Bac : Maths

Correction : Exercices : Révision Bac 2023

Exercice 1

1/a-

	$2I^-$	$+ \ S_2O_8^{2-}$	$\longrightarrow I_2$	$+ \ 2SO_4^{2-}$	
à t=0	C_1V	C_2V	0	0	mol
à t	$\underbrace{C_1V-2x}_{n_{I^-}}$	$\underbrace{C_2V-x}_{n_{S_2O_8^{2-}}}$	x	$2x$	"
à t_F	C_1V-2x_F	C_2V-x_F	x_F	$2x_F$	"

b- à t $n(I^-) = C_1V - 2x = b + ax$, $a < 0$

$$n(S_2O_8^{2-}) = C_2V - x$$

$\mathcal{C}_1$ admet une pente $a = -2$

$$\Rightarrow \mathcal{C}_1 \longrightarrow n(I^-) = f(x)$$

$$\mathcal{C}_2 \longrightarrow n(S_2O_8^{2-}) = f(x)$$

2/a- $n_F(S_2O_8^{2-}) = 0 \Rightarrow$ Réaction totale

$\Rightarrow S_2O_8^{2-}$ est le réactif limitant.

$$\Rightarrow \boxed{x_F = 1{,}5\ mmol}$$

b- $S_2O_8^{2-}$ réactif limitant $\Rightarrow C_2V - x_F = 0$

$$n_0(S_2O_8^{2-}) = \boxed{n_{02}} = x_F = \boxed{1{,}5\ mmol}$$

$$n_0(I^-) = n_{01}\ ?$$

$$n_F(I^-) = n_{01} - 2x_F \Rightarrow n_{01} = n_F(I^-) + 2x_F$$

$$\boxed{n_{01}} = (1{,}5 + 2.1{,}5) = \boxed{4{,}5\ mmol}$$

3) a- $$[I^-]_F = \frac{n_F(I^-)}{V_t} = \frac{C_1V - 2x_F}{2V} = \frac{n_{01} - 2x_F}{2V}$$

$$\Rightarrow V = \frac{n_{01} - 2x_F}{2[I^-]_F} = \frac{(4{,}5 - 2.1{,}5).10^{-3}}{2.\ 1{,}25.10^{-2}}$$

$$\boxed{V = 0{,}06\ L = 60\ mL}$$

b- $$\boxed{C_1} = \frac{n_{01}}{V} = \frac{4{,}5.\cancel{10^{-3}}}{60.\cancel{10^{-3}}} = \boxed{7{,}5.10^{-2}\ mol.L^{-1}}$$

$$\boxed{C_2} = \frac{n_{02}}{V} = \frac{1{,}5.\cancel{10^{-3}}}{60.\cancel{10^{-3}}} = \boxed{2{,}5.10^{-2}\ mol.L^{-1}}$$

4/ a- $v = \frac{dx}{dt}$; x ? $n(I^-) = n_{01} - 2x$

$x = \frac{n_{01} - n(I^-)}{2}$

$\Rightarrow \boxed{v} = \frac{d}{dt}\left(\frac{n_{01} - n(I^-)}{2}\right) \boxed{= -\frac{1}{2}\frac{d}{dt}(n(I^-))}$

$v = -\frac{1}{2}(\text{pente})$

b- à $t = 0$, $v(0) = v_{max}$: concentration des réactifs est maximale.

$v_0 = -\frac{1}{2}(\text{pente de } T_0) = -\frac{1}{2}\left(\frac{2{,}5 - 4{,}5}{10 - 0}\right).10^{-3}$

$v_0 = -\frac{1}{2}(-2.10^{-4}) \Rightarrow \boxed{v_0 = 10^{-4} mol.min^{-1}}$

5/ a- A l'équivalence: on a disparition de la couleur jaune-brune des molécules I_2.

b- A l'équivalence: $n(I_2) = \frac{n(S_2O_3^{2-})}{2}$

à $t = 10$ min, $n(I^-) = 3{,}25$ mmol, $\boxed{\frac{n(I^-)}{10} = n'(I^-)}$

$\Rightarrow n(I_2) = x = \frac{(n_{01} - n(I^-))}{2} = \frac{(4{,}5 - 3{,}25)}{2}.10^{-3}$

