I Champs électrique et magnétique

2. $t = \frac{\ell}{v_0} = 1,2\,\mu s$ $= 1,2 \cdot 10^{-6}\,s$

3. $y_S = \frac{-2eE}{2mv_0^2}\ell^2$

A.N. : $y_S = \frac{-2 \cdot 1,602 \cdot 10^{-19} \cdot 720}{2 \cdot 6,6447 \cdot 10^{-27} \cdot (100 \cdot 10^3)^2} \cdot 0,12^2\,m = -2,5\,cm$ $= -0,025\,m$

$v_S = \sqrt{v_{Sx}^2 + v_{Sy}^2} = \sqrt{v_0^2 + \left(\frac{-qEt}{m}\right)^2} = 108\,km/s$ $= 108\,333\,m/s$

4. $F_m = qv_0B = 2 \cdot 1,602 \cdot 10^{-19}\,C \cdot 10^5\,m/s \cdot 48 \cdot 10^{-6}\,T = 1,54 \cdot 10^{-18}\,N$
$F_e = qE = 2 \cdot 1,602 \cdot 10^{-19}\,C \cdot 720\,V/m = 2,31 \cdot 10^{-16}\,N$
$F_e/F_m = 150$

II Satellites

2. $a = \frac{KM_J}{r_C^2}$; A.N. : $a = \frac{6,673 \cdot 10^{-11} \cdot 318 \cdot 5,98 \cdot 10^{24}}{(1882709 \cdot 10^3)^2} = 3,58 \cdot 10^{-2}\,m/s^2$ $= 0,0358\,m/s^2$

$v = \sqrt{\frac{KM_J}{r_C}}$; A.N. : $v = \sqrt{\frac{6,673 \cdot 10^{-11} \cdot 318 \cdot 5,98 \cdot 10^{24}}{1882709 \cdot 10^3}}\,m/s = 8,21\,km/s$ $= 8210\,m/s$

3. $\frac{T_G}{T_E} = \frac{r_G^{3/2}}{r_E^{3/2}} = 2$; $\frac{T_G}{T_I} = \frac{r_G^{3/2}}{r_I^{3/2}} = 4$

III Ondes

2. $c = \lambda \cdot f = 1\,m \cdot 5\,Hz = 5\,m/s$
$v_{max} = 2\pi f y_{max} = \pi\,m/s$

4. Puisque $f \sim \sqrt{F}$, il faut diminuer la tension.

IV Effet photoélectrique

1. $E_c = E - W_s = \frac{hc}{\lambda} - W_s = \frac{1}{2}mv^2 \Longrightarrow v = \sqrt{\frac{2}{m}\left(\frac{hc}{\lambda} - W_s\right)}$

A.N. : $v = \sqrt{\frac{2}{9,1094 \cdot 10^{-31}}\left(\frac{6,626 \cdot 10^{-34} \cdot 2,998 \cdot 10^8}{400 \cdot 10^{-9}} - 2,25 \cdot 1,602 \cdot 10^{-19}\right)}\,m/s = 547\,km/s$ $= 547\,000\,m/s$

2. $P = \frac{N_\gamma hf}{t} = \frac{N_\gamma hc}{\lambda t} \Longleftrightarrow N_\gamma = \frac{P\lambda t}{hc}$
$N_e = 20\,\%\,N_\gamma = 0,2 \cdot \frac{10^{-3} \cdot 400 \cdot 10^{-9} \cdot 1}{6,626 \cdot 10^{-34} \cdot 2,998 \cdot 10^8} = 4,03 \cdot 10^{14}$ électrons

V Physique nucléaire

2. ${}^{239}_{94}Pu \rightarrow {}^{235}_{92}U + {}^{4}_{2}He$

3a) $E = E_\ell(\text{produits}) - E_\ell(\text{réactifs})$
$= 98 \cdot 8,581507\,MeV + 139 \cdot 8,311590\,MeV - 239 \cdot 7,560310\,MeV$
$E = 189,4\,MeV$

3b) $\gamma = 1 + \frac{E_c}{m_n c^2} = 1 + \frac{15}{939,57} = 1,0160$
$v = \sqrt{1 - \frac{1}{\gamma^2}} \cdot c = 0,1766c$ $= 5,30 \cdot 10^7\,m/s$