

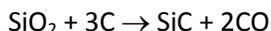
LIMITING REAGENT PROBLEMS

1. A 2 g of H₂ and 8 grams of O₂ are put in a closed container. How many grams of water can be obtained after the reaction?
2. 3 moles of SO₂ are allowed to react with 4 moles of O₂ to produce SO₃. How many moles of which gas are in excess?
3. 29.4 g of sulfuric acid reacted with 13 g of zinc. What is the volume of evolved gas in liters at STP?
4. 4.16 g of barium chloride is reacted with 39.2 g of 2.5 % sulfuric acid solution. What is the mass of barium sulfate produced in grams?
5. 3 moles of CS₂ and 5 moles of O₂ gases are reacted according to the following reaction.
$$\text{CS}_2 + 3\text{O}_2 \rightarrow \text{CO}_2 + 2\text{SO}_2$$
In order to allow all the gases to react, how many moles of which gas must be added?
6. After the reaction of a certain mass of nitrogen gas with 12 g of hydrogen gas 4 g of nitrogen remains unreacted. What is the initial mass of nitrogen gas?
7. 8 g of carbon and 8 g of oxygen are allowed to react with each other to form carbon dioxide. How many grams of which element remain unreacted?
8. $\text{Ca}(\text{CN})_2 + 3\text{H}_2\text{O} \rightarrow \text{CaCO}_3 + 2\text{NH}_3$ for the above reaction.
If 6 moles of each of the reactants are reacted
 - a. What is the excess reagent and how many grams is it?
 - b. What is the volume of the produced NH₃ at STP?
 - c. What is the mass of CaCO₃ that produced?
9. Equal masses for each of the elements Cu and S are reacted with each other by the following equation.
$$\text{Cu} + \text{S} \rightarrow \text{CuS}$$
What is the ratio of the mass of CuS produced to the mass of excess sulfur?
10. 8 grams of gas CO reacts with 28.4 grams of the gas Cl₂ in order to produce the gas COCl₂ in closed elastic container. What is the total volume of gases at STP in the container after the reaction? (C: 12 , O: 16 , Cl: 35.5)
11. 20 grams of Ca and 20 grams of Br₂ undergo reaction to produce CaBr₂. When one of the reactants is

- consumed up completely, how many grams of which of the compounds remains unreacted? (Ca: 40, Br:80)
12. When a sample of CaCO₃ is heated, 60% by mass of it decomposes and 6.72 L gas is produced at STP. How many grams of CaCO₃ remain unreacted?
 13. 3 moles of SO₂ gas reacts with 4 moles of O₂. Which one is the excess and how many moles is it?
 14. 0.02 moles of C₃H₄ reacts with 2.408·10²² O₂–molecules. How many grams of CO₂ is produced after the reaction?
 15. At the same conditions, 9 liters of N₂ and 9 liters of H₂ gases react in order to produce NH₃. Which gas will be excess and how many liters?
 16. Equal volumes of N₂ and H₂ gases are reacted to give NH₃ at the same conditions.
After one of the reactants is completely used V liter of NH₃ gas is produced. Which one of the reactants remains unreacted and how many V liters?
 17. How many grams of water can be produced at most when 4 g of hydrogen and 8 g of oxygen are reacted?
 18. 18 g of carbon and 8 g of oxygen are reacted to form carbon dioxide. Which element and how many grams remain behind?
 19. Equal weights of calcium and oxygen gas are reacted in a closed container to give 112 g of calcium oxide. Which element and how many grams will remain behind?
 20. Equal volumes of sulfur dioxide and oxygen gases are reacted to give 5 liters of sulfur trioxide at the same conditions. Which one remains unreacted and how many liters?
 21. What is the mole number of excess reagent when 36 g of pentane (C₅H₁₂) are burned with 112 L of oxygen at STP?
 21. How many liters of CH₄ gas at STP are obtained from the reaction of 3 moles of Al₄C₃ with 108 g of water? The equation of the reaction is:
$$\text{Al}_4\text{C}_3 + 12\text{H}_2\text{O} \rightarrow 3\text{CH}_4 + 4\text{Al}(\text{OH})_3$$
 23. The mixture of 2 mol of H₂ and 2 mol of O₂ gases are ignited to obtain water .Which reactant is limiting?

Which is the excess reactant? How much water will be produced?

24. Carborundum, SiC, is used as an abrasive. It is formed by the combination of SiO₂ and carbon, according to the reaction:



What mass of SiC is formed from 6 grams of SiO₂ and 6 grams of C?

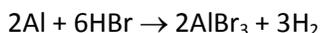
25. Given: $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$

If 20 L of N₂ and 15 L of H₂ gases at the same conditions are reacted, which gas will be excess and how many liters?

