

Electric circuits

Question Paper 2

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Electricity and Magnetism
Sub-Topic	Electric circuits
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 2

Time Allowed: 60 minutes

Score: /50

Percentage: /100

- 1 In the circuit shown in Fig. 9.1, resistors can be connected between terminals P and Q. The e.m.f. of the battery is 6.0V.

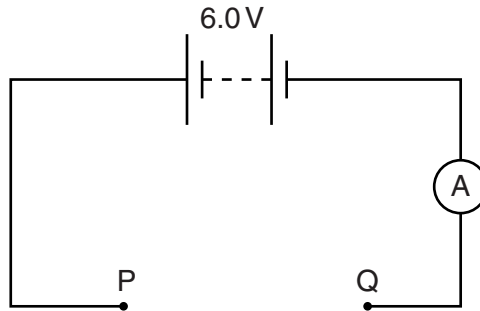


Fig. 9.1

- (a) Calculate the current shown by the ammeter when a 12.0Ω resistor and a 4.0Ω resistor are

- (i) connected in series between P and Q,

current = [2]

- (ii) connected in parallel between P and Q.

current = [3]

- (b) State the relationship between

- (i) the resistance R and the length l of a wire of constant cross-sectional area,

.....

- (ii) the resistance R and the cross-sectional area A of a wire of constant length.

.....

[2]

- (c) The 12.0Ω and 4.0Ω resistors in (a) are wires of the same length and are made of the same alloy.

Calculate the ratio: $\frac{\text{cross-sectional area of } 12.0\Omega \text{ resistor}}{\text{cross-sectional area of } 4.0\Omega \text{ resistor}}$

ratio = [1]

[Total: 8]

2 Fig. 8.1 shows three cells each with e.m.f. 1.5V connected in series.

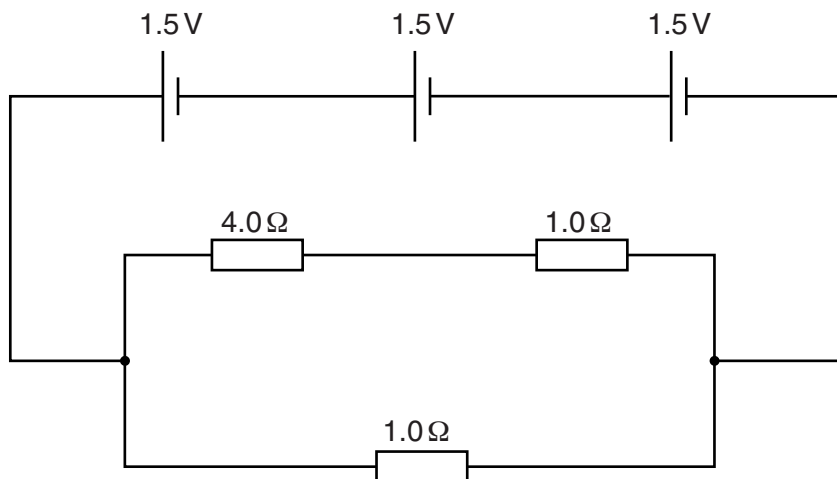


Fig. 8.1

(a) Calculate the combined e.m.f. of the cells.

e.m.f. = [1]

(b) Calculate the combined resistance of the three resistors shown in Fig. 8.1.

resistance = [2]

(c) Calculate the current in the 4.0Ω resistor in Fig. 8.1.

current = [3]

(d) Calculate the combined e.m.f. of the cells if one cell is reversed.

e.m.f. = [1]

[Total: 7]

- 3 The electric circuit in a clothes dryer contains two heaters X and Y in parallel. Fig. 10.1 shows the circuit connected to a 230V power supply.

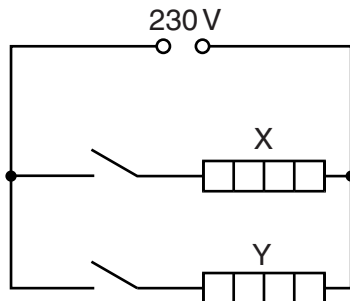


Fig. 10.1

When both switches are closed, the current in X is 3.5 A.

