ΔE electronic transition

$\Delta E = h\nu = E_{final} - E_{initial} = R_H \left(\frac{1}{n_i^2} - \frac{1}{n_f^2}\right)$

H atom $R_H = 2.18 \times 10^{-18}$ J

a) Calculate the E of a photon released for an e^- $n=4 \longrightarrow n=1$

b) Calculate the λ of the photon (nm)

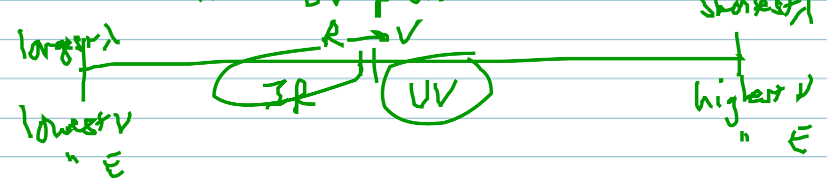
a) $\Delta E = R_H \left(\frac{1}{4^2} - \frac{1}{1^2}\right) = \ominus 2.04 \times 10^{-18}$ J

$E_{photon} = 2.04 \times 10^{-18}$ J

b) $E = h\nu$ $\quad c = \lambda\nu$ $\quad E = \frac{hc}{\lambda}$ $\quad \lambda = \frac{hc}{E}$

$$\lambda = \frac{(6.63 \times 10^{-34}\ \cancel{J \cdot s})(3.00 \times 10^{17}\ nm/\cancel{s})}{2.04 \times 10^{-18}\ \cancel{J}} = 97.5\text{nm}$$

$\#n \longrightarrow n=1$ UV photon



DeBroglie $\Rightarrow$ dual nature wave/particle

e^- behaving as a "standing wave"

for each n there is only 1 λ that "fits"

$2\pi r = n\lambda$

$n = 1, 2, 3$

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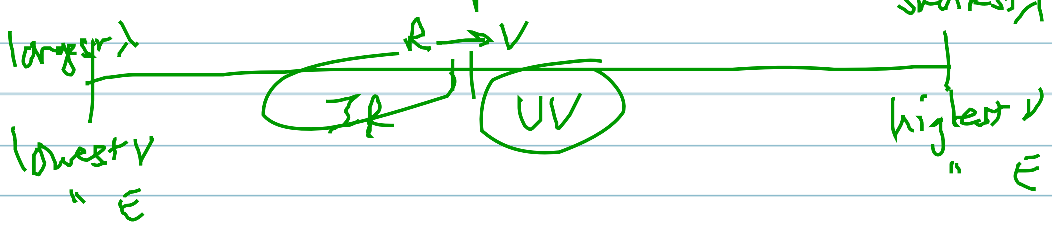

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↖ $n = 1, 2, 3$

$$\lambda = \frac{h}{m u}$$

$h \rightarrow J \cdot s$

mass (kg) $\rightarrow m$

speed $\frac{m}{s} \rightarrow u$

- NO PLANETARY ORBITS
- all material objects have a wavelength

3200 lbs   204 miles/hr

1 kg = 2.20 lbs

1 inch = 2.54 cm

$\lambda = ?$

$$3200\ lbs \times \frac{1\ kg}{2.20\ lbs} = 1500\ kg$$

$$\frac{204\ \cancel{miles}}{\cancel{hr}} \times \frac{5280\ \cancel{ft}}{1\ \cancel{mile}} \times \frac{12\ \cancel{in}}{1\ \cancel{ft}} \times \frac{2.54\ \cancel{cm}}{1\ \cancel{in}} \times \frac{1\ m}{100\ \cancel{cm}} \times \frac{1\ \cancel{hr}}{60\ \cancel{min}} \times \frac{1\ min}{60\ sec}$$

$= 91.2\ m/s$

$$\lambda = \frac{6.63 \times 10^{-34}\ J \cdot s}{(1500\ kg)(91.2\ m/s)} = 4.8 \times 10^{-39}\ m$$

$4.8 \times 10^{-30}\ nm$

single atom 0.05 nm $\longrightarrow$ 5 nm