For Examiner's Use

7 **(a)** Two horizontal metal plates are connected to a power supply, as shown in Fig. 7.1.

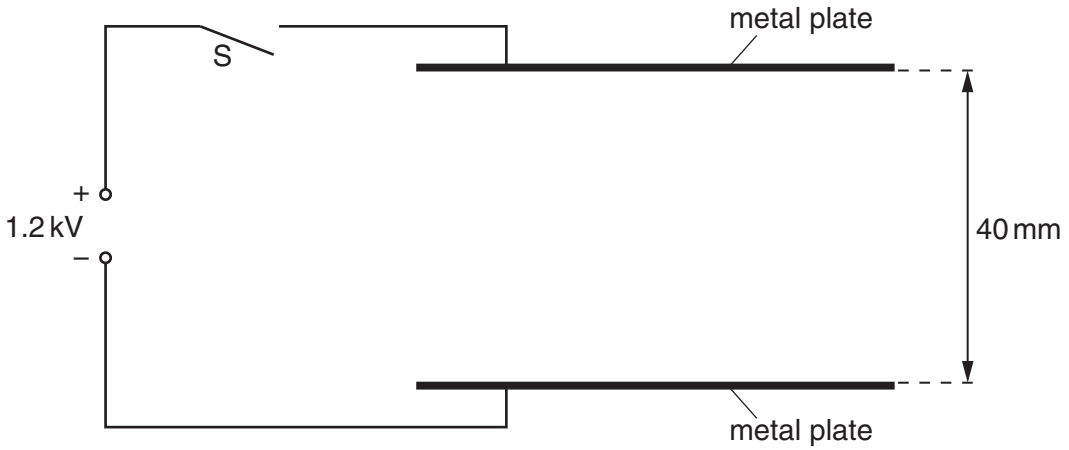

Fig. 7.1

The separation of the plates is 40 mm.

The switch S is then closed so that a potential difference of 1.2 kV is applied across the plates.

(i) On Fig. 7.1, draw six field lines to represent the electric field between the metal plates. [2]

(ii) Calculate the electric field strength E between the plates.

E = ... $V\,m^{-1}$ [2]

(b) The switch S is opened and the plates lose their charge. Two very small metal spheres A and B joined by an insulating rod are placed between the metal plates as shown in Fig. 7.2.

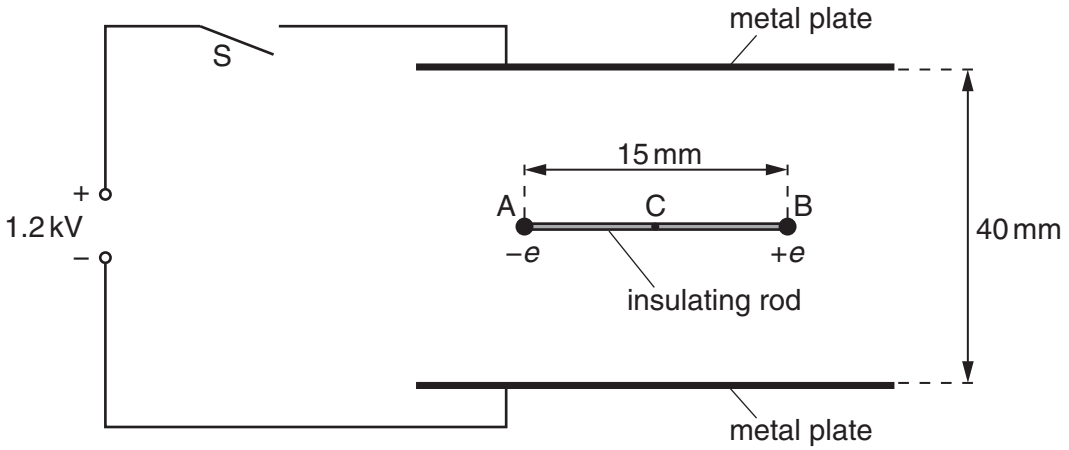

Fig. 7.2

Sphere A has charge $-e$ and sphere B has charge $+e$, where e is the charge of a proton. The length AB is 15 mm. The rod is supported at its centre C so that the rod is horizontal and in equilibrium.

For Examiner's Use

The switch S is then closed so that the potential difference of 1.2 kV is applied across the plates.

(i) There is a force acting on A due to the electric field between the plates. Show that this force is 4.8×10^{-15} N.

[2]

(ii) The insulating rod joining A and B is fixed in the position shown in Fig. 7.2. Calculate the torque of the couple acting on the rod.

torque = ... unit ..... [3]

(iii) The insulating rod is now released so that it is free to rotate about C. State and explain the position of the rod when it comes to rest.

.....

.....

.....

.....[2]

BLANK PAGE