O level chemistry formula sheet pdf

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Every Compound can be represented by a formula. There are 3 types of formula: Empirical Formula –> Simplest whole number ratio of atoms present Molecular Formula –> Total number of atoms in one molecule Structural Formula –> Shows how the atoms are linked together in a molecule Note: => Structural Formula DOES NOT give the molecular shape Related Articles: O Level Chemistry: Mole Concepts / Chemical Calculations More Error in Marshall Cavendish GCE O-Level Chemistry Matters Textbook – Part 2 O Levels Chemistry Questions – Mole Calculations / Mole Concepts O Level Chemistry: Elements, Compounds & Mixture O Level Chemistry – Basicity of Acids

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O Level Chemistry Chap 10: Chemical Calculations Basic Chemical Calculations 1) $2Mg\ (s) + O_2\ (g) \rightarrow 2MgO\ (s)$ means that ∙   2 mol/48g of magnesium reacts with 1 mol/32g of oxygen to produce 2 mol/80g of magnesium oxide. 2) $1dm^3 = 1000cm^3$ Therefore, $50cm^3 =$ $dm^3 = 0.05dm^3$ and $50dm^3 = 50 \times 1000 = 50000cm^3$ 2) Example: Calculate the mass of water produced in the complete combustion of 4g of methane, given the equation: $CH_4\ (g) + 2O_2\ (g) \rightarrow CO_2\ (g) + 2H_2O\ (l)$ Amt of CH4 = = 0.25 mol According to the eqn, 1 mol of CH4 forms 2 mol of H2O. 0.25 mol of CH4 forms 0.5 mol of H2O. Mass of water produced = 0.5mol x 18 = 9g 3) For chemical calculations involving gases, we can use the volume of the gas to compare the ratio of the reactants and products (change moles to volume). This is because the volume of gas is proportional to its number of moles. [For gases to compare volume only!] 4) Example: Hydrogen reacts with water to form water according to the equation below. Given that the volume of hydrogen is 10cm3, calculate (a)   the volume of oxygen gas required for the reaction (b)   the amount of water (in moles) produced. $2H_2 + O_2 \rightarrow 2H_2O$ (a) According to the eqn, 2 mol of hydrogen reacts with 1 mol of oxygen. Volume of oxygen required = = 5cm3 (b) Amt of hydrogen reacted = ≈ 4.167 x 10-4 mol According to the eqn, 2 mol of hydrogen forms 2 mol of water. Amt of water produced = 4.167 x 10-4 mol Concentration of solutions 5) The concentration of a solution is the amount of solute dissolved per unit volume in a solution. 6) Note: Concentration in mol/dm3 is also known as molar concentration (M). 7) Example: A 50cm3 solution is formed by 8g of NaOH. Calculate (a)   the concentration in g/dm3 (b)   the molar concentration (mol/dm3), using your answer in (a) (c)   the mass of NaOH in 75cm3 of the solution. (a) Concentration (g/dm3) =   =160g/dm3 (b) Concentration (mol/dm3) = = 4mol/dm3 (c) Mass of NaOH = concentration x volume = = 12g Limiting Reactant 8) Limiting reactant is the reactant that is completely used up in a reaction and which limits the amount of products formed. 9) Example: Zinc reacts with hydrochloric acid according to the equation below. $Zn\ (s) + 2HCl\ (aq) \rightarrow ZnCl_2\ (aq) + H_2\ (g)$ Given that 0.05mol of Zn and 0.075mol of hydrochloric acid, a)   Identify the limiting reactant. Calculate the amount (in moles) of excess reactant which remained unreacted. b)   Calculate the mass of ZnCl2 produced. a) According to the eqn, 1 mol of Zn reacts with 2 mol of HCl. 0.05mol of Zn reacts with 0.10mol of HCl. HCl is the limiting reactant. Amt of Zn in excess = 0.05 – 0.0375 = 0.0125mol b) According to the eqn, 2mol of HCl forms 1mol of ZnCl2. 0.075mol of HCL forms 0.0375mol of ZnCl2. Mass of ZnCl2 = 0.0375 x [65+2(35.5)] =5.1g 10) Example: A mixture of 8.0g of hydrogen and 8.0g of oxygen is ignited according to the given equation. Calculate the mass of water formed. $2H_2\ (g) + O_2\ (g) \rightarrow 2H_2O\ (l)$ Amt of H2 = = 4mol Amt of O2 = = 0.25mol According to the eqn, 2mol of H2 reacts with 1 mol of O2. 4mol of H2 reacts with 2mol of O2. O2 is the limiting reactant. According to the eqn, 1 mol of O2 forms 2 mol of H2O. Amt of H2O formed = 0.25 x 2 = 0.5mol Mass of H2O formed = 0.5 x 18   =9g Percentage yield and purity 11) The actual yield is always lower than the theoretical yield (calculated yield according to an eqn) due to: ∙   Impure reactants ∙   Human error (transferring of solutions), ∙   Loss of reactants and products through evaporation ∙   Reversible reactions 12) 13) Example: When 128g of sulphur dioxide was reacted with excess oxygen, 140g of sulphur trioxide was produced. $2SO_2 + O_2 \rightarrow 2SO_3$ Calculated the percentage yield of sulphur dioxide. Amt of SO2 = = 2mol According to the eqn, 2mol of SO2 forms 2 mol of SO3. Theoretical mass of SO3 = 2 x [32+3(16)] = 160g % yield = x 100% = x 100% = 87.5% 14) When excess hydrochloric acid was added to 6g of impure calcium carbonate, 1200cm3 of gas was produced. $CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$ Calculate the percentage purity of the calcium carbonate sample. Amt of CO2 produced = = 0.05mol According to the eqn, 1 mol of CaCO3 forms 1mol of CO2. 0.05mol of CaCO3 forms 0.05mol of CO2. % purity of CaCO3 = = x 100% = 83.3% (3sf) 15) A 5.00g sample of copper was contaminated with copper (II) oxide, which was found to react with 0.020mol of hydrochloric acid. $CuO\ (s) + 2HCl\ (aq) \rightarrow CuCl_2\ (aq) + H_2O\ (l)$ Calculate the percentage purity of copper metal in the sample. According to the eqn, 1mol of CuO reacts with 2mol of HCl. 0.010mol of CuO reacts with 0.020mol of HCl. Mass of CuO = 0.010 x (64+16) = 0.80g Mass of pure copper = 5.00g – 0.80g = 4.2g % purity of copper metal = x 100%   = 84% Notes:

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