AQA GCSE QUANTITATIVE CHEMISTRY 1

Relative formula mass (M_r)

M_r	*The sum of the relative atomic masses of the atoms in the numbers shown in the formula*	The sum of the M_r of the reactants in the quantities shown equals the sum of the M_r of the products in the quantities shown.	$2Mg + O_2 \rightarrow 2MgO$ $48g + 32g = 80g$ $80g = 80g$

Limiting reactants (HT only)

The reactant that is completely used up	*Limits the amount of product that is made*	Less moles of product are made.

Chemical measurements

Whenever a measurement is taken, there is always some uncertainty about the result obtained	*Can determine whether the mean value falls within the range of uncertainty of the result*	1. Calculate the mean 2. Calculate the range of the results 3. Estimate of uncertainty in mean would be half the range

Example:
1. Mean value is 46.5s
2. Range of results is 44s to 49s = 5s
3. Time taken was 46.5s ±2.5s

Mass changes when a reactant or product is a gas

Mass appears to increase during a reaction	*One of the reactants is a gas*	Magnesium + oxygen → magnesium oxide
Mass appears to decrease during a reaction	*One of the products is a gas and has escaped*	Calcium carbonate → carbon dioxide + calcium oxide

Conservation of mass and balanced symbol equations

Conservation of mass	*No atoms are lost or made during a chemical reaction*	Mass of the products equals the mass of the reactants.

Balanced symbol equations

Represent chemical reactions and have the same number of atoms of each element on both sides of the equation	$H_2 + Cl_2 \rightarrow 2HCl$ Subscript — Normal script Subscript numbers show the number of atoms of the element to its left. Normal script numbers show the number of molecules.

Moles (HT only)

Chemical amounts are measured in moles (mol)	*Mass of one mole of a substance in grams = relative formula mass*	One mole of H_2O = 18g (1 + 1 + 16) One mole of Mg = 24g

Avogadro constant

Avogadro constant	*One mole of any substance will contain the same number of particles, atoms, molecules or ions.*	6.02×10^{23} per mole One mole of H_2O will contain 6.02×10^{23} molecules One mole of NaCl will contain 6.02×10^{23} Na^+ ions

Number of moles = $\frac{\text{mass (g)}}{A_r}$ or $\frac{\text{mass (g)}}{M_r}$

How many moles of sulfuric acid molecules are there in 4.7g of sulfuric acid (H_2SO_4)?
Give your answer to 1 significant figure.

$\frac{4.7}{98} = 0.05$ mol ← (M_r of H_2SO_4)

Amounts of substances in equations (HT only)

The balancing numbers in a symbol equation can be calculated from the masses of reactants and products	*Convert the masses in grams to amounts in moles and convert the number of moles to simple whole number ratios.*

Using moles to balance equations (HT only)

Chemical equations show the number of moles reacting and the number of moles made	*$Mg + 2HCl \rightarrow MgCl_2 + H_2$* *One mole of magnesium reacts with two moles of hydrochloric acid to make one mole of magnesium chloride and one mole of hydrogen*	If you have a 60g of Mg, what mass of HCl do you need to convert it to $MgCl_2$? A_r : Mg =24 so mass of 1 mole of Mg = 24g M_r : HCl (1 + 35.5) so mass of 1 mole of HCl = 36.5g So 60g of Mg is 60/24 = 2.5 moles Balanced symbol equation tells us that for every one mole of Mg, you need two moles of HCl to react with it. So you need 2.5x2 = 5 moles of HCl You will need 5 x 36.5g of HCl= 182.5g

Concentration of solutions

Measured in mass per given volume of solution (g/dm^3)	*Conc. = mass (g) / volume (dm^3)*	HT only Greater mass = higher concentration. Greater volume = lower concentration.

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The sum of the relative atomic masses of the atoms in the numbers shown in the formula	The sum of the M_r of the reactants in the quantities shown equals the sum of the M_r of the products in the quantities shown.

$2Mg + O_2 \rightarrow 2MgO$

$48g + 32g = 80g$

$80g = 80g$

Mass changes when a reactant or product is a gas

One of the reactants is a gas	Magnesium + oxygen → magnesium oxide
One of the products is a gas and has escaped	Calcium carbonate → carbon dioxide + calcium oxide

Conservation of mass and balanced symbol equations

No atoms are lost or made during a chemical reaction	Mass of the products equals the mass of the reactants.	
Represent chemical reactions and have the same number of atoms of each element on both sides of the equation	$H_2 + Cl_2 \rightarrow 2HCl$ Subscript — Normal script Subscript numbers show the number of atoms of the element to its left. Normal script numbers show the number of molecules.	

