# PREVIOUS YEAR QUESTION

For any given series of spectral lines of atomic hydrogen, let $\Delta\bar{v} = \Delta\bar{v}_{\text{max}} - \Delta\bar{v}_{\text{min}}$ be the difference in maximum and minimum frequencies in cm$^{-1}$. The ratio Lyman Balmer $\frac{\Delta\bar{v}_{Lyman}}{\Delta\bar{v}_{Balmer}}$ is :

(A) 9 : 4

(B) 4 : 1

(C) 27 : 5

(D) 5 : 4

## Explanation

We know,

$\bar{v} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

∴ For Lyman series,

$\Delta\bar{v}_{Lyman} = \Delta\bar{v}_{\text{max}} - \Delta\bar{v}_{\text{min}}$

$= \left[\frac{1}{1} - \frac{1}{\infty}\right] - \left[\frac{1}{1} - \frac{1}{4}\right]$

$= \frac{1}{4}$

∴ For Balmer series,

$\Delta\bar{v}_{Balmer} = \Delta\bar{v}_{\text{max}} - \Delta\bar{v}_{\text{min}}$

$= \left[\frac{1}{4} - \frac{1}{\infty}\right] - \left[\frac{1}{4} - \frac{1}{9}\right]$

$= \frac{1}{9}$

$\therefore \frac{\Delta\bar{v}_{Lyman}}{\Delta\bar{v}_{Balmer}} = \frac{\frac{1}{4}}{\frac{1}{9}} = \frac{9}{4}$