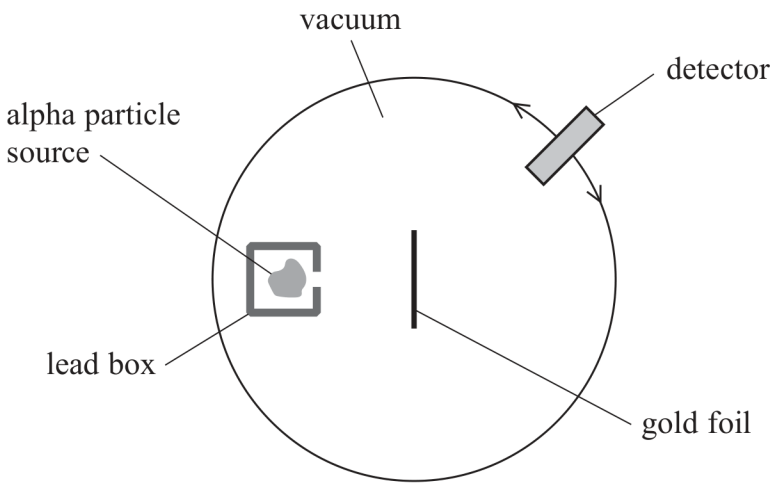
16 In the early 20th century, experiments were carried out in which alpha particles were directed towards thin gold foil.

A simplified diagram of the apparatus used is shown.



(a) State three observations and the corresponding conclusions made from the alpha particle scattering experiment.

(6)

(b) One experiment used gold foil made from the gold isotope $^{197}_{79}$Au. The alpha particles had an initial kinetic energy of 4.7 MeV.

(i) Show that the closest distance these alpha particles can get to a gold nucleus is about 5×10^{-14} m.

(4)

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(ii) Calculate the strength of the electric field due to the gold nucleus at this distance.

(3)

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Strength of electric field = ...

(Total for Question 16 = 13 marks)