

# Determination of an Empirical Formula

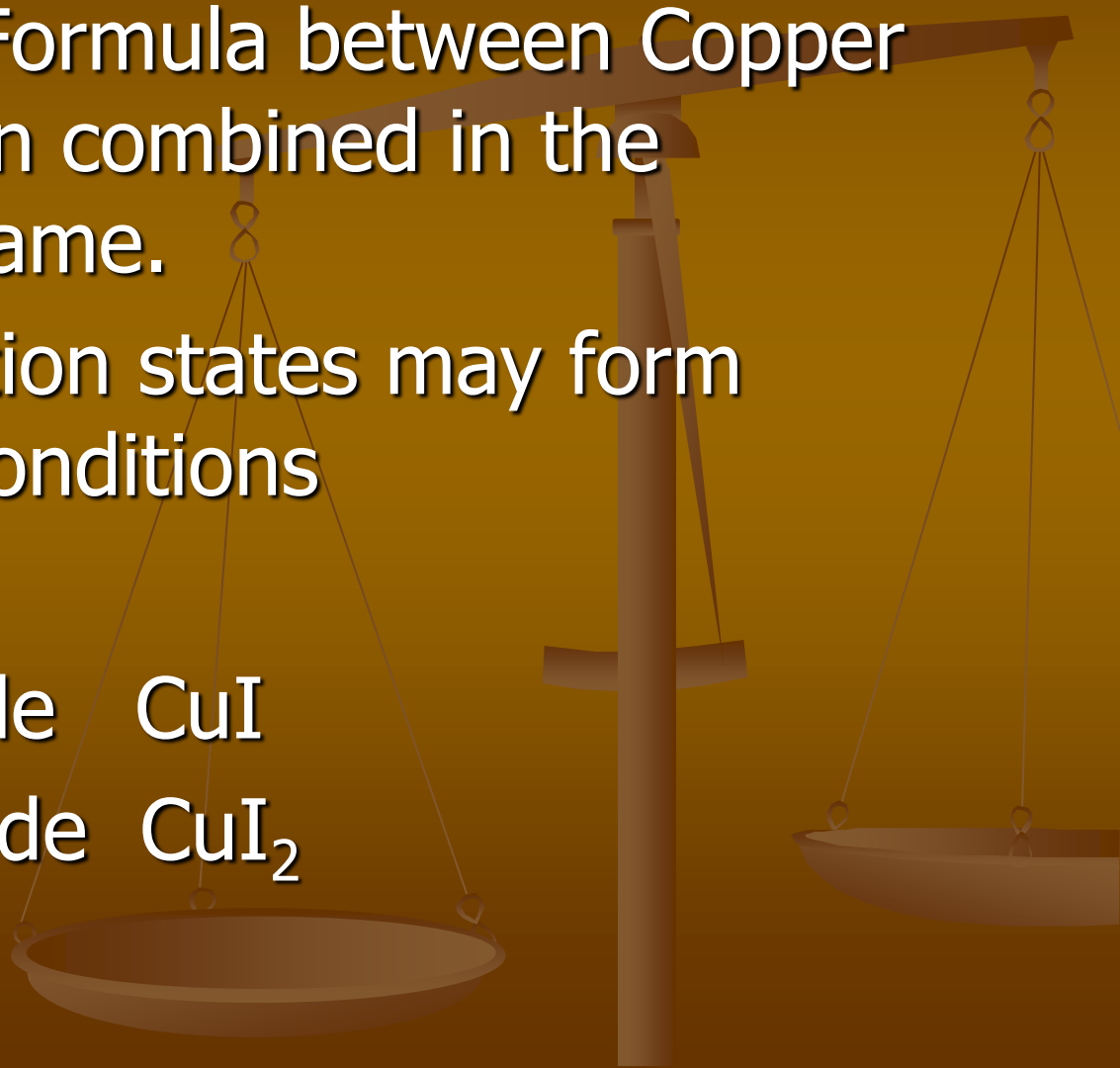


Created by Schweitzer

9/30/04

# Objective $\text{CuI}_x$

- Determine the Formula between Copper and Iodine when combined in the presence of a flame.
- Different Oxidation states may form depending on conditions
- Copper (I) Iodide  $\text{CuI}$
- Copper (II) Iodide  $\text{CuI}_2$



# How to determine Empirical formula?

% → Mass → Moles → divide

This is the general progression.

