

LATEX PRACTICE

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$$\begin{aligned}
 U(x) &= \frac{mw^2x^2}{2} \\
 E_n &= \left(n + \frac{1}{2}\right)\hbar\omega \\
 \psi_0(x) &= \left(\frac{\beta^2}{\pi}\right)^{\frac{1}{4}} e^{-\frac{1}{2}\beta^2x^2} \\
 -\frac{\hbar^2}{2m} \frac{d^2}{dx^2} \psi(x) + U(x)\psi(x) &= E\psi(x) \\
 \beta &= \sqrt{\frac{m\omega}{\hbar}}
 \end{aligned}$$

(4) d. From $n = 4$ to $n = 1$

Find energy (eV)

$$\begin{aligned}
 E_n &= \left(n + \frac{1}{2}\right)\hbar\omega \\
 E_n &= \left(n + \frac{1}{2}\right)\left(\frac{h}{2\pi}\right)(2\pi f) \\
 E_n &= \left(n + \frac{1}{2}\right)hf \\
 E_n &= \left(n_a + \frac{1}{2}\right)hf - \left(n_b + \frac{1}{2}\right)hf \\
 E_n &= (n_a - n_b)hf \\
 E_1 &= 13.6 \text{ eV} \\
 E_p &= |E_f - E_i| \\
 E_p &= \left| \frac{-13.6\text{eV}}{1^2} - \frac{-13.6\text{eV}}{4^2} \right| = 12.75 \text{ eV} \\
 E_p &= 12.75 \text{ eV} \left(\frac{1.602 \times 10^{-19}\text{J}}{1\text{eV}} \right) = 2.043 \times 10^{-18} \text{ J}
 \end{aligned}$$

Find frequency (Hz)

$$f = \frac{E}{h}$$

$$f = \frac{2.043 \times 10^{-18} \text{ J}}{6.626 \times 10^{-34} \text{ J s}} = 3.083 \times 10^{15} \text{ Hz}$$

Find wavelength

$$\lambda = \frac{v}{f}$$

$$\lambda = \frac{3.00 \times 10^8 \frac{\text{m}}{\text{s}}}{3.083 \times 10^{15} \text{ Hz}} = 9.732 \times 10^{-8} \text{ m}$$