

- 4 The variation with potential difference V of current I in a resistor X is shown in Fig. 4.1.

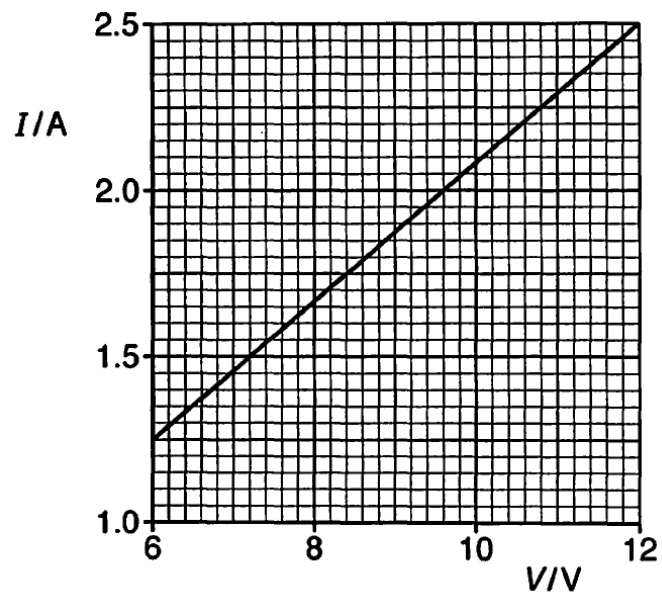


Fig. 4.1

- (a) Use Fig. 4.1 to show that the resistance of X remains constant.

- (b) In an attempt to obtain the graph of Fig. 4.1 for resistor X, a student sets up a circuit as shown in Fig. 4.2.

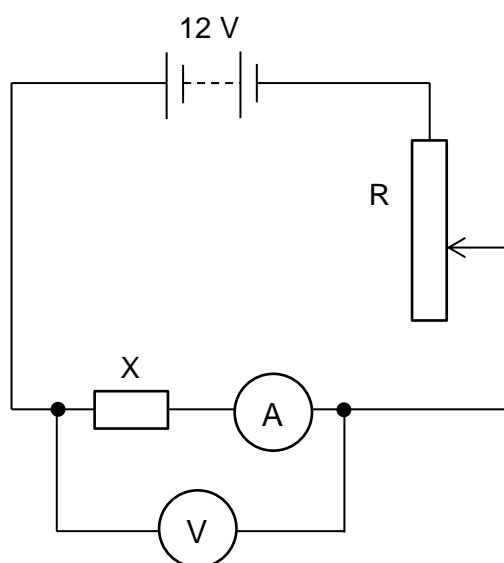


Fig. 4.2

The battery has an e.m.f. of 12 V and negligible internal resistance. The resistor R has a resistance that can be varied between 0 Ω and 2.0 Ω . The voltmeter and ammeter are both ideal.

State and explain why the circuit shown in Fig. 4.2 is inappropriate for obtaining data from $V = 6$ V to $V = 12$ V for the graph in Fig. 4.1.

[2]

- (c) In the space below, draw a circuit diagram using the same components as shown in Fig. 4.2 from which the graph of Fig. 4.1 may be determined.

- (d) Calculate the difference in the power dissipated in resistor X when V is increased from 7.2 V to 9.6 V.

difference in power = W [2]

- (f) Suppose the battery has an internal resistance of $0.50\ \Omega$, and R in Fig. 4.2 is adjusted to $0\ \Omega$. Calculate the terminal potential difference across the battery.

terminal potential difference = V [2]

[Total: 9]