

- 5 (a) Electromotive force (e.m.f.) and potential difference (p.d.) both have the volt as a unit.

(i) Define the *volt*.

.....
..... [1]

(ii) Using energy considerations, distinguish between e.m.f. and p.d.

e.m.f.

.....
p.d.

..... [2]

- (b) A battery of electromotive force (e.m.f.) 4.5 V and negligible internal resistance is connected to two filament lamps P and Q and a resistor R, as shown in Fig. 5.1.

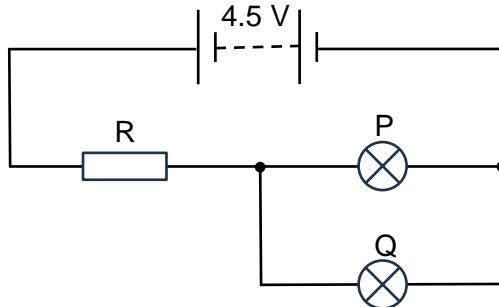


Fig. 5.1

The current in lamp P is 0.15 A. The I - V characteristics of the filament lamps are shown in Fig. 5.2.

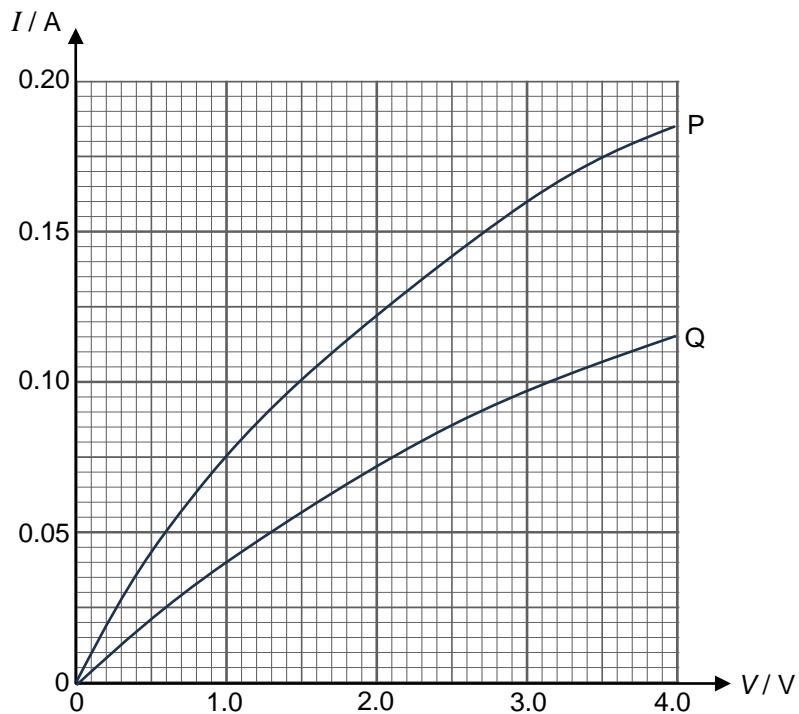


Fig. 5.2

- (i) Using Fig. 5.2, determine the current in the battery. Explain your working.

current = A [2]

- (ii) Calculate the resistance of resistor R.

resistance = Ω [2]

[Turn over]

- (iii) The filament wires of the two lamps are made from material with the same resistivity at their operating temperature in the circuit. The diameter of the wire of lamp P is twice the diameter of the wire of lamp Q.

Determine the ratio

$$\frac{\text{length of filament wire of lamp P}}{\text{length of filament wire of lamp Q}}$$

ratio = [3]

- (iv) The filament wire of lamp Q breaks and stops conducting.

Without further calculation, state and explain the effect on the resistance of lamp P.

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.....

..... [2]

[Total:12]