

- 1) An X-ray is incident on a brick and scatters an electron out of the material. If the outgoing photon has a wavelength 0.002 nm different than the incident one, what angle does it exit with respect to the incident photon?

$$\lambda' - \lambda = \frac{h}{mc} (1 - \cos \theta)$$

$$\lambda_{\text{Compton}} = h/mc = 2.43 \times 10^{-12} \text{ m}$$

$$\Delta \lambda = 0.002 \text{ nm}$$

$$2 \times 10^{-12} \text{ m} = \lambda_{\text{Compton}} (1 - \cos \theta)$$

$$\frac{2 \times 10^{-12} \text{ m}}{2.43 \times 10^{-12} \text{ m}} - 1 = -\cos \theta$$

$$\theta = \cos^{-1}(0.177)$$

$$\theta = 79.8^\circ$$

