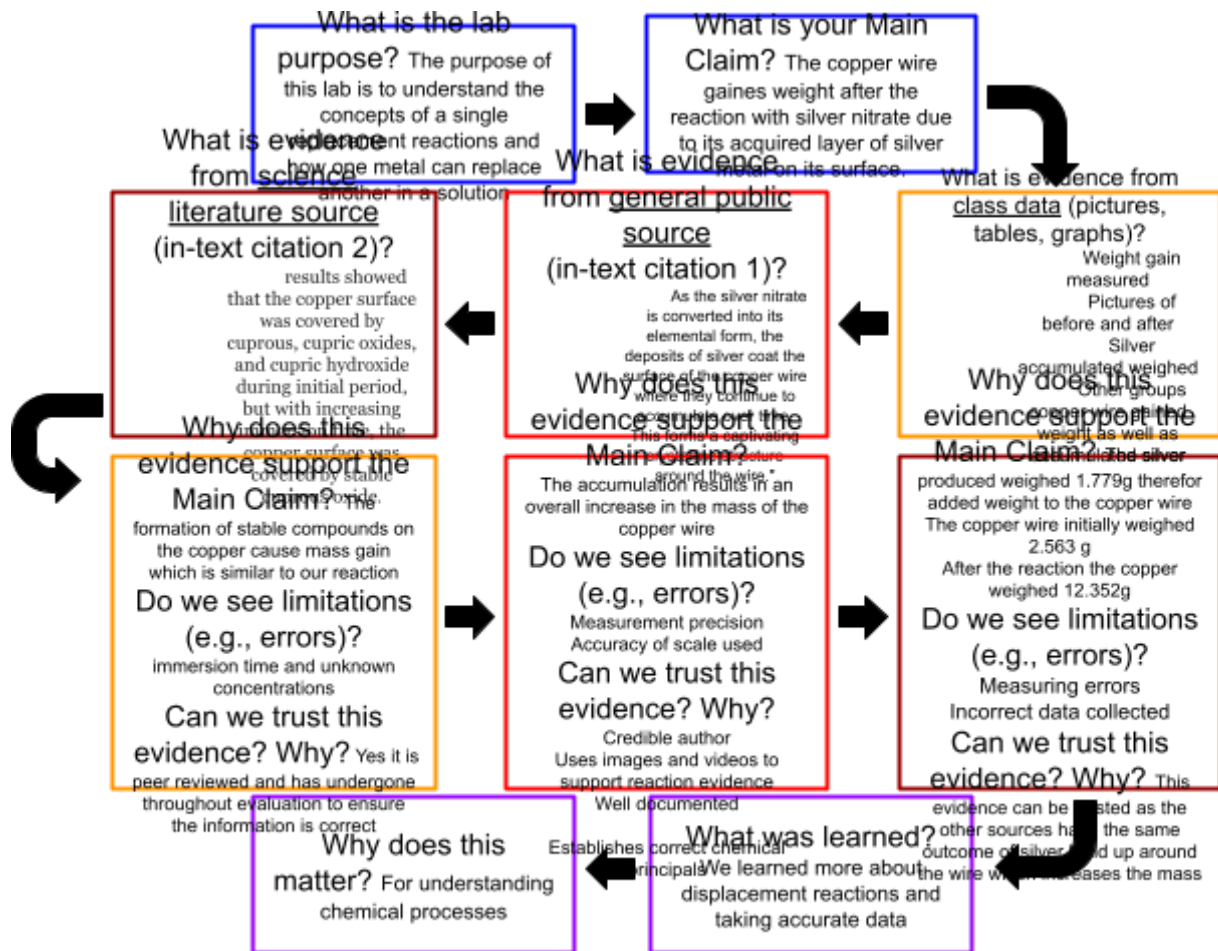
Pick one bubble to focus on for this lab write-up

Main Claim: The copper wire gains weight after the reaction with silver nitrate due to its acquired layer of silver metal on its surface.

