

Q32. The Balmer series in the hydrogen spectrum corresponds to the transition from $n_1 = 2$ to $n_2 = 3, 4, \dots$. This series lies in the visible region. Calculate the wave number of line associated with the transition in Balmer series when the electron moves to $n = 4$ orbit. ($R_H = 109677 \text{ cm}^{-1}$).

Sol.
$$\bar{\nu} = R_H \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right) \text{cm}^{-1}$$
$$= 109677 \left(\frac{1}{2^2} - \frac{1}{4^2} \right) = 109677 \left(\frac{1}{4} - \frac{1}{16} \right)$$
$$= 20564.44 \text{ cm}^{-1}$$