

\* 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?

① Convert the 25.0 g of bromine to moles. Use formula weight.  $\text{Br}_2: \frac{2 \times 79.90}{159.8}$

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

$$25.0 \text{ g Br}_2 \times \frac{\text{mol Br}_2}{159.8 \text{ g Br}_2} = 0.1564455569 \text{ mol Br}_2$$


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② Convert the moles bromine to moles aluminum. Use chemical equation.  
 $2 \text{ mol Al} = 3 \text{ mol Br}_2$

$$0.1564455569 \text{ mol Br}_2 \times \frac{2 \text{ mol Al}}{3 \text{ mol Br}_2} = 0.104297038 \text{ mol Al}$$


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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!

- 1 - Convert the 25.0 g of bromine to moles. Use formula weight.
- 2 - Convert the moles bromine to moles aluminum. Use chemical equation.
- 3 - Convert the moles aluminum to mass. Use formula weight.

$$\textcircled{1} \quad 159.8 \text{ g Br}_2 = \text{mol Br}_2$$

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

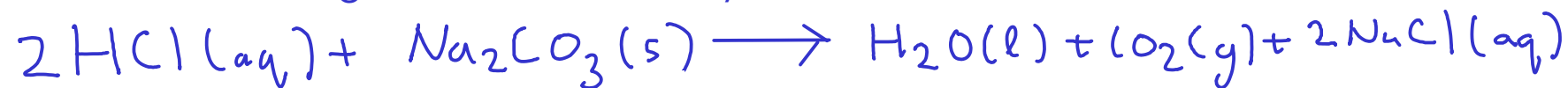
$$\textcircled{3} \quad 26.98 \text{ g Al} = \text{mol Al}$$

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

$\textcircled{1}$                        $\textcircled{2}$                        $\textcircled{3}$

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.

2 - Convert mol NaCl to mol sodium carbonate. Use BALANCED CHEMICAL EQUATION.

3 - Convert mol sodium carbonate to grams sodium carbonate. Use FORMULA WEIGHT.

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$$\textcircled{1} \text{NaCl} - \text{Na: } 1 \times 22.99 \\ \text{Cl: } 1 \times 35.45$$

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

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

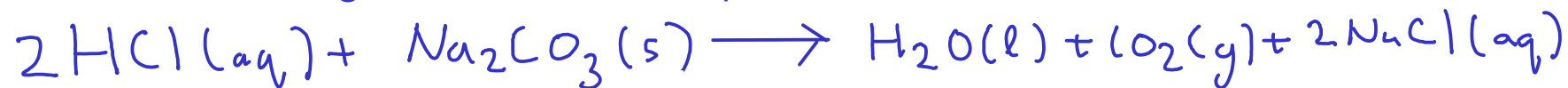
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$$\textcircled{2} \text{mol Na}_2\text{CO}_3 = 2 \text{ mol NaCl}$$

$$0.265229295 \text{ mol NaCl} \times \frac{\text{mol Na}_2\text{CO}_3}{2 \text{ mol NaCl}} = 0.1326146475 \text{ mol Na}_2\text{CO}_3$$

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.

2 - Convert mol NaCl to mol sodium carbonate. Use BALANCED CHEMICAL EQUATION.

3 - Convert mol sodium carbonate to grams sodium carbonate. Use FORMULA WEIGHT.

$$\textcircled{3} \text{Na}_2\text{CO}_3 - \begin{array}{l} \text{Na} : 2 \times 22.99 \\ \text{C} : 1 \times 12.01 \\ \text{O} : 3 \times 16.00 \end{array}$$

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$$105.99 \text{ g Na}_2\text{CO}_3 = \text{mol Na}_2\text{CO}_3$$

$$0.1326146475 \text{ mol } \cancel{\text{Na}_2\text{CO}_3} \times \frac{105.99 \text{ g Na}_2\text{CO}_3}{\cancel{\text{mol Na}_2\text{CO}_3}} = 14.1 \text{ g Na}_2\text{CO}_3$$

EXAMPLE PROBLEM:



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

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1 - Convert 2545 g chlorine gas to moles chlorine gas. Use FORMULA WEIGHT

2 - Convert moles chlorine gas to moles sodium metal. Use BALANCED CHEMICAL EQUATION

3 - Convert moles sodium metal to grams. Use FORMULA WEIGHT.

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$$\textcircled{1} \quad \text{Cl}_2: \frac{2 \times 35.45}{70.90 \text{ g Cl}_2 = \text{mol Cl}_2}$$

$$\textcircled{2} \quad 2 \text{ mol Na} = \text{mol Cl}_2$$

$$\textcircled{3} \quad \text{Na}: 22.99 \text{ g Na} = \text{mol Na}$$

$$2545 \text{ g Cl}_2 \times \frac{\cancel{\text{mol Cl}_2}}{70.90 \text{ g Cl}_2} \times \frac{2 \cancel{\text{mol Na}}}{\cancel{\text{mol Cl}_2}} \times \frac{22.99 \text{ g Na}}{\cancel{\text{mol Na}}} = \boxed{1650. \text{ g Na}}$$