1 **(a)** The following are three statements about boiling.

- A liquid boils at a fixed temperature.
- During boiling, vapour can form at any point within the liquid.
- Without a supply of thermal energy, boiling stops.

Complete the following equivalent statements about evaporation.

- A liquid evaporates at .....

  ..... .
- Du ing evaporation .....

  ..... .
- Without a supply of thermal energy, evaporation ..... .

[3]

(b) A pan containing water boiling at 100 °C is standing on an electrically heated hot-plate. In 20 minutes, 0.075 kg of water is lost as steam. The specific latent heat of vaporisation of water is 2.25×10^6 J / kg.

(i) Calculate the energy used in converting 0.075 kg of boiling water to steam.

energy = ... [2]

(ii) The hot-plate operates at 240 V, 0.65 A.

Calculate the energy supplied to the hot-plate in 20 minutes.

energy = ... [2]

(iii) Suggest why the answers to **(b)(i)** and **(b)(ii)** are not the same.

.....

..... [1]

[Total: 8]

2 In Fig. 9.1, A and B are two conductors on insulating stands. Both A and B were initially uncharged.

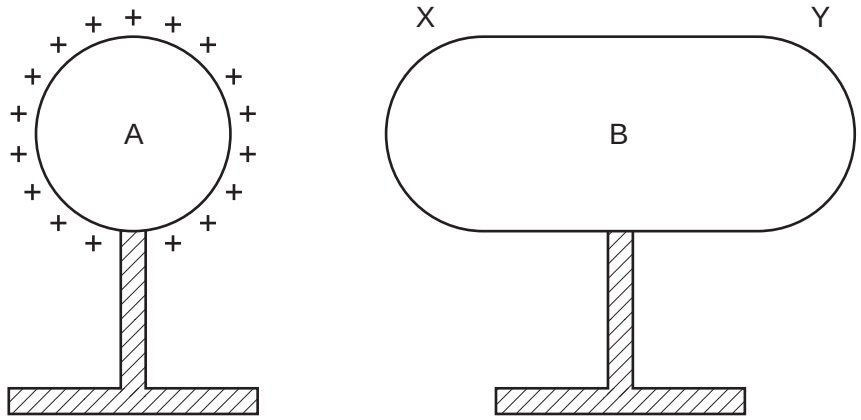

Fig. 9.1

(a) Conductor A is given the positive charge shown on Fig. 9.1.

(i) On Fig. 9.1, mark the signs of the charges induced at end X and at end Y of conductor B. [1]

(ii) Explain how these charges are induced.

.....

.....

..... [3]

(iii) Explain why the charges at X and at Y are equal in magnitude.

.....

.....

..... [1]

(b) B is now connected to earth by a length of wire.

Explain what happens, if anything, to

(i) the charge at X,

.....

..... [1]

(ii) the charge at Y.

.....

..... [2]

[Total: 8]

3 When he leaves work at 6.30 p.m. (18:30) one evening, a caretaker forgets to switch off the 100W lamp in his office. He doesn't discover this until he returns at 7.30 a.m. (07:30) the next morning.

The mains electricity supply is 250V.

(a) Calculate how much energy the caretaker has wasted.

energy wasted = ... [2]

(b) Calculate the charge that passed through the lamp during this time.

charge = ... [3]

(c) What happened to the energy wasted by the lamp?

.....

..... [1]

[Total: 6]