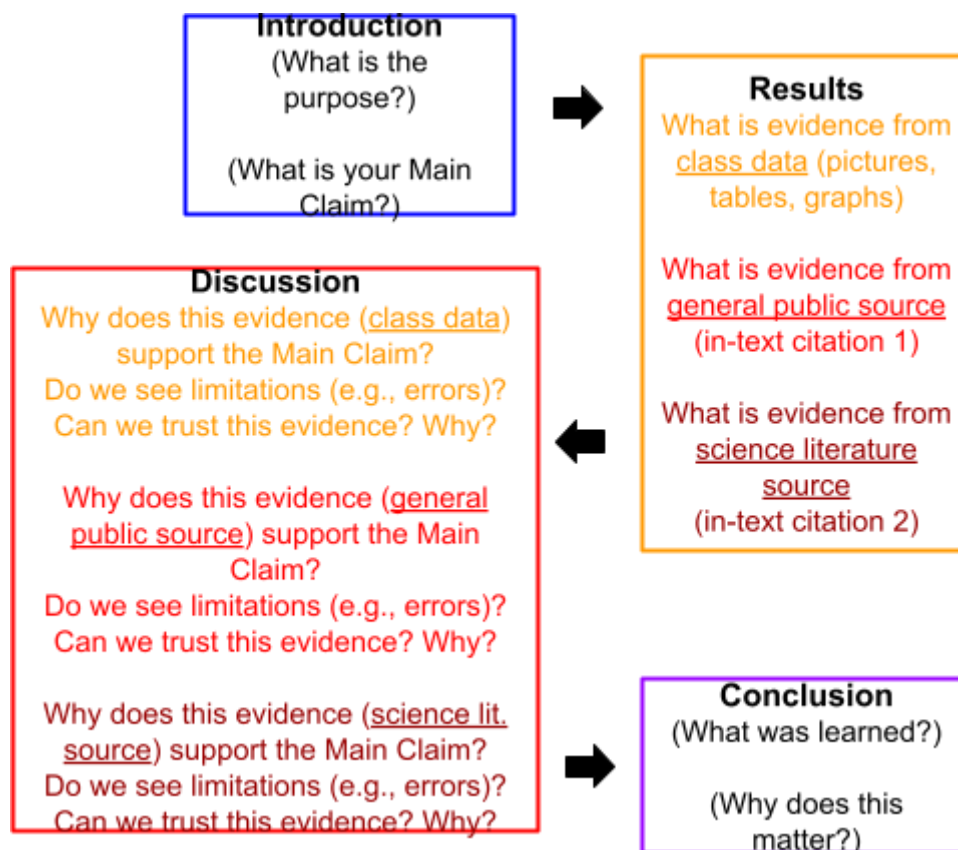
Develop an outline for your Lab Write-up:

### Flow Map Outline

**Double click** on the map below and fill in **briefly** based on your lab experience



## Lab Write-Up Format (for reference ONLY)



### Introduction

In this lab we explore a single replacement reaction where one metal replaces another in a solution. The purpose of this lab is to understand these concepts in depth by particularly focusing on a reaction that contains copper wire and silver nitrate. Through this experiment we were able to observe that the copper wire gains weight after the reaction with silver nitrate due to its acquired layer of silver metals on its surface.

## Results

Part II: Single Replacement Cu + AgNO <sub>3</sub>				
Silver nitrate reacted	Mass (g)	1.313	33.189	19.028
Silver nitrate reacted	Number of particles (moles)	0.008	5.118	0.112
Copper reacted	(Initial-Final) Mass (g)	0.234	0.214	-0.211
Copper reacted	Number of particles (moles)	0.004	0.0034	0.194
Silver Product produced	Mass (g)	0.69		1.779
Silver Product produced	Number of particles (moles)	0.005		0.016
Silver:Copper Ratio	Ag moles / Cu moles	1.25		1.69
<b>Excess Reactant</b>	<b>Cu or AgNO<sub>3</sub>?</b>	<b>Cu</b>	<b>Cu</b>	<b>Cu</b>
<b>Limiting Reactant</b>	<b>Cu or AgNO<sub>3</sub>?</b>	<b>AgNO<sub>3</sub></b>	<b>AgNO<sub>3</sub></b>	<b>AgNO<sub>3</sub></b>
Theoretical Silver Product Yield	Number of particles (moles)	0.43		0.833
Percent Yield	(Experimental / Theoretical) * 100	160%		7.93%



After the reaction the copper wire had a loss of -0.211 g which is a result of inaccurate measurements. The decrease in mass does not support my claim that during the reaction the reason that the copper gained weight is due to the accumulation of silver metal. However, if you take a look at all the other groups, they observed weight gains of 0.228g, 0.214g, and 0.232g indicating that the addition of silver onto the copper wire consistently resulted in an increase of the mass. Overall, the reaction aligns with the stoichiometry of the reaction where the copper molecules were oxidized into copper ions and silver ions were reduced to solid silver forming that metallic layer on the wire seen in the pictures.

