Calculating Hydrogen Alpha Wavelength

https://gemini.google.com/app/029893e0a5711ee1

Response: The H_α (Balmer-alpha) line corresponds to the transition from $n = 3$ to $n = 2$ in the hydrogen atom.

1. Energy Difference Calculation (ΔE)

$$\Delta E = E_3 - E_2$$

$$\Delta E = (-2.41 \times 10^{-19}\ \mathrm{J}) - (-5.45 \times 10^{-19}\ \mathrm{J})$$

$$\Delta E = 3.04 \times 10^{-19}\ \mathrm{J}$$

2. Wavelength Calculation (λ)

Using Planck's relation $\Delta E = \frac{hc}{\lambda}$ (where $h \approx 6.63 \times 10^{-34}\ \mathrm{J\ s}$ and $c \approx 3.00 \times 10^{8}\ \mathrm{m\ s^{-1}}$):

$$\lambda = \frac{hc}{\Delta E}$$

$$\lambda = \frac{(6.63 \times 10^{-34}\ \mathrm{J\ s}) \cdot (3.00 \times 10^{8}\ \mathrm{m\ s^{-1}})}{3.04 \times 10^{-19}\ \mathrm{J}}$$

$$\lambda \approx 6.54 \times 10^{-7}\ \mathrm{m}$$

Correct Answer: 4) $6.54 \times 10^{-7}\ \mathrm{m}$
