Homework 9 PS405

Due: Friday, November 4, 2016

1. A 3 MeV beam of α particles strikes an aluminum target.

   a. Determine the distance of closest approach D between the α particles and the aluminum nuclei at this energy. (note: this is the "head on" distance of closest approach).

   $D =$ _____ fm

   b. Calculate the number of aluminum nuclei per unit volume in the target.
   (Aluminum has $Z = 13$, $A = 27$, and *density* 2.70 g/cm^3, $m = 26.98$ g/mol)

   # Al nuclei / m^3 = _____

   c. Suppose the beam of α particles has a flux of 10^5 α particles/sec. If the thickness of the aluminum target is 10^{-4} cm, calculate the number of α particles scattered per second into the backward hemisphere.

   Flux into the backward hemisphere = _____ α particles/sec

   d. What is the distance of closest approach for an α particle scattered at 90º?

   r_{min} = _____ fm