

Mécanique Quantique

①

TAI 1:

1/ monochromatique $\lambda = 450 \text{ nm}$

$$E_{450} = h\nu = \frac{hc}{\lambda} \quad \text{car } \nu = \frac{c}{\lambda}$$

AN: $E_{450} = \frac{6,62 \times 10^{-34} \times 3 \times 10^8}{450 \times 10^{-9}}$

$$\begin{aligned} h &= 6,62 \cdot 10^{-34} \text{ J.s} \\ c &= 3 \cdot 10^8 \text{ m.s}^{-1} \\ \lambda &= 450 \cdot 10^{-9} \text{ m} \end{aligned}$$

$$E_{450} = 4,413 \cdot 10^{-19} \text{ J}$$

$$E_{450} = \frac{4,413 \cdot 10^{-19}}{1,6 \cdot 10^{-19}} \text{ eV}$$

$$E_{450} = 2,758 \text{ eV}$$

- Pour le Mg $E_{\text{Mg}} = 3,68 \text{ eV}$

donc $E_{450} < E_{\text{Mg}}$ donc pas d'extraction

- Pour le K $E_K = 2 \text{ eV}$

donc $E_{450} > E_K$ donc extraction

$$E_{450} - E_K = 2,758 - 2 = 0,758 \text{ eV}$$

$$= 0,758 \cdot 1,6 \cdot 10^{-19} \text{ J}$$

$$= 1,2128 \cdot 10^{-19} \text{ J}$$

$$E = \frac{1}{2} m v^2$$

$$v = \sqrt{\frac{2E}{m}}$$

AN: $v = \sqrt{\frac{2 \cdot 1,2128 \cdot 10^{-19}}{9,1 \cdot 10^{-31}}}$

$$v = 5,1 \cdot 10^5 \text{ m.s}^{-1}$$

(2)

$$E_{mg} = 3,68 \text{ eV}$$

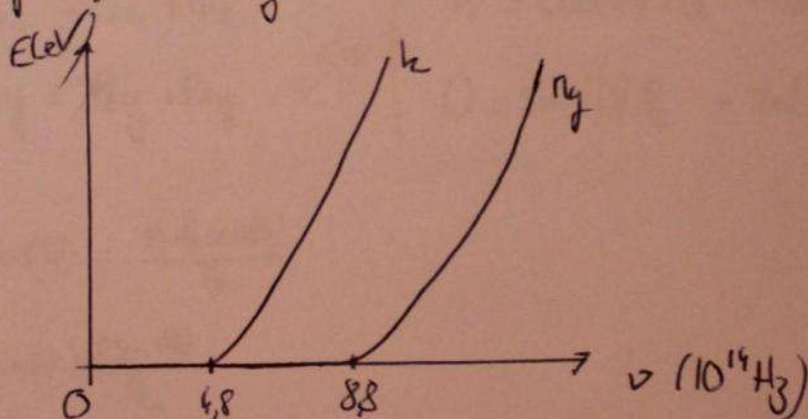
$$E_{mg} = 3,68 \cdot 1,6 \cdot 10^{-19} \text{ J}$$

$$E_{mg} = h \nu_{mg}$$

$$\nu_{mg} = \frac{E_{mg}}{h}$$

$$\text{AN: } \nu_{mg} = \frac{3,68 \cdot 1,6 \cdot 10^{-19}}{6,62 \cdot 10^{-34}}$$

$$\nu_{mg} = 8,89 \cdot 10^{14} \text{ Hz}$$



$$E_k = 2 \text{ eV}$$

$$E_k = 2 \cdot 1,6 \cdot 10^{-19} \text{ J}$$

$$E_k = h \nu_k$$

$$\nu_k = \frac{E_k}{h}$$

$$\text{AN: } \nu_k = \frac{2 \cdot 1,6 \cdot 10^{-19}}{6,62 \cdot 10^{-34}}$$

$$\nu_k = 4,8 \cdot 10^{14} \text{ Hz}$$

2) On a $E = 200 \text{ eV}$
 $E = 200 \cdot 1,6 \cdot 10^{-19} \text{ J}$

$$\text{or } E = h\nu = \frac{hc}{\lambda}$$

$$\text{donc } \lambda = \frac{hc}{E}$$

$$\text{AN: } \lambda = \frac{6,62 \cdot 10^{-34} \cdot 3 \cdot 10^8}{200 \cdot 1,6 \cdot 10^{-19}}$$

$$\lambda = 6,208 \text{ nm}$$

$$D = 2 \text{ cm} \gg \lambda$$

3) Longueur d'onde de Broglie

$$\lambda = \frac{h}{p} = \frac{h}{mv} = \frac{h}{m \sqrt{\frac{2E_k}{m}}}$$

$$\text{AN: } \frac{6,62 \cdot 10^{-34}}{9,1 \cdot 10^{-31} \sqrt{\frac{2 \cdot 7 \cdot 1,6 \cdot 10^{-19}}{9,1 \cdot 10^{-31}}}} = 4,63 \cdot 10^{-10} \text{ m}$$

$$\approx 46,3 \text{ nm}$$

$$\left. \begin{array}{l} \sin \theta = \frac{\lambda}{D} \\ \text{et } \tan \theta = \frac{\Delta}{2b} \end{array} \right\} \begin{array}{l} \Delta = 2b \cdot \tan \theta \\ \Delta = 2b \tan \left(\sin^{-1} \left(\frac{\lambda}{D} \right) \right) \end{array}$$

$$\text{AN: } \Delta = 8 \cdot 2 \cdot 10^{-2} \cdot \tan \left(\sin^{-1} \left(\frac{6,208 \cdot 10^{-9}}{8 \cdot 10^{-2}} \right) \right)$$

$$\Delta = 1,27 \cdot 10^{-7} \text{ m}$$

$\Rightarrow$ Trop petit!