Remember: empirical formula is just a ratio of individual particles.

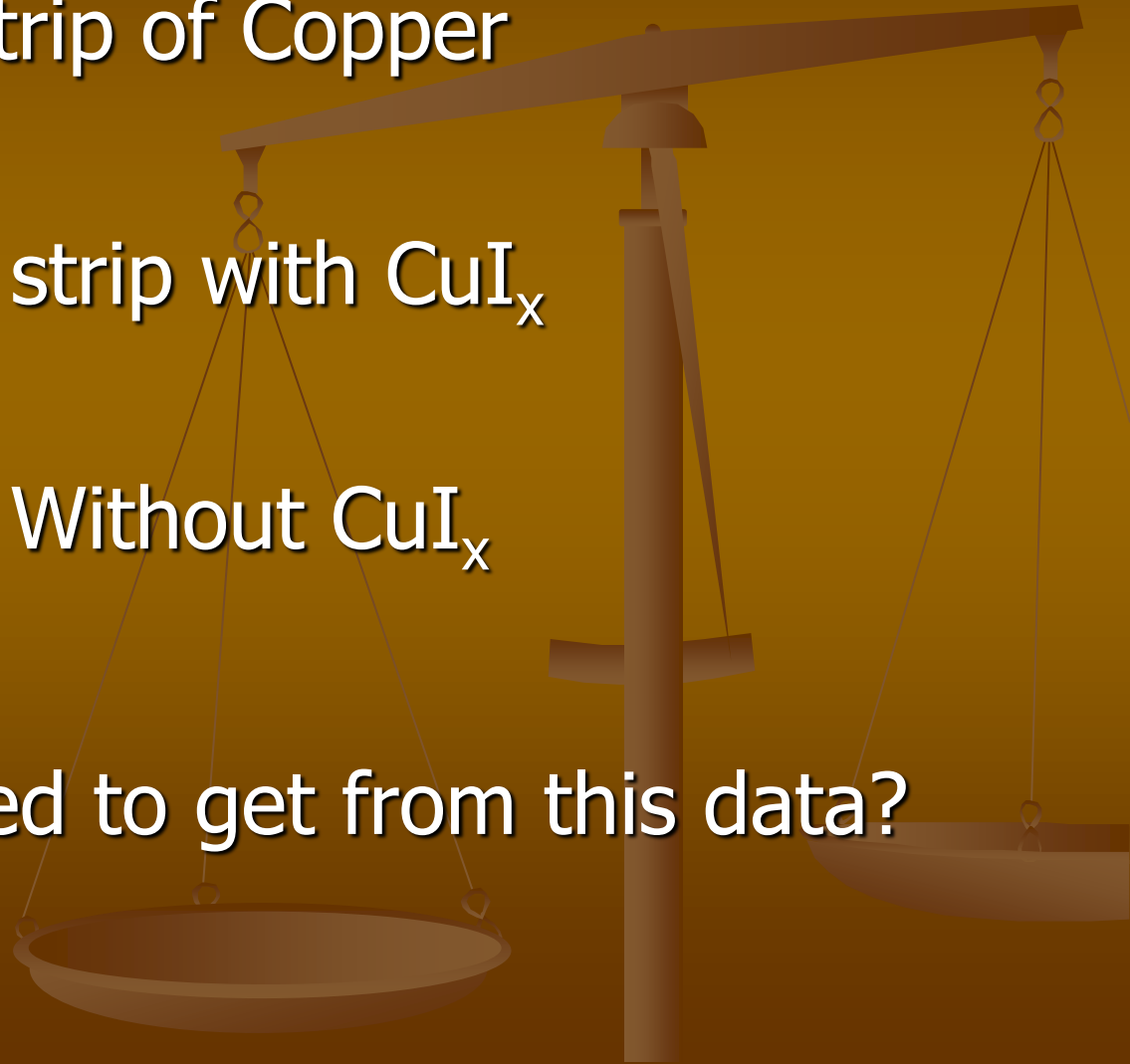


# Perform Lab

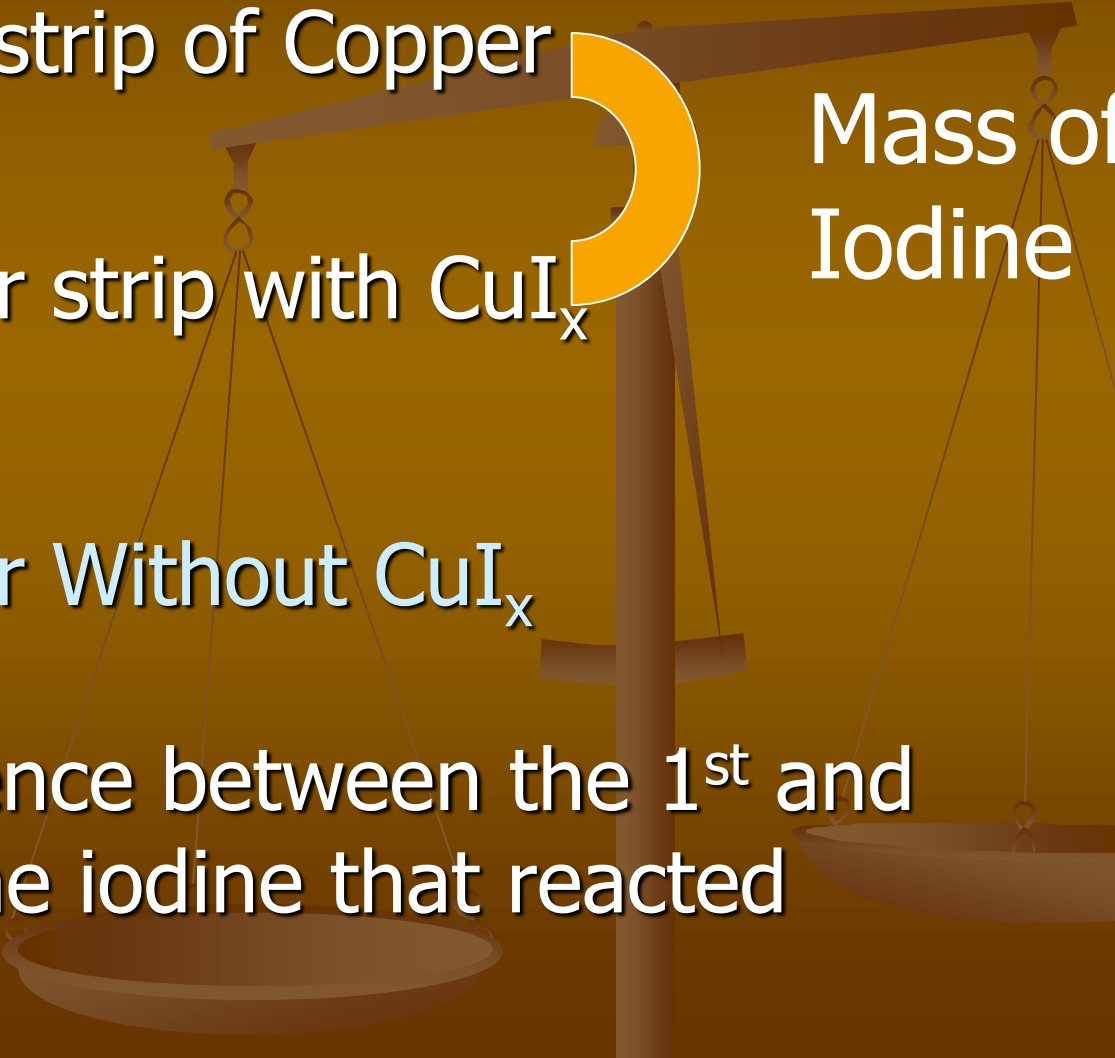


# Data Collected

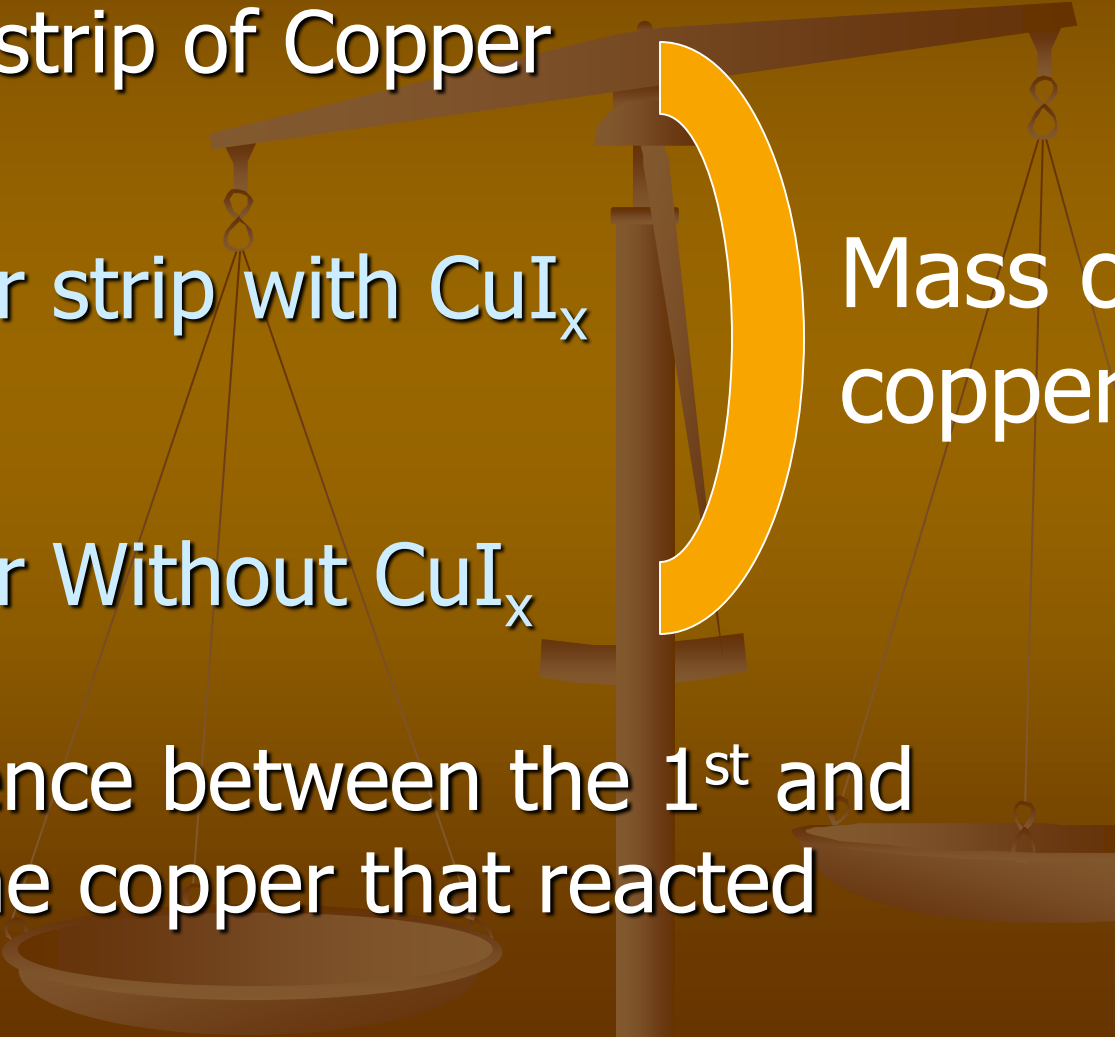
- Mass of Clean strip of Copper
- Mass of Copper strip with  $\text{CuI}_x$
- Mass of Copper Without  $\text{CuI}_x$
- What do we need to get from this data?



# How do we get the Mass of the Iodine?

1. Mass of Clean strip of Copper
  2. Mass of Copper strip with  $\text{CuI}_x$
  3. Mass of Copper Without  $\text{CuI}_x$
- The only difference between the 1<sup>st</sup> and 2<sup>nd</sup> masses is the iodine that reacted
- 
- Mass of Iodine

# How do we get the Mass of the Copper?

1. Mass of Clean strip of Copper
  2. Mass of Copper strip with  $\text{CuI}_x$
  3. Mass of Copper Without  $\text{CuI}_x$
- The only difference between the 1<sup>st</sup> and 3<sup>rd</sup> masses is the copper that reacted
- 
- Mass of copper

# Here is the math to get the moles?

## ■ Moles of Copper in $\text{CuI}_x$

- $\text{Cu}_{\text{mass}} = \text{Cu}_{\text{original}} - \text{Cu}_{\text{after}}$  (convert to moles)
- $X \text{ g Cu} * 1 \text{ mole}/63.54\text{g} = ???$

