Exercice 01 (3pt)

$m_{Al} = \frac{M \times I \times t}{Z \times F}$; (0,5)

$Al^{+3} + 3e^- \xrightarrow{0,5} Al$ (0,5) $(Z = 3)$.

$I = \frac{m_{Al} \times Z \times F}{M \times t} = \frac{10 \times 3 \times 96500}{26,98 \times 20 \times 60}$ (0,5)

$I = 89,41\ A$ (1)

Exercice 02 (4pt)

$^{39}K \rightarrow x_1$; $^{40}K \rightarrow x_2$; $^{41}K \rightarrow x_3$; $x_2 = 0,012\%$

$$\begin{cases} x_1 + x_2 + x_3 = 1 \\ M_1 x_1 + M_2 x_2 + M_2 x_3 = M_{moy} \end{cases} \quad (0,25) \Leftrightarrow \begin{cases} x_1 + x_3 = 1 - 0,00012 \ldots\ (1) \\ 38,9637 x_1 + 39,9640 x_2 + 40,9618 x_3 = 39,102 \end{cases} \quad (0,25)$$

$x_1 + x_3 = 0,99988 \Rightarrow \boxed{x_1 = 0,99988 - x_3}$ (0,25) (3)

On remplace (3) dans (2) on trouve :

$38,9637 \times (0,99988 - x_3) + 39,9640 x_2 + 40,9618 x_3 = 39,102$ (0,25)

$38,9590 - 38,9637 x_3 + 39,9640 x_2 + 40,9618 x_3 = 39,102$

$1,9981 x_3 + 0,004795 + 38,9590 = 39,102$

$1,9981 x_3 + 38,9638 = 39,102$.

$1,9981 x_3 = 0,138205$ (0,5) (0,1) $\Rightarrow x_3 = \frac{0,138205}{1,9981} = 0,0691$

$x_3 = 6,91\ \%$ (1)

$x_1 = 100 - 6,91 - 0,012.$

$x_1 = 93,078\ \%$ (0,1)

2/ L'énergie de liaison du noyau ^{39}K (Z=19).

$\Delta E_l = \Delta m \times 933 = (m_{tho} - m_{reo}) \times 933$ (0,25)

$\Delta E_l = [(19 \times 1,0\,0728 + 20 \times 1,00866) - 38,9637] \times 933$ (0,25)

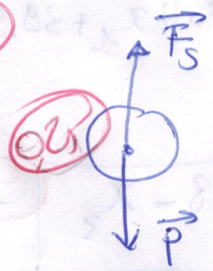
$\Delta E_l = (19,13832 + 20,1732 - 38,9637) \times 933$

$\Delta E_l = 324,51\ MeV$ (0,25) $\Rightarrow \Delta E_{l,moy} = \frac{\Delta E_l}{A} = \frac{324,51}{39}$

$\Delta E_{l,moy} = 8,32\ MeV/nucléon$ (0,25)

Exercice 03 5pt

1/ Chute libre :



(0,25) (0,25)

$x = vt \Rightarrow v = \frac{x}{t} = \frac{4 \times 10^{-3}}{12,8}$

$v = 3,125 \times 10^{-4}\ m/s$ (0,25)

$\vec{P} + \vec{F_s} = \vec{0} \Rightarrow P = F_s \Rightarrow m \times g - 6\pi\eta r v = 0.$ (0,25)

$\rho = \frac{m}{V} \Rightarrow m = \rho . V = \rho \times \frac{4}{3}\pi r^3 \Rightarrow \rho \times \frac{4}{3}\pi r^3 g - 6\pi\eta r v = 0.$ (0,25)

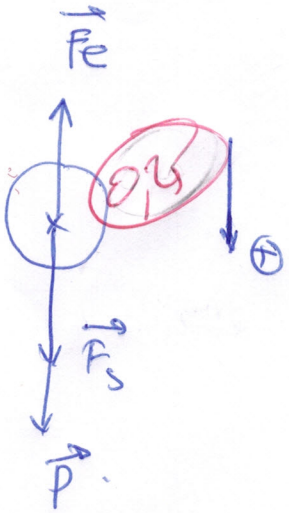
$\frac{4}{3}\rho\pi r^2 g = 6\eta v \Rightarrow r^2 = \frac{18\eta v}{4\rho g} \Rightarrow r = \sqrt{\frac{9\eta v}{2\rho g}} = \sqrt{\frac{9 \times 1,8 \times 10^{-4} \times 3,14 \times 1}{2 \times 1260 \times 9,81}}$ (0,25)

$r = 4,52 \times 10^{-6}\ m$ (0,5)

$m = \frac{4}{3}\pi r^3 \times \rho$ (0,25) $= \frac{4}{3} \times 3,14 \times (4,52 \times 10^{-6})^3 \times 1260$

$m = 4,87 \times 10^{-13}\ kg$ (0,5)

2/ En appliquant un champ électrique



$\sum \vec{F}_{ext} = \vec{0}$.

$\vec{F_e} + \vec{F_s} + \vec{P} = \vec{0}$.

$6\pi\eta r v' + mg - qE = 0$ (0,5)

$qE = 6\pi\eta r v' + mg$

$q = \dfrac{6\pi\eta r v' + mg}{E}$. (0,5)

$v' = \dfrac{x'}{t} = \dfrac{4\times10^{-3}}{16} = 2{,}5\times10^{-4}$ m/s (0,5)

$q = \dfrac{6\times3{,}14\times1{,}8\times10^{-4}\times4{,}12\times10^{-6}\times2{,}5\times10^{-4} + 4{,}87\times10^{-13}\times9{,}81}{1{,}8\times10^{7}}$ (0,5)

$q = 4{,}78\times10^{-19}$ C (0,5) $\Rightarrow$ $q = ne$ donc $n = \dfrac{q}{e} = \dfrac{4{,}78\times10^{-19}\text{ C}}{1{,}6\times10^{-19}\text{ C}}$ (0,5)

$n \simeq 3$ (0,5)