(Exp. #3)

ⓐ Tared mass of salt mixture. 1g

ⓑ mass of Filter Paper : 1g

ⓒ mass of Filter paper and $BaSO_4$ : 1.219g

ⓓ mass of $BaSO_4$ : ⓒ − ⓑ (1.21 − 1) = 0.219g

L.R :- $BaCl_2 \cdot 2H_2O$

E.R :- $Na_2SO_4$

① Moles $BaSO_4$ : $\#mol = \frac{mass}{M.mass\ (F.wt)} = \frac{0.219g}{233.38\ g/mol} = 8.99 \times 10^{-4}\ mol$

② moles For L.R = ① = $8.99 \times 10^{-4}$ mol

③ Mass For L.R ($BaCl_2 \cdot 2H_2O$) = #mol . M.mass

$8.99 \times 10^{-4} \times 244.27 = 0.2197$

④ moles of E.R ($Na_2SO_4$) that react = ① = $8.99 \times 10^{-4}$ mol

⑤ mass of E.R that react = #mol . M.mass = $8.99 \times 10^{-4} \times 142.04\ g/mol = 0.1276$

⑥ mass of original salt (mixture) = 1g

⑦ mass E.R that unreact. ⑥ − (⑤ + ③)

0.6533 ⑨

⑧ mass Percent of L.R in a mixture. = ③/⑥ = 0.219/1 × 100% = 21.9%

⑨ mass percent For E.R in the mixture = (⑤ + ⑦)/⑥ × 100% = (0.1276 + 0.6533)/1 × 100% = 78.1% = 0.781

Mass Percent % = mass of Component / Total mass (mixture) × 100%

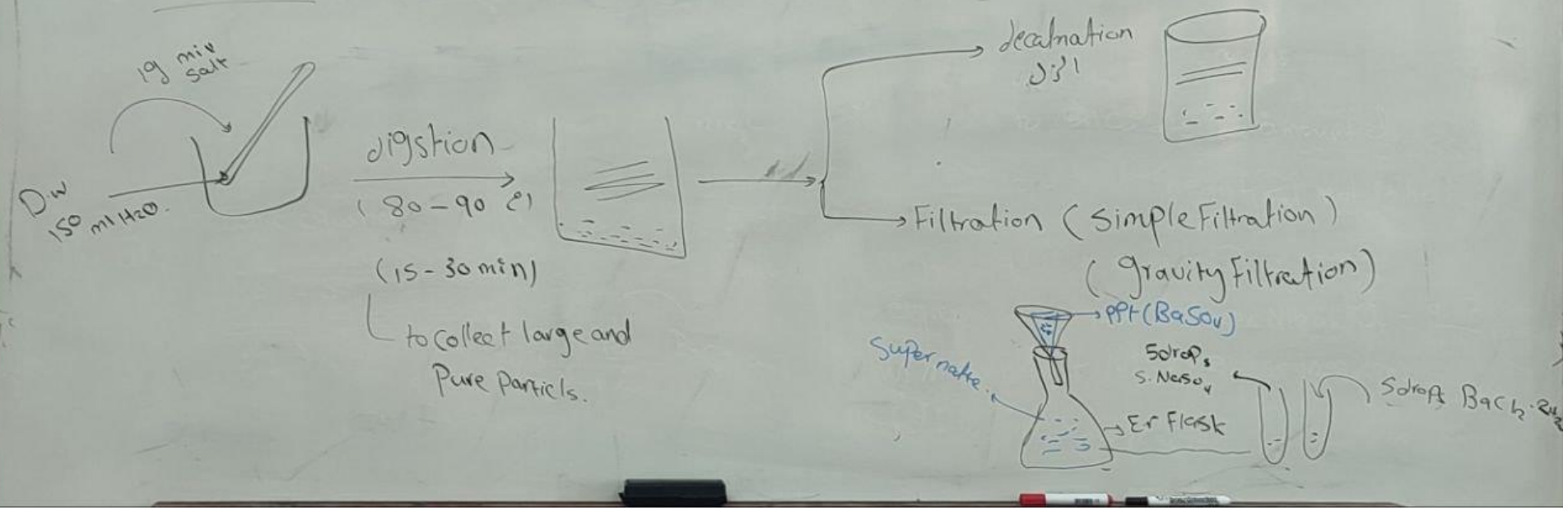
[mass ER = 100% − mass % L.R]

