

PREVIOUS YEAR QUESTION

The ratio of the shortest wavelength of two spectral series of hydrogen spectrum is found to be about 9. The spectral series are :

- A Paschen and Pfund
- B Balmer and Brackett
- C Lyman and Paschen
- D Brackett and Pfund

Explanation

Shortest wavelength can found when $n_2 = \infty$

$$\lambda_{shortest} = RZ^2 \left\{ \frac{1}{n_1^2} - \frac{1}{\infty^2} \right\}$$

Here n_1 = series number.

$$\Rightarrow \lambda_{shortest} = \frac{RZ^2}{n_1^2} = \frac{R(1)^2}{n_1^2}$$

$$\therefore \frac{\lambda_A}{\lambda_B} = \left(\frac{n_B}{n_A} \right)^2$$

$$\text{Given, } \left(\frac{n_B}{n_A} \right)^2 = 9$$

$$\Rightarrow \frac{n_B}{n_A} = 3$$

\therefore Series number of B = 3 \times Series number of A

So,

If series number of A is Lyman($n = 1$)

then series number of B is Paschen($n = 3$).