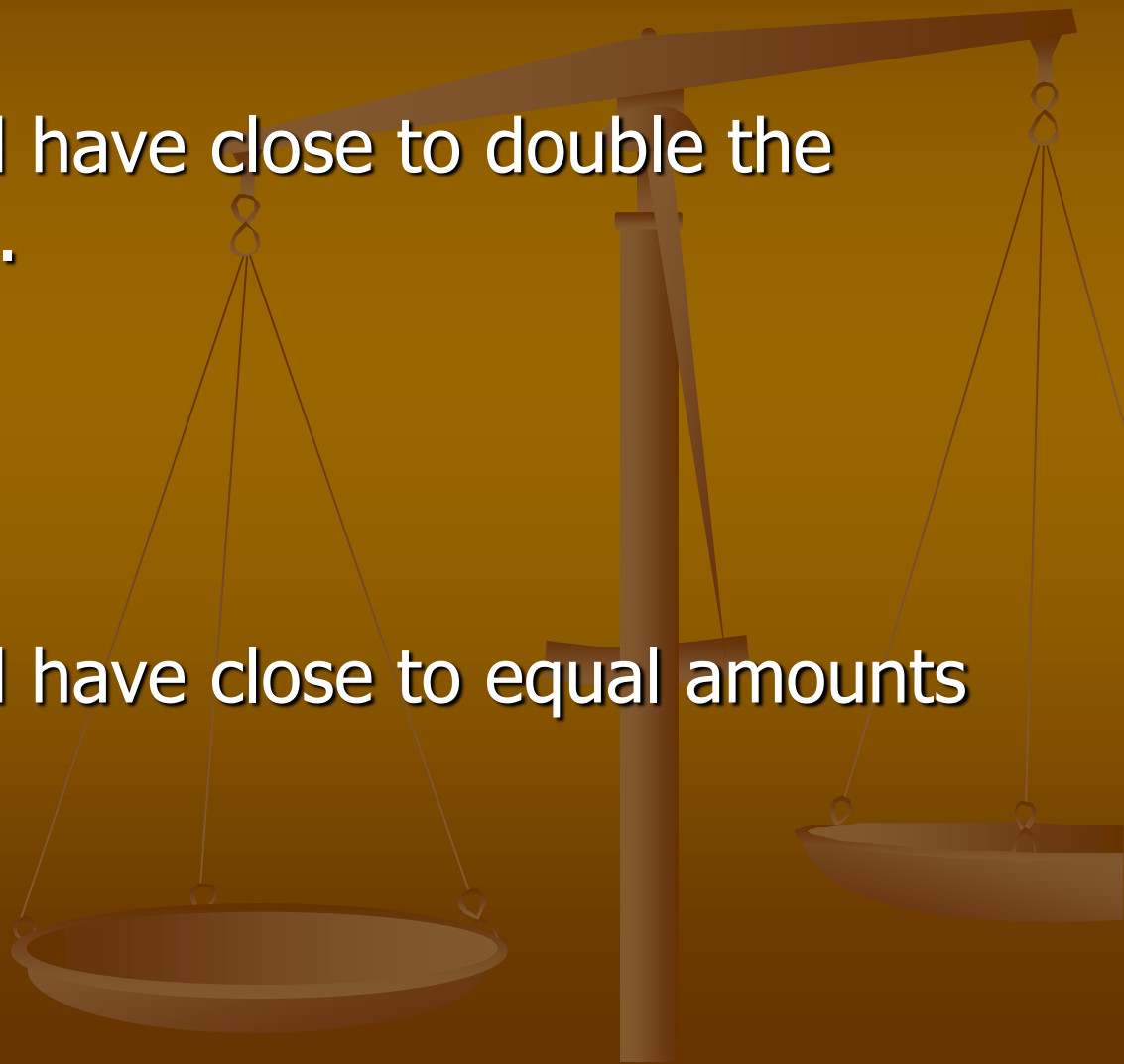
## ■ Moles of Iodine in $\text{CuI}_x$

- $\text{I}_{\text{mass}} = \text{CuI} - \text{Cu}_{\text{original}}$  (convert to moles)
- $X \text{ g I} * 1 \text{ mole}/126.90\text{g} = ???$
- Note: if you divide by the molecular weight of  $\text{I}_2$  that will tell you how many  $\text{I}_2$ 's you can make. This will not help you for this question.



# We have the moles...Ok???

- If  $\text{CuI}_2$ ...
  - Then we should have close to double the moles of Iodine.
  
