Chapter 3: Quantum Physics

de Broglie Hypothesis

P 20: (a) An electron has a kinetic energy of 3.0 eV. Find its wavelength.

(b) Also find the wavelength of a photon having the same energy.

Ans :

(a) For electron

$$\lambda = \frac{h}{\sqrt{2mE}} = \frac{6.626 \times 10^{-34}}{\sqrt{2 \times 9.1 \times 10^{-31} \times 3.0 \times 1.6 \times 10^{-19}}} = 0.709\ nm$$

(b)

For photon

$$E = \frac{hc}{\lambda}$$

$$\lambda = \frac{hc}{E} = \frac{6.626 \times 10^{-34} \times 3 \times 10^{8}}{3.0 \times 1.6 \times 10^{-19}} = 414\ nm$$