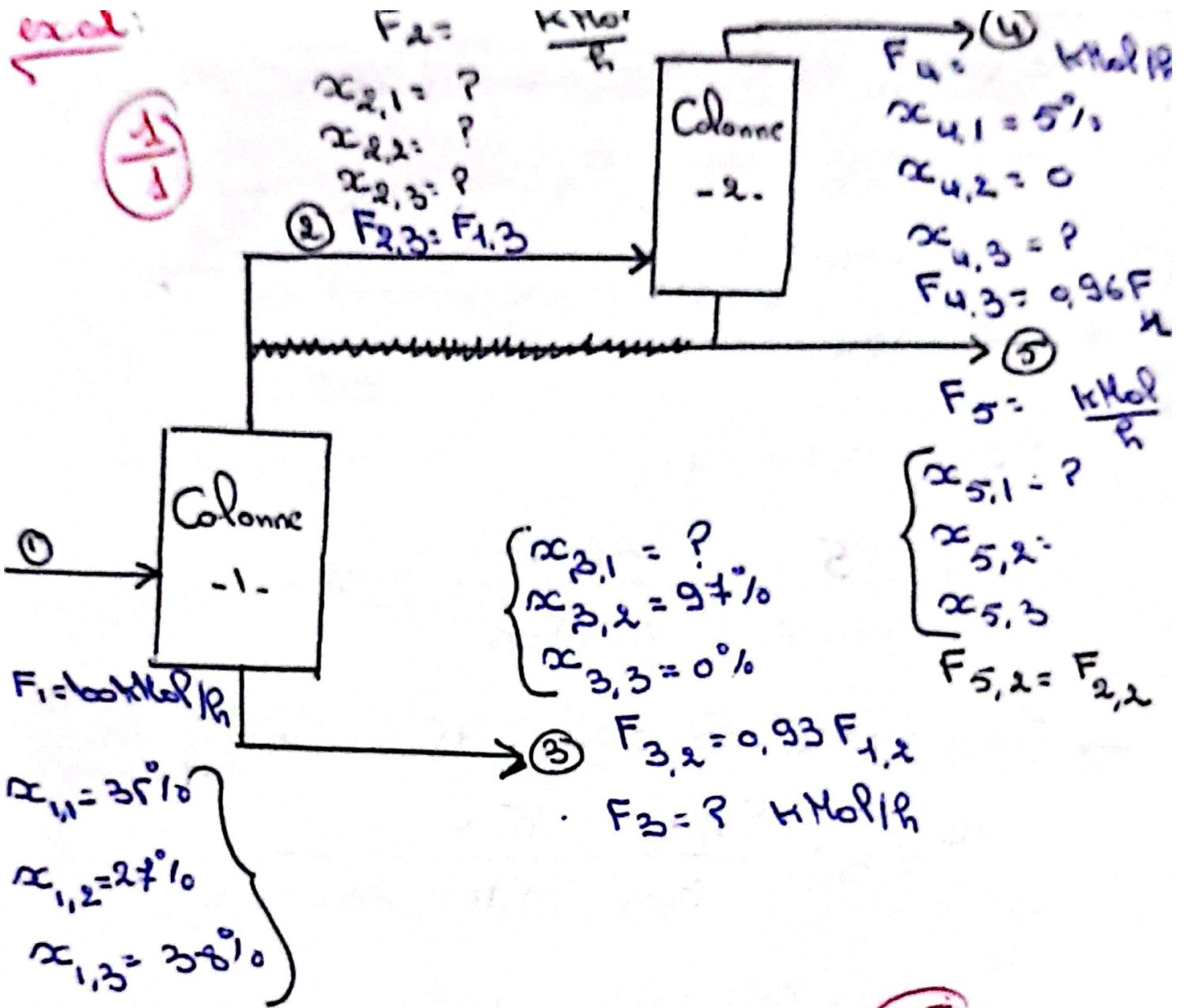


exal:

$\frac{1}{1}$



Bilan Global: $\sum E = \sum S$

$F_1 = F_3 + F_4 + F_5$

B/P(1): $F_{1,1} = F_{3,1} + F_{4,1} + F_{5,1}$

B/P(2):

B/P(2):

