

5 Americium-241 decays by emitting α -particles each with kinetic energy of $8.78 \times 10^{-13} \text{ J}$.

- (a) Calculate the speed of an α -particle emitted by americium-241.
mass of an α -particle = $6.64 \times 10^{-27} \text{ kg}$

speed = ms^{-1} [3]

- (b) In a vacuum chamber, there is a magnetic field of magnetic field strength 0.682 T that is directed out of the plane of the page. A sample of americium-241 is placed in this field.

Fig. 5.1 shows that an α -particle initially travels in the plane of the page, perpendicular to the magnetic field. The arrow represents the initial path of an α -particle.

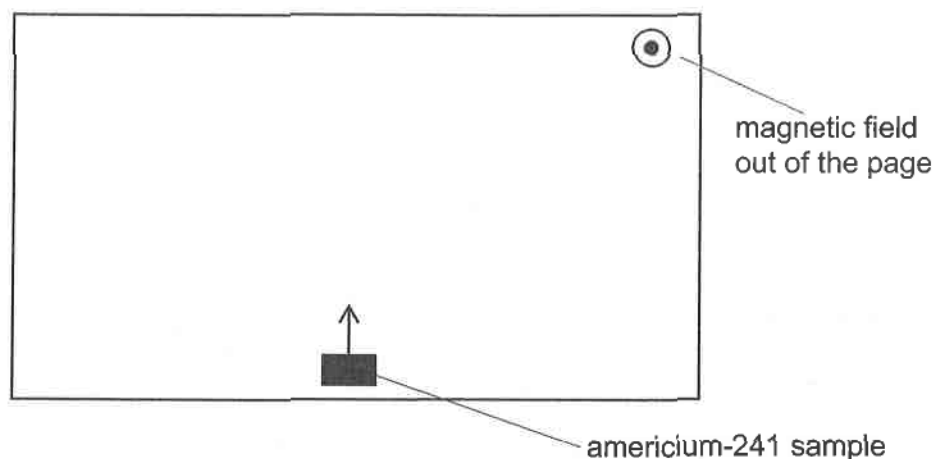


Fig. 5.1

- (i) On Fig. 5.1, sketch the path of the α -particle. [1]
- (ii) Calculate the magnitude of the force on the α -particle due to the magnetic field.

force = N [2]





- (c) State and explain one difference in the path taken by the α -particle after air is allowed to enter the vacuum chamber.

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..... [2]

- (d) The americium-241 source used in (b) is replaced with a source which emits β -particles.

State and explain **two** differences in the path of a β -particle compared to the path of the α -particle.

1.

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2.

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[4]

[Total: 12]

