Atomics - Problem IV (7 points)

Compton scattering

A photon of wavelength λ_i is scattered by a moving, free electron. As a result the electron stops and the resulting photon of wavelength λ_0 scattered at an angle $\theta = 60°$ with respect to the direction of the incident photon, is again scattered by a second free electron at rest. In this second scattering process a photon with wavelength of $\lambda_f = 1{,}25 \times 10^{-10} m$ emerges at an angle $\theta = 60°$ with respect to the direction of the photon of wavelength λ_0. Find the de Broglie wavelength for the first electron before the interaction. The following constants are known:

$h = 6{,}6 \times 10^{-34} J \cdot s$ - Planck's constant

$m = 9{,}1 \times 10^{-31} kg$ - mass oh the electron

$c = 3{,}0 \times 10^{8} m/s$ - speed of light in vacuum