

- 5 (a) Define the *ohm*.

..... [1]

- (b) A wire is made of metal of resistivity ρ . The length L of the wire is gradually increased. Assume that the volume V of the wire remains constant as its length is increased.

Show that the resistance R of the extending wire is proportional to L^2 .

[2]

- (c) A battery of electromotive force (e.m.f.) E and internal resistance r is connected to a variable resistor of resistance R , as shown in Fig. 5.1.

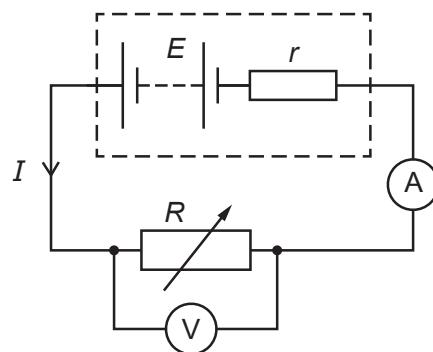


Fig. 5.1

An ammeter measures the current I in the circuit. A voltmeter measures the potential difference V across the variable resistor.

The resistance R is now varied to change the values of I and V .

The variation with I of V is shown in Fig. 5.2.

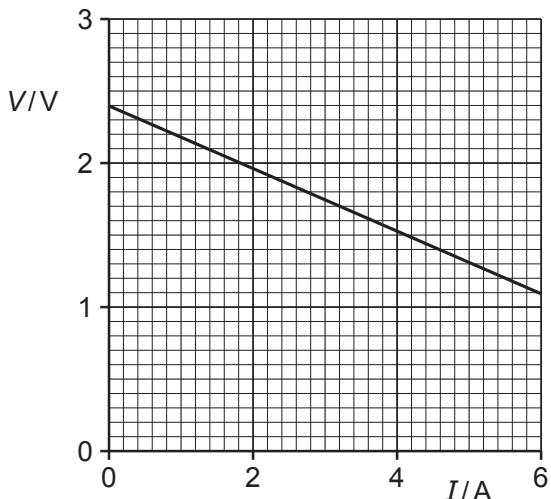


Fig. 5.2

- (i) Use Fig. 5.2 to state the e.m.f. E of the battery.

$$E = \dots \text{V} [1]$$

- (ii) Use Fig. 5.2 to determine the power dissipated in the variable resistor when there is a current of 5.0A.

$$\text{power} = \dots \text{W} [3]$$

- (iii) State what is represented by the value of the gradient of the graph.

..... [1]