- If  $\text{CuI}$ ....
  - Then we should have close to equal amounts of Iodine.



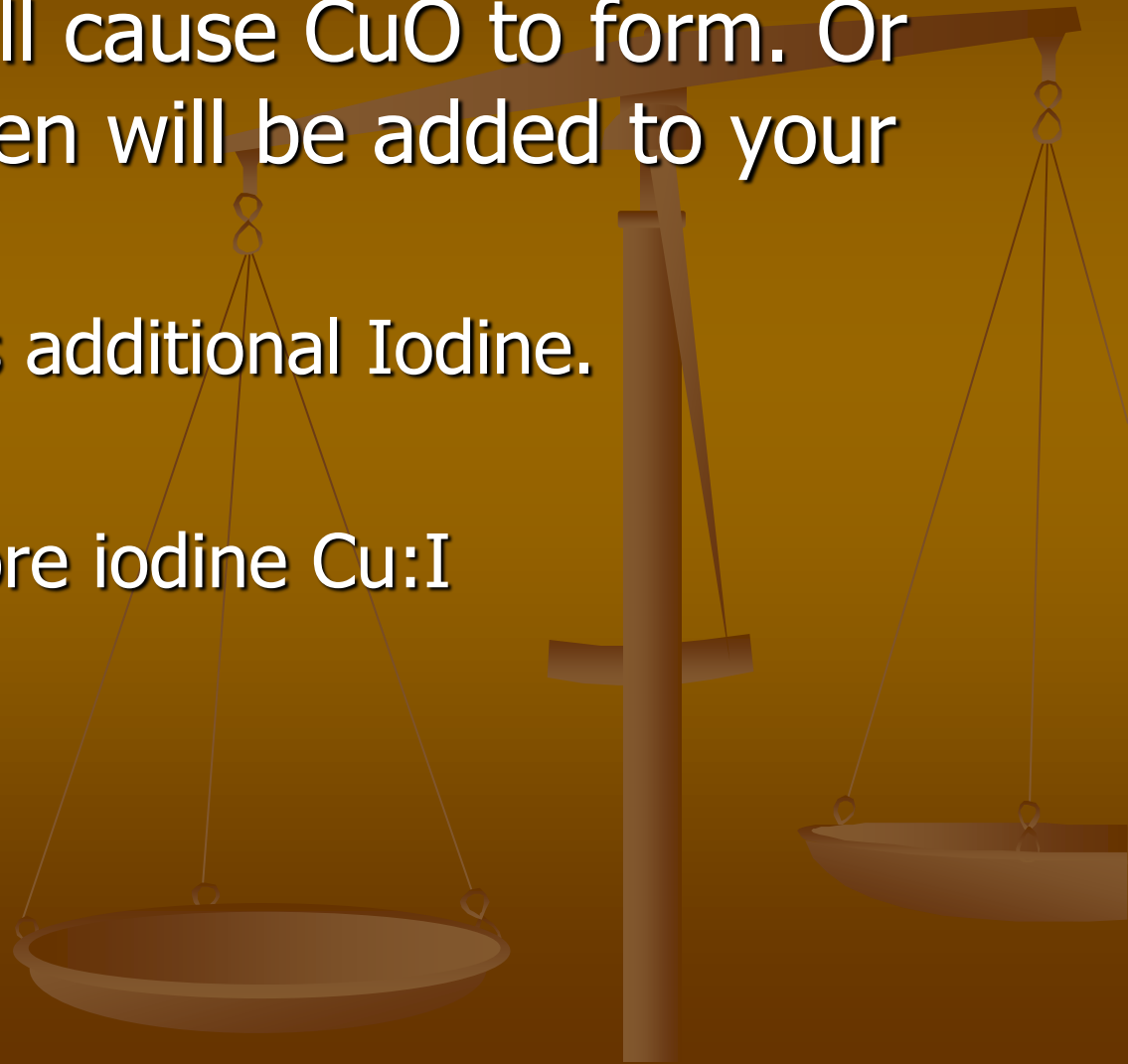
# Error analysis

- You hastily over heated your Copper strip producing a cool green flame.
  - How will this affect your result?



