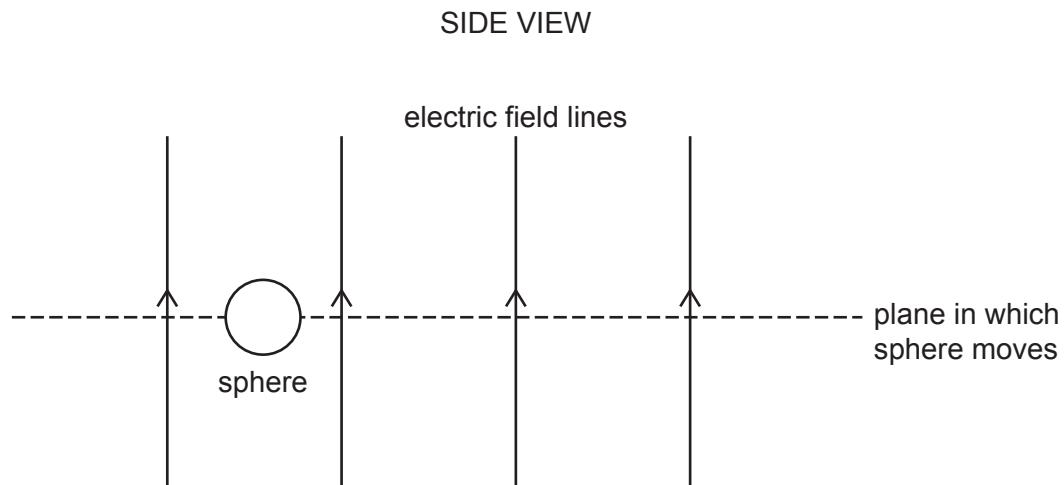


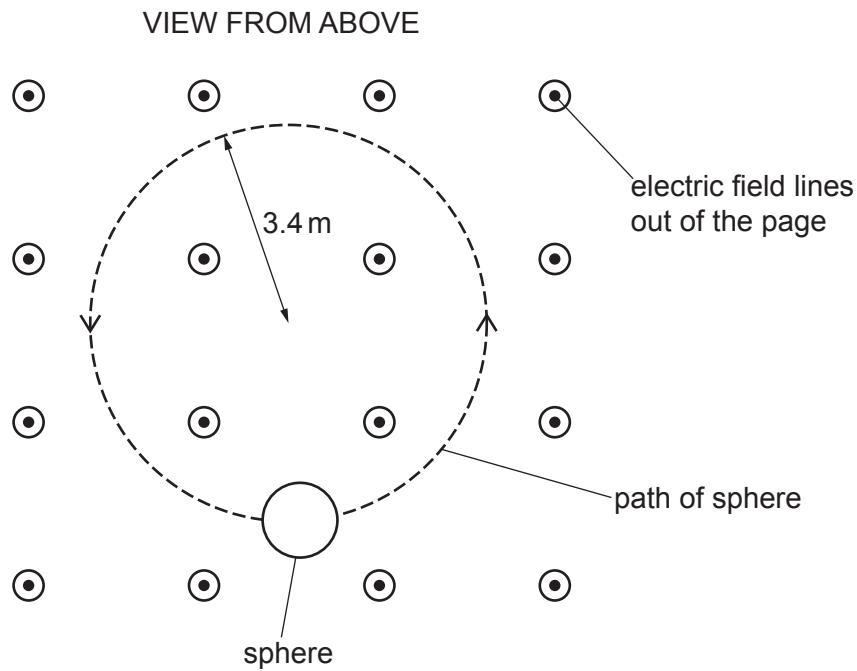
- 2 A sphere of mass  $1.6 \times 10^{-10}$  kg has a charge of +0.27 nC. The sphere is in a uniform electric field that acts vertically upwards, as shown in the side view in Fig. 2.1.



**Fig. 2.1**

The force exerted on the sphere by the electric field causes the sphere to remain at a fixed vertical height in a horizontal plane.

There is a uniform magnetic field in the region of the electric field. The sphere moves at a speed of  $0.78 \text{ m s}^{-1}$  in the horizontal plane. The magnetic field causes the sphere to move in a circular path of radius 3.4 m, as shown in the view from above in Fig. 2.2.



**Fig. 2.2**

- (a) (i) Determine the direction of the uniform magnetic field.

..... [1]

- (ii) Explain why the motion of the sphere in the horizontal plane is circular.

.....

.....

..... [2]

- (b) Calculate the strength of the uniform electric field.

electric field strength = .....  $\text{NC}^{-1}$  [2]

- (c) By considering the magnetic force on the sphere, show that the flux density of the uniform magnetic field is 0.14 T.

[3]