Chemistry Stoichiometry Problem Sheet 2 Answer Key

Chemistry Stoichiometry Problem Sheet 2 Answer Key Chemistry Stoichiometry Problem Sheet 2 Answer Key This answer key provides detailed solutions and explanations for the problems presented in Chemistry Stoichiometry Problem Sheet 2 The problems focus on key concepts in stoichiometry including Mole conversions Converting between grams moles and particles atoms molecules or formula units Balancing chemical equations Ensuring the number of atoms of each element is equal on both sides of the equation Stoichiometric calculations Using mole ratios from balanced equations to determine the amount of reactants or products involved in a reaction Limiting reactants Identifying the reactant that limits the amount of product that can be formed Percent yield Calculating the efficiency of a reaction based on the actual yield obtained compared to the theoretical yield Problem 1 Mole Conversions a How many moles are in 250 g of sodium chloride NaCl Solution 1 Molar mass Find the molar mass of NaCl Na 2299 gmol Cl 3545 gmol 5844 gmol 2 Conversion Use the molar mass to convert grams to moles 250 g NaCl 1 mol NaCl 5844 g NaCl 0427 mol NaCl b How many grams are in 0750 mol of carbon dioxide CO_2 Solution 1 Molar mass Find the molar mass of CO_2 C 1201 gmol 2O 1600 gmol 4401 gmol 2 Conversion Use the molar mass to convert moles to grams 2 0750 mol CO_2 4401 g CO_2 1 mol CO_2 330 g CO_2 c How many particles are in 150 mol of water H_2O Solution 1 Avogadros number Use Avogadros number 6022 x 1023 particlesmol to convert moles to particles 150 mol H_2O 6022 x 1023 molecules H_2O 1 mol H_2O 903 x 1023 molecules H_2O Problem 2 Balancing Chemical Equations Balance the following chemical equation CH_4 O_2 CO_2 H_2O Solution 1 Count atoms On the reactant side we have 1 C 4 H and 2 O On the product side we have 1 C 2 H and 3 O 2 Adjust coefficients To balance the equation we need to adjust the coefficients in front of each molecule CH_4 $2O_2$ CO_2 $2H_2O$ 3 Recount atoms Now we have 1 C 4 H and 4 O on both sides of the equation Problem 3 Stoichiometric Calculations Consider the balanced equation 2Na Cl_2 2NaCl a How many grams of sodium chloride NaCl can be produced from 500 g of sodium Na Solution 1 Molar mass Find the molar masses of Na 2299 gmol and NaCl 5844 gmol 2 Convert grams to moles 500 g Na 1 mol Na 2299 g Na 0217 mol Na 3 Use mole ratio The balanced equation shows a 22 mole ratio between Na and NaCl This means 0217 mol Na will produce 0217 mol NaCl 4 Convert moles to grams 0217 mol NaCl 5844 g NaCl 1 mol NaCl 127 g NaCl b How many grams of chlorine gas Cl_2 are required to react completely with 100 g of sodium Na Solution 1 Convert grams to moles 100 g Na 1 mol Na 2299 g Na 0435 mol Na 2 Use mole ratio The balanced equation shows a 21 mole ratio between Na and Cl_2 This 3 means 0435 mol Na will react with 0217 mol Cl_2 3 Convert moles to grams 0217 mol Cl_2 7090 g Cl_2 1 mol Cl_2 154 g Cl_2 Problem 4 Limiting Reactants Suppose 200 g of magnesium Mg reacts with 300 g of oxygen O_2 according to the following balanced equation 2Mg O_2 2MgO a Which reactant is the limiting reactant Solution 1 Convert grams to moles 200 g Mg 1 mol Mg 2431 g Mg 0823 mol Mg 300 g O_2 1 mol O_2 3200 g O_2 0938 mol O_2 2 Determine limiting reactant Mg to MgO ratio 2 moles Mg 2 moles MgO 11 O_2 to MgO ratio 1 mole O_2 2 moles MgO 12 Calculate moles of MgO produced 0823 mol Mg 2 mol MgO 2 mol Mg 0823 mol MgO 0938 mol O_2 2 mol MgO 1 mol O_2 1876 mol MgO The limiting reactant is Mg as it produces less MgO b How many grams of magnesium oxide MgO can be produced Solution 1 Use limiting reactant Since Mg is the limiting reactant we use its moles 0823 mol to calculate MgO production 2 Convert moles to grams 0823 mol MgO 4030 g MgO 1 mol MgO 332 g MgO Problem 5 Percent Yield In a reaction 150 g of sodium chloride NaCl is theoretically expected However only 125 g of NaCl is actually produced What is the percent yield Solution 1 Percent yield formula Percent yield actual yield theoretical yield 100 2 Plug in values Percent yield 125 g 150 g 100 833 Conclusion This answer key provides a comprehensive understanding of the concepts and calculations involved in stoichiometry By working through these problems and understanding the 4 explanations you can gain a strong foundation in solving stoichiometry problems in chemistry Remember to Always balance chemical equations before performing any stoichiometric calculations Use mole ratios from balanced equations to determine the amounts of reactants and products involved Identify the limiting reactant to determine the maximum amount

of product that can be formed Calculate percent yield to assess the efficiency of a reaction Stoichiometry is a crucial aspect of chemistry enabling us to predict and analyze chemical reactions With practice and a solid understanding of the concepts you can master this important skill

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