

3. The work function of caesium metal is 2.14 eV. When light of frequency $6 \times 10^{14} \text{ Hz}$ is incident on the metal surface, photoemission of electrons occurs. What is the
- maximum kinetic energy of the emitted electrons,
 - stopping potential, and
 - maximum speed of the emitted photoelectrons?

Sol.

$$\text{a. } K.E._{\text{max}} = h\nu - \phi_0 = \frac{6.63 \times 10^{-34} \times 6 \times 10^{14}}{1.6 \times 10^{-19}} - 2.14$$

$$K.E._{\text{max}} = 0.35 \text{ eV}$$

$$\text{b. } eV_0 = K.E._{\text{max}}$$

$$\Rightarrow V_0 = \frac{K.E._{\text{max}}}{e} = \frac{0.35 \text{ eV}}{e} = 0.35 \text{ V}$$

$$\text{c. } \frac{1}{2}mv_{\text{max}}^2 = 0.35 \text{ eV} = 0.35 \times 1.6 \times 10^{-19} \text{ J}$$

$$\Rightarrow v_{\text{max}} = \sqrt{\frac{0.35 \times 1.6 \times 10^{-19} \times 2}{9.1 \times 10^{-31}}}$$

$$= 3.34 \times 10^5 \text{ ms}^{-1}$$