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Answers to NCERT/CBSE PHYSICS Class 12(Class XII)textbook Exercise and Additional exercise

CHAPTER ELEVEN

Dual nature of Matter and Radiation

EXERCISES

(For simplicity in numerical calculations, take $g = 10 \text{ m s}^{-2}$)

$h = 6.6 \times 10^{-34} \text{ J.S}$

11.7 A 100W sodium lamp radiates energy uniformly in all directions. The lamp is located at the centre of a large sphere that absorbs all the sodium light which is incident on it. The wavelength of the sodium light is 589 nm. (a) What is the energy per photon associated

with the sodium light? (b) At what rate are the photons delivered to the sphere?

11.7 (a) Energy per photon $E = \frac{hc}{\lambda} = \frac{6.63 \times 10^{-34} \times 3 \times 10^8}{589 \times 10^{-9}} = 3.38 \times 10^{-19} \text{ J}$

(b) Number of photons $= \frac{100 \text{ J / S}}{3.38 \times 10^{-19}} = 2.95 \times 10^{20} \text{ S}^{-1} \approx 3 \times 10^{20} \text{ S}^{-1}$