

## الحلول المقترحة

## التمرين الأول:

$$\lambda = \frac{h}{mv} = \frac{6,62 \times 10^{-34}}{2 \times 10^{-3} \times 300} = 1,1 \times 10^{-33} m$$

$$E_c = \frac{1}{2}mv^2 = eU \Leftrightarrow m^2v^2 = 2meU \Rightarrow mv = \sqrt{2meU} = P$$

$$\lambda = \frac{h}{\sqrt{2meU}} = \frac{6,62 \times 10^{-34}}{(2 \times 1,66 \times 10^{-27} \times 1,6 \times 10^{-19} \times 150)^{\frac{1}{2}}} = 2,35 \times 10^{-12} m = 0,0235 \text{ \AA}$$

$$\text{حالة إثارة أولى} \Rightarrow n = 2$$

$$\lambda = \frac{h}{mv}, \quad v_n = \frac{z}{n}v_1 \Rightarrow v_2 = \frac{1}{2} \times 2,18 \times 10^6 = 1,09 \times 10^6 m/s$$

$$\Rightarrow \lambda = \frac{6,62 \times 10^{-34}}{9,1 \times 10^{-31} \times 1,09 \times 10^6} = 6,67 \times 10^{-10} m = 6,67 \text{ \AA}$$

$$\lambda = \frac{h}{m_\alpha v}, \quad E_c = \frac{1}{2}m_\alpha v^2 \Rightarrow v = \sqrt{\frac{2E_c}{m_\alpha}}$$

$$\Rightarrow \lambda = \frac{h}{m_\alpha \sqrt{\frac{2E_c}{m_\alpha}}} = \frac{h}{\sqrt{m_\alpha^2 \frac{2E_c}{m_\alpha}}} = \frac{h}{\sqrt{2m_\alpha E_c}} = 4,68 \times 10^{-12} m$$

## التمرين الثاني:

حساب الإرتياب المطلق الأدنى على سرعة الـ  $e^-$  :  $\Delta v_{min}$

$$\Delta P \cdot \Delta x \geq h \Rightarrow m \Delta v_{min} \cdot \Delta x = h \Rightarrow \Delta v_{min} = \frac{h}{m \cdot \Delta x}$$

$$\Delta v_{min} = \frac{6,62 \times 10^{-34}}{9,1 \times 10^{-31} \times 0,1 \times 10^{-10}} = 7,27 \times 10^7 m/s$$

حساب الإرتياب النسبي الأدنى على سرعة الـ  $e^-$  :  $\left(\frac{\Delta v}{v}\right)_{min}$

$$E_c = \frac{1}{2}mv^2 = eU \Rightarrow v = \sqrt{\frac{2eU}{m}} = 1,33 \times 10^7 m/s$$

$$\Rightarrow \left(\frac{\Delta v}{v}\right)_{min} = \frac{7,27 \times 10^7}{1,33 \times 10^7} = 5,47$$

$$\Delta P_{min} \cdot \Delta x = h \Rightarrow \left\{ \begin{array}{l} \Delta P_{min} = \frac{h}{\Delta x} \\ P = mv \end{array} \right. \Rightarrow \left(\frac{\Delta P}{P}\right)_{min} = \frac{h}{mv \cdot \Delta x}$$

$$v_H = 2,18 \times 10^6 m/s \text{ حالة أساسية} \Rightarrow \left(\frac{\Delta P}{P}\right)_{min} = 1,66$$

$$\lambda = \frac{h}{mv} \Rightarrow v = \frac{h}{\lambda m} = 1,1 \times 10^6 \text{ m/s}$$

$$\Delta P \cdot \Delta x \geq h \Rightarrow \Delta x_{\min} = \frac{h}{\Delta P_X} \dots \dots \dots (1)$$

$$\Delta P_X = m \Delta v_x$$

$$\frac{\Delta v}{v} = \frac{1}{100} \Rightarrow \Delta v = \frac{v}{100}$$

$$\Delta P_X = \frac{m \cdot v}{100} \dots \dots \dots (2)$$

$$(2) \text{ dans } (1) : \Delta x_{\min} = \frac{h \cdot 100}{m \cdot v} = \frac{6,62 \times 10^{-34} \times 100}{9,1 \times 10^{-31} \times 1,1 \times 10^6} = 6,631 \cdot 10^{-8} \text{ m}$$

### التمرين الثالث :

$$4S^1 \Rightarrow n = 4, l = 0, m = 0, S = \frac{1}{2} \text{ ou } -\frac{1}{2}$$

$$\Psi_{2S} \Rightarrow n = 2, l = 0, m = 0$$

$$\Psi_{2P_z} \Rightarrow n = 2, l = 1, m = 0$$

$$E_n = \frac{Z^2}{n^2} E_1, E_1 = -13,6 \text{ eV} \Rightarrow E_2 = \frac{1}{4} (-13,6) \text{ eV}$$

$$\Psi_{3f_X} \text{ خاطئ } n = 3 \Rightarrow l = 3$$

$$\Psi_{5d} \text{ صحيح } n = 5 \Rightarrow l = 2$$

$$\Psi_{632} \text{ صحيح } n = 6 \Rightarrow l = 3 \Rightarrow m = 2$$

$$\Psi_{601} \text{ خاطئ } n = 6 \Rightarrow l = 0 \Rightarrow m = 0$$

$$\Psi_{333\frac{1}{2}} \text{ خاطئ } n = 3 \Rightarrow l = 0, 1, 2$$

$$\Psi_{520} \text{ صحيح } n = 5 \Rightarrow l = 2 \Rightarrow m = 0$$