DST 10/06/22

A-1) ordre 1 $\Rightarrow v = k_2 [N_2O_5]^1 = k_2 C = -\frac{dC}{dt}$

$\frac{dC}{C} = -k_2 dt \Rightarrow \ln C = -k_2 t + C^{te}$

à $t = 0$, $C = C_0 \Rightarrow \ln \frac{C_0}{C} = k_2 t$

(1) soit $\boxed{C = C_0 e^{-k_2 t}}$

A-2) $k_2 = \frac{1}{t} \ln \frac{C_0}{C}$ AN

t (h)	1	2	3	4
k_2 (h^{-1})	0,0619	0,0620	0,0619	0,0619

(1) $\Rightarrow \boxed{\langle k_{298K} \rangle = 0,0619\ h^{-1}}$

A-3) AN $C = C_0 e^{-k_2 t} = 0,265 \times e^{-0,0619 \times 20}$

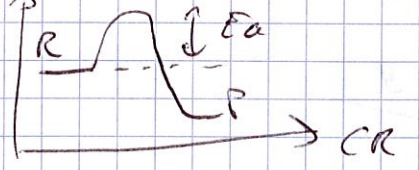
(1) $\Rightarrow \boxed{C_{20h} = 0,0768\ mol/l}$

A-4) temps de ½ réaction τ ($\Leftrightarrow C = C_0/2$) 0,5

$\tau = \frac{1}{k_2} \ln \left(\frac{C_0}{C_0/2} \right) = \frac{\ln 2}{k_2}$ AN $\boxed{\tau = 11,2\ h}$ 0,5

A-5) Energie d'activation :

$k_T = A e^{-E_A/RT}$ 0,5



$k_{298K} = e^{-E_a/(R \cdot 298)}$

$k_{308K} = e^{-E_a/(R \cdot 308)}$

$\Rightarrow \ln \left(\frac{k_{298K}}{k_{308K}} \right) = \frac{E_A}{R} \left(\frac{1}{308} - \frac{1}{298} \right)$

AN $E_A = \frac{-1,3526 \times R}{\left(\frac{1}{308} - \frac{1}{298} \right)}$ 0,5

$\Leftrightarrow \boxed{E_A = +103,2\ kJ/mol}$

Ex 5 (2)

	$C_2H_4(g)$	+ $H_2O(g)$	⇌ $C_2H_5OH(g)$	$T = 500K$, $K = 10^{-2}$
t_0	3	2	0	
t_{eq}	$3-\xi$	$2-\xi$	ξ	

B-1) $K = \dfrac{a_{C_2H_5OH}}{a_{C_2H_4}\, a_{H_2O}} = \dfrac{P_{C_2H_5OH}}{P_{C_2H_4}\, P_{H_2O}}\, P_0$

avec $P_i = \dfrac{n_i}{n_{tot}} P_{tot}$ et $n_{tot} = 5 - \xi$ (g)

(2) $\Rightarrow \boxed{K = \dfrac{\xi(5-\xi)}{(3-\xi)(2-\xi)} \dfrac{P_0}{P_{tot}}}$

B-2) $\dfrac{\xi(5-\xi)}{(3-\xi)(2-\xi)} = K \dfrac{P_{tot}}{P_0} = C = 10^{-2} \times \dfrac{317}{1} = 3,17$.

$\Rightarrow 5\xi - \xi^2 = C(6 - 5\xi + \xi^2)$

$\Rightarrow \xi^2(C+1) + \xi(-5C-5) + 6C = 0$

$\Rightarrow \xi^2(4,17) + \xi(-20,85) + 19,02 = 0$

(2) $\Delta = 117,47 \Rightarrow \xi = \dfrac{20,85 \pm \sqrt{\Delta}}{8,34}$ $\begin{cases} + \nearrow 3,8 \ (> \xi_{max} = 2) \\ - \rightarrow \boxed{1,12 = \xi} \end{cases}$

B-3) $P_{C_2H_4} = \dfrac{3-\xi}{5-\xi} P_{tot} = 0,474\, P_{tot} = 150,1$ bar

$P_{H_2O} = \quad - \quad - \quad - \quad - \quad = 66,7$ bar

(1) $P_{C_2H_5OH} = \quad - \quad - \quad - \quad - \quad = 100,1$ bar

$\Sigma P_i = 317$ bar

Exc $\alpha = (1) \Rightarrow$ 11 pts (3)

C-1) $C_3H_6O_{3(l)} + 3O_{2(g)} \rightarrow 3CO_{2(g)} + 3H_2O_{(l)}$

C-2) $\Delta_{comb}H^\circ = 3\Delta_fH^\circ_{CO_2(g)} + 3\Delta_fH^\circ_{H_2O(l)} - \Delta_fH^\circ_{al(l)}$

C-3) $\Rightarrow -1364,4 = 3(-393,5) + 3(-285,8) - \Delta_fH^\circ_{al(l)}$

$\Rightarrow \boxed{\Delta_fH^\circ_{al(l)} = -673,5 \text{ kJ/mol}}$

C-4) $\Delta_{glyc}H^\circ = 2\Delta_fH^\circ_{al(l)} - \Delta_fH^\circ_{glu(s)}$
$= 2(-673,5) - (-1274,5)$
$= -72,5 \text{ kJ/mol}$.

C-5) $\Delta_{glyc}S^\circ = +172 \text{ J/mol/K}$

C-6) $C_6H_{12}O_6 + 6O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O_{(l)}$

C-7) $\Delta_{comb}H^\circ = 6\Delta_fH^\circ_{CO_2(g)} + 6\Delta_fH^\circ_{H_2O(l)} - \Delta_fH^\circ_{glu}$
$= 6(-393,5) + 6(-285,8) - (-1275,5)$
$= -2801,3 \text{ kJ/mol}$

C-8) $C_2H_5OH_{(l)} + 3O_{2(g)} \rightarrow 2CO_{2(g)} + 3H_2O_{(l)}$

C-9) $\Delta_{comb}H^\circ = -1366,8 \text{ kJ/mol}$.

(1) = 2 × 0,5

C-10) $\Delta_{comb}H^\circ_{glu(s)} = -2801,3 \text{ kJ/mol} = -15,5 \text{ kJ/g}$
$\Delta_{comb}H^\circ_{eth(l)} = -1366,8 \text{ kJ/mol} = -29,7 \text{ kJ/g}$

C-11) $eth_{(l)} >> glu_{ce(s)}$