OCR
Oxford Cambridge and RSA

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.

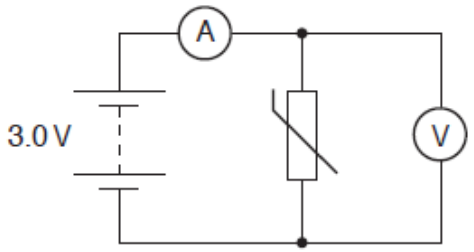

Fig. 24.1

The battery has electromotive force (e.m.f.) 3.0 V and negligible internal resistance. The ammeter has negligible resistance and the voltmeter has a very large resistance.
The thermistor has resistance 100 Ω at room temperature and a cross-sectional area of 3.8×10^{-6} m^2.
The number density of the free electrons within the thermistor is 5.0×10^{25} 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.

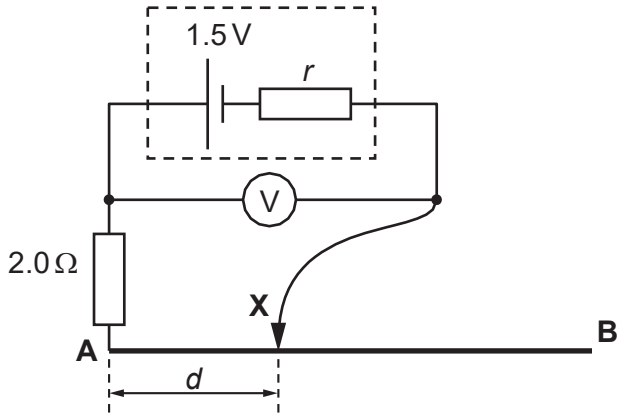

Fig. 24.2

The cell has e.m.f. 1.5 V and an internal resistance *r*.
The uniform wire **AB** has length 1.0 m and resistance 16 Ω.

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

r = Ω

[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.

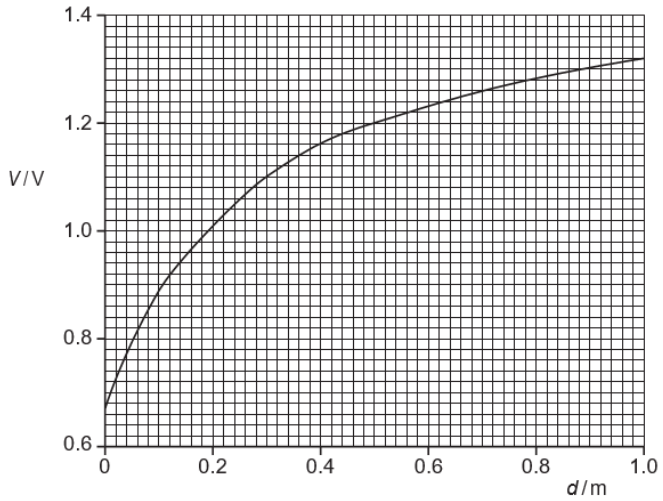

Fig. 24.3

Explain the variation of *V* with *d* in terms of the current in the circuit. **[3]**

Total Marks for Question Set 7: 11