- Toluène (1)
- Xylène (2)
- Benzène (3)

Colonne -1-	Colonne -2-
BG BP/1 BP/2 BP/3	BG BP/1 BP/2 BP/3
$F_1 = F_3 + F_2$	$F_2 = F_4 + F_5$

2. Calculer le flux molaire $F_{3,2} - F_3 - F_2$

$F_{3,2}$: $F_{3,2} = 0.93 F_{1,2} = 0.93 F_1 \cdot x_{1,2}$

Applic. atome ne — que: $F_{3,2} = 0.93 \cdot 100 \cdot 0.27$ $\left(\frac{0.7}{0.7}\right)$
 $F_{3,2} = 25.11 \text{ kmol/h}$

F_3 : $F_{3,2} = x_{3,2} \cdot F_3 \rightarrow F_3 = \frac{F_{3,2}}{x_{3,2}}$

Applic: $F_3 = \frac{25.11}{0.97} = 25.88 \text{ kmol/h}$

F_2 : \rightarrow a partir le bilan Global de colonne - 1. $\left(\frac{0.7}{0.7}\right)$
 $F_2 = F_1 - F_3 = 100 - 25.88 = 74.11 \text{ kmol/h}$

Calculer les fractions $x_{2,1} - x_{2,2} - x_{2,3}$

~~$F_{2,2} = 0$~~

$F_{3,2}$: $F_{3,2} = 0.93 F_{1,2} = 0.93 x_{1,2} F_1 = 0.93 \cdot 100 \cdot 0.27$
 $F_{3,2} = 25.11 \text{ kmol/h}$

$F_{2,2}$: $F_{2,2} = 0.07 F_{1,2} = 0.07 x_{1,2} F_1$ $\left(0.27\right)$

Applic: $F_{2,2} = 0.07 \cdot 100 \cdot 0.27 = 1.89 \text{ kmol/h}$

$F_{2,3} = F_{1,3} = x_{1,3} \cdot F_1 = 100 \cdot 0.38 = 38 \text{ kmol/h}$ $\left(0.27\right)$

R $F_2 = \sum F_{2,i} = F_{2,1} + F_{2,2} + F_{2,3} \Rightarrow F_{2,1} = F_2 - F_{2,2} - F_{2,3}$
 Applic: $F_{2,1} = 74.11 - 1.89 - 38 = 34.28 \text{ kmol/h}$ $\left(0.27\right)$

$$F_{2,1} = \alpha_{2,1} \cdot F_2 \rightarrow \alpha_{2,1} = \frac{F_{2,1}}{F_2} = \frac{34,22}{74,11}$$

$$\alpha_{2,1} = 0,46 \quad \alpha_{2,1} = 46\%$$

$$F_{2,2} = \alpha_{2,2} \cdot F_2 \rightarrow \alpha_{2,2} = \frac{F_{2,2}}{F_2} = \frac{25,11}{74,11} = 0,339$$

$$\alpha_{2,2} = 33,9\%$$

$$\sum \alpha_{2,i} = \alpha_{2,1} + \alpha_{2,2} + \alpha_{2,3} = 1 \rightarrow \alpha_{2,3} = 1 - \alpha_{2,1} - \alpha_{2,2}$$

$$\alpha_{2,3} = 1 - 0,339 - 0,46 = 0,201 \quad \alpha_{2,3} = 20,1\%$$

Calculer le flux molaire $F_{4,3} = F_4 = F_5$

$$F_{4,3} = 0,96 \cdot F_{1,3} = 0,96 F_1 \cdot \alpha_{1,3} = 0,96 \cdot 100 \cdot 0,38$$

$$F_{4,3} = 36,48 \frac{\text{KMol}}{\text{h}} \quad 0,7$$

$$\alpha_{4,3} = 1 - \alpha_{4,2} - \alpha_{4,1} = 1 - 0 - 0,07 = 0,97$$

$$F_{4,3} = F_4 \cdot \alpha_{4,3} \rightarrow \alpha_{4,3} = \frac{F_{4,3}}{F_4}$$

$$\alpha_{4,3} \rightarrow F_4 = \frac{F_{4,3}}{\alpha_{4,3}} = \frac{36,48}{0,97} = 38,4 \frac{\text{KMol}}{\text{h}} \quad 0,7$$