Exp. #3

19

Reaction of two water soluble two salts

$$Na_2SO_4 + BaCl_2 \cdot 2H_2O \longrightarrow BaSO_4\ (s) + 2NaCl + 2H_2O$$



Exp. #3

Reaction of two water soluble two salts

$$aA + bB \longrightarrow cC + dD$$

1 mol + 1 mol ⟶ 1 mol 1 mol

2 mol + 2 mol ⟶ 2 mol 2 mol

1 mol ½ mol ⟶ ½ mol ½ mol

(Theoritical mol ratio).

1 mol → Excess E.R → unreact

½ mol → B.L.R → react

mol ratio between $NH_3$ and $O_2$ = $\frac{0.117}{0.125}$ ≠ 0.936

That $NH_3$ is exist in excess amount

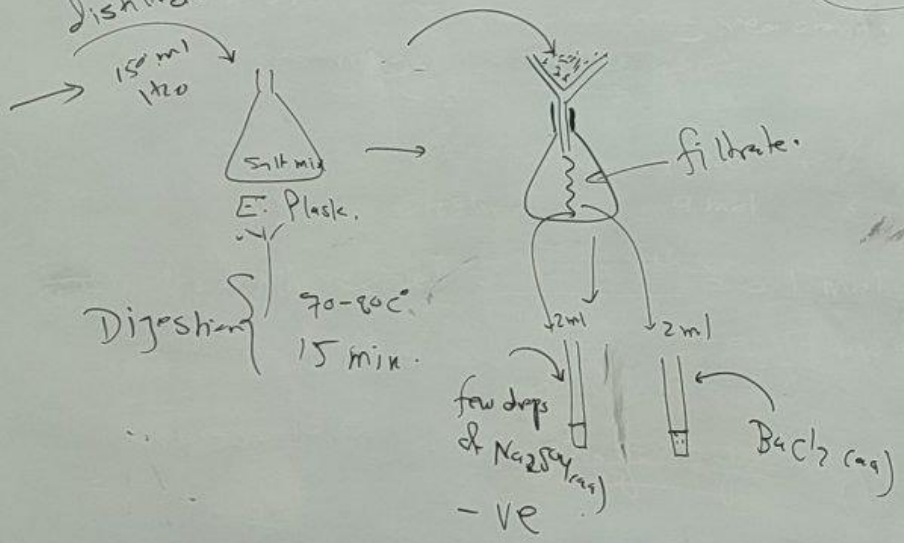
limiting reactant

Exp. #3

Reaction of two water soluble two salts,

$Na_2SO_{4(aq)} + BaCl_2 \cdot 2H_2O_{(aq)} \rightarrow BaSO_{4(s)}\downarrow + 2NaCl + 2H_2O$

1 mol  1 mol.  1 mol.




(Theoritical mol ratio)

mol ratio between $NH_3$ and $O_2$ = $\frac{0.117}{0.1}$

That $NH_3$ is exist in excess and $O_2$ is limiting reactant

Exp. #3

# Limiting Reactant.

Example: 2.0 g of $NH_3$ is reacted with 4.0 of $O_2$ to produce NO and $H_2O$

1- Write right Chemical equation.
2- Balance the Chemical equation.
3- Determine the Limiting reactant.

$$-2\left[2\,NH_3 + \tfrac{5}{2}O_2 \longrightarrow 2\,NO + 3H_2O\right]$$

$$4\,NH_3 + 5\,O_2 \longrightarrow 4\,NO + 6\,H_2O$$

4 mol  5 mol  4 mol  6 mol.

What is the mole ratio between $NH_3$ and $O_2$ $= \frac{4\text{ mol}}{5\text{ mol}} = 0.8$ (Theoritical mol ratio).

