Limiting reactant practice problems and answers

Take reaction: NH3 + O2 NO + H2O. In one experiment, 3.25 g of NH3 are allowed to react with 3.50 g of O2. A. Which reagent is the limiting reagent? O2 B. How many grams of NO are formed? 2.63 g NO c. How much of the excess reagent remains after the reaction? 1.76 g NH3 left If 4.95 g of ethylene (C2H4) are burned with 3.25 g of oxygen. A. What is the limiting reagent? O2 B. How many grams of CO2 are formed? 2.98 g CO2 Consider the reaction of C6H6 + Br2 C6H5Br + HBr a. What is the theoretical yield of C6H5Br if 42.1 g of C6H6 react with 73.0 g of R$ 2? 71.6 g C6H5Br b. If the actual yield of C6H5Br is 63.6 g, what is the percentage yield? 88.8% Use the following reaction: C4H9OH + NaBr + H2SO4 C4H9Br + NaHSO4 + H2O If 15.0 g of C4H9OH react with 22.4 g of NaBr and 32.7 g of H2SO4 to yield 17.1 g of C4H9Br, what is the percentage of yield of this reaction? 61.6% Silicon nitride (Si3N4) is made by a gas itself and nitrogen (N2) combined at a high temperature. How much (in g) Is it necessary to react with an excess of nitrogen gas to prepare 125 g of silicon nitride if the percentage yield of the reaction is 95.0%? 79.1 g Si Wine oil occurs when ethanol is converted into acetic acid by oxygen by the following reaction: C2H5OH + O2 CH3COOH + H2O. A 1.00 L bottle of wine, labeled as 8.5% (by volume) of ethanol, is with a defective seal. The 1.00 mL analysis showed that there were 0.0274 grams of acetic acid in those 1.00 mL. The ethanol density is 0.816 g/mL and the water density is 1.00 g/mL. A. What mass of oxygen must have leaked into the bottle? 14.6 g O2 b. What is the percentage yield for converting ethanol to acetic acid if O2 is in excess? 30.3% A reaction vessel contains 5.77 g of P4 and 5.77 g of O2. The following reaction occurs: P4 + O2 P4O6. If enough oxygen is available, the P4O6 reacts further: P4O6 + O2 P4O10. A. What is the limiting reagent for p4o10 formation? O2 B. What mass of P4O10 is produced? P4O10 c 5.78 g. What excess reagent mass is left in the reaction container? 5.76 g P4O6 remain If you are seeing this message, it means that we are having trouble loading external resources on our site. If you are behind a web filter, make sure that the *.kastatic.org and *.kasandbox.org domains are unlocked. If you are seeing this message, it means that we are having trouble uploading external resources to our website. If you are behind a web filter, make sure that the *.kastatic.org and *.kasandbox.org domains are unlocked. Related Topics: More Lessons for IGCSE Chemistry Lessons and Experiments (KS3/Checkpoint 1) More Science Lessons (KS3/Checkpoint 2) A series of free IGCSE Chemistry activities and experiments .C.I. Chemistry. The following stochiometry road map gives a summary of how to use stochiometry to calculate mols, masses, volumes, and in a chemical reaction with limiting reagents and excesses. Scroll through the page for more examples and solutions. Stochiometry - Limitation and Excess Excess Introduction to Limiting Reagent and Excess Reagent The limiting or limiting reagent is the first reagent to get used to a chemical reaction. Once the limiting reagent is used, the reaction has to stop and cannot continue and there are extra of the other reagents left over. They're called over-reagents. We'll learn about limiting reagents and limiting the reagent by comparing chemical reactions to cooking recipes and we'll look at a real stochiometry problem. Example: What is the largest amount of NH3 (in mols) that can be done with 3.2 mols of N2 and 5.4 mols of H2? What is the limiting reagent? Which reagent is in excess and how many warts are left? Show Step-by-Step Solutions Limiting The Desercionary Practice Problem (mols) To resolve stomyometry issues with reagent limitation or reagent limiting: 1. Find out which of the reagents is the limiting reagent or limiting reagent. 2. See how much product can be formed using the maximum amount of limiting reagent or limiting reagent. 3. Excess reagent is what's left after all the limiting reagent has been used. Example: 1. What is the highest amount of MgO (in mols) that can be done with 7.8 mg mols and 4.7 mols of O2? What is the limiting reagent? Which reagent is in excess and how many warts are left? Show Step-by-Step Solutions Limiting The Reactive Problem (grams) Example: 1. What is the largest amount of AlCl3 (in grams) that can be done with 114 grams of Al and 186 grams of CL2? What is the limiting reagent? Which reagent is in excess, and how many grams are left? Show Step by Step Solutions Questions: 1. Take the reaction: NH3 + O2 → NO + H2O. In one experiment, 3.25 g of NH3 are allowed to react with 3.50 g of O2. A. Which reagent is the limiting reagent? B. How many grams of NO are formed? c. How much of the excess reagent remains after the reaction? 