## Discussion

The evidence from this source supports my claim about the reaction between copper wire and silver nitrate by highlighting the transformations occurring on the copper surface during the process. The article notes “results showed that the copper surface was covered by cuprous, cupric oxides, and cupric hydroxide during initial period, but with increasing immersion time, the copper surface was covered by stable cuprous oxide.”(Shim, Kim, 2004). This indicates that as the reaction continues the formation of stable compounds on the copper wire occurs which contributes to the overall mass increase. Still there are limitations that must be considered. Immersion times, solutions, and specific concentrations used could lead to inconsistent results across the experiment. In spite of these limitations the evidence is trustworthy because it is a peer reviewed scientific journal which ensured that it has undergone strict evaluation to ensure the information is correct.

The article explains that when copper wire is added into a silver nitrate solution a displacement reaction occurs which leads to the formation of silver metal on the surface of the copper wire. It states “As the silver nitrate is converted into its elemental form, the deposits of silver coat the surface of the copper wire where they continue to accumulate over time. This forms a captivating crystalline structure around the wire” (Clifton, 2018). The accumulation of silver metal on the copper wire results in an overall increase in the mass of the copper wire which supports my claim about the weight gain due to the layer of silver. However, there are several limitation factors to be considered such as measurement accuracy and variations of the amount of copper wire immersed in the silver nitrate which could lead to inconsistent weight gains. Despite the limitations the

evidence given in the article is trustworthy because it references well known chemical principals, includes a video of the reaction process, and is consistent with results reported in other sources.

The evidence gathered from our experiment supports my claim regarding the weight gain of the copper wire after its reaction with silver nitrate. The initial mass of the wire was 2.563g and the final mass significantly increased to 12.352g indicating a substantial weight gain. The recorded amount of silver produced was 1.179g which directly correlates with the displacement of silver onto the copper wire. However, there are a few limitations to take into consideration. One major issue I came across was incorrect measurements observed in our data where the amount of copper reacted was collected as -0.211g suggesting inconsistency with our measurements. Additionally, the mass of the beaker was incorrectly recorded as 52.110g which ended up being larger than the combined mass of the beaker and dry silver recorded at 32.779g. Regardless of the limitations the evidence remains trustworthy as it aligns with the data from other sources and the clear documentation of data even with measurement errors still adds credibility to the overall conclusion about the weight gain due to silver.

### Conclusion

In conclusion this lab provided valuable insight on single replacement reactions specifically highlighting how copper wire reacts when it's in silver nitrate. The experiment demonstrates that the copper wire gains weight due to the accumulation of silver metal on its surface reinforcing the concept that metals can replace one another in a solution. Despite some limitations such as measurement accuracy and potential

inconsistencies in data collection, the findings highlight the importance of being precise to fully understand chemical reactions. This lab not only solidified our understanding of these reactions, but it also emphasized on the importance of careful data analysis. Ultimately this lab matters because it expands our understanding of fundamental chemical processes which may be important for various fields. Through this experiment we got to learn a lot about the reaction itself and the critical role of observation and measurement when conducting scientific research.

## References

- Clifton, J. (2024, April 30). *What happens when you put copper wire in silver nitrate?*. ReAgent Chemical Services.  
<https://www.chemicals.co.uk/blog/what-happens-when-you-put-copper-wire-in-silver-nitrate>
- Jae Joo Shim, Jung Gu Kim (2004, May) *Copper corrosion in potable water distribution systems: influence of copper products on the corrosion behavior*.  
<https://www.sciencedirect-com.libproxy.estrellamountain.edu/science/article/abs/pii/S0167577X04000291>