# Limiting Reagent Chemistry Questions with Solutions

**Q1. We can calculate the limiting reagent in a reaction by many factors, but which of the factors cannot help to determine the limiting reactant:**

a) Number of moles
b) Mass given
c) Volume given
d) Pressure given

**Correct Answer:** (d) Pressure given

**Q2. Silicon nitride ($Si_3N_4$) is made by combining Si and nitrogen gas ($N_2$) at a high temperature. How much (in g) Si is needed to react with an excess of nitrogen gas to prepare 125 g of silicon nitride if the percent yield of the reaction is 95.0%?**

a) 89 g
b) 79.1
c) 75 g
d) 90.8 g

**Correct Answer:** (b) 79.1 g

**Q3. What is a limiting reactant?**

a) The reactant that is used up first and prevents more product from being made.
b) The reactant that makes the product.
c) The reactant that is used up last and prevents more product from being made
d) The substance that is in excess that doesn't get used up as a reactant.

**Correct Answer:** (a) The reactant that is used up first and prevents more product from being made.

**Q4. In the following reaction:**
**$4NH_3(g) + 5O_2(g) \rightarrow 4NO(g) + 6H_2O(l)$**
**When 1 mole ammonia and 1 mole of $O_2$ are mixed, then the number of moles of NO formed will be:**

a) 0.8
b) 0.7
c) 0.6
d) 0.5

**Correct Answer:** (a) 0.8 mole

**Q5. 10 g of marble(calcium carbonate) was added to 15 g of dilute hydrochloric acid, product formed is calcium chloride, water and carbon dioxide. Which of the following is true?**

a) Hydrochloric acid is the limiting reactant
b) Hydrochloric acid is the excess reactant
c) Calcium carbonate is the excess reactant
d) None of the above

**Correct Answer:** (b) Hydrochloric acid is the excess reactant

**Q6. What is a Limiting reagent?**

**Answer.** A limiting reagent is a reactant that occurs in lower concentrations in a reaction. When it is consumed, the reaction will stop, regardless of the amount of reactant present in the reaction. It restricts the amount of product produced. In other words, it determines the magnitude of the reaction.

**Q7. $NO_2$ is formed when 0.740 g of $O_3$ reacts with 0.670 g of NO. What is the limiting reagent?**

**Answer.** $O_3 + NO \rightarrow O_2 + NO_2$
1 mole of $O_3$ reacts with 1 mole of NO.
0.74 g $O_3$ = 0.74 / 48 = 0.0154 mol $O_3$
0.67 g NO = 0.67 / 30 = 0.0223 mol NO
$O_3$ is the limiting reagent and NO is in excess.

**Q8. How do you determine which product is the limiting one?**

**Answer.** Compare the calculated amount of a reactant to the actual amount available to determine which reactant is the limiting one. If more is needed than what is available, it is the limiting reactant.

**Q9. If 4.95 g of ethylene ($C_2H_4$) are combusted with 3.25 g of oxygen. What is the limiting reagent?**

**Answer.** The limiting reagent would be $O_2$.

**Q10. Calculate the limiting reagent in $2H_2 + O_2 \rightarrow 2H_2O$**

**Answer.** Given 1 mol of hydrogen and 1 mol of oxygen in the reaction:
$2H_2 + O_2 \rightarrow 2H_2O$
The limiting reactant would be hydrogen because the reaction uses up hydrogen twice as fast as oxygen.

**Q11. 50.0 kg of $N_2$ (g) and 10.0 kg of $H_2$ (g) are mixed to produce $NH_3$ (g). Identify the limiting reagent in the production of $NH_3$ in this situation.**

**Answer.**
$N_2 + 3H_2 \leftrightarrows 2NH_3$
1 mol $N_2$ (g) requires 3 mol $H_2$ (g), for the reaction.
Hence, for 17.86 $\times 10^2$ mol of $N_2$, the moles of H2 (g) required would be 17.86 $\times 10^2$ mol $N_2$ × (3 mol $H_2$ (g)) / (1 mol $N_2$ (g)
= 5.36 $\times 10^3$ mol $H_2$
But we have only 4.96$\times 10^3$ mol $H_2$. Hence, dihydrogen is the limiting reagent

**Q12. What is the greatest amount of MgO (i moles) that can be made with 7.8 moles of Mg and 4.7 moles of $O_2$? Which is the limiting reagent?**

**Answer.** $2Mg + O_2 \rightarrow 2MgO$
For 7.8 moles of Mg = (1 moles of $O_2$ / 2 moles of Mg) × 7.8 mole Mg = 3.9 moles of $O_2$
For 4.7 moles of $O_2$ = (2moles of Mg / 1 mole of $O_2$) × 4.7 moles $O_2$ = 9.4 moles Mg.
Therefore, Mg is the limiting reagent.

**Q13. Calculate the amount of C formed in the reaction $2A + 4B \rightarrow 3C + 4D$ when 5 moles of A react with 6 moles of B.**

**Answer.** The balanced reaction is $2A + 4B \rightarrow 3C + 4D$
Moles given is 5 moles of A and 6 moles of B
Ratio of moles given and stoichiometry coefficients:
For A: 5/2 = 2.5
For B: 6/4 = 1.5
Since 1.5 is less than 2.5, B is the limiting reagent because it will be used first.
Therefore, the moles produced of C = ¾ = 4.5 mol.

