Electrical Quantities

Question Paper 6

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Electricity and Magnetism
Sub-Topic	Electrical quantities
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 6

Time Allowed: **62 minutes**

Score: **/51**

Percentage: **/100**

1 Fig. 9.1 shows a 12 V battery connected in a circuit containing resistors A, B, C and D. Each resistor has a resistance of 6.0 Ω.

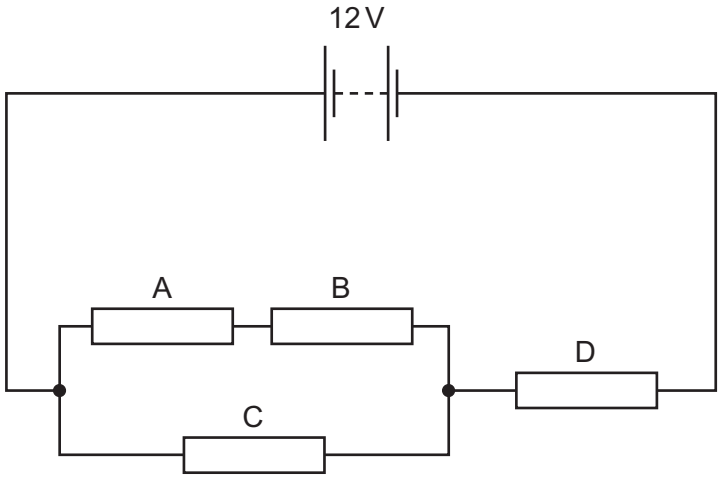

Fig. 9.1

(a) Calculate the combined resistance of

(i) resistors A and B,

resistance = ... [1]

(ii) resistors A, B and C,

resistance = ... [2]

(iii) resistors A, B, C and D.

resistance = ... [1]

(b) Calculate

(i) the current in the battery,

current = ... [1]

(ii) the energy transferred from the battery to the circuit in 50 s.

energy transferred = ... [2]

[Total: 7]

2 **(a)** Fig. 8.1 shows 3 lamps and a fuse connected to a power supply.

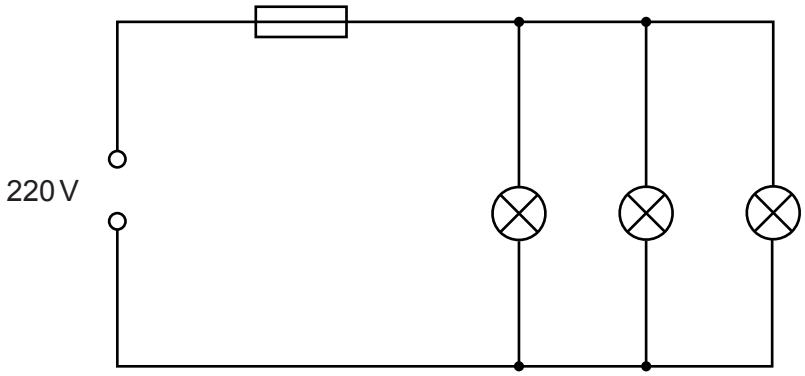

Fig. 8.1

The e.m.f. of the supply is 220V. Each lamp is labelled 220V, 40W. The rating of the fuse is 2.0A.

Calculate

(i) the current in each lamp,

current = ...[2]

(ii) the current in the fuse,

current = ...[1]

(iii) the total number of lamps, all in parallel, that could be connected without blowing the fuse.

number = ...[2]

(b) After a very long period of use, the wire filament of one of the lamps becomes thinner.

(i) Underline the effect of this change on the resistance of the filament.

resistance increases resistance remains the same resistance decreases [1]

(ii) State and explain the effect of this change on the power of the lamp.

.....

.....

.....[2]

[Total: 8]

3 The circuit of Fig. 7.1 includes an immersion heater and a 6.0 V battery.

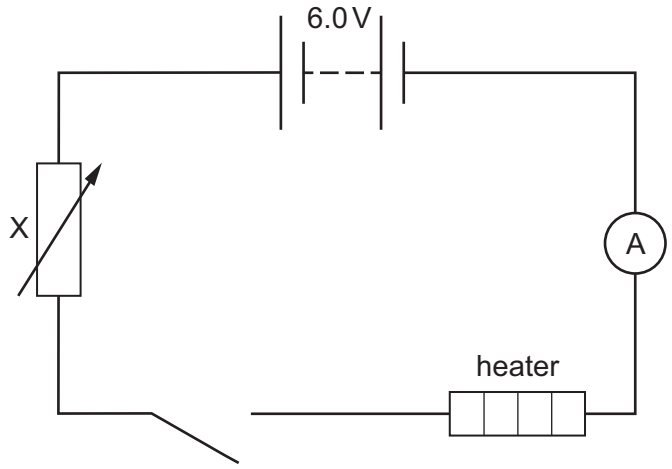

Fig. 7.1

(a) State the name and purpose of component X.

name .....

purpose .....

