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

Calculate the resistivity of the metal of the wire.

resistivity = ... Ω m [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.

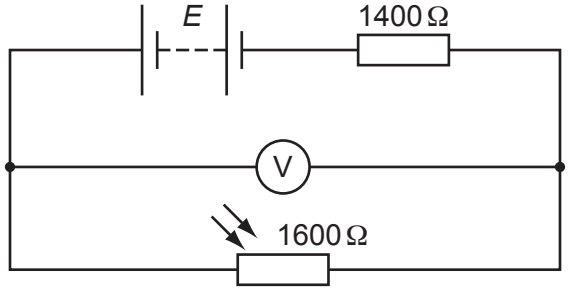

Fig. 6.1

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

(i) Show that the current in the LDR is 4.0×10^{-3} 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 = ... V [2]

(iv) Determine the ratio

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

ratio = ... [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]