Science Faculty | Directed Improvement Sheet

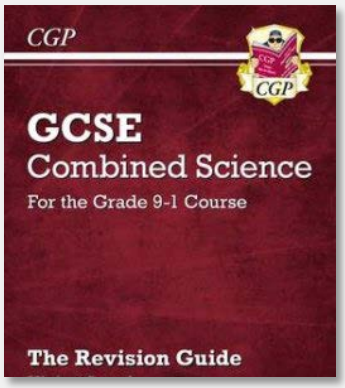
Year 10

Develop your understanding of balancing chemical equations and the calculation of relative formula mass

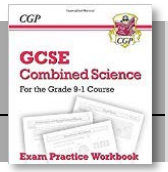
Step 1 What do I need to know?

- The law of conservation of mass states that no atoms are lost or made during a chemical reaction so the mass of the products equals the mass of the reactants.
- That chemical reactions can be represented by symbol equations which are balanced in terms of the numbers of atoms of each element involved on both sides of the equation.
- You should understand the use of the multipliers in equations in normal script before a formula and in subscript within a formula.
- The relative formula mass (M_r) of a compound is the sum of the relative atomic masses of the atoms in the numbers shown in the formula.
- In a balanced chemical equation, the sum of the relative formula masses of the reactants in the quantities shown equals the sum of the relative formula masses of the products in the quantities shown.

Step 2 How do I find out about it?

Revision Guide Page		Web Links
		Bitesize Balancing Equations Relative Formula Mass YouTube Balancing Equations Video Relative Formula Mass Video
Higher	**Pg. 99; 123**	
Foundation	**Pg. 99; 123**	
Triple Chemistry	**Pg. 15; 41**	

Step 3 What can I do to help me learn it?



Complete the relevant questions in your CGP Science Workbook

Higher	**Pages 94; 122**
Foundation	**Pages 84; 108**
Triple Chemistry	**Pages 4; 35**

TASK 1- Balance the following equations;

1. $Mg + O_2 \rightarrow MgO$
2. $Na + H_2O \rightarrow NaOH + H_2$
3. $Na + Cl_2 \rightarrow NaCl$
4. $Cl_2 + KI \rightarrow I_2 + KCl$
5. $Cl_2 + KBr \rightarrow Br_2 + KCl$
6. $Al + O_2 \rightarrow Al_2O_3$

TASK 2- Calculate the relative formula mass of the following;

1. MgO
2. $NaOH$
3. $MgCl_2$
4. Al_2O_3
5. $C_6H_{12}O_6$

TASK 3- State what is meant by the conservation of mass

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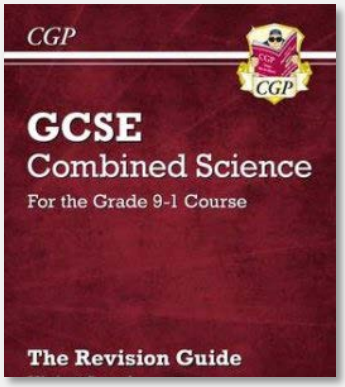
Year 10

Ensure you can explain how to calculate the concentration of a solution in g/dm^3 and mol/dm^3 (Mol HT only)

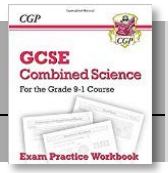
Step 1 What do I need to know?

- How to calculate the mass of solute in a given volume of solution of known concentration in terms of mass per given volume of solution
- (HT only) How the mass of a solute and the volume of a solution is related to the concentration of the solution.
- How to covert between cm^3 and dm^3. 1dm^3 = 1000cm^3

Step 2 How do I find out about it?

Revision Guide Page		Web Links
		Bitesize Concentration Calculations YouTube Concentration Video
Higher	Pg. 128	
Foundation	Pg. 126	
Triple Chemistry	Pg. 47	

Step 3 What can I do to help me learn it?



Complete the relevant questions in your CGP Science Workbook

Higher	Page 129
Foundation	Page 111
Triple Chemistry	Page 44

TASK 1- Convert the following units; a) 1dm^3 into cm^3 b) 5dm^3 into cm^3 c) 1500cm^3 into dm^3

TASK 2- State the equation that links concentration, mass and volume. Include units for each part of the equation

TASK 3- Work out the following (Do not forget to include units!)

i) How many moles are in 100 cm^3 of a 2 mol/dm^3 solution?
ii) What is the concentration in mol/dm^3 of a solution containing 1 mol solute in a 250 cm^3 solution?
iii) A sample of a 0.5 mol/dm^3 solution contains 0.1 mol solute. What is its volume in dm^3?
iv) What is the concentration of a solution in mol/dm^3 if it contains 0.01 mol of solute in a 500 cm^3 solution?
v) How many moles of solute are in 50 cm^3 of a 2.0 mol/dm^3 solution?
vi) What is the concentration in mol/dm^3 of a solution containing 0.25 mol solute in a 250 cm^3 solution?