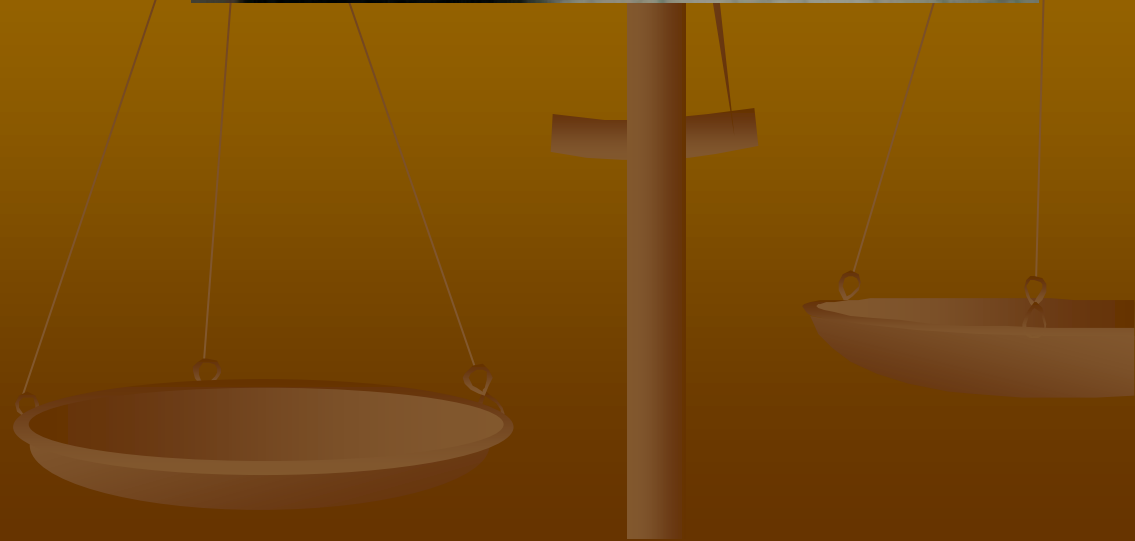
# Error analysis

- Over heating will cause  $\text{CuO}$  to form. Or additional Oxygen will be added to your Copper strip.
  - This appears as additional Iodine.
  - 
  - Less copper more iodine  $\text{Cu:I}$



