6 (a) (i) Define *electric field strength*.

.....

..... [2]

(ii) Describe what is meant by a uniform electric field.

.....

..... [2]

(b) A ball of mass m, 10 g, is suspended from an insulating thread that is fixed at the top. The ball has electric charge q, +9.0 nC. The thread hangs in a uniform horizontal electric field of field strength E. When the ball is in equilibrium, the thread makes an angle of 30° to the vertical. This is shown in Fig. 6.1.

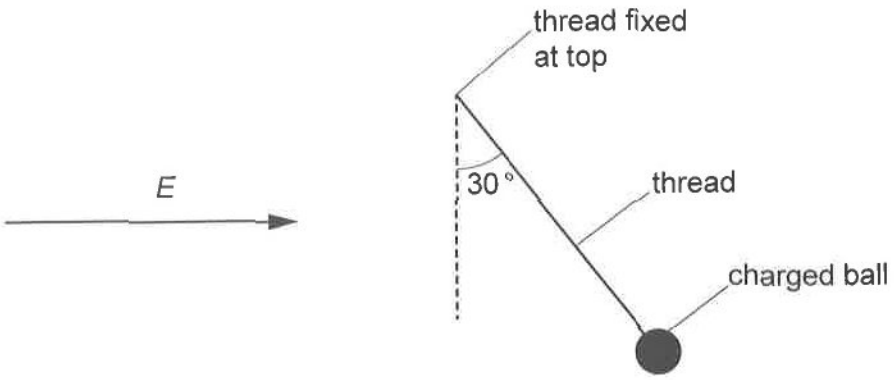

Fig. 6.1 (not to scale)

(i) Draw and label a vector triangle to show the forces acting when the ball is in equilibrium.

[3]

(ii) *Show that the electric field strength E is given by the expression:*

$$E = \frac{mg}{\sqrt{3}q}$$

[4]

(iii) Calculate the electric field strength E and state its unit.

electric field strength = ... unit ..... [2]

(c) The thread is cut. Air resistance is negligible.

Describe and explain the resulting motion of the ball.

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..... [4]

(d) A different ball is suspended from a new thread. This ball has the same mass but has a charge of –6.0 nC. The electric field strength remains the same.

The new thread is cut.

Describe and explain how the motion of this ball differs from the motion of the ball in part **(c)**.

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..... [3]

[Total: 20]