PH-105 QM Sheet 1

Vipul Singh

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

   Solution :

   We use the Compton scattering formula
   $\lambda^{'} - \lambda = \frac{h}{m_0 c}(1 - cos\theta)$ where λ = wavelength of incoming photon = $0.1\mathring{A}$
   $\lambda^{'}$ = wavelength of scattered photon = $0.11\mathring{A}$
   m_0 = mass of stationary particle
   For an electron, $\frac{h}{m_0 c} = 0.0242\mathring{A}$. So, we get $0.11 - 0.1 = 0.0242(1 - cos\theta)$. Solving for θ yields a value of $54°$.