à partir du Bilan Global de la colonne - 2 -

$$F_2 = F_4 + F_5$$

$$F_5 = F_2 - F_4$$

$$F_5 = 74,11 - 38,4 = 35,71 \frac{\text{KMol}}{\text{h}} \quad 0,7$$

Déduire les fractions molaires $x_{S,1}$, $x_{S,2}$, $x_{S,3}$

$$F_{S,2} = F_{2,2} = x_{S,2} \cdot F_S \rightarrow x_{S,2} = \frac{F_{S,2}}{F_S}$$

$$\rightarrow x_{S,2} = \frac{27,11}{37,11} = 0,73 \quad (0,7)$$

$$F_{S,3} = 0,04 F_{4,3} = 0,04 F_1 \cdot x_{1,3}$$

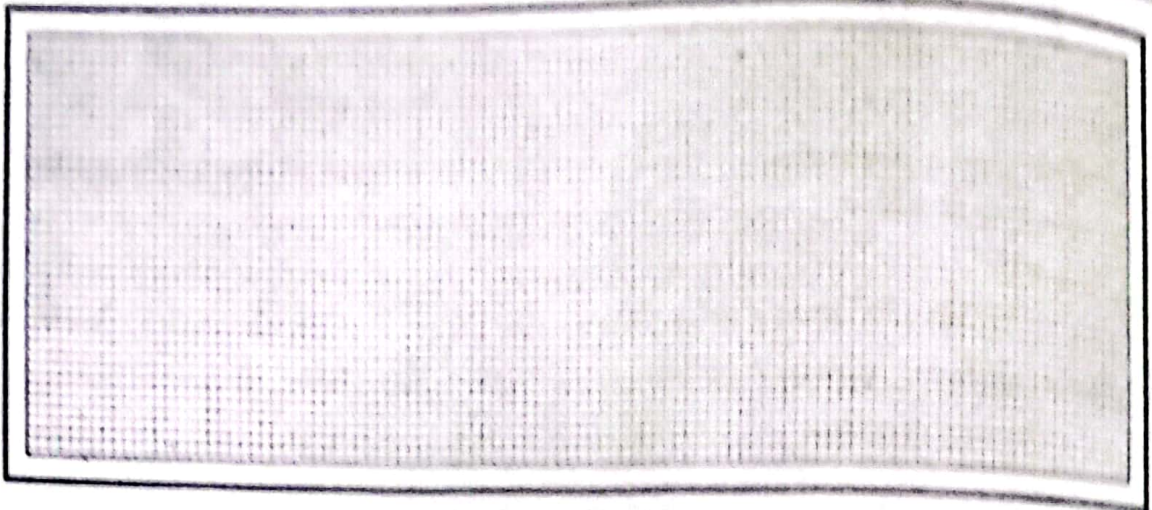
$$x_{1,3} = \frac{F_{S,3}}{0,04 \cdot F_1} = \frac{36,48}{0,04 \cdot 100} = 9,12$$

$$\rightarrow F_{S,3} = 0,04 \cdot 100 \cdot 0,33 = 13,2 \text{ kmol/h} \quad (0,7)$$

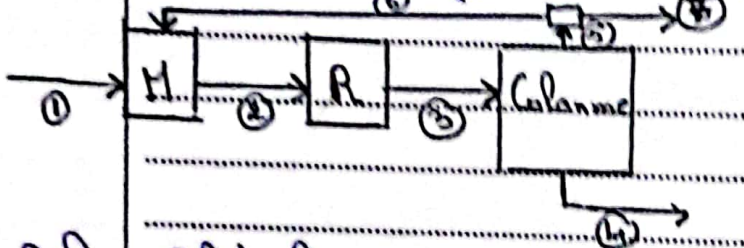
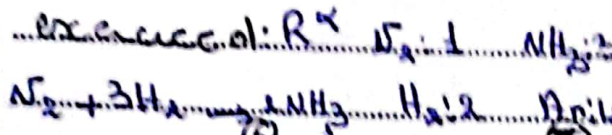
$$x_{S,3} = \frac{F_{S,3}}{F_S} = \frac{13,2}{37,11} = \underline{\quad}$$

$$x_{S,4} = x_{S,1} + x_{S,2} + x_{S,3}$$

$$x_{S,1} = 1 - x_{S,2} - x_{S,3} = \underline{\quad} \quad (0,7)$$



Solution Bilan Macroscopique



Bilan Global $\sum F_i = \sum F_j$

$F_1 = F_4 + F_5$ (I)