4 Fig. 7.1 shows how the resistance of the filament of a lamp changes as the current through the lamp changes.

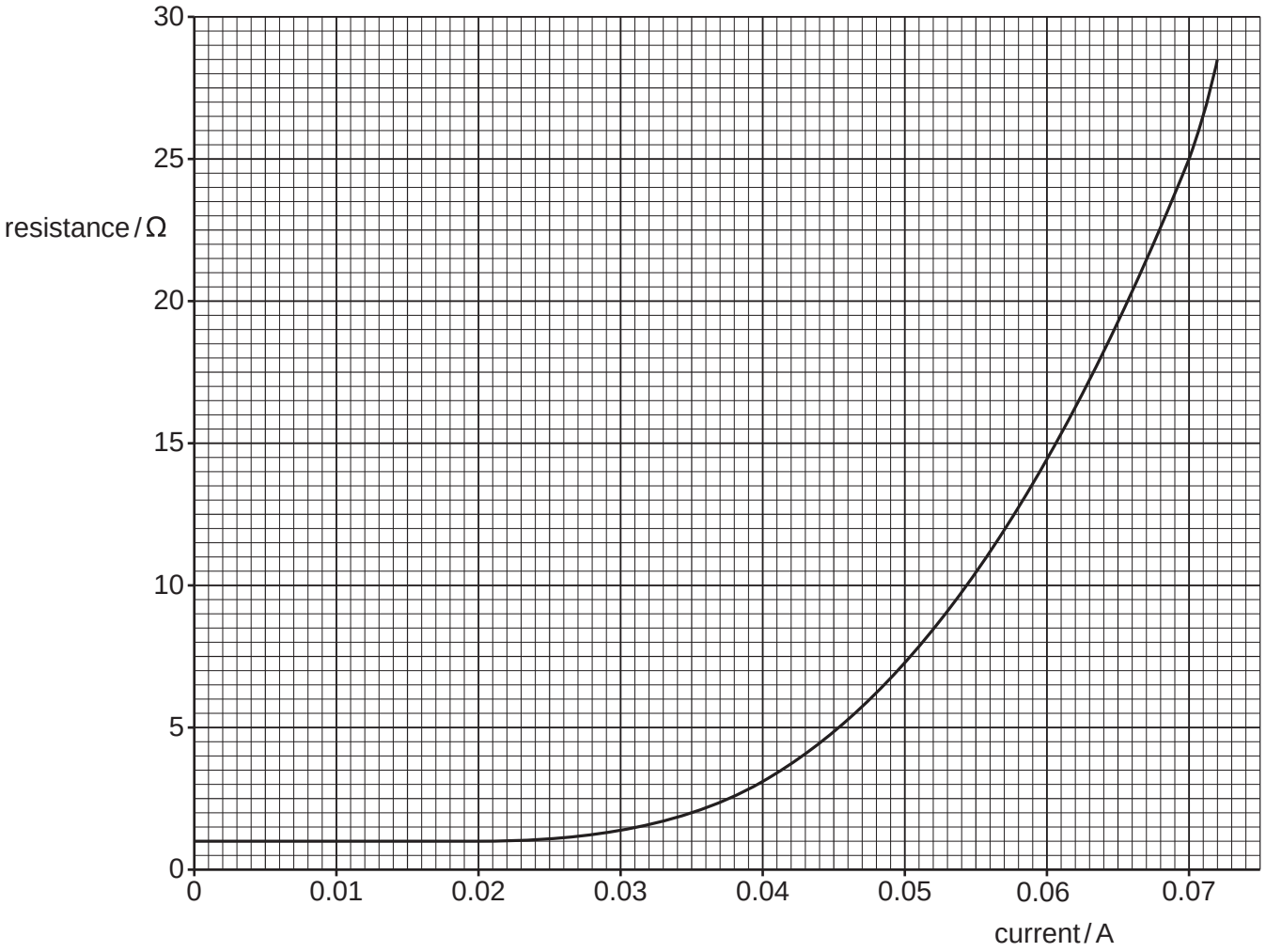

Fig. 7.1

(a) Describe how the resistance of the lamp changes.

.....

.....

..... [2]

(b) For a current of 0.070 A, find

(i) the resistance of the lamp,

resistance = ... [1]

(ii) the potential difference across the lamp,

potential difference = ... [2]

(iii) the power being dissipated by the lamp.

power = ... [2]

(c) Two of these lamps are connected in parallel to a cell. The current in each lamp is 0.070 A.

(i) State the value of the e.m.f. of the cell.

e.m.f. = ... [1]

(ii) Calculate the resistance of the circuit, assuming the cell has no resistance.

resistance = ... [2]

[Total: 10]

5 **(a)** Fig. 10.1 shows a positively charged plastic rod, a metal plate resting on an insulator, and a lead connected to earth.

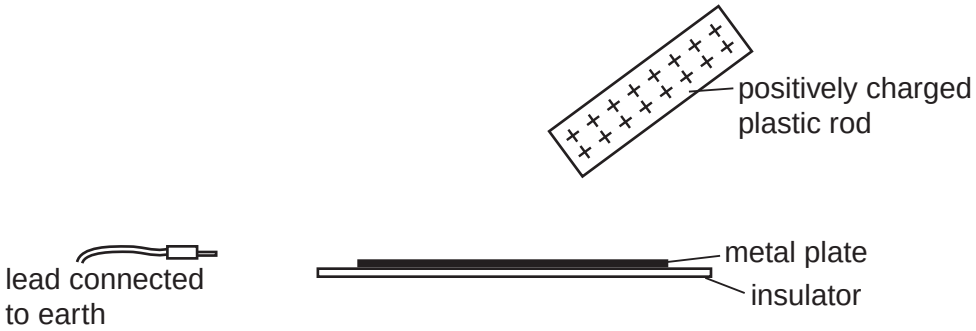

Fig. 10.1

Describe how the metal plate may be charged by induction.

.....

.....

.....[3]

(b) An electrostatic generator sets up a current of 20 mA in a circuit.

Calculate

(i) the charge flowing through the circuit in 15 s,

charge = ...

(ii) the potential difference across a 10 kΩ resistor in the circuit.

potential difference = ...
[3]

[Total : 6]

6 Fig. 8.1 shows a high-voltage supply connected across two metal plates.

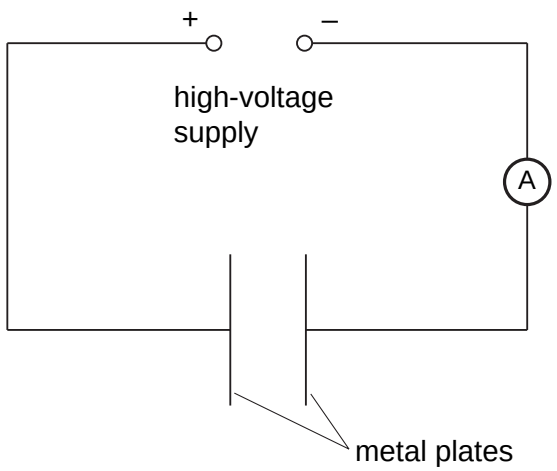

Fig. 8.1

When the supply is switched on, an electric field is present between the plates.

(a) Explain what is meant by an *electric field*.

..... [2]

(b) On Fig. 8.1, draw the electric field lines between the plates and indicate their direction by arrows. [2]

(c) The metal plates are now joined by a high-resistance wire. A charge of 0.060 C passes along the wire in 30 s.
Calculate the reading on the ammeter.

ammeter reading = …… [2]

(d) The potential difference of the supply is re-set to 1500 V and the ammeter reading changes to 0.0080 A. Calculate the energy supplied in 10 s. Show your working.

energy = …… [3]

[Total : 9]