2. If 4.95 g of ethylene (C2H4) is burned with 3.25 g of oxygen. A. What is the limiting reagent? B. How many grams of CO2 are formed? 3. A reaction vessel contains 5.77 g of P4 and 5.77 g of O2. The following reaction occurs: P4 + O2 → P4O6. If enough oxygen is available, the P4O6 reacts further: P4O6 + O2 → P4O10. A. What is the limiting reagent for p4o10 formation? B. What mass of P4O10 is produced? c. What excess reagent mass is left in the reaction vessel? Answers Show Solutions 1. a. O2 b. 2.63 g NO c. 1.76 g NH3 left 2. a. O2 b. 2.98 g CO2 3. a. O2 b. 5.78 g P4O10 c. 5.76 g P4O10 remain Try the free mathway calculator and troubleshooter below to practice various mathematical topics. Try the data examples or type your own problem and check your answer with step-by-step explanations. We welcome your comments, comments and questions on this site or page. Send your comments or questions via our Comments page. A balanced chemical equation shows molar amounts of reagents that will react together produce molar quantities of products. In the real world, reagents are rarely reunited with the exact amount required. A reagent will be completely used in front of the others. The reagent used first is known as the limiting reagent. The other reagents are partially consumed where the remaining amount is considered to be in excess. This sample problem demonstrates a method for determining the limiting reagent of a chemical reaction. Sodium hydroxide (NaOH) reacts with phosphoric acid (H3PO4) to form sodium phosphate (Na3PO4) and water (H2O) by reaction: 3 NaOH(aq) + H3PO4(aq) → Na3PO4(aq) + 3 H2O(l) If 35.60 grams of NaOH are reacted with 30.80 grams of H3PO4, a. How many grams of Na3PO4 are formed?b. What is the limiting reagent?c. How many grams of excess reagent remains when the reaction is complete? Useful information: NaOH molar mass = 40.00 grams H3PO4 mass = 98.00 grams Na3PO4 mass = 163.94 grams To determine the limiting reagent, calculate the amount of product formed by each reagent. The reagent that produces the least amount of product is the limiting reagent. To determine the number of grams of Na3PO4 formed: grams Na3PO4 = (reagent grams) x (mol reagent mass/reagent molar) x (mole ratio: product/reagent) x (product molar mass/soft product) Amount of Na3PO4 formed from 35,000 60 grams of Na OOH grams Na3PO4 = (35.60 g NaOH) x (1 mol NaOH/40.00 g NaOH) x (1 mol Na3PO4/3 mol NaOH) x (163.94 g Na3PO4/1 mol Na3 PON4)grams of Na3PO4 = 48.64 grams Amount of Na3PO4 formed from 30.80 grams of H3PO4 grams Na3PO4 = (30.80 g H3PO4) x (1 mol H3PO4/98.00 grams H3 PO4) x (1 mol Na3PO4/1 mol H3PO4) x (163.94 g Na3PO4/1 mol Na3PO4)grams Na3PO4 = 51.52 grams Sodium hydroxide formed less product than phosphoric acid. This means that sodium hydroxide was the limiting reagent and 48.64 grams of sodium phosphate is formed. To determine the amount of excess reagent remaining, the amount used is required. grams of reagent used = (grams of formed product) x (1 mol product mass/product molar) x (soft reagent/product ratio) x (reagent molar mass)grams of H3PO4 used = (48.64 grams Na3PO4) x (1 mol Na3PO4/163.94 g Na3PO4) x (1 mol H3PO4/1 mol Na3PO4) x (98 g H3PO4/1 mol)grams of H3PO4 used = 29.08 grams This number can be used to determine the remaining amount of excess reagent. Grams Remaining H3PO4 = initial grams H3PO4 - h3po4 grams ugrams H3PO4 remaining = 30.80 grams - 29.08 grams Remaining H3PO4 = 1.72 grams When 35.60 grams of NaOH is reacted with 30.80 grams of H3PO4, a. 48.64 grams of Na3PO4 are formed.b. NaOH was the reactive limiting.c. 1.72 grams of H3PO4 remain at completion. Take reaction: NH3 + O2 NO + H2O. In one experiment, 3.25 g of NH3 are allowed to react with 3.50 g of O2. A. Which reagent is the limiting reagent? O2 B. How many grams of NO are 2.63 g NO c. How much of the excess reagent remains after the reaction? 1.76 g NH3 left If 4.95 g ethylene ethylene burned with 3.25 g of oxygen. A. What is the limiting reagent? O2 B. How many grams of CO2 are formed? 2.98 g CO2 Consider the reaction of C6H6 + Br2 C6H5Br + HBr a. What is the theoretical yield of C6H5Br if 42.1 g of C6H6 react with 73.0 g of R$ 2? 71.6 g C6H5Br b. If the actual yield of C6H5Br is 63.6 g, what is the percentage yield? 88.8% Use the following reaction: C4H9OH + NaBr + H2SO4 C4H9Br + NaHSO4 + H2O If 15.0 g of C4H9OH react with 22.4 g of NaBr and 32.7 g of H2SO4 to yield 17.1 g of C4H9Br, what is the percentage of yield of this reaction? 61.6% Silicon nitride (Si3N4) is made by a gas itself and nitrogen (N2) combined at a high temperature. 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What excess reagent mass is left in the reaction container? 5.76 g P4O6 remain