

To explain what chemical equations tell us about chemical reactions

HIGHER LESSON

Balanced Equations

- They tell us how much of each substance is involved in a chemical reaction



2 moles of hydrogen react with 1 mole of oxygen to make 2 moles of water

- This is useful because now we can use it to work out what mass of hydrogen and oxygen we need and how much water is made

To explain what chemical equations tell us about chemical reactions

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Masses in the equation

- 2 moles of hydrogen = $2 \times 2\text{g} = 4\text{g}$
- 1 mole of oxygen = $1 \times 16\text{g} = 16\text{g}$
- 2 moles of water = $2 \times 18\text{g} = 36\text{g}$

To explain what chemical equations tell us about chemical reactions

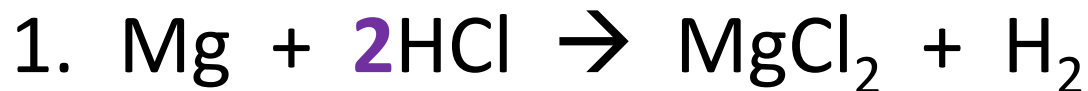
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Task

- Balance and explain in terms of moles and mass what is happening in the reaction



Answers



1 mole of magnesium reacts with 2 moles of hydrochloric acid to produce 1 mole of magnesium chloride and 1 mole of hydrogen.

1 mole of Magnesium = 24g

1 mole of magnesium chloride = 95g

2 moles of hydrochloric acid = 73g

1 mole of hydrogen = 2g



2 moles of sodium hydroxide reacts with 1 mole of chlorine to produce 1 mole of sodium hypochlorite, 1 mole of sodium chloride and 1 mole of water

2 moles of sodium hydroxide = 80g

1 mole of sodium hypochloite = 74.5g

1 mole of chlorine = 71g

1 mole of sodium chloride = 58.5g

1 mole of water = 18g

To explain how we use equations to calculate masses of reactants and products

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How Much?

We need balanced chemical equations so we know how much of two chemicals to react together.

If we have too much of a reactant it will be wasted

If we have too little of a reactant not all of the other reactant will react

To explain how we use equations to calculate masses of reactants and products

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Worked Example 1

If we have a solution containing 100g of sodium hydroxide, how much chlorine gas should we pass through the solution to make bleach?

STEP 1 : Balance the equation



STEP 2 : Work out the mass of 1 mole

$$\text{NaOH} = 40\text{g}$$

$$\text{Cl}_2 = 71\text{g}$$

STEP 3 : Work out moles of the mass in the question

So 100g of sodium hydroxide is $100 \div 40 = 2.5$ moles

STEP 4 : Calculate the number of moles you need of the other reactant

The chemical equation tells us that for every 2 moles of sodium hydroxide we need one mole of chlorine

So we need $2.5 \div 2 = 1.25$ moles of chlorine

STEP 5 : Multiply the number of moles needed by the mass of 1 mole substance

So we'll need $1.25 \times 71\text{g} = 88.75\text{g}$ of chlorine to react with 100g of sodium hydroxide

To explain how we use equations to calculate masses of reactants and products

Worked Example 2

HIGHER LESSON

You start with a solution containing 0.95g of magnesium chloride. You add silver nitrate. If all the magnesium chloride reacts, how much silver chloride could be made?



$$\text{MgCl}_2 = 95\text{g}$$

$$\text{AgCl} = 143.5\text{g}$$

So 0.95g of Magnesium chloride is $0.95\text{g} \div 95\text{g} = 0.01$ moles

The chemical equation tells us that for every 1 mole of magnesium chloride we need 2 moles of silver chloride

$$0.01 \times 2 = 0.02 \text{ moles of silver chloride}$$

$$0.02 \times 143.5\text{g} = \underline{2.87\text{g}}$$

Task

1. Zinc oxide is heated with carbon to make zinc and carbon monoxide. How much zinc oxide do you need to make 130 tonnes of zinc?

162 tonnes

2. A student adds 4.8g of magnesium to excess dilute hydrochloric acid. What mass of magnesium chloride would be made?

19g

3. If you add 5.5g of sodium carbonate to excess dilute sulphuric acid, what mass of sodium sulphate would be made?

7.1g (rounded)

7.3g (un rounded throughout question)