(4-25) Calculate f of photon emitted by H atom in $n=4 \longrightarrow n=3$ transition and compare with frequency of revolution

$$E_\gamma = E_4 - E_3 = -\frac{13.6}{4^2} - \left(-\frac{13.6}{3^2}\right) = 13.6\left(\frac{1}{9} - \frac{1}{16}\right)$$

$$E_\gamma = 0.661111 \text{ eV}$$

$$\lambda = \frac{c}{f} = \frac{hc}{hf} = \frac{hc}{E_\gamma} = \frac{1240 \text{ eV.nm}}{0.661111} = 1875.6 \text{ nm}$$

$$f = \frac{c}{\lambda} = \frac{3\times10^{17} \text{ nm/s}}{1875.6 \text{ nm}} = 1.60\times10^{14} \text{ Hz}$$

You can also use $\frac{1}{\lambda} = R\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$

but then you need to know R.

It is easier to remember $\underline{\underline{13.6 \text{ eV}}}$

$$f_n^{classical} = \frac{1}{\text{period}} = \frac{v_n}{2\pi r_n} , \quad v_n = \frac{n\hbar}{m_e r_n} , \quad r_n = a_0 n^2 , \quad a_0 = 0.529 \text{ Å}$$

$$f_n^{classial} = \frac{n\hbar}{2\pi m_e r_n^2} \times \frac{c^2}{c^2} = \frac{n(\hbar c)c}{2\pi(m_e c^2)\, a_0^2 n^4} = \frac{(\hbar c)(c)}{2\pi(m_e c^2) a_0^2 n^3}$$

$$f_n^{classical} = \frac{(197 \text{ eV.nm}) \times (3\times10^{17} \text{ nm/s})}{2\pi(0.511\times10^6 \text{ eV})(0.0529 \text{ nm})^2} \frac{1}{n^3} = \frac{6.58\times10^{15}}{n^3}$$

$$f_4^{classical} = 1.02\times10^{14} \text{ Hz} , \quad f_3^{classical} = 2.43\times10^{14} \text{ Hz}$$