

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 .....
- During evaporation .....
- Without a supply of thermal energy, evaporation ..... [3]

(b) A pan containing water boiling at  $100^{\circ}\text{C}$  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  $2.25 \times 10^6 \text{ J/kg}$ .

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

energy = ..... [2]

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

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

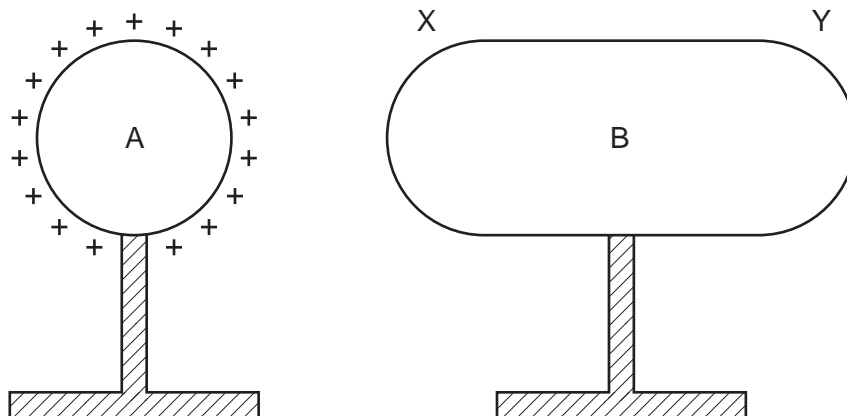
energy = ..... [2]

(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.

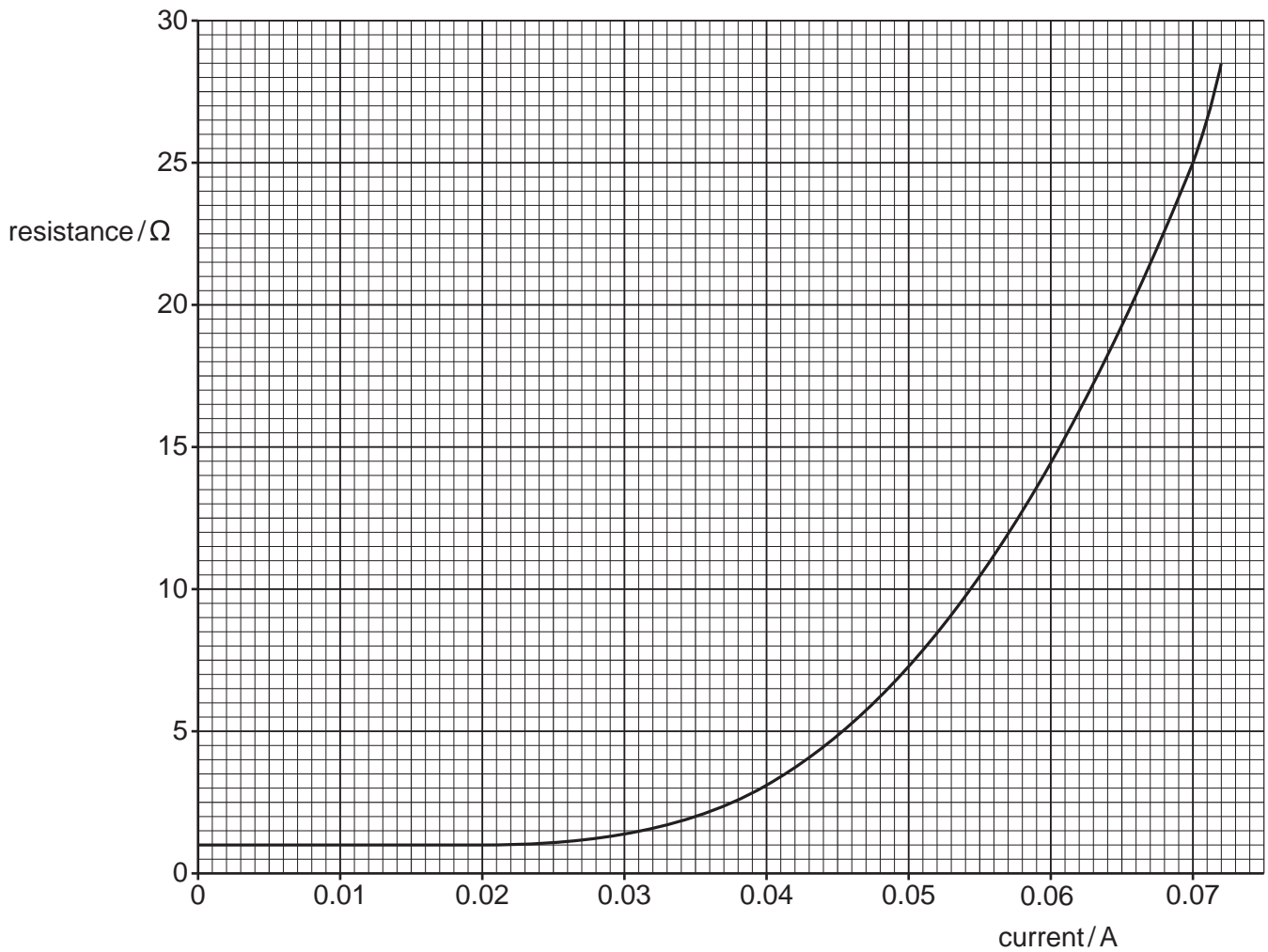
charge = ..... [3]

- (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.

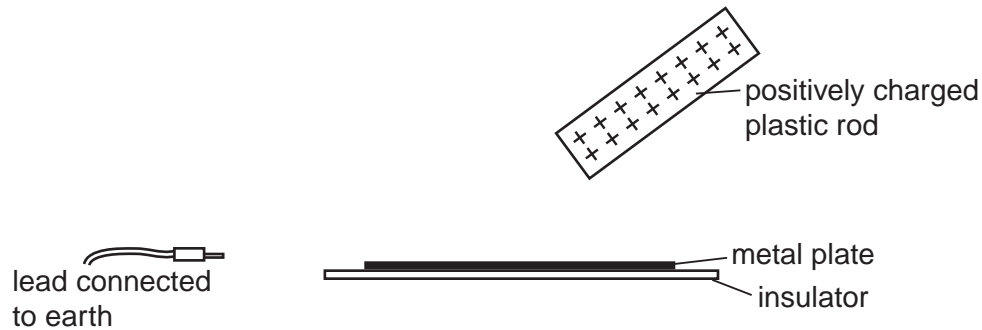
**(i)** State the value of the e.m.f. of the cell. e.m.f. = ..... [1]

**(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,

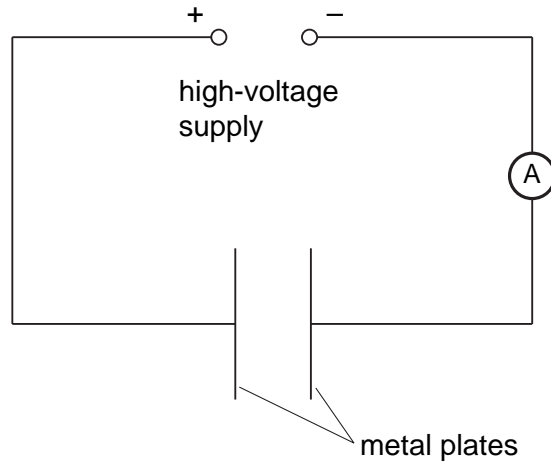
charge = .....

- (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 ]