

A hydrogen atom emits ultraviolet radiation of wavelength 102.5 nm . What are the quantum numbers of the states involved in the transition?

As the light emitted lies in ultraviolet range the line lies in Lyman series.

$$\frac{1}{\lambda} = R \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$$

$$\Rightarrow \frac{1}{102.5 \times 10^{-9}} = 1.1 \times 10^7 (1/1^2 - 1/n_2^2)$$

$$\Rightarrow \frac{10^9}{102.5} = 1.1 \times 10^7 (1 - 1/n_2^2) \Rightarrow \frac{10^2}{102.5} = 1.1 \times 10^7 (1 - 1/n_2^2)$$

$$\Rightarrow 1 - \frac{1}{n_2^2} = \frac{100}{102.5 \times 1.1} \Rightarrow \frac{1}{n_2^2} = \frac{1 - 100}{102.5 \times 1.1}$$

$$\Rightarrow n_2 = 2.97 = 3.$$