

PH-105 QM Sheet 1

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4. X-ray of wavelength $\lambda = 0.1\text{\AA}$ is scattered by an electron. At what angle will the scattered photon have a wavelength of 0.11\AA ?

Solution :

We use the Compton scattering formula

$$\lambda' - \lambda = \frac{h}{m_0 c}(1 - \cos\theta) \text{ where } \lambda = \text{wavelength of incoming photon} = 0.1\text{\AA}$$

$$\lambda' = \text{wavelength of scattered photon} = 0.11\text{\AA}$$

m_0 = mass of stationary particle

For an electron, $\frac{h}{m_0 c} = 0.0242\text{\AA}$. So, we get $0.11 - 0.1 = 0.0242(1 - \cos\theta)$. Solving for θ yields a value of 54° .