Electrical Quantities

Question Paper

Course	CIE IGCSE Physics
Section	4. Electricity & Magnetism
Topic	Electrical Quantities
Difficulty	Medium

Time Allowed 70

Score /54

Percentage /100

Question 1a

A student rubs a polythene rod with a dry cloth. The polythene rod becomes negatively charged.

Describe and explain how the rod becomes negatively charged.

[3 marks]

Question 1b

The negatively charged polythene rod hangs from a nylon thread so that it is free to turn.

The student charges a second polythene rod and brings it close to the first rod, as shown in Fig.11.1.

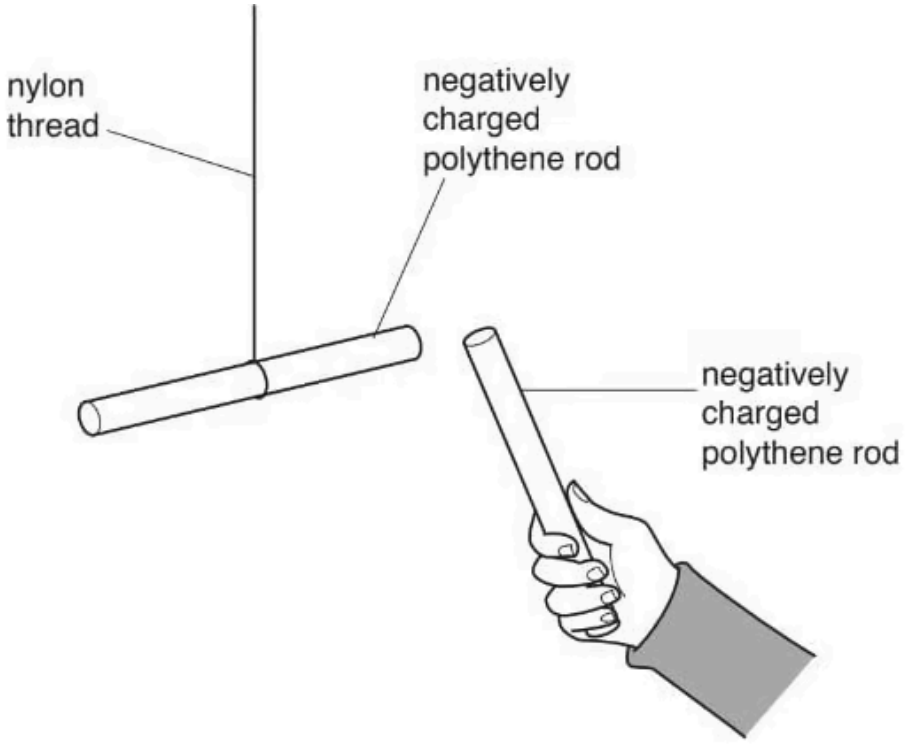

Fig. 11.1

Describe and explain what happens when the negatively charged rods are close to each other.

[2 marks]

Question 2a

A student experiments with electric charge.

The student uses a dry cloth to rub a plastic rod. The rod becomes positively charged.

Explain how the friction between the rod and the cloth causes the rod to become positively charged.

Use your ideas about the movement of charge.

[2 marks]

Question 2b

The student suspends a balloon from an insulating thread, as shown in Fig. 9.1.

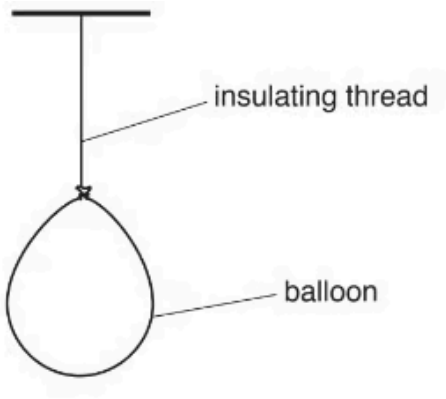

Fig. 9.1

The balloon has an electric charge.

Explain how the student can use a positively charged rod to determine the charge on the balloon.

[3 marks]

Question 3a

The lamp of a car headlight is rated at 12 V, 50 W.

Calculate the current in the lamp when operating normally.

current = ...

[2 marks]

Question 3b

Extended tier only

A car is driven at night.

In a journey, the total charge that passes through the 12 V battery is 270 kC.

(i) Calculate the electrical energy transferred.

energy = ... [3]

(ii) The fuel used by the car provides 3.6×10^4 J / cm^3.

Calculate the volume of fuel used to provide the energy calculated in **(b)(i)**.

volume = ... [2]

[5 marks]

Question 4a

Fig. 9.1 shows the symbol for a 12V battery.

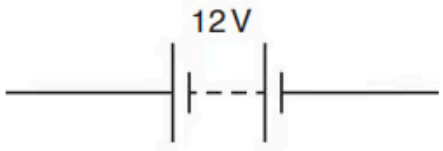

Fig. 9.1

Two lamps are connected in parallel with the battery.

On Fig. 9.1, using the correct symbols, complete the circuit diagram.

