

Corrige de l'examen Final

20-21

Exercice 1 (03,5pts)

1/ $T = \frac{\ln 2}{\lambda} \Rightarrow \lambda = \frac{\ln 2}{T} = \frac{\ln 2}{3,3} = 0,182 \text{ jour}^{-1}$ (0,5pt)

2/ $m_0 = 1 \text{ g}$; $m_0 = \frac{m_0}{H} = \frac{N_0}{\lambda_A} \Rightarrow N_0 = \frac{m_0}{H} \cdot \lambda_A \Rightarrow N_0 = \frac{1}{222} \cdot 6,023 \cdot 10^{23}$ (0,5pt)

$N_0 = 2,71 \cdot 10^{21} \text{ noyaux}$ (0,5pt)

3/ $A_t = \frac{A_0}{8}$; $A_t = A_0 e^{-\lambda t} \Rightarrow \frac{A_0}{8} = A_0 e^{-\lambda t} \Rightarrow e^{-\lambda t} = \frac{1}{8}$ (0,5pt)
 $\Rightarrow -\lambda t = \ln \frac{1}{8} \Rightarrow \lambda t = \ln 8 \Rightarrow t = \frac{\ln 8}{\lambda} = \frac{\ln 8}{0,182} = 11,42 \text{ jours}$ (0,5pt)

Exercice 2 (5,5pts)

1/ L'ion hydrogénéide est le : ${}^4\text{Be}^{3+}$; la charge est : +3 (0,5pt)

2/ L'état fondamental $n_1 = 1$

* Première ionisation $\Rightarrow n_1 = 1, n_2 = 2$ (0,5pt)

$\Delta E_{1 \rightarrow 2} = |E_2 - E_1|$; $E_n = -13,6 \frac{Z^2}{n^2}$ (0,5pt)

$E_{1 \rightarrow 2} = \left| \frac{-13,6(4)^2}{(2)^2} + \frac{13,6(4)^2}{(1)^2} \right| = 13,6(4)^2 \cdot \frac{3}{4} = 163,2 \text{ eV}$ (0,5pt)

* Ionisation $\Rightarrow n_1 = 1, n_2 = \infty$ (2x 0,25pt)

$E_{\infty} = |E_{\infty} - E_1| = \frac{13,6(4)^2}{(1)^2} = 217,6 \text{ eV}$ (0,5pt)

3/ La raie limite de la série de Balmer : $n_1 = 2, n_2 = \infty$ (2x 0,25pt)

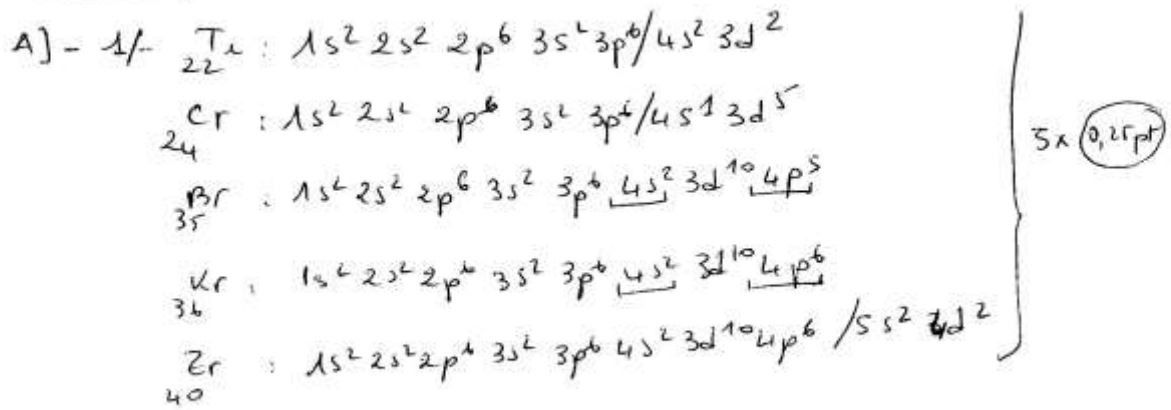
$\frac{1}{\lambda_{\infty}} = Z^2 R_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) = (4)^2 \cdot 1,096 \cdot 10^4 \left(\frac{1}{4} - \frac{1}{\infty} \right)$

$\lambda_{\infty} = 2,28 \cdot 10^{-8} \text{ m} \Rightarrow \text{Domaine spectral est U.V}$

(0,25pt)

(0,5pt)

Exercice 3



2/-

Element	période	groupe
${}_{22}^{Ti}$	4	IV_B
${}_{24}^{Cr}$	4	VI_B
${}_{35}^{Br}$	4	VII_A
${}_{36}^{Kr}$	4	$VIII_A$
${}_{40}^{Zr}$	5	IV_B

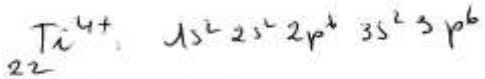
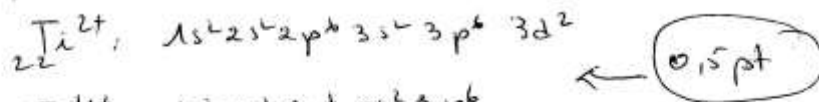
10 x (0,25 pt)

3/- * $Ti, Cr, Zr \Rightarrow$ métaux de transition ($ns^2(n-1)d^x$)

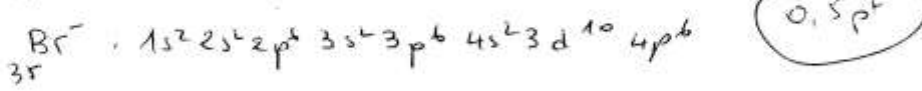
* Br : halogène (ns^2, np^5) 5 x (0,25 pt)

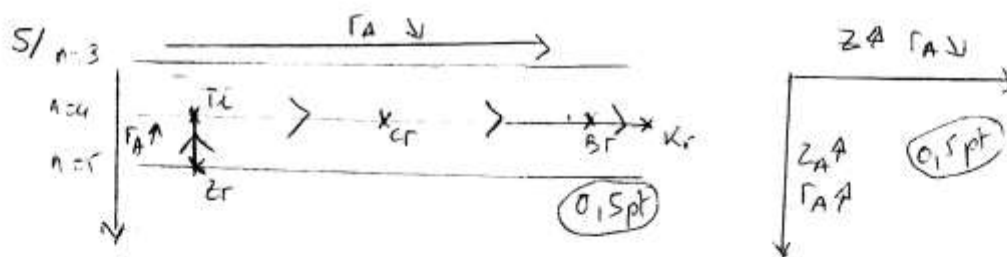
* Kr : gaz rare (ns^2, np^6)

4/- les ions stables du ${}_{22}^{Ti}$ sont :



* l'ion stable du Brome est :





Classement des rayons par ordre croissant :

$$r_A(Kr) < r_A(Br) < r_A(Cr) < r_A(Ti) < r_A(Zr).$$

B-1 $X \in \left\{ \begin{array}{l} P=3 \Rightarrow \text{troisième couche} \\ n=III_A \Rightarrow \text{nombre d'électrons de valence}=3 \end{array} \right\} \Rightarrow \text{couche de valence } 3s^2 3p^1$

$$X: 1s^2 2s^2 2p^6 / 3s^2 3p^1 \Rightarrow Z=13$$

2. Charge effective Z^*



$$Z^* = Z - \sum \sigma_i$$

$$Z^* = 13 - 2(0,35) - 8 \times 0,85 - 2 \times 1 = 3,5$$

