Example:
How many milliliters of 6.00M hydrochloric acid is needed to completely react with 25.0 g of sodium carbonate?

$$2HCl(aq) + Na_2CO_3(s) \longrightarrow H_2O(l) + CO_2(g) + 2NaCl(aq)$$

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1 - Convert 25.0g of sodium carbonate (mass) to moles using the formula weight.
2 - Convert moles sodium carbonate to moles hydrochloric acid using chemical equation.
3 - Convert moles hydrochloric acid to volume using concentration (6.00 moles / L)

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① Na_2CO_3 : Na : 2 x 22.99
C : 1 x 12.01
O : 3 x 16.00
105.99 g Na_2CO_3 = mol Na_2CO_3 <- Formula weight calculation

$$25.0\ g\ Na_2CO_3 \times \frac{mol\ Na_2CO_3}{105.99\ g\ Na_2CO_3} = 0.235871308\ 6\ mol\ Na_2CO_3$$

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② 2 mol HCl = 1 mol Na_2CO_3

$$0.235871308\ 6\ mol\ Na_2CO_3 \times \frac{2\ mol\ HCl}{1\ mol\ Na_2CO_3} = 0.471742617\ 2\ mol\ HCl$$

Example:

How many milliliters of 6.00M hydrochloric acid is needed to completely react with 25.0 g of sodium carbonate?

$$2HCl(aq) + Na_2CO_3(s) \longrightarrow H_2O(l) + CO_2(g) + 2NaCl(aq)$$

1 - Convert mass sodium carbonate to moles. Use formula weight.
2 - Convert moles sodium carbonate to moles hydrochloric acid. Use chemical equation.
3 - Convert moles hydrochloric acid to volume. Use concentration (6.00 M)

③ $6.00\ mol\ HCl = L$ $\quad mL = 10^{-3} L$

$$0.4717426172\ mol\ HCl \times \frac{L}{6.00\ mol\ HCl} \times \frac{mL}{10^{-3} L} = \boxed{78.6\ mL}$$

If you like, you can solve the entire problem on one line and enter everything into the calculator at once!

$$\underbrace{25.0\ g\ Na_2CO_3 \times \frac{mol\ Na_2CO_3}{105.99\ g\ Na_2CO_3}}_{①} \times \underbrace{\frac{2\ mol\ HCl}{1\ mol\ Na_2CO_3}}_{②} \times \underbrace{\frac{L}{6.00\ mol\ HCl} \times \frac{mL}{10^{-3} L}}_{③} = \boxed{78.6\ mL}$$

EXAMPLE PROBLEM:

$$2\,Na(s) + Cl_2(g) \rightarrow 2\,NaCl(s)$$

How many grams of sodium metal is required to completely react with 2545 grams of chlorine gas?

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1 - Convert 2545g of chlorine gas to moles using the formula weight of chlorine gas.
2 - Convert moles chlorine gas to moles sodium metal using chemical equation.
3 - Convert moles sodium chloride to mass using formula weight of sodium metal.

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① $Cl_2 : 2 \times 35.45 : 70.90\ g\ Cl_2 = mol\ Cl_2$ ② $2\ mol\ Na = mol\ Cl_2$

③ $22.99\ g\ Na = mol\ Na$

$$2545\ g\ Cl_2 \times \underset{①}{\frac{mol\ Cl_2}{70.90\ g\ Cl_2}} \times \underset{②}{\frac{2\ mol\ Na}{mol\ Cl_2}} \times \underset{③}{\frac{22.99\ g\ Na}{mol\ Na}} = \boxed{1650.\ g\ Na}$$

$$(1.650 \times 10^3\ g\ Na)$$