

Lab report 4: Limiting Reactant

Name:..... Section:.....
Students' ID:..... Date:.....

Pre- Laboratory Questions

1. Define the following terms:

a) Limiting Reactant

b) Excess Reactant

c) Filtrate **The liquid that passes through the filter paper during filtration, leaving the solid behind**

d) Precipitate **The solid that forms in a chemical reaction and settles at the bottom of the container because it is insoluble in the solution.**

2. If 2.00 g of $BaCl_2 \cdot 2H_2O$ (M.M. = 244.2 g/mol) is allowed to react with a 2.40 g of $Na_3PO_4 \cdot 12H_2O$ (M.M. = 380.2 g/mol) in a sufficient amount of water. Calculate the mass of the precipitate (M.M. = 601.9 g/mol) that is formed.



m	<u>2.00g</u>	<u>2.40g</u>
↓	244.2	380.2
n	<u>0.00819</u>	<u>0.00631</u>
↓	3	2
	<u>0.00273</u>	0.00316

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$$3BaCl_2 \rightarrow Ba_3(PO_4)_2$$

$$0.00819 \rightarrow ?$$

$$n Ba_3(PO_4)_2 = \frac{0.00819}{3}$$

$$= 0.00273$$

$$m = n * M.M$$

$$= 0.00273 * 601.9$$

$$= 1.64 g$$



Results and Calculations

A. Precipitation of $Ba_3(PO_4)_2$:

NO.	Term	Value	Error
1	Mass of salt mixture (m_1)		
2	Mass of empty filter paper (m_2)		
3	Mass of filter paper and $Ba_3(PO_4)_2$ (m_3)		

B. Determination of the Limiting Reactant:

- Limiting reactant in salt mixture is:
- Excess reactant in salt mixture is:

NO.	Term	Value	Error
1	Mass of $Ba_3(PO_4)_2$ precipitated ($m_3 - m_2$)		
2	Number of moles of $Ba_3(PO_4)_2$ precipitated (n_1)		

1. If the limiting reactant is $BaCl_2 \cdot 2H_2O$

NO.	Term	Value	Error
1	Number of moles of $BaCl_2 \cdot 2H_2O$ reacted (n_2)		
2	Number of moles of $Na_3PO_4 \cdot 12H_2O$ reacted (n_3)		
3	Mass of $BaCl_2 \cdot 2H_2O$ reacted (m_4)		
4	Mass of $Na_3PO_4 \cdot 12H_2O$ reacted (m_5)		
5	Mass of excess $Na_3PO_4 \cdot 12H_2O$ [$m_1 - (m_4 + m_5)$]		
6	Mass percentage of $BaCl_2 \cdot 2H_2O$		

2. If the limiting reactant is $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$

NO.	Term	Value	Error
1	Number of moles of $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ reacted (n_2)		
2	Number of moles $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ reacted (n_3)		
3	Mass of $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ reacted (m_4)		
4	Mass of $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ reacted (m_5)		
5	Mass of excess $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$ [$m_1 - (m_4 + m_5)$]		
6	Mass percentage of $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$		



Questions

1. Calculate the mass of $\text{Ba}_3(\text{PO}_4)_2$ produced from the reaction of 0.78 g $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$ with excess $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$. What is the purpose of heating the mixture in step 3 for 20 minutes?

We heat the mixture to coagulate the precipitate and allow it to form larger particles that can be easily filtered and weighed.

2. What is the purpose of washing the precipitate with hot water in step 4? How would the reported percentage of the excess reactant be affected if the precipitate was not washed in this step?

We wash the precipitate with hot water to remove any soluble impurities and excess reactant, ensuring a pure and accurate mass.

If the precipitate is not washed, the amount of excess will be lower so the percentage of excess will be low.