

TFY4205 Quantum Mechanics II
Problemset 6 fall 2022

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Problem 1 (Born approximation)

Fast electrons are scattered on a hydrogen atom in the ground state, with the electron density $|\psi_{100}(r)|^2$. Calculate the atomic form factor and thereby the differential scattering cross section for elastic scattering in the Born approximation.

Show that the corresponding total cross section (remember the word *fast*) is:

$$\sigma = \frac{7\pi}{3k^2}. \quad (1)$$

The relation between the energy E and the wavevector \mathbf{k} for the incoming particle is that $E = \hbar^2|\mathbf{k}|^2/2m$.