Answer on Question #44000-Physics-Atomic Physics

In Rutherford's experiment if 2000 particles are deflected at angle of 60 degree then how many particles are deviated at 120 degree?

Solution

For a detector at a specific angle with respect to the incident beam, the number of particles per unit area striking the detector is proportional to

$$N(\theta) \sim \frac{1}{\sin^4 \frac{\theta}{2}} \to N(\theta) \cdot \sin^4 \frac{\theta}{2} = const,$$

where θ is scattering angle.

The number of particles have been deviated at 120 degree is

$$N(120°) = \frac{N(60°) \sin^4 \frac{60°}{2}}{\sin^4 \frac{120°}{2}} = \frac{2000 \sin^4 30°}{\sin^4 60°} = 2000 \frac{\left(\frac{1}{2}\right)^4}{\left(\frac{\sqrt{3}}{2}\right)^4} = \frac{2000}{9} = 222.$$

Answer: 222.