$n(I_2) = 0{,}625.10^{-3} mol = 6{,}25.10^{-4} mol$

dans 12mL on $n'(I_2) = 0,625 \cdot 10^{-4} mol = \frac{n(I_2)}{10}$

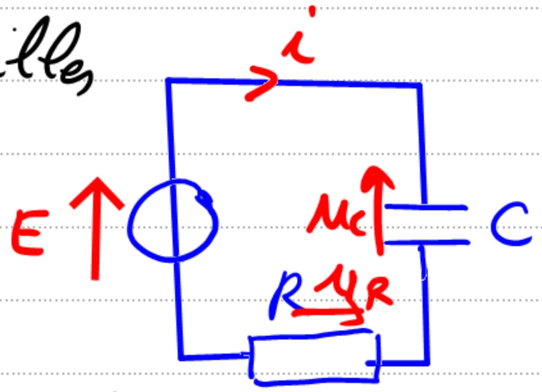
$\Rightarrow n'(I_2) = \frac{n(S_2O_3^{2-})}{2} = \frac{C_0 V_0}{2}$

$V_0 = \frac{2\, n'(I_2)}{C_0} = \frac{\cancel{2} \cdot 6,25 \cdot 10^{-5}}{\cancel{2} \cdot 10^{-2}}$

$$\boxed{V_0 = 6,25 \cdot 10^{-3} L = 6,25 mL}$$

Exercice 2

I- 1/ Loi des mailles



$u_R + u_C - E = 0$

$Ri + u_C = E \quad , \quad i = \frac{dq}{dt} = \frac{d(Cu_C)}{dt} = C\frac{du_C}{dt}$

$RC\frac{du_C}{dt} + u_C = E \quad , \text{ soit } \tau = RC$

$$\boxed{\tau \frac{du_C}{dt} + u_C = E}$$

2/ a- La courbe $\frac{du_c}{dt} = f(u_c)$ est une dte ↘ d'équation $\frac{du_c}{dt} = A u_c + B$, $A<0$

théoriquement : $\tau \frac{du_c}{dt} + u_c = E$

$\tau \frac{du_c}{dt} = E - u_c \Rightarrow \frac{du_c}{dt} = \frac{E}{\tau} - \frac{1}{\tau} u_c$

. $B = \frac{E}{\tau}$: ordonné à l'origine

. $A = -\frac{1}{\tau} = \text{pente} = \frac{(0-12).10^3}{6-0} = -2.10^3 s^{-1}$

– $\boxed{\tau} = -\frac{1}{A} = -\frac{1}{-2.10^3} = 0,5.10^{-3} s = \boxed{0,5 ms}$

– $B = \frac{E}{\tau} \Rightarrow E = B\tau = 12.\cancel{10^3}.0,5.\cancel{10^{-3}}$

$$\boxed{E = 6V}$$

b- $\tau = RC \Rightarrow C = \frac{\tau}{R} = \frac{5.10^{-4}}{40} = 1,25.10^{-5}$

$$\boxed{C = 12,5 \mu F}$$

3/ a- La bobine n'est pas purement inductive ($r \neq 0$), car l'amplitude des oscillations diminue au cours du temps

b- $T \simeq T_0 = \frac{2\pi}{\omega_0} = 2\pi\sqrt{LC}$

$$T^2 = 4\pi^2 LC \Rightarrow L = \frac{T^2}{4\pi^2 C}$$

$$L = \frac{\cancel{4\pi^2}.\cancel{10^{-6}}}{\cancel{4\pi^2}.12{,}5.\cancel{10^{-6}}} \Rightarrow \boxed{L = 0{,}08\,H}$$

c- $\frac{E(T)}{E(0)} = e^{-\frac{r}{L}T} \Rightarrow Ln\left(\frac{E(T)}{E(0)}\right) = -\frac{r}{L}T$

$$r = \frac{L}{T} Ln\left(\frac{E(0)}{E(T)}\right) = \frac{L}{T} Ln\left(\frac{\cancel{\frac{1}{2}C}u_C^2(0)}{\cancel{\frac{1}{2}C}u_C^2(T)}\right)$$

$$r = \frac{0{,}08}{2\pi.10^{-3}} Ln\left(\frac{36}{16}\right) \Rightarrow \boxed{r \simeq 10\,\Omega}$$

II- 1/ a- $\left.\begin{array}{l} U_m = Z\,I_m \\ U_{R_m} = R\,I_m \end{array}\right\} \underline{Z > R} \Rightarrow \underline{U_m > U_{R_m}}$

