$$2\,Al(s) + 3\,Br_2(l) \longrightarrow 2\,AlBr_3(s)$$

* Given that we have 25.0 g of liquid bromine, how many grams of aluminum would we need to react away all of the bromine? How many grams of aluminum bromide would be produced?

① Convert the 25.0 g of bromine to moles. Use formula weight. $Br_2: 2 \times 79.90 = 159.8$

$159.8\ g\ Br_2 = mol\ Br_2$

$$25.0\ g\ Br_2 \times \frac{mol\ Br_2}{159.8\ g\ Br_2} = 0.156445 6\ mol\ Br_2$$

---

② Convert the moles bromine to moles aluminum. Use chemical equation.

$2\ mol\ Al = 3\ mol\ Br_2$

$$0.156445 6\ mol\ Br_2 \times \frac{2\ mol\ Al}{3\ mol\ Br_2} = 0.104297038\ mol\ Al$$

---

③ Convert the moles aluminum to mass. Use formula weight. $Al: 26.98$

$26.98\ g\ Al = mol\ Al$

$$0.104297038\ mol\ Al \times \frac{26.98\ g\ Al}{mol\ Al} = \boxed{2.81\ g\ Al}$$

You can combine all three steps on one line if you like!

$$25.0\text{ g } Br_2 \times \frac{\text{mol } Br_2}{159.8\text{ g } Br_2} \times \frac{2\text{ mol Al}}{3\text{ mol } Br_2} \times \frac{26.98\text{ g Al}}{1\text{ mol Al}} = \boxed{2.81\text{ g Al}}$$

① ② ③

$$\begin{array}{r} 25.0\text{ g } Br_2 \\ +\ 2.81\text{ g Al} \\ \hline 27.8\text{ g } AlBr_3 \end{array}$$

Conservation of mass!

But ...
...what would you have done to calculate the mass of aluminum bromide IF you had NOT been asked to calculate the mass of aluminum FIRST?

Calculating the mass of aluminum bromide directly:

$$25.0\text{ g } Br_2 \times \frac{1\text{ mol } Br_2}{159.8\text{ g } Br_2} \times \frac{2\text{ mol } AlBr_3}{3\text{ mol } Br_2} \times \frac{266.68\text{ g } AlBr_3}{1\text{ mol } AlBr_3} = 27.8\text{ g } AlBr_3$$

$AlBr_3$: Al : 1×26.98

Br : 3×79.90

266.68

Example:

How many grams of sodium carbonate is needed to make 15.5 grams of sodium chloride, assuming there is sufficient hydrochloric acid for the reaction

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

1 - Convert 15.5 g NaCl to moles. Use FORMULA WEIGHT of NaCl.
2 - Convert moles NaCl to moles sodium carbonate. Use the ratio in the CHEMICAL EQUATION
3 - Convert moles sodium carbonate to grams. Use FORMULA WEIGHT.

① NaCl: Na: 1×22.99
Cl: 1×35.45

$$\frac{}{58.44\ g\ NaCl} = mol\ NaCl$$

$$15.5\ g\ NaCl \times \frac{mol\ NaCl}{58.44\ g\ NaCl} = 0.265229295\ mol\ NaCl$$