[1 mark]

Question 4b

One of these lamps has a resistance of 6.0 Ω.

Calculate, for this lamp:

(i) the current

current = ...[1]

(ii) the power.

power = ...[2]

[3 marks]

Question 4c

The power of the other lamp is 36 W.

Calculate the total energy delivered to this lamp in 20 hours.

energy = ...

[3 marks]

Question 5a

Extended tier only

Fig. 9.1 shows current-potential difference graphs for a resistor and for a lamp.

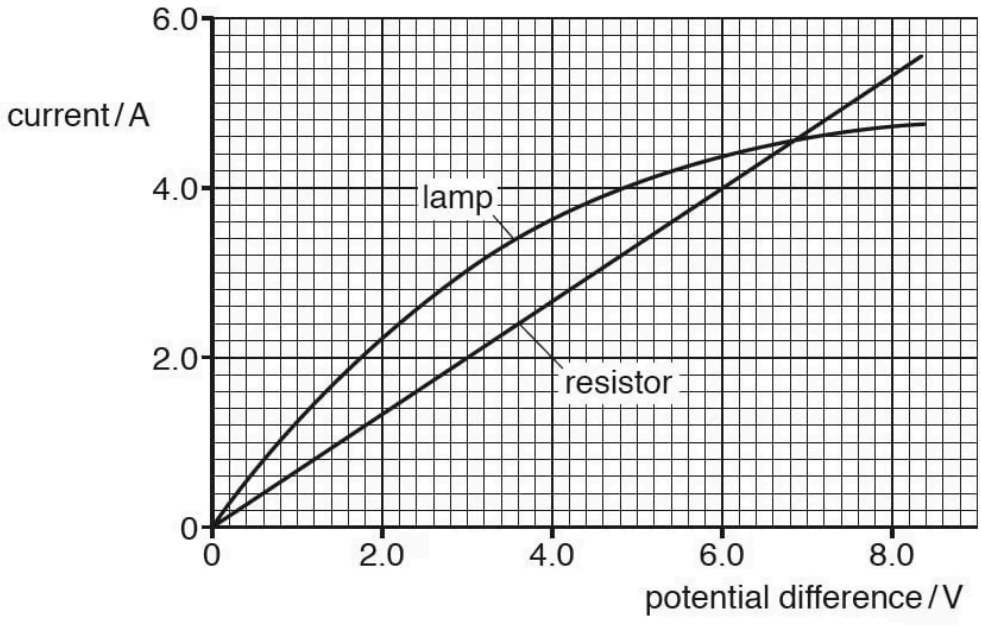

Fig. 9.1

(i) The potential difference (p.d.) applied to the resistor is increased. Tick the box that indicates the effect on the resistance of the resistor.

☐ resistance increases

☐ resistance is constant

☐ resistance decreases

[1]

(ii) The potential difference (p.d.) applied to the lamp is increased. Tick the box that indicates the effect on the resistance of the lamp.

☐ resistance increases

☐ resistance is constant

☐ resistance decreases

[1]

[2 marks]

Question 5b

The p.d. across the lamp is 6.0V. Calculate the resistance of the lamp.

resistance = ...

[2 marks]

Question 5c

The lamp and the resistor are connected in parallel to a 6.0 V supply.

Calculate the current from the supply.

current = ...

[2 marks]

Question 5d

Extended tier only

The lamp and the resistor are connected in series to another power supply. The current in the circuit is 4.0 A.

Calculate the total p.d. across the lamp and the resistor.

p.d. = ...

[2 marks]

Question 6a

Fig. 10.1 shows a circuit used by a student to test a metal wire made of nichrome.

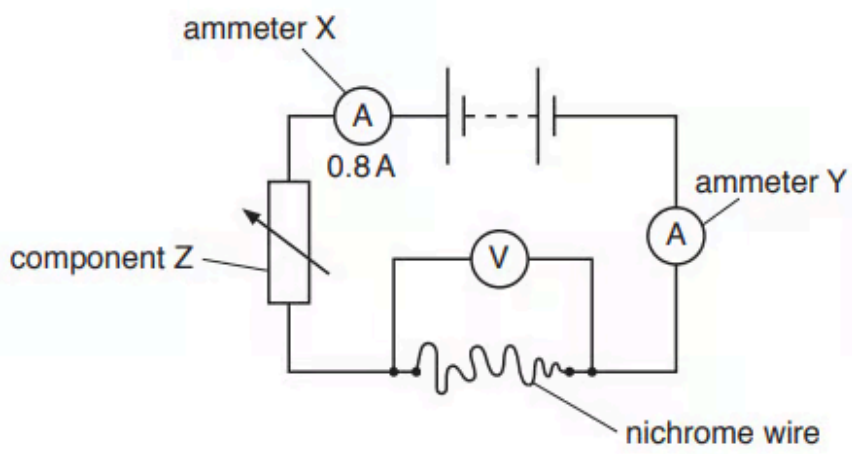

Fig. 10.1

State the name of component Z.

[1 mark]

Question 6b

The current reading on ammeter X is 0.8 A. State the reading on ammeter Y.

