

- 6 (a) There are two situations in which a charged particle in a magnetic field does not experience a magnetic force.

State these two situations.

1.

.....

2.

..... [2]

- (b) A beam of particles of charge $+3.2 \times 10^{-19}$ C travels in a vacuum at 4.7×10^5 m s⁻¹. The particles enter a region of uniform magnetic field of flux density 0.12 T at an angle of 20° to the direction of magnetic field as shown in Fig. 6.1.

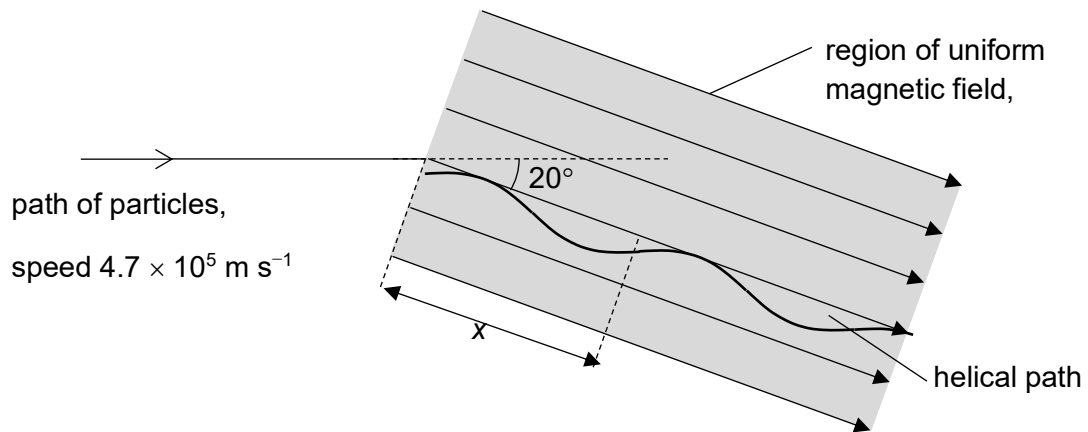


Fig. 6.1

The path of the particles in the magnetic field is a helix with a diameter of 5.6 cm.

In the time taken for the particles to complete one revolution in the helix, the particles travel a displacement x along the direction of the magnetic field.

- (i) Calculate the component of the velocity of the particles in the direction normal to the magnetic field.

component of velocity = m s^{-1} [1]

(ii) Determine the mass of each particle.

mass = kg [2]

(iii) Determine the displacement x .

x = m [3]

- (iv) Electrons with the same speed of $4.7 \times 10^5 \text{ m s}^{-1}$ enter the magnetic field at the same angle of 20° .

Without further calculation, state **two** differences between the path of the electrons and the path of the particles in the magnetic field.

1.

.....

2.

..... [2]

