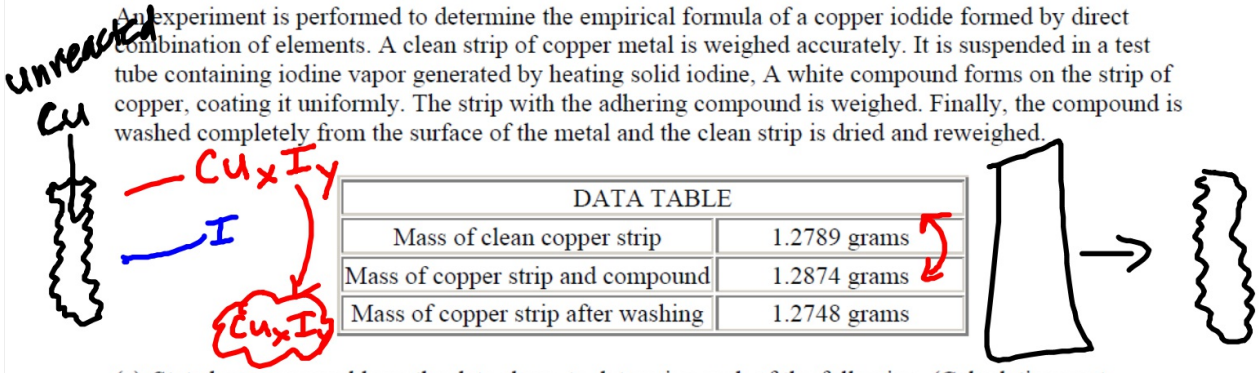
AP FRQ: Empirical Formula

An experiment is performed to determine the empirical formula of a copper iodide formed by direct combination of elements. A clean strip of copper metal is weighed accurately. It is suspended in a test tube containing iodine vapor generated by heating solid iodine, A white compound forms on the strip of copper, coating it uniformly. The strip with the adhering compound is weighed. Finally, the compound is washed completely from the surface of the metal and the clean strip is dried and reweighed.



DATA TABLE	
Mass of clean copper strip	1.2789 grams
Mass of copper strip and compound	1.2874 grams
Mass of copper strip after washing	1.2748 grams

(a) State how you would use the data above to determine each of the following. (Calculations not required.)

(1) The number of moles of iodine that reacted
(2) The number of moles of copper that reacted

(b) Explain how you would determine the empirical formula for the copper iodide.

(c) Explain how each of the following would affect the empirical formula that could be calculated.

(1) Some unreacted iodine condensed on the strip.
(2) A small amount of the white compound flaked off before weighing.

(a) State how you would use the data above to determine each of the following. (Calculations not required.)

(1) The number of moles of iodine that reacted
(2) The number of moles of copper that reacted

(1). Subtract mass of clean copper strip from mass of copper w/ compound to get the mass of iodine that reacted.
- divide mass of iodine by its molar mass to get moles of iodine

(2) - Subtract mass of washed copper from mass of clean copper to get mass of Cu reacted
- divide mass Cu reacted by its molar mass (63.55 g/
Mol
to moles Cu reacted.

(b) Explain how you would determine the empirical formula for the copper iodide.

calculate the mole ratio of mols Cu : mols I

$$\frac{\text{mols Cu}}{\text{mols I}}$$

(c) Explain how each of the following would affect the empirical formula that could be calculated.

(1) Some unreacted iodine condensed on the strip.
(2) A small amount of the white compound flaked off before weighing.

(1) mass of iodine will be too high, thus mols of iodine will be too high. ∴ the mole ratio of Cu to I will be too low.

(2) mass of iodine will be too low, thus mols of iodine will be too low. ∴ the mole ratio of Cu to I will be too high.