B Global: Mélange $F_1 + F_6 = F_2$ (II)

BP/1: $F_{1,2} + F_{6,1} = F_{2,1}$

$\alpha_{1,1} F_1 + \alpha_{6,1} F_6 = \alpha_{2,1} F_2$ (1)

BP/2: $F_{2,2} + F_{6,2} = F_{2,2}$

$\alpha_{1,2} F_1 + \alpha_{6,2} F_6 = \alpha_{2,2} F_2$ (2)

BP/3: $F_{2,3} + F_{6,3} = F_{2,3}$

$\alpha_{1,3} F_1 + \alpha_{6,3} F_6 = \alpha_{2,3} F_2$ (3)

BP/4: $F_{2,4} + F_{6,4} = F_{2,4}$

$\alpha_{1,4} F_1 + \alpha_{6,4} F_6 = \alpha_{2,4} F_2$ (4)

Remarque: $F_{2,2} = F_2 = \sum F_{2,i}$

$F_1 = F_{1,1} + F_{1,2} + F_{1,3} + F_{1,4}$

$F_2 = \sum F_{2,i} = F_{2,1} + F_{2,2} + F_{2,3} + F_{2,4}$
 $F_3 = \sum F_{3,i} = F_{3,1} + F_{3,2} + F_{3,3} + F_{3,4}$

Constante: $F_1 = 100 \text{ kgol/h}$

$\alpha_{1,1} = 32\%$ $\alpha_{1,2} = 64\%$

$\alpha_{1,3} = 0$ $\alpha_{1,4} = 4\%$

Remarque: $\sum \alpha_{1,i} = 1$
 $32 + 64 + 0 + 4 = 100\%$

Calculer: $F_{1,1} = \alpha_{1,1} F_1$

$F_{1,1} = 100 \times 0,32 = 32 \text{ kgol/h}$

$F_{1,2} = \alpha_{1,2} F_1 = 0,64 \cdot 100 = 64 \text{ kgol/h}$

$F_{1,3} = \alpha_{1,3} F_1 = 100 \times 0 = 0 \text{ kgol/h}$

$F_{1,4} = \alpha_{1,4} F_1 = 0,04 \cdot 100 = 4 \text{ kgol/h}$

Pour conclure le résultat
 $F_1 = \sum F_{1,i} = 4 + 64 + 32 = 100 \text{ kgol/h}$

Constante: $F_2 = ?$

$\alpha_{2,1} = ?$ $\alpha_{2,2} = ?$ $\alpha_{2,3} = 0$

$\alpha_{2,4} = ?$

Comat 3: $F_3 = ?$, $\alpha_{3,1} = ?$, $\alpha_{3,2} = ?$

a partir equation n° 1

$\alpha_{3,3} = 0$, $\alpha_{3,4} = 0$

$$F_{1,2} - F_{G,2} = F_{2,2}$$

Comat 4: $F_4 = ?$, $\alpha_{4,2} = 0$

$$F_{2,2} - 0,15(1-x_2)F_{2,2} = F_{2,2}$$

$\alpha_{4,1} = 0$
($\alpha_{4,3} = 1$) par $\alpha_{4,4} = 0$

$$F_{2,2} = \frac{F_{1,2}}{1-0,15(1-x_2)} = \frac{64}{1-0,15(1-x_2)}$$

$$F_{2,2} = 67,015 \text{ Mol/h}$$

$\sum \alpha_{4,i} = 0 + 0 + 1 + 0 = 1$

a partir eq (5) $F_{2,4} = 0$

$F_{4,1} = 0$, $F_{4,2} = 0$, $F_{4,3} = ?$, $F_{4,4} = 0$

a partir eq (6)

