

To determine the yield of a reaction mass
of product is limiting reagent

$$\begin{aligned} \text{b) Amount left} &= \text{Given amt} - \text{amt needed} \\ &= 25.75 - 23.14 \\ &= 4.81 \text{ moles} \end{aligned}$$

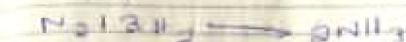
$$\begin{aligned} \text{Mass will be} \\ \text{No of moles} \times \text{molar mass} &= (4.81 \text{ moles}) \\ &= 142.4 \text{ g} \end{aligned}$$

$$\begin{aligned} \% \text{ Excess} &= \frac{\text{Mass left}}{\text{Initial mass}} \times 100 \\ &= \frac{142.4}{150} \times 100 \\ &= 94.93\% \end{aligned}$$

$$\begin{aligned} \text{c) 1 mole of } \text{Cl}_2 &\longrightarrow 1 \text{ mole of } \text{NaOCl} \\ 71 \text{ g of } \text{Cl}_2 &\longrightarrow 74.5 \text{ g of } \text{NaOCl} \\ 650 \text{ g of } \text{Cl}_2 &\longrightarrow 2 \text{ g} \\ \therefore \frac{74.5 \times 650}{71} \\ &= 694.90 \text{ g} \end{aligned}$$

$$\begin{aligned} \text{Degree Conversion} &= \frac{600}{694.90} = 0.863 \\ \text{d) Yield} &= \frac{600}{694.90} \times 100 = 86.3\% \end{aligned}$$

h) 5 moles of N_2



Initially 42.19 24.39 -

change -x -3x 100

3 moles

of moles of N_2 which reacted = $42.19 - 3$
= 7.19 moles

No of moles of H_2 which reacted

$$= 3 (\text{No of moles of } \text{N}_2) \\ = 3 (7.19) = 21.57 \text{ moles}$$

$$\begin{aligned} \text{No of moles of } \text{H}_2 \text{ left} &= 24.39 - 21.57 \\ &= 2.82 \text{ moles} \end{aligned}$$

$$\begin{aligned} \% \text{ conversion} &= \frac{21.57}{24.39} \times 100 = 88.4\% \\ &= \frac{21.57}{24.39} \times 100 = 88.4\% \end{aligned}$$

Q11.5

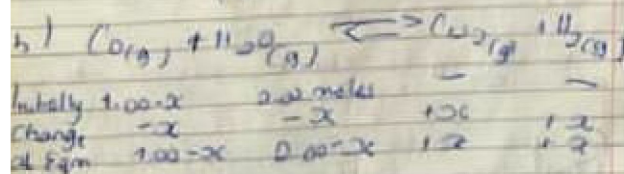
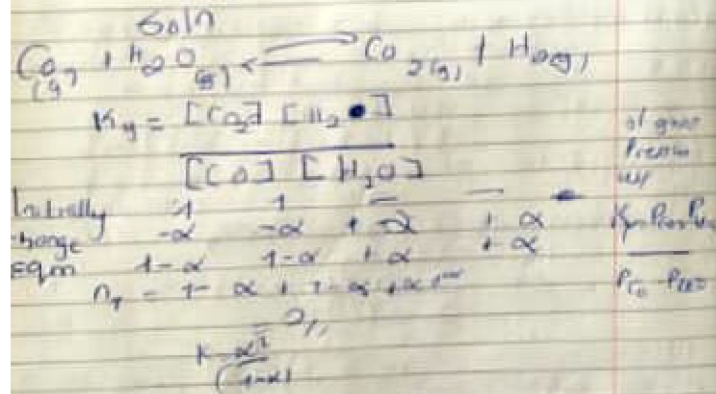


If the water-gas shift reaction starts
produces to equilibrium at temperature
T(K)

of H_2O the mole fractions to derive
the equilibrium constant expression (154)

beginning with one mole of reactants

5) At $T = 1405\text{K}$, $K_{eq} = 1.0$. Suppose the feed to the reactor contains 1.0 mol of CO , 2.00 mol of H_2O & the reaction mixture comes to equilibrium at 1405K, calc the equilibrium composition & the conversion of limiting reagent.



Buckingham Method

$\Delta P = f(d, \mu, \rho, \eta, \omega)$
for us to find the number of characteristic groups using the degree of freedom method
 $K = n - 1$
 $6 - 3 = 3 \Rightarrow \Pi_1, \Pi_2, \Pi_3$

We choose from the list of basic quantities those of the simplest dimensions

$d = L$
 $\mu = L T^{-1}$
 $\rho = M L^{-3}$

$L = d$
 $T = d \mu^{-1}$
 $M = \rho d^3$

Remaining quantities $\Delta P, \eta, \omega$

$\Pi_1 = \frac{\Delta P}{\rho \mu^2}$
 $\Pi_2 = \frac{\eta}{\rho \mu}$
 $\Pi_3 = \frac{\omega}{\rho \mu^2}$