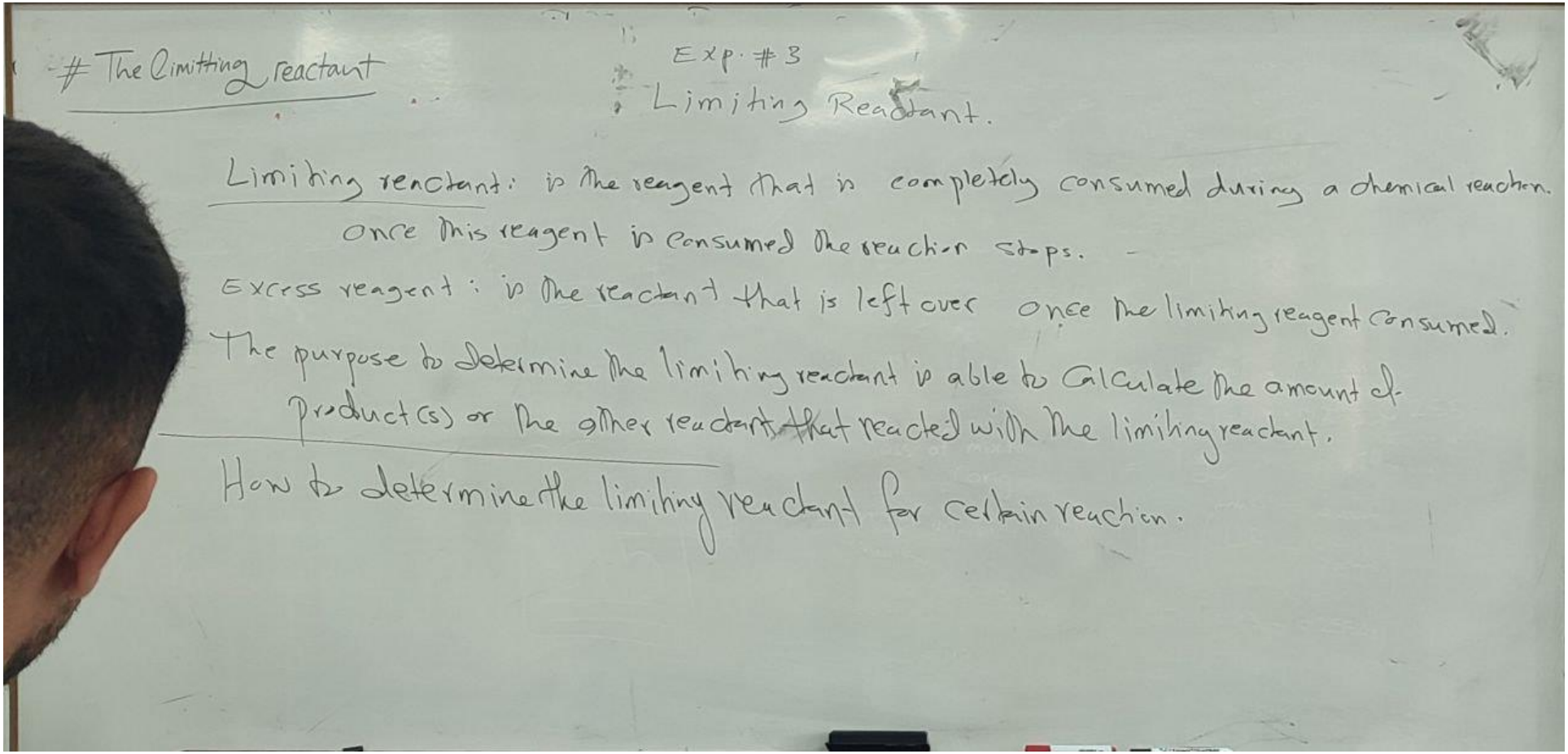
But # mols of $NH_3 = \frac{2.0}{17\text{ g/mol}} = 0.117$ mol

# mols of $O_2 = \frac{4.0}{32} = 0.125$ mol.

∴ The experimental mol ratio between $NH_3$ and $O_2 = \frac{0.117}{0.125} = 0.936$

This means that $NH_3$ is exist in excess amount

∴ $O_2$ is limiting reactant


# The limitting reactant
Exp. #3
Limiting Reactant.
Limiting reactant: is the reagent that is completely consumed during a chemical reaction.
once this reagent is consumed the reaction stops.
Excess reagent: is the reactant that is left over once the limiting reagent consumed.
The purpose to determine the limiting reactant is able to calculate the amount of product(s) or the other reactant that reacted with the limiting reactant.
How to determine the limiting reactant for certain reaction.