[1]

(b) The heater is designed to work from a 3.6 V supply. It has a power rating of 4.5 W at this voltage.

By considering the current in the heater, calculate the resistance of component X when there is the correct potential difference across the heater.

resistance = ... [5]

(c) Some time after the heater is switched on, the ammeter reading is seen to have decreased.

Suggest why this happens.

.....

..... [2]

[Total: 8]

4 In Fig. 9.1, a 12 V battery supplies a current I to a circuit. The circuit contains a thermistor and a 1000 Ω resistor in parallel, with a 500 Ω resistor in series.

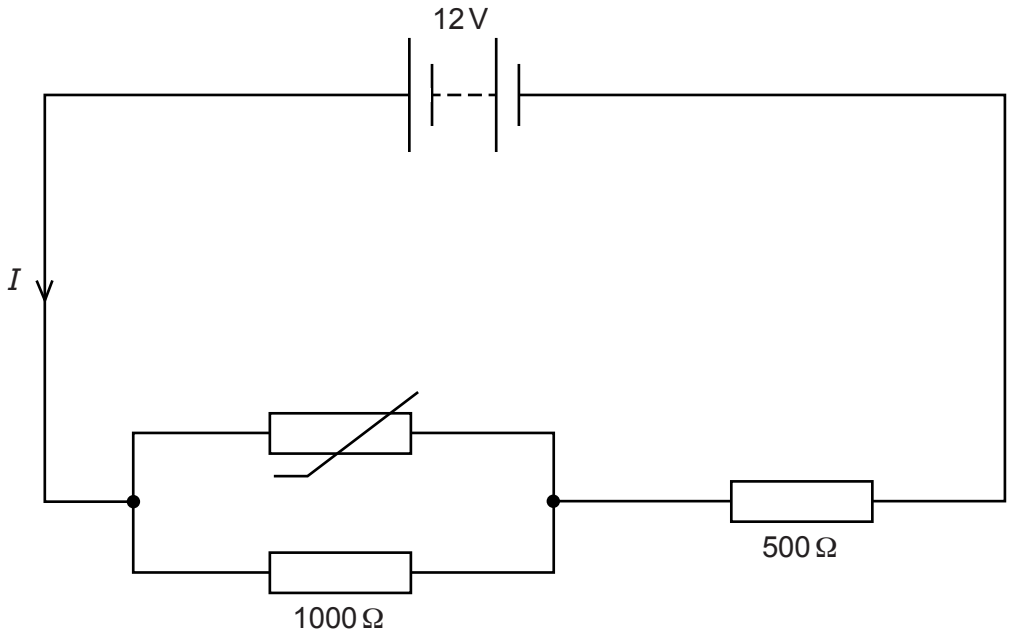

Fig. 9.1

(a) At a certain temperature, the thermistor has a resistance of 1000 Ω.

Calculate

(i) the combined resistance of the thermistor and the 1000 Ω resistor,

resistance = ... [2]

(ii) the current I,

current = ... [1]

(iii) the potential difference across the 500 Ω resistor.

potential difference = ... [2]

(b) The temperature of the thermistor is increased so that its resistance decreases.

State the effect of this change in resistance on the current through the 500 Ω resistor. Explain your answer.

.....

.....

..... [2]

[Total: 7]

5 **(a)** A student determines the resistance of a length of aluminium wire.

She connects the wire in series with a battery and a variable resistor. The circuit is shown in Fig. 8.1.

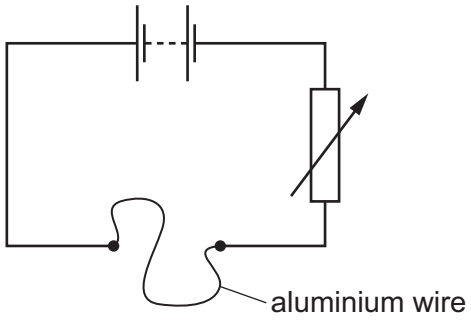

Fig. 8.1

She knows that an ammeter and a voltmeter are needed in the circuit.

(i) On Fig. 8.1, draw the circuit symbol for an ammeter connected in a suitable position. [1]

(ii) A variable resistor is included so that the current in the circuit may be changed.

Suggest an advantage of being able to change the current.

.....

.....[1]

(b) Electricity is transmitted from a power station to a distant city using an aluminium cable of resistance 1.2 Ω. Power loss occurs because of the resistance of the cable.

The current in the cable is 250 A.

