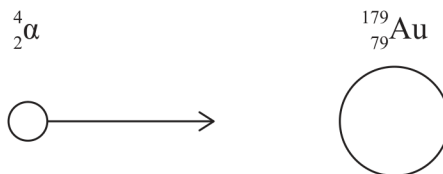**15** The nuclear model of the atom was developed after a series of experiments in which alpha particles were directed at thin gold foil.

An alpha particle $\left(^4_2\alpha\right)$ with kinetic energy 5.52 MeV approaches a gold nucleus $\left(^{179}_{79}\text{Au}\right)$ head-on, as shown.

$$^4_2\alpha \qquad\qquad\qquad ^{179}_{79}\text{Au}$$

The alpha particle is brought to rest and then returns along its original path.

(a) Calculate the minimum distance between the alpha particle and the gold nucleus.

(4)

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....

Minimum distance = ...

(b) An alpha particle with a different energy approaches the gold nucleus. The minimum distance between this alpha particle and the gold nucleus is 5.68×10^{-14} m.

Calculate the maximum electrostatic force F that acts between this alpha particle and the gold nucleus.

(2)

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$F =$ ....

(Total for Question 15 = 6 marks)