Moles (HT only)

	Mass of one mole of a substance in grams = relative formula mass	One mole of H_2O = 18g (1 + 1 + 16) One mole of Mg = 24g
	One mole of any substance will contain the same number of particles, atoms, molecules or ions.	6.02×10^{23} per mole One mole of H_2O will contain 6.02×10^{23} molecules One mole of NaCl will contain 6.02×10^{23} Na^+ ions
Number of moles = $\frac{\text{mass (g)}}{A_r}$ or $\frac{\text{mass (g)}}{M_r}$	How many moles of sulfuric acid molecules are there in 4.7g of sulfuric acid (H_2SO_4)? Give your answer to 1 significant figure. $\frac{4.7}{98} = 0.05$ mol ← (M_r of H_2SO_4)	

Amounts of substances in equations (HT only)

Using moles to balance equations (HT only)

	$Mg + 2HCl \rightarrow MgCl_2 + H_2$ *One mole of magnesium reacts with two moles of hydrochloric acid to make one mole of magnesium chloride and one mole of hydrogen*	If you have a 60g of Mg, what mass of HCl do you need to convert it to $MgCl_2$? A_r : Mg =24 so mass of 1 mole of Mg = 24g M_r : HCl (1 + 35.5) so mass of 1 mole of HCl = 36.5g So 60g of Mg is 60/24 = 2.5 moles Balanced symbol equation tells us that for every one mole of Mg, you need two moles of HCl to react with it. So you need 2.5x2 = 5 moles of HCl You will need 5 x 36.5g of HCl= 182.5g

Limiting reactants (HT only)

	Limits the amount of product that is made	Less moles of product are made.

Chemical measurements

	Can determine whether the mean value falls within the range of uncertainty of the result	1. Calculate the mean 2. Calculate the range of the results 3. Estimate of uncertainty in mean would be half the range

Example:
1. Mean value is 46.5s
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Concentration of solutions

	Conc. = $\frac{\text{mass (g)}}{\text{volume (dm}^3\text{)}}$	HT only Greater mass = higher concentration. Greater volume = lower concentration.
	Convert the masses in grams to amounts in moles and convert the number of moles to simple whole number ratios.	

AQA GCSE QUANTITATIVE CHEMISTRY 1

The sum of the M_r of the reactants in the quantities shown equals the sum of the M_r of the products in the quantities shown.

$2Mg + O_2 \rightarrow 2MgO$

$48g + 32g = 80g$

$80g = 80g$

Less moles of product are made.

Relative formula mass (M_r)

Limiting reactants (HT only)

Chemical measurements

1. Calculate the mean
2. Calculate the range of the results
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Example:

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Magnesium + oxygen → magnesium oxide

Calcium carbonate → carbon dioxide + calcium oxide

Mass changes when a reactant or product is a gas

Concentration of solutions

Conc. = mass (g) / volume (dm^3)

Mass of the products equals the mass of the reactants.

$H_2 + Cl_2 \rightarrow 2HCl$

Subscript — Normal script

Subscript numbers show the number of atoms of the element to its left.

Normal script numbers show the number of molecules.

Conservation of mass and balanced symbol equations

Moles (HT only)

Amounts of substances in equations (HT only)

Using moles to ses balance equations (HT only)

Convert the masses in grams to amounts in moles and convert the number of moles to simple whole number ratios.

One mole of H_2O = 18g (1 + 1 + 16)

One mole of Mg = 24g

6.02×10^{23} per mole

One mole of H_2O will contain 6.02×10^{23} molecules

One mole of NaCl will contain 6.02×10^{23} Na^+ ions

How many moles of sulfuric acid molecules are there in 4.7g of sulfuric acid (H_2SO_4)?
Give your answer to 1 significant figure.

$\frac{4.7}{98} = 0.05$ mol ← (M_r of H_2SO_4)

$Mg + 2HCl \rightarrow MgCl_2 + H_2$

One mole of magnesium reacts with two moles of hydrochloric acid to make one mole of magnesium chloride and one mole of hydrogen

If you have a 60g of Mg, what mass of HCl do you need to convert it to $MgCl_2$?

A_r : Mg =24 so mass of 1 mole of Mg = 24g

M_r : HCl (1 + 35.5) so mass of 1 mole of HCl = 36.5g

So 60g of Mg is 60/24 = moles

Balanced symbol equation tells us that for every one mole of Mg, you need two moles of HCl to react with it.

So you need = 5 moles of HCl

You will need = 182.5g

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Limiting reactants (HT only)

Chemical measurements

Concentration of solutions

Conservation of mass and balanced symbol equations

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Using moles to ses equations (HT only)

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Magnesium + oxygen →

Calcium carbonate →

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1.

2.

3.

Example:

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Equation

HT

Mass of the products equals the mass of the reactants.

$H_2 + Cl_2 \rightarrow 2HCl$

Subscript

Normal script

Convert the masses in grams to amounts in moles and convert the number of moles to simple whole number ratios.

One mole of H_2O = 18g (1 + 1 + 16)

One mole of Mg = 24g

6.02×10^{23} per mole

One mole of H_2O will contain

One mole of NaCl will contain

How many moles of sulfuric acid molecules are there in 4.7g of sulfuric acid (H_2SO_4)?
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