Limiting Excess Reagent Problems

So far all stoichiometric calculations have involved one input number that leads to one possible answer.

In a limiting excess calculation, information is given about two reactants which makes possible two different answers!!

What actually happens is that one of the reactants will run out first and thus determine the **maximum possible** product that can form. (i.e begonia in the greenhouse)

To determine which is the correct answer, simply do the question twice and pick the smaller answer. You can recognize a limiting excess reagent calculation from the fact that information will be given about two (or more) reactants (two different input numbers)

eg. Determine the maximum possible mass of aluminum carbonate that can form from 100.00 g of aluminum nitrate and 100.00 g of potassium carbonate.

$$\underset{100.00\ g}{2Al(NO_3)_3} + \underset{100.00\ g}{3K_2CO_3} \rightarrow \underset{?\ (g)}{Al_2(CO_3)_3} + 6KNO_3$$

$$100.00\ g\ Al(NO_3)_3 \times \frac{1\ mol\ Al(NO_3)_3}{213.01\ g\ Al(NO_3)_3} \times \frac{1\ mol\ Al_2(CO_3)_3}{2\ mol\ Al(NO_3)_3} \times \frac{233.99\ g\ Al_2(CO_3)_3}{1\ mol\ Al_2(CO_3)_3} = 54.92\ g\ Al_2(CO_3)_3$$

$$100.0\ g\ K_2CO_3 \times \frac{1\ mol\ K_2CO_3}{138.21\ g\ K_2CO_3} \times \frac{1\ mol\ Al_2(CO_3)_3}{3\ mol\ K_2CO_3} \times \frac{233.99\ g\ Al_2(CO_3)_3}{1\ mol\ Al_2(CO_3)_3} = 56.43\ g\ Al_2(CO_3)_3$$

Since the answer using 100.00 g of aluminum nitrate is small than the answer obtained from 100.00 g of potassium carbonate, aluminum nitrate is the limiting reagent and 54.92 g of aluminum carbonate is the maximum possible mass of product.