Solution Stoichiometry

As you know, stoichiometry is the mole concept applied to chemical reactions. Solution stoichiometry is the same except for a few differences. The basic 3 steps of stoichiometry still hold true as:

- 1) change substance that you know something about (I will call known substance) to mole of that substance,
- 2) using the coefficient in the balanced chemical reaction, step up the molar ratio to go from moles of known substance to the moles of the unknown substance (substance that you are looking for information on),
- 3) change mole of unknown substance to desired units.

The only difference with solution stoichiometry is that to find the moles of known or unknown substance require knowledge about both the Molarity of the substance solution and its volume (in liters). It follows the equation:

$mole_{sub} = (M_{sub})(V_{sub})$ where sub = substance (either known or unknown substance)

So an example of solution stoichiometry is as follows:

I added 0.283L of a 0.256M Ca_1Cl_2 to excess $Na_2(CO_3)_2$ to produce how many grams of product, $Ca_1(CO_3)_1$ by the following balanced chemical reaction.

$1\ Ca_1Cl_{2\ (aq)} + 1\ Na_2(CO_3)_{2\ (aq)} \Longrightarrow 1\ Ca_1(CO_3)_{1\ (s)} + 2\ Na_1Cl_{1\ (aq)}$

$V = 0.283\ l\ Ca_1Cl_2$

$M = 0.256\ M\ Ca_1Cl_2$

$mm\ Ca_1(CO_3)_1 = 1(40_g) + 1(12_g) + 3(16_g) = \frac{100.\ g\ Ca_1(CO_3)_1}{1\ mol\ Ca_1(CO_3)_1}$

$$\left(\frac{0.256\ mol\ Ca_1Cl_2}{1\ l\ solution}\right)\left(0.283\ l_{solution}\right)\left(\frac{1\ mol\ Ca_1(CO_3)_1}{1\ mol\ Ca_1Cl_2}\right)\left(\frac{100.\ g\ Ca_1(CO_3)_1}{1\ mol\ Ca_1(CO_3)_1}\right) =$$

step 1 | step 2 | step 3

$= 7.244_2\ Ca_1(CO_3)_1$

$= \boxed{7.24_2\ Ca_1(CO_3)_1}$