- (a) Calculate the power developed in heater X.

power = [2]

- (b) The resistance of X is double that of Y.

Determine the total resistance of X and Y in parallel.

resistance = [4]

[Total: 6]

- 4 (a) In a room in a house there are four electric lamps in parallel with each other, controlled by a single switch.

With all the lamps working, one of the lamp filaments suddenly breaks.

What, if anything happens to the remaining lamps? Explain your answer.

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.....

.....

.....[2]

- (b) Fig. 10.1 shows the circuit diagram for the lamp in another room. X and Y are 2-way switches.

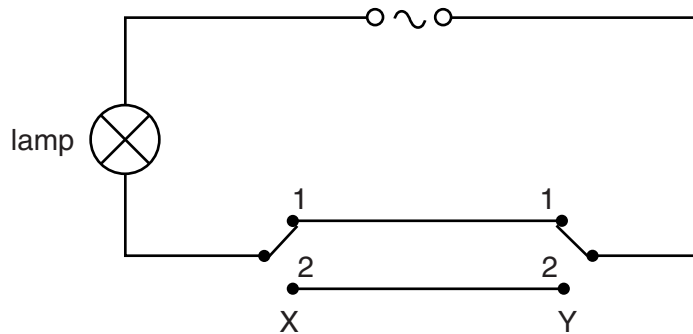


Fig. 10.1

- (i) Complete the table, by indicating whether the lamp is on or off for each of the switch positions.

position of switch X	position of switch Y	state of lamp
1	1	
1	2	
2	1	
2	2	

[2]

- (ii) Explain why this arrangement of switches is useful.

.....

.....[1]

[Total: 5]

- 5 (a) Fig. 8.1 shows two resistors **X** and **Y** in series.

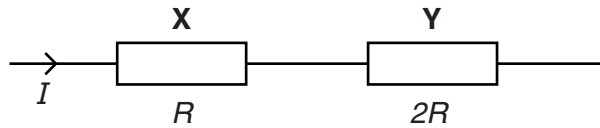


Fig. 8.1

Complete the table below, using only the symbols I and R , alone or in combination.

resistor	resistance	current	potential difference	power
X	R	I		I^2R
Y	$2R$		$2IR$	

[3]

- (b) Fig. 8.2 represents the system used to transmit electricity from a power station to a factory.

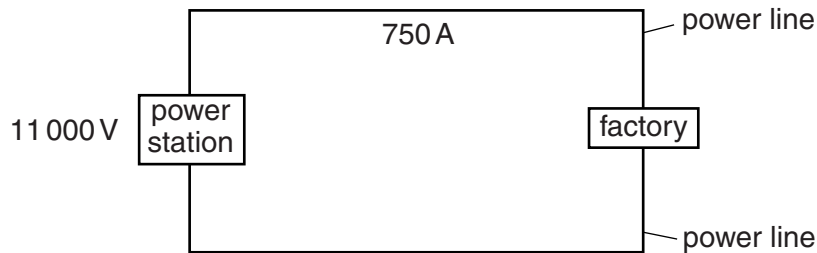


Fig. 8.2

The power station generates 11 000V and supplies a current of 750 A. The total resistance of the power lines between the power station and the factory is 1.5Ω .

Calculate

- (i) the power output of the power station,

power = [1]

(ii) the potential difference across the $1.5\ \Omega$ of the power lines,

potential difference = [1]

(iii) the power supplied to the factory.

power = [3]

[Total: 8]

- 6 A student sets up a circuit containing three identical cells. Each cell has an e.m.f. (electromotive force) of 2.0V.

Fig. 8.1 shows the cells in series with a length of uniform metal wire connected between two terminals K and L, an ammeter and a resistor X.

