

AS Level Physics A
H156/01 Breadth in Physics

Question Set 7

1. (a)

Fig. 24.1 shows a battery connected across a negative temperature coefficient (NTC) thermistor.

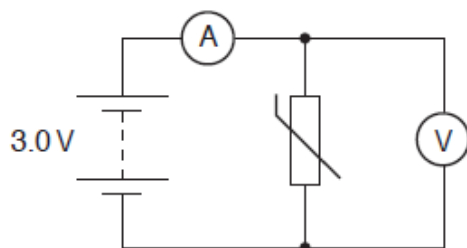


Fig. 24.1

The battery has electromotive force (e.m.f.) 3.0V and negligible internal resistance. The ammeter has negligible resistance and the voltmeter has a very large resistance.

The thermistor has resistance $100\ \Omega$ at room temperature and a cross-sectional area of $3.8 \times 10^{-6}\ \text{m}^2$.

The number density of the free electrons within the thermistor is $5.0 \times 10^{25}\ \text{m}^{-3}$.

- (i) Calculate the mean drift velocity v of the free electrons in the thermistor.

$v =$ ms^{-1}

[2]

- (ii) The thermistor is now heated using a naked flame. Describe and explain the effect on the ammeter and voltmeter readings.

[3]

- (b) Fig. 24.2 shows a circuit designed by a student.

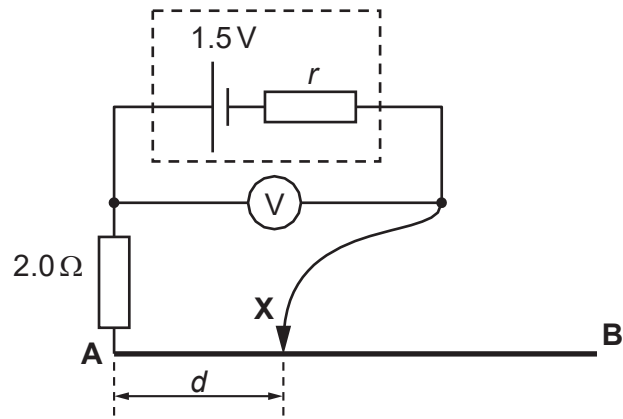


Fig. 24.2

The cell has e.m.f. $1.5\ \text{V}$ and an internal resistance r .
The uniform wire AB has length $1.0\ \text{m}$ and resistance $16\ \Omega$.

- (i) When the contact X is in the **middle** of the wire, the voltmeter reading is $1.2\ \text{V}$.
Calculate the internal resistance r of the cell.

$$r = \quad \quad \quad \Omega$$

[3]

- (ii) The contact X is now moved along the wire from A to B .
The distance of the contact X from A is d .
Fig. 24.3 shows the variation of the potential difference V across the terminals of the cell.

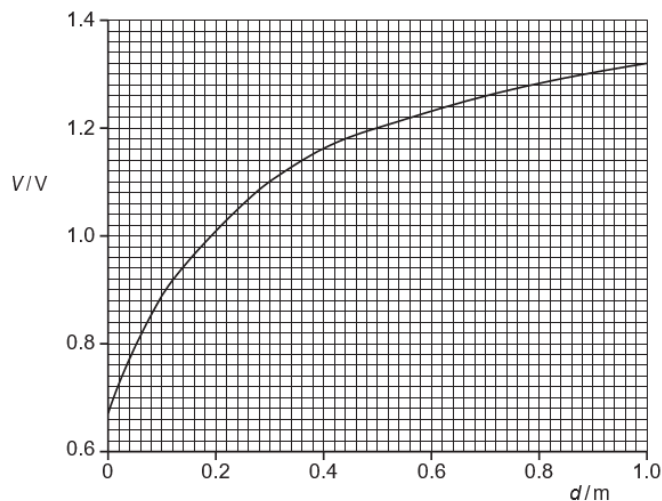


Fig. 24.3

Explain the variation of V with d in terms of the current in the circuit.

[3]

Total Marks for Question Set 7: 11

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