

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

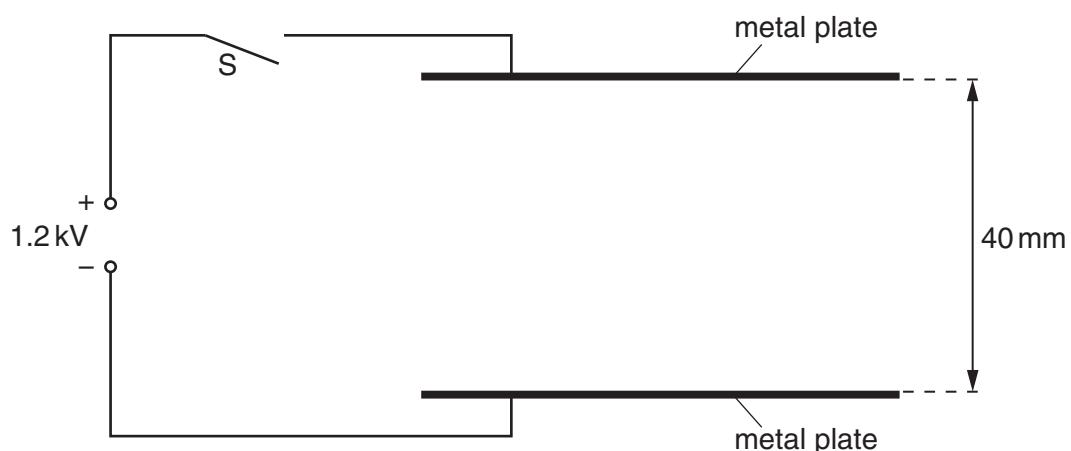


Fig. 7.1

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.

$$E = \dots \text{Vm}^{-1} \quad [2]$$

- (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.

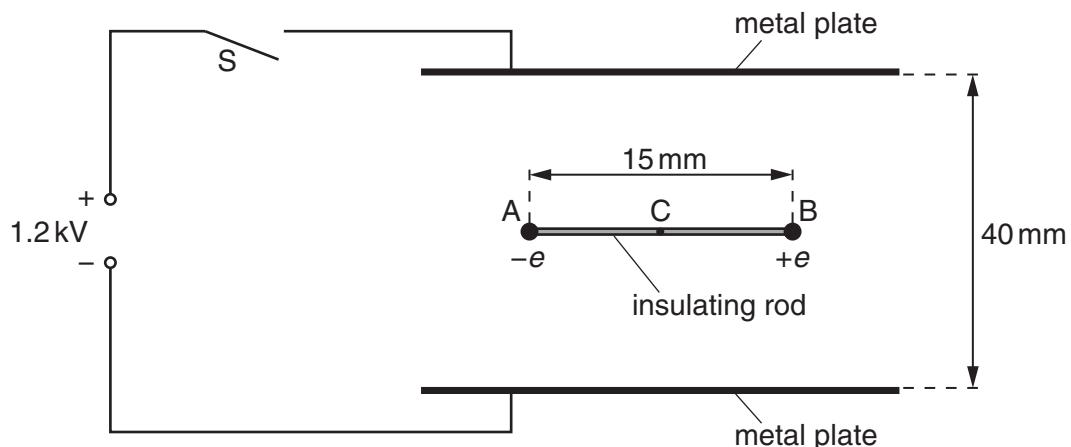


Fig. 7.2

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.

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.

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[2]

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