**Q14 What would be the limiting reagent if 75 grams of $C_2H_3Br_3$ reacted with 50.0 grams of $O_2$ in the following reaction:**
**$4C_2H_3Br_3 + 11O_2 \rightarrow 8CO_2 + 6H_2O + 6Br_2$.**

**Answer.** Conversion to moles
75 g × (1mole / 266.72 g) = 0.28 mole $C_2H_3Br_3$
50 g × (1mole /32 g) = 1.56 mol $O_2$
To calculate how much $C_2H_3Br_3$ would be required if all the $O_2$ is used up:
1.56 mol $O_2$ × (4 mol $C_2H_3Br_3$ /11 mol $O_2$) = 0.567 mol $C_2H_3Br_3$
This shows that 0.567 mol $C_2H_3Br_3$ is needed to react with all of the oxygen. $C_2H_3Br_3$ is the limiting reagent because there is only 0.28 mol of it present.

**Q15. What would be the limiting reagent if 80.0 grams of $Na_2O_2$ reacted with 30.0 grams of $H_2O$ in the reaction?**
**$2Na_2O_2 + 2H_2O \rightarrow 4NaOH + O_2$**

**Answer.** 80 g $Na_2O_2$ × (1 mol $Na_2O_2$/77.98 g $Na_2O_2$) × (4moles NaOH / 2moles $Na_2O_2$) = 2.06 moles NaOH
30 g $H_2O$ × (1 mol $H_2O$/18g $H_2O$) × (4moles NaOH / 2moles $Na_2O_2$) = 3.33 moles NaOH
Since $Na_2O$ produces less NaOH than $H_2O$, it is the limiting reagent.

## Practise Questions on Limiting Reagent

**Q1. The reactant which is not consumed completely in the reaction is _____.**

**Answer.** Excess reactant.

**Q2. In a reaction: - $A + B_2 \rightarrow AB_2$**
**Identify the limiting reagent, if any, in the following reaction mixtures.**

(i) 300 atoms of A + 200 molecules of B
(ii) 2 mol A + 3 mol B
(iii) 100 atoms of A + 100 molecules of B
(iv) 5 mol A + 2.5 mol B
(v) 2.5 mol A + 5 mol B

**Answer.** The extent of a reaction is determined by a limiting reagent. During a reaction, the reactant is the first to be consumed, causing the reaction to stop and limiting the amount of products formed.

(i) In the given reaction, one atom of A reacts with one molecule of B. As a result, 200 molecules of B will react with 200 atoms of A, leaving 100 atoms of A unreacted. As a result, B is the limiting reagent.
(ii) The reaction states that 1 mole of A reacts with 1 mole of B. As a result, two moles of A will react with only two moles of B. As a result, only one mole of A will be consumed. As a result, A is the limiting reagent.
(iii) In the given reaction, 1 atom of A reacts with 1 molecule of B. As a result, all 100 A atoms will combine with all 100 B molecules. As a result, where no limiting reagent is present, the mixture is stoichiometric.
(iv) 1 mole of atom A and 1 mole of molecule B combine. As a result, 2.5 mole B will combine with only 2.5 mole A. As a result, 2.5 mole of A will remain unchanged. As a result, B is the limiting reagent.
(v) The reaction states that 1 mole of atom A combines with 1 mole of molecule B. As a result, 2.5 mole of A will combine with only 2.5 mole of B, leaving the remaining 2.5 mole of B. Hence, A is the limiting reagent.

**Q3. The reactant which is entirely consumed in the reaction is known as the limiting reagent. In the reaction 2A + 4B⟶ 3C + 4D, if 5 moles of A react with 6 moles of B then, which is the limiting reagent?**

a) A
b) B
c) C
d) D

**Correct Answer:** (b) B
**Explanation:** The balanced reaction is 2A + 4B ⟶ 3C+4D
Ratio of moles given and stoichiometry coefficients:
For A: 5/2 = 2.5
For B: 6/4 = 1.5
Since 1.5 is less than 2.5, B is the limiting reagent because it will be used first.

**Q4. If you have an actual yield of 29.3 grams of product and the theoretical yield is 35.0 grams, what is your percent yield?**

**Answer.** The reaction's actual yield is 29.3 grams, while the theoretical yield is 35.0 grams. When we calculate the percent yield, we get the following value.
% yield = (actual yield / theoretical yield) × 100
% yield = (29.3 g / 35 g) × 100
% yield = 83.7 %

**Q5. 6 g of $H_2$ reacts with 14 g of $N_2$ to form $NH_3$ until the reaction consumes the limiting reagent completely. The amount of another reactant remaining in g is:**

**Answer.** The balanced equation for the reaction is-
$N_2 + 3H_2 \longrightarrow 2NH_3$
28 g of $N_2$ is reacting with 6g of $H_2$ to give 34 g of $NH_3$
Given- 14 g of $N_2$ and 6g of $H_2$
The actually consumed quantity is 14 g of $N_2$ and 3g of $H_2$
So, nitrogen is the limiting reagent, therefore, the excess reagent left is 3g.