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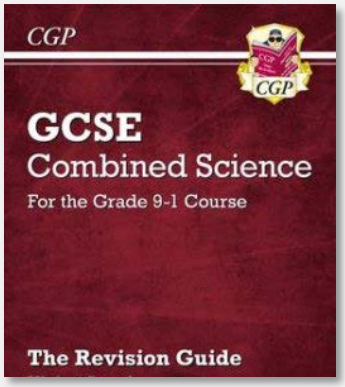
Year 10

Develop your understanding of the Mole concept, including the calculation of reacting masses **(HT)**

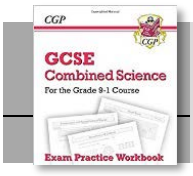
Step 1 What do I need to know?

- HT- Chemical amounts are measured in moles.
- HT- The symbol for the unit mole is mol.
- HT- The mass of one mole of a substance in grams is numerically equal to its relative formula mass.
- HT- One mole of a substance contains the same number of the stated particles, atoms, molecules or ions as one mole of any other substance.
- HT- The number of atoms, molecules or ions in a mole of a given substance is the Avogadro constant.
- HT- The value of the Avogadro constant is 6.02×10^{23} per mole.
- HT- You should understand that the measurement of amounts in moles can apply to atoms, molecules, ions, electrons, formulae and equations, for example that in one mole of carbon (C) the number of atoms is the same as the number of molecules in one mole of carbon dioxide (CO_2).
- The masses of reactants and products can be calculated from balanced symbol equations.
- Chemical equations can be interpreted in terms of moles. For example: Mg + 2HCl $MgCl_2$ + H_2 shows that one mole of magnesium reacts with two moles of hydrochloric acid to produce one mole of magnesium chloride and one mole of hydrogen gas.
- Be able to calculate the masses of substances shown in a balanced symbol equation
- Calculate the masses of reactants and products from the balanced symbol equation and the mass of a given reactant or product.
- The balancing numbers in a symbol equation can be calculated from the masses of reactants and products by converting the masses in grams to amounts in moles and converting the numbers of moles to simple whole number ratios.
- You should be able to balance an equation given the masses of reactants and products.
- You should be able to change the subject of the equation Moles = Mass/ Molar Mass
- In a chemical reaction involving two reactants, it is common to use an excess of one of the reactants to ensure that all of the other reactant is used. The reactant that is completely used up is called the limiting reactant because it limits the amount of products.
- You should be able to explain the effect of a limiting quantity of a reactant on the amount of products it is possible to obtain in terms of amounts in moles or masses in grams.

Step 2 How do I find out about it?

Revision Guide Page		Web Links
		Bitesize Moles and Avogadro's Constant Reacting Masses YouTube Calculating Moles Using Moles to Balance Equations Reacting Masses
Higher	**Pg. 124-127**	
Foundation	**N/A**	
Triple Chemistry	**Pg. 42-45**	

Step 3 What can I do to help me learn it?



Complete the relevant questions in your CGP Science Workbook	Higher	Pages 123-128
	Foundation	N/A
	Triple Chemistry	Pages 36-41

TASK 1- Define the term 'mole' and state its units

TASK 2- State how many particles there are in 1 mole of water, H_2O

TASK 3- State the equation that links moles, mass and molar mass. Use a formula triangle to show how this can be rearranged

TASK 4- Calculate the number of moles of iron chloride ($FeCl_3$) in 150g

Task 5- A 0.050 mol sample of a hydrocarbon was burned in excess oxygen. The products were 3.60g of water and 6.60g of carbon dioxide. Calculate the number of moles of carbon dioxide produced

Task 6- Magnesium sulphate can be made from magnesium and dilute sulphuric acid.

This is the equation for the reaction. $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

Calculate the mass of magnesium sulphate that would be obtained from 4g of magnesium. (Show your working.)

Task 7- The balanced equation for the reaction between Magnesium and Hydrochloric acid is:

$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$

Calculate the mass of magnesium required to produce 0.50 g of hydrogen.

Show clearly how you work out your final answer and give the unit.

TASK 8- The equation for this reaction is shown below.

$C_7H_6O_3 + C_4H_6O_3 \rightarrow C_9H_8O_4 + CH_3COOH$
salicylic acid aspirin

Calculate the maximum mass of aspirin that could be made from 2.00 g of salicylic acid.

The relative formula mass (M_r) of salicylic acid, $C_7H_6O_3$, is 138

The relative formula mass (M_r) of aspirin, $C_9H_8O_4$, is 180