(i) Calculate the power loss in the cable.

power loss = ...[3]

(ii) The aluminium cable is replaced with a new aluminium cable of the same length. The current remains at 250 A. The diameter of the new cable is double the diameter of the original cable.

State and explain how the power loss is affected by this change.

.....

.....

.....[3]

[Total: 8]

6 An extremely violent nuclear reaction is taking place at the centre of the Sun. It is this reaction that enables the Sun to emit both a very large quantity of energy and an extremely large number of charged particles.

(a) Name the type of nuclear reaction taking place in the Sun.

.....[1]

(b) Many of the charged particles produced by the Sun are emitted from its surface at high speeds and travel out into space.

(i) Explain why these particles constitute an electric current.

.....

.....[1]

(ii) State the equation that relates the electric current I to the charge Q that is flowing. Define any other terms in the equation.

.....

.....[1]

(c) Some of the particles emitted by the Sun travel straight towards the Earth until they enter the Earth's magnetic field. Because they constitute a current, they experience a force and are deflected.

(i) Describe the relationship between the direction of the force and

1. the direction of the current,

.....[1]

2. the direction of the magnetic field.

.....[1]

(ii) A negatively charged particle is travelling in a magnetic field. This is represented in Fig. 9.1. The direction of the magnetic field is into the page.

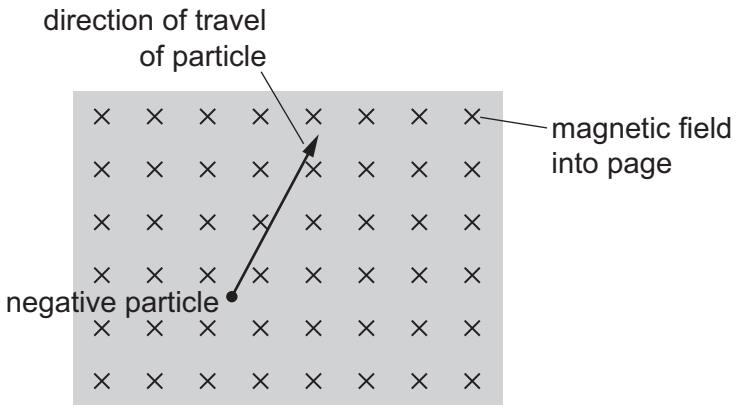

Fig. 9.1

On Fig. 9.1, draw an arrow, labelled F, to show the direction of the force that acts on the particle. [1]

[Total: 6]

7 **(a)** Fig. 8.1 shows a 12.0 V battery connected to a resistor and a component X in series.

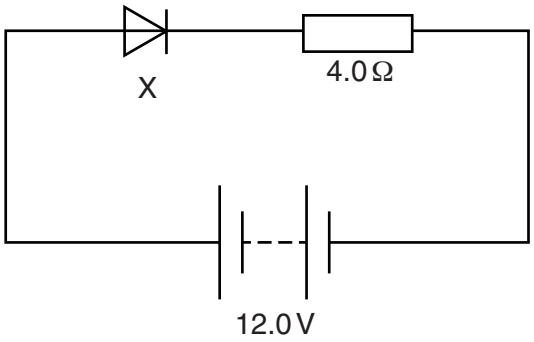

Fig. 8.1

(i) Identify the component X.

..... [1]

(ii) The p.d. across the 4.0 Ω resistor is 11.3 V.

Calculate

1. the p.d. across component X,

p.d. = ... [1]

2. the current in the 4.0 Ω resistor.

current = ... [2]

(b) The circuit in Fig. 8.1 is now modified as shown in Fig. 8.2.

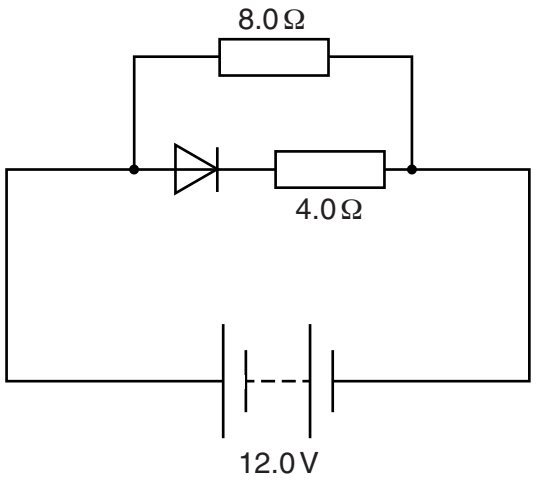

Fig. 8.2

(i) Calculate

1. the current in the 8.0 Ω resistor,

current = ... [1]

2. the current in the battery.

current = ... [1]

(ii) The battery is now reversed.

State the current in the battery.

current = ... [1]

[Total: 7]