Exercice 3 : $A \longrightarrow B$ $\quad -r_A = k\, C_A^{\frac{1}{2}} = r$

$X_A = 80\%$

1/ Le temps de séjour : RF.

Bilan : $\alpha_A \cdot r \cdot V = \frac{dn_A}{dt}$

$$\int_0^{t_s} dt = \int_{C_{A0}}^{C_A} \frac{dC_A}{\alpha_A \cdot r} = \int_{C_{A0}}^{C_A} \frac{dC_A}{-k\, C_A^{\frac{1}{2}}}$$

$$t_s = \frac{2}{k}\left[C_A^{\frac{1}{2}} - C_{A0}^{\frac{1}{2}}\right]$$

$$t_s = \frac{2}{k}\left[C_{A0}^{\frac{1}{2}}(1 - X_A)^{\frac{1}{2}} - 1\right]$$

calcul de $C_{A0} = \frac{P}{RT} = \frac{1}{0{,}082 \cdot (25 + 273)} = 0{,}124 \ \frac{mol}{l}$

$$t_s = (0{,}124)^{\frac{1}{2}} \frac{2}{10^{-2}}\left[(1 - 0{,}8)^{\frac{1}{2}} - 1\right]$$

$$t_s = 38{,}93 \ S$$

2/ Le temps de Passage RAC phase gazeuse.

Bilan $F_{Ae} + \alpha_A \cdot r \cdot V_R = F_{As}$

$$V_R = \frac{F_{As} - F_{Ae}}{\alpha_A \cdot r}$$

on passe que $X_{Ae} = 0$ $\quad X_{As} = X_A$ $\quad V_R = \frac{F_{A0}(1 - X_{As}) - F_{A0}(1 - X_{Ae})}{\alpha_A \cdot k \cdot C_{A0}^{\frac{1}{2}} \cdot (1 - X_A)^{\frac{1}{2}}}$

$$V_R = \frac{Q_0 \cdot C_{A0}^{\frac{1}{2}} \cdot X_A}{k \cdot (1 - X_A)^{\frac{1}{2}}}$$

$$\tau = \frac{V_R}{Q_0} = \frac{C_{A0}^{\frac{1}{2}} \cdot X_A}{k(1 - X_A)^{\frac{1}{2}}}$$

$$= 62{,}9 \ S$$

3/ Le temps de passage RP

Bilan : $F_A + \alpha_A \cdot r \cdot dV_R = F_A + dF_A \Rightarrow dV = \frac{dF_A}{\alpha_A \cdot r}$

$$\int_0^{V_R} dV_R = \frac{-F_{A0}}{-k} \int_0^{X_A} \frac{dX_A}{(1 - X_A)^{\frac{1}{2}}} \Rightarrow V_R = \frac{2 Q_0 \cdot C_{A0}}{k \cdot C_{A0}^{\frac{1}{2}}}\left((1 - X_A)^{\frac{1}{2}} - 1\right)$$

$$\tau = \frac{V_R}{Q_0} = \frac{2 \cdot C_{A0}^{\frac{1}{2}}}{k}\left((1 - X_A)^{\frac{1}{2}} - 1\right)$$

$$\Rightarrow \tau_{RP} = t_s$$