[1 mark]

Question 6c

The current in the nichrome wire is 0.8 A. The potential difference (p.d.) across the nichrome wire is 4.5 V.

Calculate the resistance of the nichrome wire.

resistance = ... Ω

[3 marks]

Question 6d

The student tests a different nichrome wire, which is thicker than the wire in **(c)**, but of the same length. When testing this wire, the current in the wire is different from the value given in **(c)**.

State and explain the difference in current.

[2 marks]

Question 7a

Fig. 10.1 shows an electrical circuit.

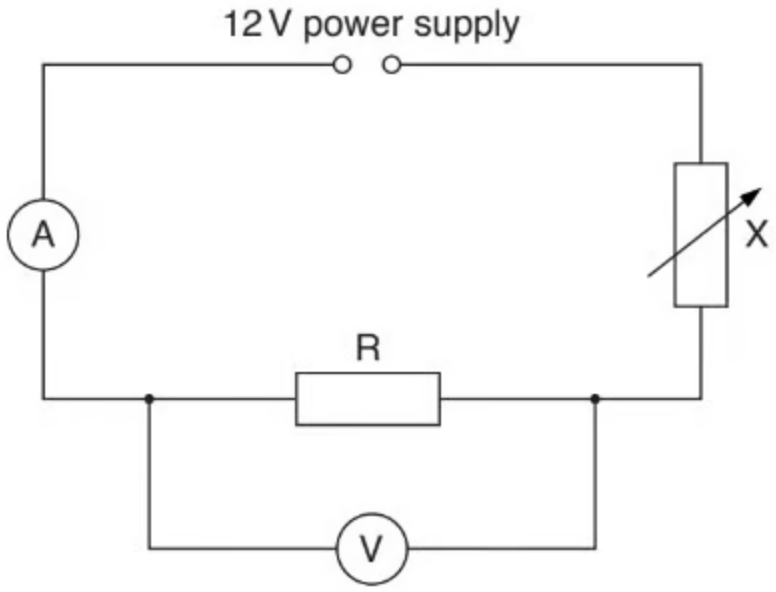

Fig. 10.1

(i) State the name for the component labelled X and state its function in this circuit.

[2]

(ii) Describe how the circuit shown in Fig. 10.1 could be used to find the resistance of the fixed resistor R.

[3]

[5 marks]

Question 7b

An electrical heater has a resistance of 21.8 Ω when connected to a 240 V mains supply.

(i) Calculate the current in the heater.

current = ... A [3]

(ii) Suggest a rating for the fuse to be fitted to the mains plug for the heater.

fuse rating = ... A [1]

[4 marks]

Question 8a

An uncharged conducting metal plate rests on insulating supports. Fig. 10.1 shows the plate and a positively charged insulating plastic sheet placed on top of the metal plate.

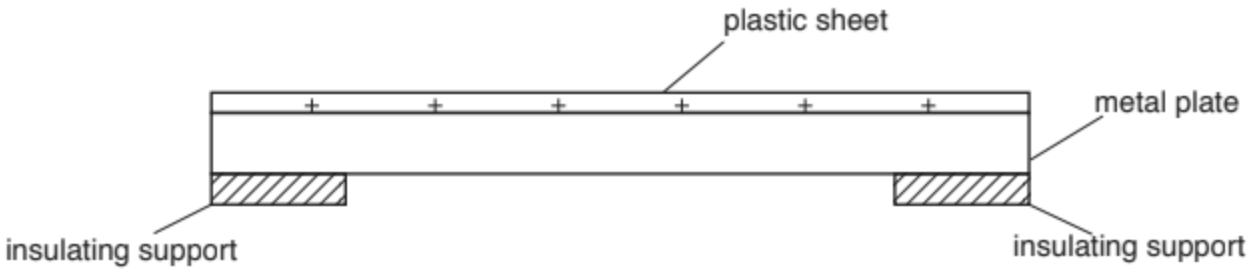

Fig. 10.1

(i) Describe any flow of charge that takes place when the plastic sheet is placed onto the metal plate.

[1]

(ii) On Fig. 10.1, draw how charges are now arranged within the metal plate.

[1]

(iii) State and explain if this arrangement of charge helps to keep the plastic sheet in place.

[2]

[4 marks]

Question 8b

Fig. 10.2 shows two uncharged conducting spheres suspended on insulating threads.

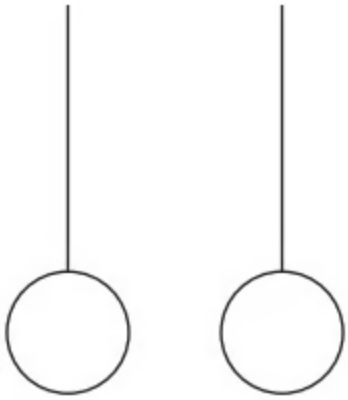

Fig. 10.2

1. The spheres are now both given positive charges. On Fig. 10.2, draw a possible position of each sphere and thread.
2. Explain the positions you have drawn.

[2 marks]