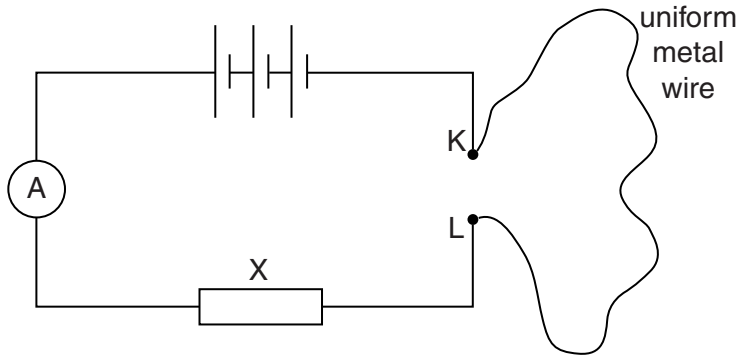


Fig. 8.1

- (a) State the total e.m.f. of the three cells in series.

total e.m.f. = [1]

- (b) The ammeter reading is 0.25 A.

- (i) State the name of the unit in which electric charge is measured.

..... [1]

- (ii) Calculate the charge that flows through the circuit in twelve minutes.

charge = [2]

- (iii) The metal wire has a resistance of $16\ \Omega$.

Calculate the resistance of resistor X.

resistance = [2]

- (c) The student removes the 16Ω wire from the circuit and cuts it into two equal lengths. He then connects the two lengths in parallel between K and L, as shown in Fig. 8.2.

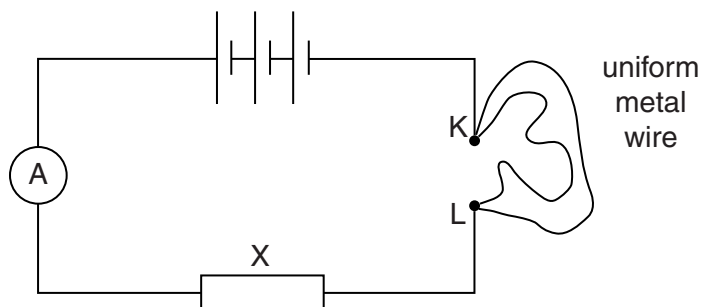


Fig. 8.2

Calculate the resistance of the two lengths of wire in parallel.

resistance = [3]

[Total: 9]

7 Fig. 9.1 shows the circuit that operates the two headlights and the two sidelights of a car.

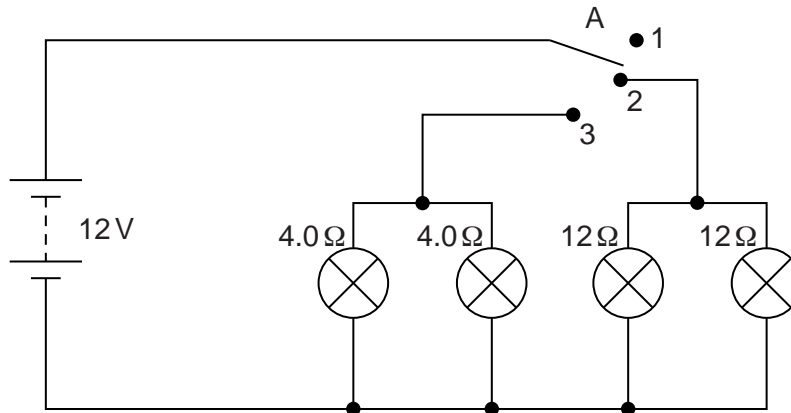


Fig. 9.1

Two of the lamps have resistances of $4.0\ \Omega$ when lit. The other two lamps have resistances of $12\ \Omega$ when lit. Switch A can be connected to positions 1, 2 or 3.

(a) State what happens when switch A is connected to

(i) position 1,

(ii) position 2,

(iii) position 3.

[1]

(b) (i) State the potential difference across each lamp when lit.

potential difference = [1]

(ii) Calculate the current in each $12\ \Omega$ lamp when lit.

current = [2]

- (c) Show, with reasons for your answer, which type of lamp, 4.0Ω or 12Ω , has the higher power.

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.....

.....

..... [3]

[Total: 7]