

- 7 A student set up the circuit shown in Fig. 7.1.

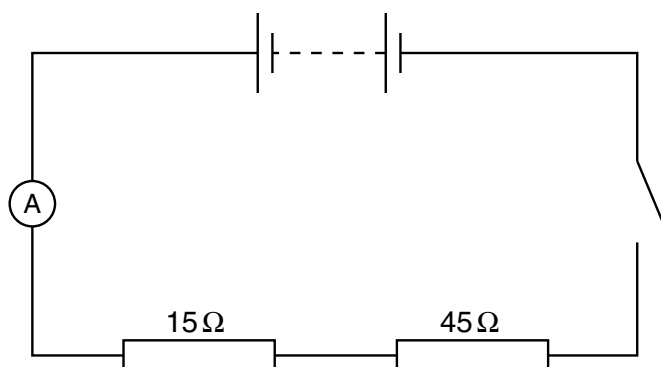


Fig. 7.1

The resistors are of resistance $15\ \Omega$ and $45\ \Omega$. The battery is found to provide $1.6 \times 10^5\text{ J}$ of electrical energy when a charge of $1.8 \times 10^4\text{ C}$ passes through the ammeter in a time of $1.3 \times 10^5\text{ s}$.

- (a)** Determine

- (i)** the electromotive force (e.m.f.) of the battery,

e.m.f. = V

- (ii)** the average current in the circuit.

current = A
[4]

- 8 A student has available some resistors, each of resistance $100\ \Omega$.
- (a) Draw circuit diagrams, one in each case, to show how a number of these resistors may be connected to produce a combined resistance of
- (i) $200\ \Omega$,
- (ii) $50\ \Omega$,
- (iii) $40\ \Omega$.

[4]

- (b) The arrangement of resistors shown in Fig. 8.1 is connected to a battery.

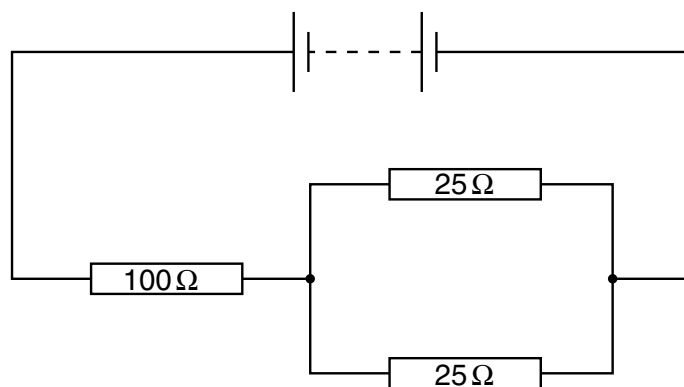


Fig. 8.1

The power dissipation in the $100\ \Omega$ resistor is $0.81\ \text{W}$. Calculate

- (i) the current in the circuit,

current = A

- (ii) the power dissipation in each of the $25\ \Omega$ resistors.

power = W

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- 7 (a) A student has been asked to make an electric heater. The heater is to be rated as 12 V 60 W, and is to be constructed of wire of diameter 0.54 mm. The material of the wire has resistivity $4.9 \times 10^{-7} \Omega \text{ m}$.

(i) Show that the resistance of the heater will be 2.4Ω .

[2]

(ii) Calculate the length of wire required for the heater.

length = m [3]

- (b) Two cells of e.m.f. E_1 and E_2 are connected to resistors of resistance R_1 , R_2 and R_3 as shown in Fig. 7.1.

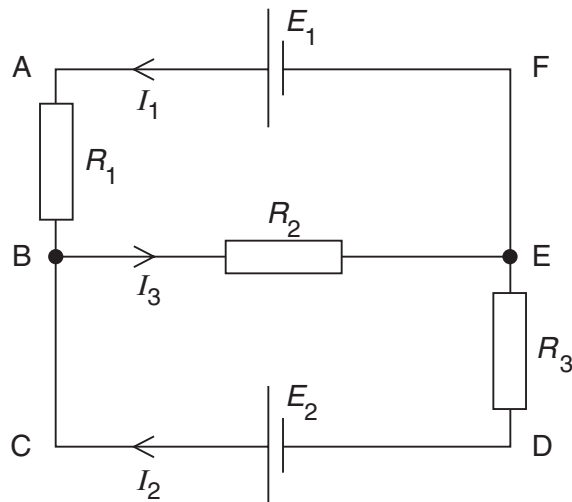


Fig. 7.1

The currents I_1 , I_2 and I_3 in the various parts of the circuit are as shown.

(i) Write down an expression relating I_1 , I_2 and I_3 .

.....[1]

(ii) Use Kirchhoff's second law to write down a relation between

1. E_1 , R_1 , R_2 , I_1 and I_3 for loop ABEFA,

.....

2. E_1 , E_2 , R_1 , R_3 , I_1 and I_2 for loop ABCDEFA.

.....

[2]

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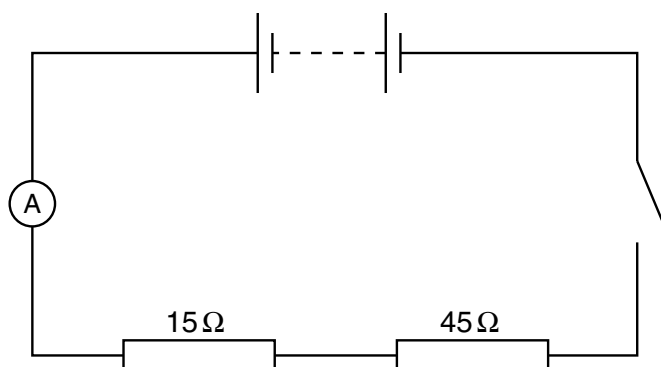


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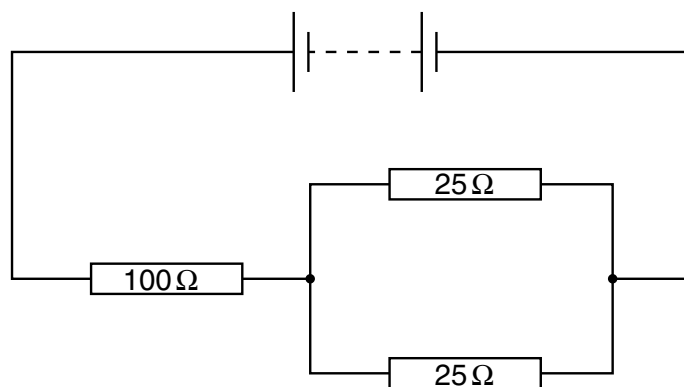


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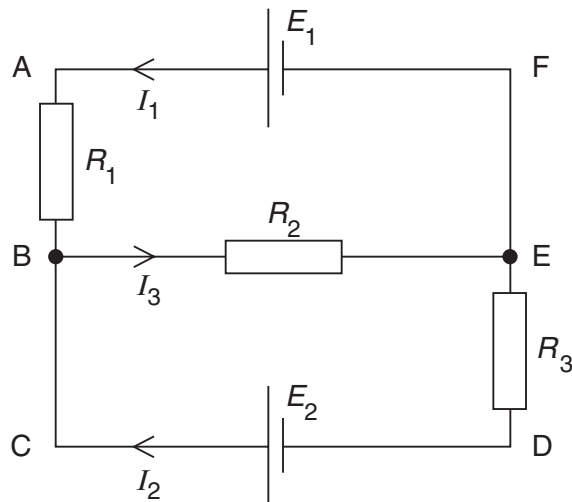


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