LAD J1 Calculating Theoretical (aka Expected) Mass

Consider the reaction that we did in class when we were first learning about single replacement reactions.

You dissolved green copper(II) chloride in a flask, then stuffed in an excess amount of aluminum metal which produced copper metal and colorless dissolved aluminum chloride. The balanced equation is shown below.

$$3\ CuCl_2 + 2\ Al \rightarrow 3\ Cu + 2\ AlCl_3$$

Suppose you had measured your starting mass of copper(II) chloride as 1.684 g, and you would like to know what mass of copper you can *expect* to produce (*theoretical* mass) from the reaction with an excess amount of aluminum?

It is important to remember that there is a 3:3 MOLE ratio between copper produced and copper(II) chloride started with, but we measured the amount of copper(II) chloride in grams. This means we must change to moles using the molar mass.

$$1.684\ g\ CuCl_2 \times \frac{1\ mol\ CuCl_2}{134.45\ g\ CuCl_2} \times \frac{3\ Cu}{3\ CuCl_2} \times \frac{63.55\ g\ Cu}{1\ mol\ Cu} = 0.796\ g\ Cu\ could\ be\ expected$$

theoretical mass

Δ to moles

mole ratio from the balanced equation

Δ back to grams

Use the calculation above to model the calculation required to determine the *theoretical* (*expected*) mass of silver metal that should be formed from your starting mass of silver nitrate. The concept is the same, just the identity of the chemicals and thus the molar masses have changed.