A Level · OCR · Physics

11 mins 1 question

Structured Questions

Series & Parallel Circuits

Power / Electrical Energy / Kirchhoff's Second Law / Kirchhoff's Laws in Circuits / Resistors in Series & Parallel Circuits / Series & Parallel Circuits / Circuits with Multiple Sources of e.m.f

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Total Marks **/11**

1 (a) Fig. 18.1 shows a circuit.

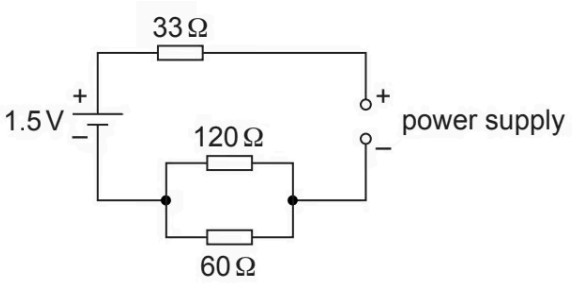

Fig. 18.1

The cell has e.m.f. 1.5 V. The cell and the variable power supply both have negligible internal resistance.

i) The e.m.f. of the power supply is set at 4.2 V.

Calculate the current *I* in the 33 Ω resistor.

I = ... A **[3]**

ii) The e.m.f. of the variable supply is now slowly decreased from 4.2 V to 0 V.

Describe the effect on the current I in the 33 Ω resistor.

[2]

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(5 marks)

(b) A group of students are investigating the power dissipated in a variable resistor connected across the terminals of a cell. The cell has e.m.f. 1.5 V.

The students determine the power *P* dissipated in the variable resistor of resistance *R*.

Fig. 18.2 shows the data points plotted by the students on a graph of P (y-axis) against R (x-axis).

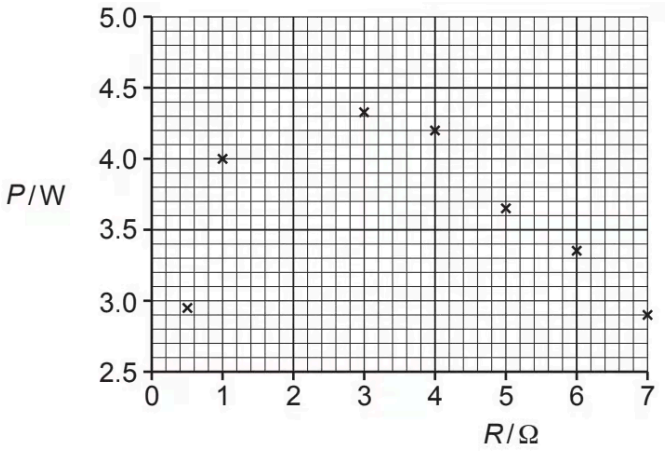

Fig. 18.2

The group of students know that **maximum power** is dissipated in the variable resistor when R is equal to the internal resistance r of the cell.

Describe, with the help of a suitable circuit diagram, how the students may have determined P and R. Use Fig. 18.2 to estimate the internal resistance r of the cell and discuss any limitations of the data plotted by the group.

(6 marks)