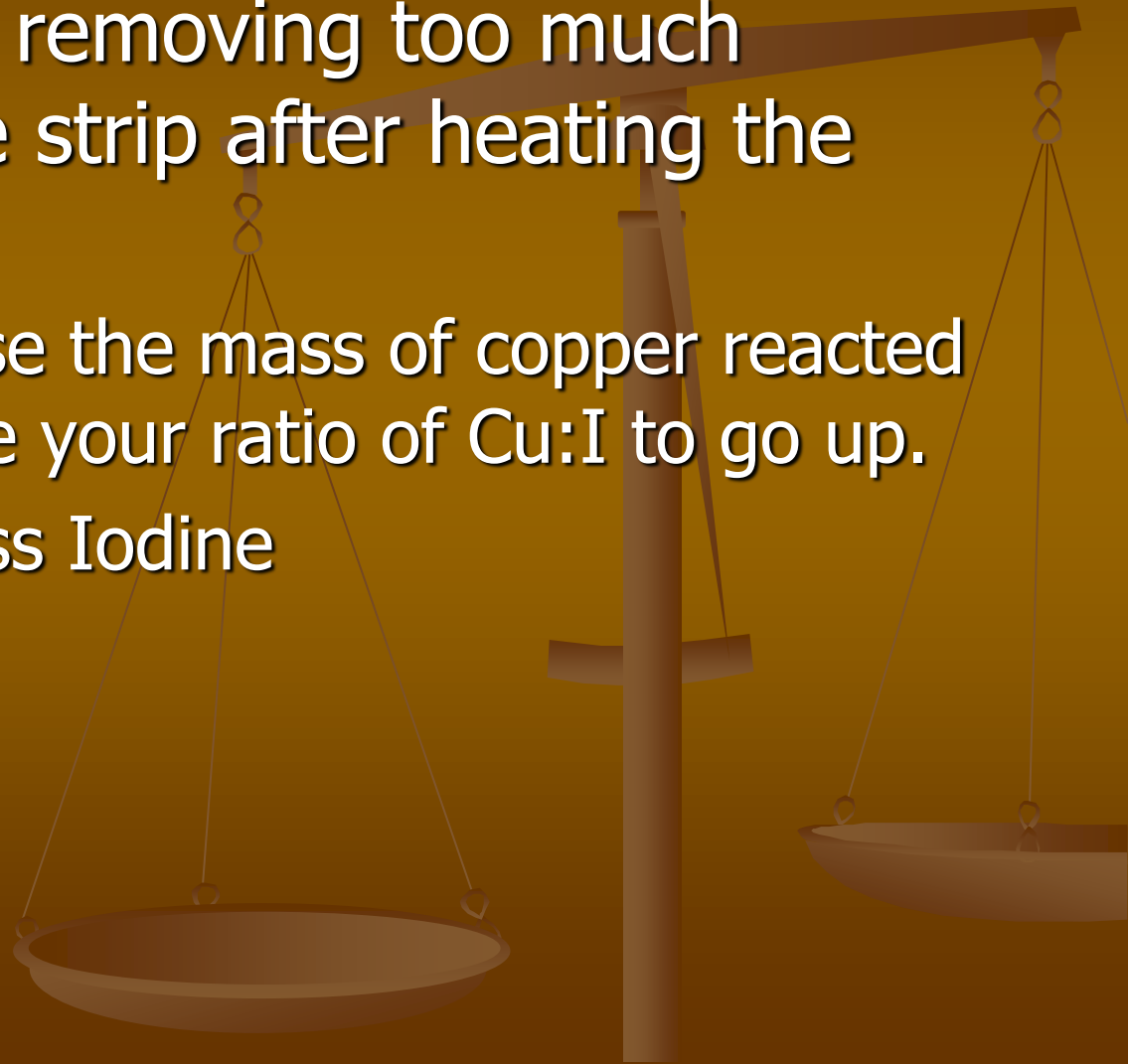
# Error analysis

- While you were cleaning the  $\text{CuI}_x$  off of the copper strip you over cleaned and removed considerable unrelated copper



# Error analysis

- What affect will removing too much copper from the strip after heating the  $\text{CuI}_x$ .
  - This will increase the mass of copper reacted which will cause your ratio of Cu:I to go up.
  - More copper less Iodine



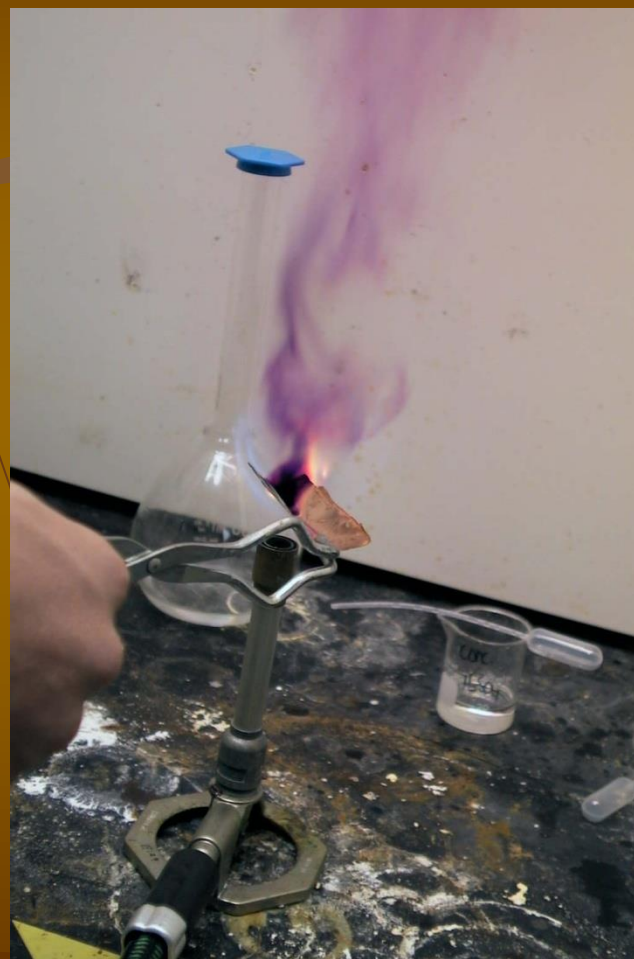
# Descriptive Chemistry

- What is the purple stuff?



# Descriptive chemistry

- What is the purple stuff?
- Iodine ( $I_2$ ) is easily converted to  $I_2$  vapor with a little heat.
- $I_2$  vapor is the purple stuff





# Descriptive Chemistry



What is the pale white substance???  
Note the Sample on the right contains some Black stuff????