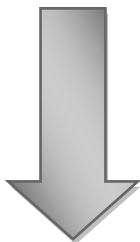


Problem-Solving Example 11

For the Paschen Series, what are the frequencies of the first three lines.

Solution



Example 11 : Solution :

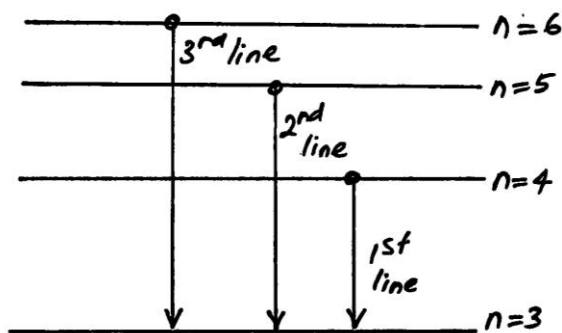
Solution :

For Paschen Series, $n_x = 3$

1st line : $n_y = 4 \rightarrow n_x = 3$

2nd line : $n_y = 5 \rightarrow n_x = 3$

3rd line : $n_y = 6 \rightarrow n_x = 3$



For the first line : $n_x = 3$; $n_y = 4$

Using Rydberg Equation (3rd form)

$$\begin{aligned} \nu &= (3.29 \times 10^{15} \text{ s}^{-1}) \left[\frac{1}{n_x^2} - \frac{1}{n_y^2} \right] \\ &= (3.29 \times 10^{15} \text{ s}^{-1}) \left(\frac{1}{3^2} - \frac{1}{4^2} \right) \\ &= 1.60 \times 10^{14} \text{ Hz} \end{aligned}$$

For the second line of Paschen Series : $n_x = 3$; $n_y = 5$

$$\begin{aligned} \nu &= (3.29 \times 10^{15} \text{ s}^{-1}) \left(\frac{1}{3^2} - \frac{1}{5^2} \right) \\ &= 2.34 \times 10^{14} \text{ Hz} \end{aligned}$$

For the third line of Paschen Series : $n_x = 3$; $n_y = 6$

$$\begin{aligned} \nu &= (3.29 \times 10^{15} \text{ s}^{-1}) \left(\frac{1}{3^2} - \frac{1}{6^2} \right) \\ &= 2.74 \times 10^{14} \text{ Hz} . \end{aligned}$$

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