$\Pi_2 = \frac{\eta}{\rho \mu} = \frac{\eta}{\rho (L T^{-1})} = \frac{\eta}{\rho L T^{-1}} = \frac{\eta T}{\rho L}$

actual

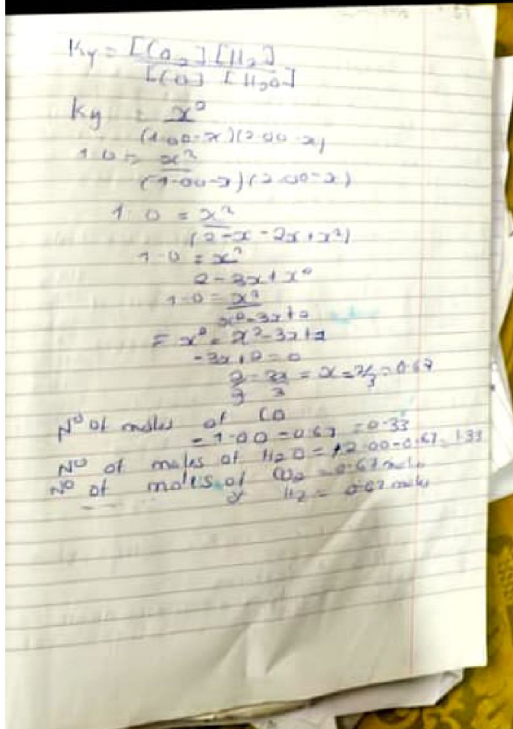
$\Delta P = d^{m_1} \mu^{m_2} \rho^{m_3} \eta^{m_4} \omega^{m_5}$

$L^1 T^{-2} = L^{m_1} L^{m_2} T^{-m_2} M^{m_3} L^{-3m_3} L^{m_4} T^{-m_4} L^{m_5} T^{-m_5}$

$M^1 T^{-2} = L^{m_1+m_2-3m_3+m_4+m_5} T^{-m_2-m_4-m_5}$

for m

$-2 = -m_2 - m_4 - m_5$ --- (2)
 $-1 = m_1 + m_2 + m_3 - 3m_4 - m_5$ --- (3)
 $-2 = -m_3 - m_5$ --- (4)



$\gamma = \frac{u \cdot v}{c^2}$

Buckingham Method

$AP = f(d, u, \rho, \mu)$

For us to find the number of dimensionless groups using the degree of freedom method

$K = n - j$

$6 - 3 = 3 \Rightarrow \Pi_1, \Pi_2, \Pi_3$

We choose from the list of basic quantities those of the simplest dimensions

$$\left. \begin{aligned} d &= L \\ u &= LT^{-1} \\ \rho &= ML^{-3} \end{aligned} \right\} \Rightarrow \begin{aligned} L &= d \\ T &= d u^{-1} \\ M &= \rho d^3 \end{aligned}$$

Remaining quantity AP, μ, ω

$\Pi_1 = \frac{AP}{\rho u^2} = \frac{AP}{\rho (L/T)^2} = \frac{AP}{\rho L^2 T^{-2}} = \frac{AP}{\rho d^2 u^2}$

$\Pi_2 = \frac{\mu}{\rho u d} = \frac{\mu}{\rho d^2 u^2} \cdot d u$

$\Pi_3 = \frac{\omega}{u} = \frac{\omega}{u} \cdot d u = \omega d$

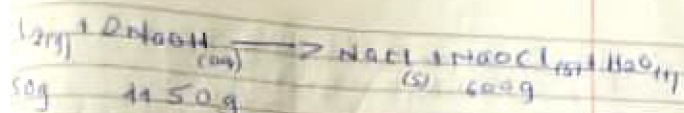
Backsubstitution Method

$AP = P(d_1, d_2, \dots, d_n)$

For us to know the complete set of characteristics given using the degree of freedom used $K = (n-1)$

$E = S - T = R_1, R_2, R_3$

We choose from the list of linear equations those of the smallest characteristics



50g 11.50g

(s) 600g

2 of moles of $\text{Cl}_2 = \frac{11.50}{71} = 0.163 \text{ moles}$

1 of moles of $\text{NaOH} = \frac{11.50}{40} = 0.2875 \text{ moles}$

2 of moles of $\text{Cl}_2 = \frac{1}{2} \times \text{moles of NaOH}$
 $= \frac{1}{2} \times 0.2875$
 $= 0.14375 \text{ moles}$

No of moles of NaOH was more than the one required for the experiment. So it is a limiting reagent.

2 of moles of $\text{Cl}_2 = \frac{\text{No of moles of NaOH}}{2}$
 $= \frac{0.2875}{2} = 0.14375 \text{ moles}$

No of moles given was less than the one needed for the experiment. So it is a limiting reagent.

When Cl_2 and NaOH will be reacted to salt will be formed and H_2O will be small.

Temperature 25°C
 No. of moles 0.163
 No. of moles 0.2875
 No. of moles 0.14375