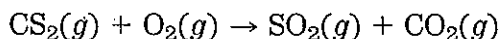


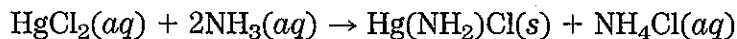
Problem Solving *continued*

8. Carbon disulfide, CS_2 , is an important industrial substance. Its fumes can burn explosively in air to form sulfur dioxide and carbon dioxide.

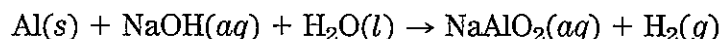


If 1.60 mol of CS_2 burns with 5.60 mol of O_2 , how many moles of the excess reactant will still be present when the reaction is over?

9. Although poisonous, mercury compounds were once used to kill bacteria in wounds and on the skin. One was called "ammoniated mercury" and is made from mercury(II) chloride according to the following equation:



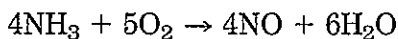
- a. What mass of $\text{Hg}(\text{NH}_2)\text{Cl}$ could be produced from 0.91 g of HgCl_2 assuming plenty of ammonia is available?
- b. What mass of $\text{Hg}(\text{NH}_2)\text{Cl}$ could be produced from 0.91 g of HgCl_2 and 0.15 g of NH_3 in solution?
10. Aluminum chips are sometimes added to sodium hydroxide-based drain cleaners because they react to generate hydrogen gas which bubbles and helps loosen material in the drain. The equation follows.



- a. Balance the equation.
- b. How many moles of H_2 can be generated from 0.57 mol Al and 0.37 mol NaOH in excess water?
- c. Which reactant should be limiting in order for the mixture to be most effective as a drain cleaner? Explain your choice.
11. Copper is changed to copper(II) ions by nitric acid according to the following equation:



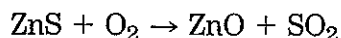
- a. How many moles each of HNO_3 and Cu must react in order to produce 0.0845 mol of NO_2 ?
- b. If 5.94 g of Cu and 23.23 g of HNO_3 are combined, which reactant is in excess?
12. One industrial process for producing nitric acid begins with the following reaction:



- a. If 2.90 mol NH_3 and 3.75 mol O_2 are available, how many moles of each product are formed?
- b. Which reactant is limiting if 4.20×10^4 g of NH_3 and 1.31×10^5 g of O_2 are available?
- c. What mass of NO is formed in the reaction of 869 kg of NH_3 and 2480 kg O_2 ?

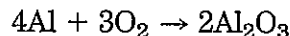
Problem Solving *continued***Additional Problems**

1. Heating zinc sulfide in the presence of oxygen yields the following:



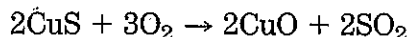
If 1.72 mol of ZnS is heated in the presence of 3.04 mol of O₂, which reactant will be used up? Balance the equation first.

2. Use the following equation for the oxidation of aluminum in the following problems.

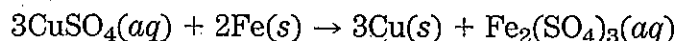


- Which reactant is limiting if 0.32 mol Al and 0.26 mol O₂ are available?
- How many moles of Al₂O₃ are formed from the reaction of 6.38×10^{-3} mol of O₂ and 9.15×10^{-3} mol of Al?
- If 3.17 g of Al and 2.55 g of O₂ are available, which reactant is limiting?

3. In the production of copper from ore containing copper(II) sulfide, the ore is first roasted to change it to the oxide according to the following equation:

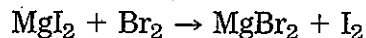


- If 100 g of CuS and 56 g of O₂ are available, which reactant is limiting?
 - What mass of CuO can be formed from the reaction of 18.7 g of CuS and 12.0 g of O₂?
4. A reaction such as the one shown here is often used to demonstrate a single replacement reaction.

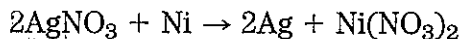


If you place 0.092 mol of iron filings in a solution containing 0.158 mol of CuSO₄, what is the limiting reactant? How many moles of Cu will be formed?

5. In the reaction $\text{BaCO}_3 + 2\text{HNO}_3 \rightarrow \text{Ba}(\text{NO}_3)_2 + \text{CO}_2 + \text{H}_2\text{O}$, what mass of Ba(NO₃)₂ can be formed by combining 55 g BaCO₃ and 26 g HNO₃?
6. Bromine replaces iodine in magnesium iodide by the following process:



- Which is the excess reactant when 560 g of MgI₂ and 360 g of Br₂ react, and what mass remains?
 - What mass of I₂ is formed in the same process?
7. Nickel replaces silver from silver nitrate in solution according to the following equation:



- If you have 22.9 g of Ni and 112 g of AgNO₃, which reactant is in excess?
- What mass of nickel(II) nitrate would be produced given the quantities above?