Three energy levels of an atom are shown in Fig. 4.33. The wavelength corresponding to three possible transitions are λ_1, λ_2, and λ_3. The value of λ_3 in terms of λ_1 and λ_2 is given by

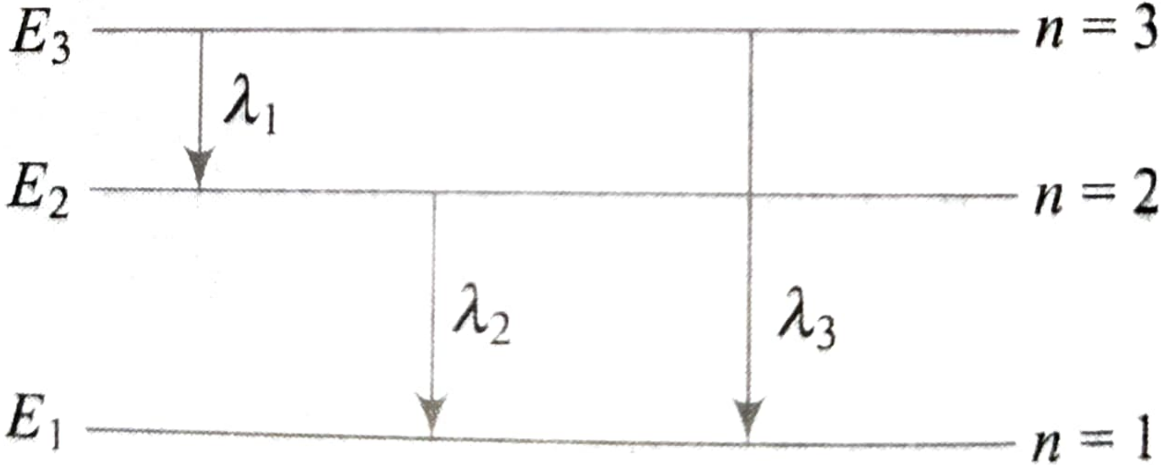

Fig. 4.33

$$\frac{1}{\lambda_1} = R_\infty Z^2\left[\frac{1}{2^2} - \frac{1}{3^2}\right] \quad \text{(i)}$$

$$\frac{1}{\lambda_2} = R_\infty Z^2\left[\frac{1}{1^2} - \frac{1}{2^2}\right] \quad \text{(ii)}$$

$$\frac{1}{\lambda_3} = R_\infty Z^2\left[\frac{1}{1^2} - \frac{1}{3^2}\right] \quad \text{(iii)}$$

On adding (i) and (ii), we get

$$\frac{1}{\lambda_1} + \frac{1}{\lambda_2} = R_\infty Z^2\left[\frac{1}{1^2} - \frac{1}{3^2}\right]$$

Thus, $$\frac{1}{\lambda_1} + \frac{1}{\lambda_2} = \frac{1}{\lambda_3}$$

$$\lambda_3 = \frac{\lambda_1 \lambda_2}{\lambda_1 + \lambda_2}$$