

Exemplar Problems

Q33. According to de Broglie, matter should exhibit dual behaviour, that is both particle and wave like properties. However, a cricket ball of mass 100 g does not move like a wave when it is thrown by a bowler at a speed of 100 km/h. Calculate the wavelength of the ball and explain why it does not show wave nature.

Sol. $m = 100 \text{ g}$ or 0.1 kg

$$v = 100 \text{ km/h} = \frac{100 \times 1000}{60 \times 60} = \frac{1000}{36} \text{ m/s}$$

$$\lambda = \frac{h}{mv} = \frac{6.63 \times 10^{-34} \text{ kg m}^2 \text{ s}^{-1}}{(0.1 \text{ kg}) (1000/36 \text{ ms}^{-1})} = 2.387 \times 10^{-34} \text{ m}$$

Since the wavelength is very small, the wave nature cannot be detected.