

An electron having de-Broglie wavelength is incident on a target in a X-ray tube. Cut-off wavelength of emitted X-ray is :

Solution:

$$\frac{h}{\sqrt{2mE}} = \lambda \quad \Rightarrow \quad \frac{h^2}{2mE} = \lambda_e^2$$
$$E = \frac{h^2}{2m\lambda_e^2}$$

Now, if complete energy is used given to X-ray photon,

$$\frac{hc}{\lambda_x} = \frac{h^2}{2m\lambda_e^2}$$

$$\lambda_x = \frac{2m\lambda_e^2 c}{h}$$