26. Given: $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$

3.01 × 10²³ molecules of nitrogen and 3.36 L of H₂ at STP are reacted. How many grams of NH₃ are produced?

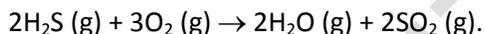
27. Aluminum and hydrogen bromide react according to the following reaction



If 4 mol and 9 mol of HBr are allowed to react

- which of the two reactants is the limiting one?
- How many moles of the excess reactant are left at the end of reaction?
- What is the maximum mole number of H₂ obtained?

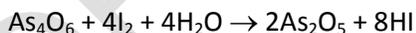
28. Given the reaction;



The quantities of reactants of the reaction are given below. For each of the following, determine the excess reactant and the maximum grams of water produced.

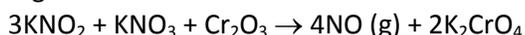
- 2 mol of H₂S and 4 mol of O₂
- 4 mol of H₂S and 6 mol of O₂
- 8.5 g of H₂S and 9.6 g of O₂
- 6.02 × 10²² H₂S molecules and 6.72 L O₂ at STP
- 4.48 L H₂S at STP and 19.2 g O₂
- 17.92 L H₂S at STP and 13.44 L O₂ at STP

28. Given the reaction:



what is the maximum grams of HI produced if 2 mol of each of the reactant are reacted? (HI: 128)

30. Nitric oxide, NO, is prepared according to the following reaction in laboratories



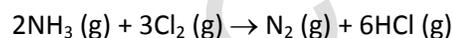
Calculate the maximum liters of NO at STP produced by the reaction if 100 g of each of the reactant?

31. Equal weights of sodium and chlorine gas are reacted in a closed container to give 0.1 mol of sodium chloride. Which element will remain behind and how many grams?

32. Equal moles of aluminum and oxygen are reacted to give 20.4 g of aluminum oxide. Which one remains unreacted and how many moles? (Al₂O₃: 102)

33. Equal volumes of sulfur dioxide and oxygen gases are reacted to give 5 liters of sulfur trioxide at the same conditions. Which one remains unreacted and how many liters?

34. Given reaction:

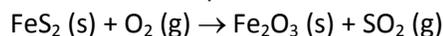


Determine the quantity in moles of the excess reactant in each of the following cases. Calculate the maximum number of moles of HCl for each case for which the amount of reactants are given below.

- 1 mol of NH₃ and 1.5 mol of Cl₂
- 7 mol of NH₃ and 9 mol of Cl₂
- 6 × 10²² NH₃ molecules and 21 × 10²² Cl₂ molecules
- 10.2 g of NH₃ and 134.9 g of Cl₂
- 1.12 L of NH₃ at STP and 4.48 L of Cl₂ at STP

35. Aluminum carbide, Al₄C₃, reacts with HCl to produce aluminum chloride and methane gas, CH₄. How many liters of CH₄ (g) at STP will be produced by the reaction of 0.2 mol of Al₄C₃ with 1.2 mol of HCl?

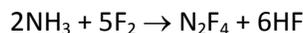
36. Given the skeleton equation:



Calculate the maximum mass of Fe₂O₃ produced when 24 g of FeS₂ is reacted with 16.8 L of O₂ at STP. Which of the two reactants is the limiting reactant? How much of the excess reactant is left at the end of reaction.

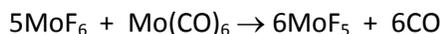
37. Balance the equation for the reaction of Mg₃N₂ with H₂O to form Mg(OH)₂ and NH₃. What is the maximum number of grams of NH₃ that can be produced from 1.00 g of Mg₃N₂ and 1.50 g of H₂O?

38. How many grams of N₂F₄ can theoretically be prepared from 17 g of NH₃ and 38 g of F₂? (N: 14, F: 19)
The chemical equation for the reaction is:



39. How many grams of beryllium fluoride, BeF₂, can be prepared from 18 g of beryllium and 19 g of fluorine?

40. What mass of MoF_5 is obtained from 42 g of MoF_6 and 66 g of $\text{Mo}(\text{CO})_6$ by the reaction :



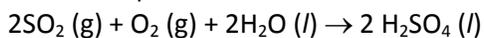
41. Given equations :



How many liters of chlorine gas at STP will be produced from 43.5 g of manganese dioxide and 36.5 g of hydrogen chloride?

42. When equal weights of X and Y are reacted to give one mole of the compound X_2Y_3 , 64 g of Y remains unreacted. If the atomic weight of Y is 16 g, what is the atomic weight of X?

43. Given the equation:



Calculate the maximum moles of H_2SO_4 produced by the reaction of 4 mol of SO_2 , 2 mol of O_2 , and 3 mol of H_2O .

44. Equal number of moles of iron and oxygen are reacted to form 32 g of iron (III) oxide. Which element and how many grams remain behind?

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