Answer on Question #58657-Physics-Quantum Mechanics

Q. show that ΔE/E = hf'/moc2(1-cos ɵ)

Solution

$$\lambda' = \lambda + \frac{h}{m_e c}(1 - \cos\theta)$$

$$E' = \frac{\mathrm{hc}}{\lambda'};\ E = \frac{\mathrm{hc}}{\lambda}.$$

$$\frac{\Delta \mathrm{E}}{\mathrm{E}} = \frac{\frac{\mathrm{hc}}{\lambda'} - \frac{\mathrm{hc}}{\lambda}}{\frac{\mathrm{hc}}{\lambda}} = \frac{\lambda - \lambda'}{\lambda'} = \frac{-\frac{h}{m_e c}(1 - \cos\theta)}{\frac{\mathrm{c}}{f'}} = -\frac{hf'}{m_e c^2}(1 - \cos\theta)$$

$$\left|\frac{\Delta \mathrm{E}}{\mathrm{E}}\right| = \frac{hf'}{m_e c^2}(1 - \cos\theta)$$