

1 Derivations

Question 1: Please derive the Lorentz-invariant Rutherford Scattering equation:

$$\frac{d\sigma}{dQ^2} = \frac{4\pi z^2 \alpha^2 \hbar^2 c^2}{\beta^2} \frac{1}{Q^2} \quad (1.1)$$

Question 2: Please derive the equation for energy emitted per unit time from an accelerated charge:

$$\frac{dW}{dt} = \frac{2}{3} \frac{z^2 e^2}{4\pi\epsilon_0 c^3} |\ddot{\vec{x}}|^2 \propto \frac{z^4 Z^2 e^6}{m^2} \quad (1.2)$$

The notations are explained either in the lectures or the textbook.