

* 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. $\text{Br}_2: \frac{2 \times 79.90}{159.8}$

$$159.8 \text{ g Br}_2 = \text{mol Br}_2$$

$$25.0 \text{ g Br}_2 \times \frac{\text{mol Br}_2}{159.8 \text{ g Br}_2} = 0.1564456 \text{ mol Br}_2$$

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

$$2 \text{ mol Al} = 3 \text{ mol Br}_2$$

$$0.1564456 \text{ mol Br}_2 \times \frac{2 \text{ mol Al}}{3 \text{ mol Br}_2} = 0.104297038 \text{ mol Al}$$

③ Convert the moles aluminum to mass. Use formula weight. $\text{Al}: 26.98$

$$26.98 \text{ g Al} = \text{mol Al}$$

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

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

$$25.0 \text{ g Br}_2 \times \frac{1 \text{ mol Br}_2}{159.8 \text{ g Br}_2} \times \frac{2 \text{ mol Al}}{3 \text{ mol Br}_2} \times \frac{26.98 \text{ g Al}}{1 \text{ mol Al}} = 2.81 \text{ g Al}$$

(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?

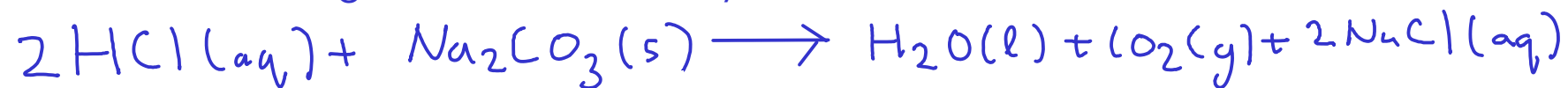
Calculating the mass of aluminum bromide directly:

$$25.0 \text{ g Br}_2 \times \frac{1 \text{ mol Br}_2}{159.8 \text{ g Br}_2} \times \frac{2 \text{ mol AlBr}_3}{3 \text{ mol Br}_2} \times \frac{266.68 \text{ g AlBr}_3}{1 \text{ mol AlBr}_3} = 27.8 \text{ g AlBr}_3$$

$$\begin{array}{r} \text{AlBr}_3: \text{ Al} = 1 \times 26.98 \\ \text{Br} = 3 \times 79.90 \\ \hline 266.68 \end{array}$$

150 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



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.

$$\textcircled{1} \quad \begin{array}{l} \text{NaCl: Na: } 1 \times 22.99 \\ \quad \quad \text{Cl: } 1 \times 35.45 \\ \hline 58.44 \text{ g NaCl} = \text{mol NaCl} \end{array}$$

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