

- 5 (a) A power supply of electromotive force (e.m.f.) 8.7 V and negligible internal resistance is connected by two identical connecting wires to three filament lamps, as shown in Fig. 5.1.

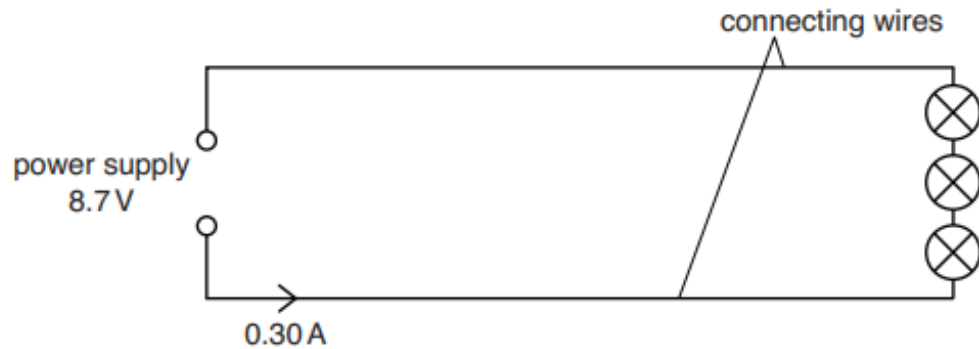


Fig. 5.1

The power supply provides a current of 0.30 A to the circuit.
The filament lamps are identical. The I - V characteristic for one of the lamps is shown in Fig. 5.2.

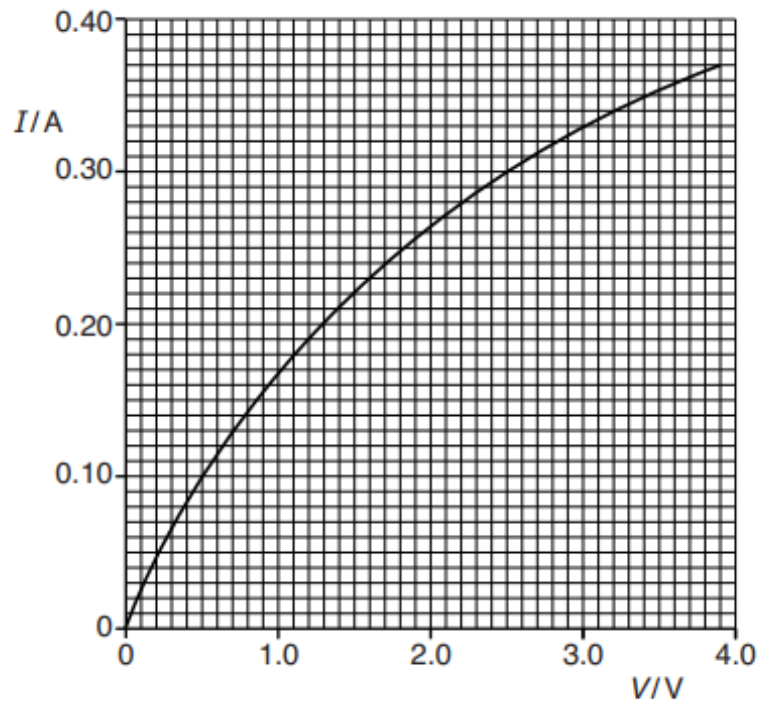


Fig. 5.2

- (i) State and explain the I - V characteristic of the filament lamp.

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.....

..... [3]

- (ii) Determine the resistance of each connecting wire.

[2]

resistance = Ω

- (iii) The resistivity of the metal of the connecting wires does not vary with temperature. On Fig. 5.2, sketch the I - V characteristic for one of the connecting wires.

[1]

- (b) The potentiometer shown in Fig. 5.3 is used to measure the e.m.f. and internal resistance of battery E_2 .

The wire AB is 80.0 cm long and has a resistance of $15.0\ \Omega$. E_1 is a driver cell of 3.0 V with an internal resistance of $0.50\ \Omega$.

R_1 and R_2 have resistance of $20.0\ \Omega$ and $5.0\ \Omega$ respectively.

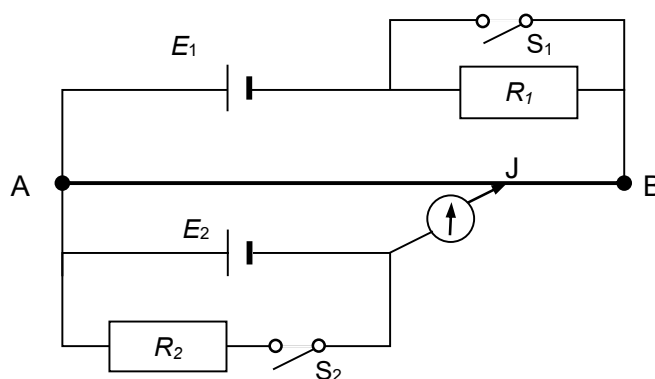


Fig. 5.3

When the switches S_1 and S_2 are both open, the galvanometer has zero deflection when AJ is 63.1 cm in length. When both switches are closed, the balanced length is 12.5 cm.

- (i) Show that the e.m.f. of E_2 is 1.00 V.

[3]

(ii) Hence, or otherwise, determine the internal resistance of E_2 .

resistance = Ω [3]

