

A Level Physics A

H556/02 Exploring physics

Question Set 20

- 1(a) The structure of atoms was deduced in the early 1900s by Rutherford and his co-workers from the scattering of alpha-particles by a very thin sheet of gold.

Rutherford assumed that the scattering of the alpha-particles was due to electrostatic forces. Fig. 23 shows a detector used to record the number N of alpha-particles scattered through an angle θ .

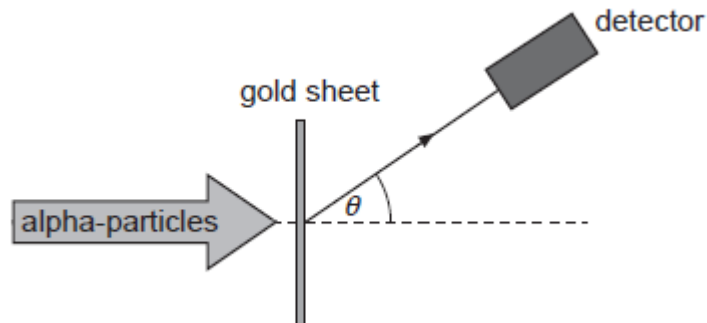


Fig. 23

At $\theta = 0^\circ$, N was too large to be measured. The table below summarises some of the collected data.

$\theta / ^\circ$	$\lg(N)$
150	1.5
75	2.3
60	2.7
30	3.9
15	5.1
0	N too large

- (i) Show that the number of alpha-particles scattered through 15° is about 4000 times more than those scattered through 150° .

[1]

- (ii) Use the evidence from the table to explain the structure of the atom.

[3]

- (b) A proton with kinetic energy 0.52 MeV is travelling directly towards a stationary nucleus of cobalt-59 ($^{59}_{2}\text{Co}$) in a head-on collision.

- (i) Explain what happens to the electric potential energy of the proton-nucleus system.

[1]

- (ii) Calculate the **minimum** distance R between the proton and cobalt nucleus.

$R = \dots\dots\dots\text{ m}$ [3]

Total Marks for Question Set 20: 8

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