Comat 5: $F_5 = ?$, $\alpha_{5,1} = ?$, $\alpha_{5,2} = ?$

$$F_{6,4} = 0,15 F_{5,4} = 0,15 F_{3,4} = 0,15 F_{2,4}$$

$\alpha_{5,3} = ?$, $\alpha_{5,4} = ?$

$$F_{6,4} + F_{1,4} = F_{2,4}$$

$F_{5,1} = F_{5,2}$, $F_{5,3} = F_{4,3}$

$$0,15 F_{2,4} + F_{1,4} = F_{2,4}$$

$F_{5,2} = F_{3,2}$, $F_{5,3} = 0$, $F_{5,4} = F_{3,4}$

$$F_{2,4} = \frac{F_{1,4}}{1-0,15} = \frac{0,04}{1-0,15}$$

avec const n° 4 (no réag + prod)

$$F_{2,4} = 0,047 \text{ Mol/h}$$

$F_{5,4} = F_{3,4} = F_{2,4}$

$$F_2 = F_{2,1} + F_{2,2} + F_{2,3} + F_{2,4}$$

Comat 6: $F_6 = 0,15 F_5$

$$F_2 = 67,015 + 33,77 + 0 + 0,047$$

$F_{6,1} = 0,15 F_{5,1}$, $F_{6,2} = 0,15 F_{5,2}$, $F_{6,3} = 0$

$$F_2 = 101,35 \text{ Mol/h}$$

$F_{6,4} = 0,15 F_{5,4}$

Calcul des fractions

Comat 7: $F_7 = 0,85 F_5$

$$F_{2,1} = \alpha_{2,1} F_2 \rightarrow \alpha_{2,1} = \frac{F_{2,1}}{F_2}$$

$F_{7,1} = 0,85 F_{5,1}$, $F_{7,2} = 0,85 F_{5,2}$

$$\alpha_{2,1} = \frac{F_{2,1}}{F_2} = \frac{33,77}{101,35} = 0,333$$

$F_{7,3} = 0$, $F_{7,4} = 0,85 F_{5,4}$

$$\alpha_{2,2} = \frac{F_{2,2}}{F_2} = 0,661$$

x_1 = taux de convert

$$\alpha_{2,4} = F_{2,4}/F_2 = 0,006$$

$x_2 = \frac{F_{2,1} - F_{2,1}}{F_{2,1} - F_{2,2}} \rightarrow F_{2,1} = F_{2,1}(1-x_1)$

Calcul des flux molaire

$x_2 = \frac{F_{2,2} - F_{2,2}}{F_{2,2}} \rightarrow F_{2,2} = F_{2,2}(1-x_2)$

$$F_6 = \sum F_{6,i} = F_{6,1} + F_{6,2} + F_{6,4}$$

a partir bilan Global de mélange (II)

$$F_{6,1} = 0,15 \cdot 33,77(1-0,65) = 1,772 \text{ Mol/h}$$

$F_6 + F_1 = F_2$ BP/4: $F_{6,1} + F_{1,4} = F_{2,1}$

$$F_{6,2} = 0,15 F_{2,2}(1-x_2)$$

$F_{6,2} = F_{5,2} \times 0,15 = 0,15 F_{2,2}$

$$= 0,15 \cdot 67,015(1-0,70) = 3,015 \text{ Mol/h}$$

$F_{6,1} = 0,15 F_{2,1}(1-x_1)$ Courbe plane

$$F_{6,3} = 0 / F_{6,4} = 0,15 F_{2,1}$$

avec bilan par table (I)

$$F_{6,1} = 0,15 F_{2,1} = 0,15 \times 4$$

$F_{1,4} = 0,15 F_{2,1}(1-x_1) - F_{2,1}$

$$F_6 = 1,772 + 3,015 + 2,015 = 5,39 \text{ Mol/h}$$

$F_{2,1} \left(\frac{1}{3} - 0,15(1-x_1) \right) = F_{1,1}$

calcul des fractions

$F_{2,1} \cdot \alpha_{1,1} F_1 = \frac{832}{1-0,15(1-0,65)}$

$$\alpha_{6,1} = \frac{F_{6,1}}{F_6} = 0,329 \quad \alpha_{6,3} = 0$$

$\alpha_{6,2} = 0,560 \quad \alpha_{6,4} = 0,115$

$$\alpha_{6,2} = 0,560 \quad \alpha_{6,4} = 0,115$$