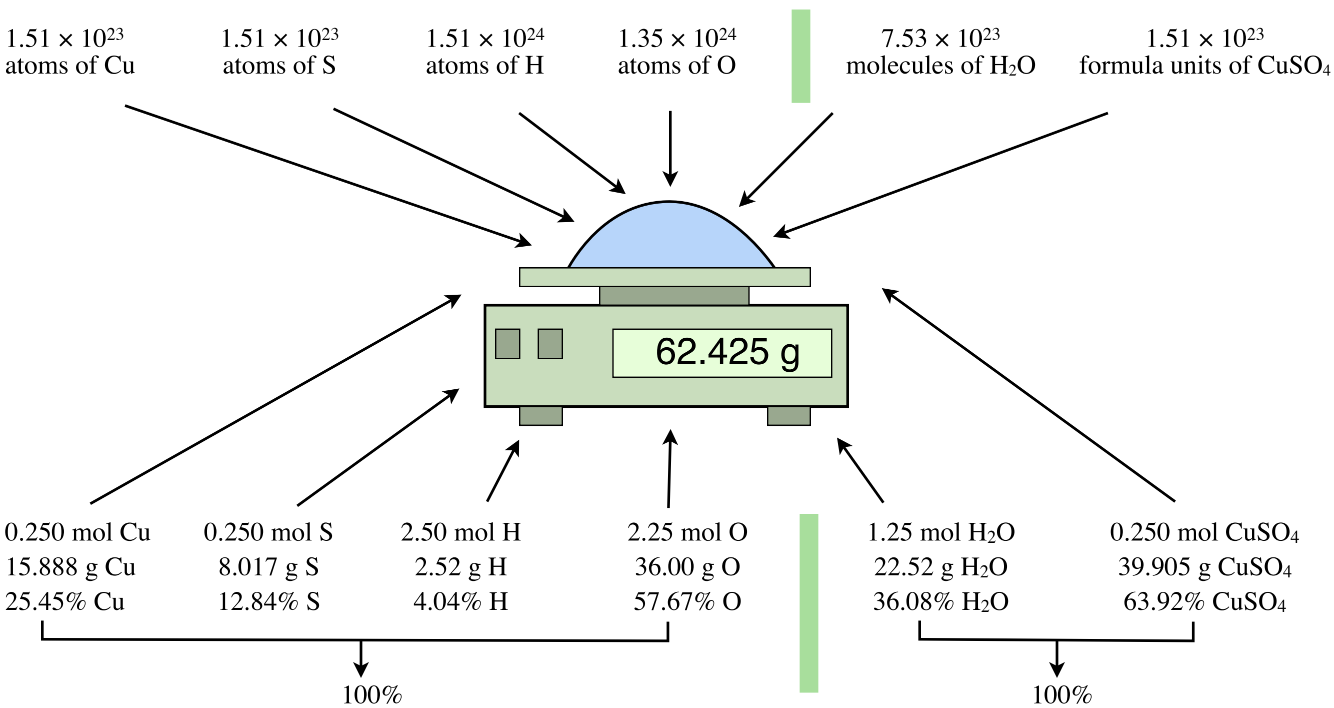
Compound Stoichiometry - Mole Concept

Consider a sample of copper(II) sulfate pentahydrate. It's a blue coarse crystalline substance and is sitting on a laboratory balance as shown below. The chemical formula for copper(II) sulfate is $CuSO_4{\cdot}5H_2O$. Note that the "·5" in front of the H_2O means that 5 waters of hydration are part of the formula. The "·5" does NOT mean *times five* (×5). If the blue hydrated copper(II) sulfate is heated to 110˚C, 4 of the 5 hydrates (water molecules) will come off leaving only 1 hydrate. The formula for copper(II) sulfate monohydrate would be $CuSO_4{\cdot}H_2O$.and it is a very pale blue color. Note how there is only one hydrate left. It is "held" tighter than the other 4 hydrates and will not come off at 110˚C. However, if it is heated to 150˚C (or higher) the last hydrate comes off and you would then have anhydrous copper(II) sulfate which has a chemical formula of $CuSO_4$ and is white in color. Needless to say, the weights of equal amounts (moles) of each of these compounds will be different because of the waters of hydration. The $CuSO_4{\cdot}5H_2O$ (249.7 g/mol) will weigh the most and the $CuSO_4$ (159.6 g/mol) will weigh the least.

Consider of all the different ways that a sample of 62.421 grams of $CuSO_4{\cdot}5H_2O$ can be looked at by a chemist. Note that this is equivalent to 0.250 moles of $CuSO_4{\cdot}5H_2O$.



Note how the individual parts add up to make the whole:

15.888	+	8.017	+	2.52	+	36.00	=	62.425
g of Cu		g of S		g of H		g of O		g of CuSO4·5H2O

Note also how you can view the sample in an elemental way (left of the green marker line), or simply as a compound ($CuSO_4$) and water (H_2O) which is on the right side of the green marker line.