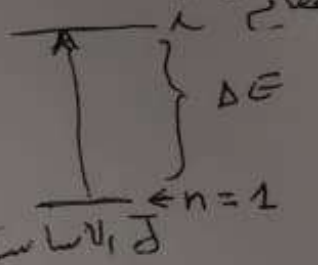
Correction du contrôle chimie organique quantique :

Exercice N°1 :

(1) $\Delta E = 10,2$ eV



$$\Delta E = \frac{(E_1)_H}{n_i^2} - \frac{(E_1)_H}{n_j^2}$$

$$\Delta E = (E_1)_H \left(\frac{1}{n_i^2} - \frac{1}{n_j^2}\right) \quad (1,25)$$

$$\Delta E = (E_1)_H \left(\frac{1}{n_i^2} - 1\right) \Rightarrow \frac{\Delta E}{(E_1)_H} = \frac{1}{n_i^2} - 1 \quad (1,25)$$

$$1 + \frac{\Delta E}{(E_1)_H} = \frac{1}{n_i^2}$$

ومنه (1)

$$\frac{1}{n_i^2} = \frac{10,2}{-13,6} + 1 = 0,25 = \frac{1}{4}$$

$$4 = n_i^2 \Rightarrow n_i = \sqrt{4} = 2 \quad (1,5)$$

الإلكترون موجود في المستوى "2" أي $n = 2$

(2) لنحسب طول موجة الإشعاع المنبعث : $\lambda = 1027\,A^\circ = 1027 \cdot 10^{-10}$ m

$$\Delta E = \frac{hc}{\lambda} = \frac{6,62 \cdot 10^{-34} \cdot 3 \times 10^8}{1027 \cdot 10^{-10}} = 1,934 \cdot 10^{-18}\ J = 12,086\ eV$$

(1,5)

$$\Delta E = \frac{hc}{\lambda} = (E_1)_H \left(\frac{1}{n_j^2} - \frac{1}{n_i^2}\right) \quad (0,5)$$

$n_i \to n_j$

En divisant sur $h.c.\lambda$ $\Rightarrow$ $\frac{1}{\lambda} = \frac{1}{h.c}(E_1)_H \left(\frac{1}{n_j^2} - \frac{1}{n_i^2}\right)$ (0,5)

$\frac{1}{h.c}.(E_1)_H = R_H$ donc

$$\frac{1}{\lambda} = R_H \left(\frac{1}{n_j^2} - \frac{1}{n_i^2}\right) = \frac{1}{1027 \cdot 10^{-10}\ m} = 1,097 \cdot 10^7\ m^{-1} \left(\frac{1}{n_j^2} - \frac{1}{3^2}\right)$$

(1)

$$= 1,097 \cdot 10^7 \left(\frac{1}{n_j^2} - \frac{1}{3^2}\right)$$

$n_j = 1$ (1,5)

ومنه

Exercice 2

n	l	m	orbitale
1	0	0	$\Psi_{1,0,0}$ (1s)
2	0	0	$\Psi_{2,0,0}$ (2s)
	1	-1	$\Psi_{2,1,-1}$ (2px)
		0	$\Psi_{2,1,0}$ (2py)
		1	$\Psi_{2,1,1}$ (2pz)
3	0	0	$\Psi_{3,0,0}$ (3s)
	1	-1	$\Psi_{3,1,-1}$ (3px)
		0	$\Psi_{3,1,0}$ (3py)
		1	$\Psi_{3,1,1}$ (3pz)
	2	-2	$\Psi_{3,2,-2}$ (3d)
		-1	$\Psi_{3,2,-1}$ (3d)
		0	$\Psi_{3,2,0}$ (3d)
		1	$\Psi_{3,2,1}$ (3d)
		2	$\Psi_{3,2,2}$ (3d)