$\boxed{\mathcal{E}_1 \rightarrow u_R(t)}$, $\mathcal{E}_2 \rightarrow u(t)$

b- $\boxed{U_{Rm} = 2V} \Rightarrow U_{Rm} = R\, I_{m_1}$

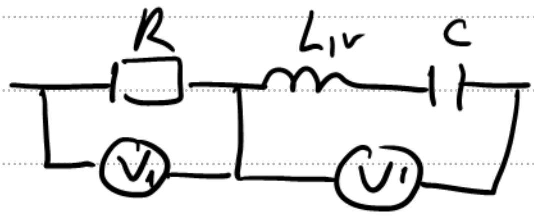
$$I_{m_1} = \frac{U_{Rm}}{R} = \frac{2}{40} = 0{,}05\,A$$

$$\boxed{I_1} = \frac{I_m}{\sqrt{2}} = \frac{0{,}05}{\sqrt{2}} = \boxed{0{,}035\,A}$$

c- $\Delta\varphi = \varphi_u - \varphi_{u_R} = \varphi_u - \varphi_i = -\omega \Delta t$

$\boxed{\Delta\varphi =} -\frac{2\pi}{T}\left(-\frac{T}{6}\right) = \boxed{\frac{\pi}{3}\,rad} > 0 \Rightarrow$ circuit inductif.

2/ a-



$$U_{R_1} = 4U'$$

$$Z_R \cancel{I_m} = 4 Z_{LC} \cancel{I_m} \Rightarrow R = 4\sqrt{r^2 + \left(L\omega_2 - \frac{1}{C\omega_2}\right)^2}$$

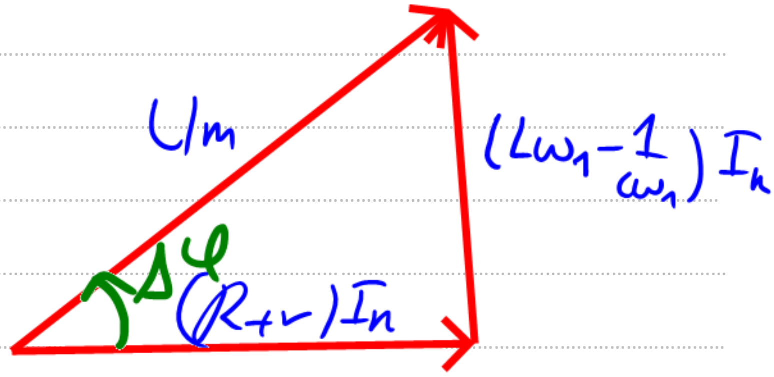
$$R^2 = 16r^2 + 16\left(L\omega_2 - \frac{1}{C\omega_2}\right)^2, \text{ or } R = 4r$$

$$\cancel{16r^2} = \cancel{16r^2} + 16\left(L\omega_2 - \frac{1}{C\omega_2}\right)^2$$

$$L\omega_2 - \frac{1}{C\omega_2} = 0 \Rightarrow L\omega_2 = \frac{1}{C\omega_2} \Rightarrow \omega_2^2 = \frac{1}{LC} = \omega_0^2$$

$\omega_2 = \omega_0 \Rightarrow$ Résonance d'intensité b_ $LC\omega_2^2 = 1 \Rightarrow \boxed{4\pi^2 N_2^2 LC = 1}$ (1)

c-



$$tg\,\Delta\varphi = \frac{L\omega_1 - \frac{1}{C\omega_1}}{R+r} = tg\frac{\pi}{3} = \sqrt{3}$$

(2) $\boxed{L\omega_1 - \frac{1}{C\omega_1} = (R+r)\sqrt{3}} = 50\sqrt{3}$

(1) $LC\omega_2^2 = 1 \Rightarrow LC = \frac{1}{\omega_2^2}$

(2) $\times\, C\omega_1 \Rightarrow LC\omega_1^2 - 1 = 50\sqrt{3}\, C\omega_1$

$$\frac{\omega_1^2}{\omega_2^2} - 1 = C\omega_1 50\sqrt{3}$$

$$C = \frac{\left(\frac{N_1}{N_2}\right)^2 - 1}{2\pi N_1 50\sqrt{3}} = \left(\frac{\left(\frac{266,7}{159}\right)^2 - 1}{2\pi . 266,7 . 50\sqrt{3}}\right)$$

$$\boxed{C = 12,5\,\mu F}$$

(1) : $LC\omega_2^2 = 1 = LC\,4\pi^2 N_2$

$$L = \frac{1}{4\pi^2 N_2^2 C} = \frac{10^6}{40 \cdot 159^2 \cdot 12{,}5}$$

$$\boxed{L = 0{,}08\ H}$$