

- 6 (a) A metal wire has a resistance per unit length of $0.92 \Omega \text{m}^{-1}$. The wire has a uniform cross-sectional area of $5.3 \times 10^{-7} \text{m}^2$.

Calculate the resistivity of the metal of the wire.

resistivity = Ωm [2]

- (b) A battery of electromotive force (e.m.f.) E and negligible internal resistance is connected in series with a fixed resistor and a light-dependent resistor (LDR), as shown in Fig. 6.1.

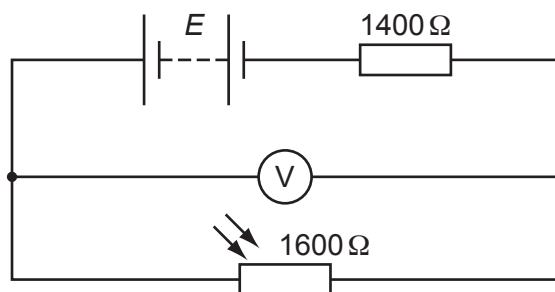


Fig. 6.1

The resistance of the fixed resistor is 1400Ω . The intensity of the light illuminating the LDR causes it to have a resistance of 1600Ω . A voltmeter connected across the LDR reads 6.4V .

- (i) Show that the current in the LDR is $4.0 \times 10^{-3} \text{A}$.

[1]

- (ii) Calculate the number of free electrons passing through the LDR in a time of 3.2 minutes.

number of free electrons = [2]

(iii) Calculate the e.m.f. E .

$$E = \dots\dots\dots \text{ V [2]}$$

(iv) Determine the ratio

$$\frac{\text{power dissipated in LDR}}{\text{power dissipated in fixed resistor}}.$$

$$\text{ratio} = \dots\dots\dots \text{ [2]}$$

(c) The environmental conditions change causing a decrease in the resistance of the LDR in (b). The temperature of the environment does not change.

State whether there is a decrease, increase or no change to:

(i) the intensity of the light illuminating the LDR

..... [1]

(ii) the current in the battery

..... [1]

(iii) the reading of the voltmeter.

..... [1]

[Total: 12]