

4

- The *I-V* characteristic of a light-emitting diode (LED) is shown in Fig. 4.1.

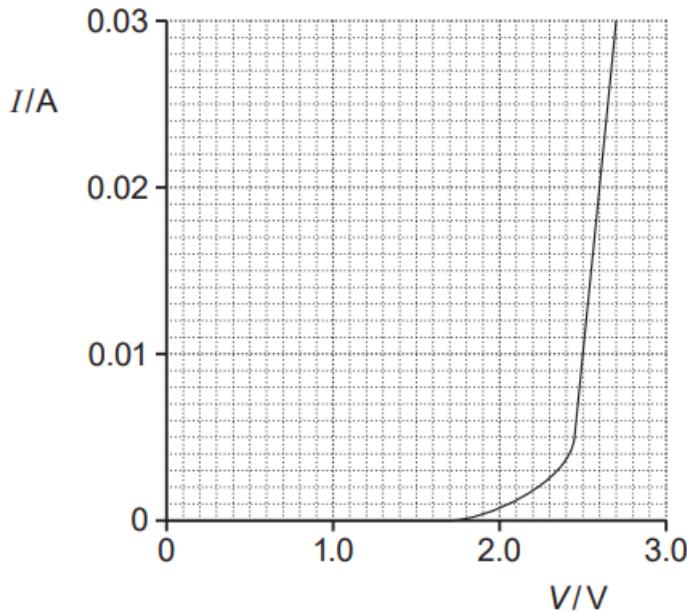


Fig. 4.1

- (a) Describe the variation of the resistance of the LED as V increases from zero to 2.7 V.

[2]

- (b) The LED is connected in a circuit as shown in Fig. 4.2.

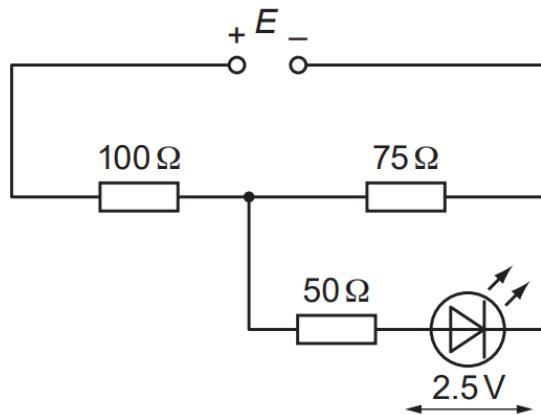


Fig. 4.2

The power supply has electromotive force (e.m.f.) E and negligible internal resistance. The resistance values of the resistors are indicated in the figure.

The potential difference (p.d.) across the LED is 2.5 V.

[Turn over

(i) Use Fig. 4.1 to show that the p.d. across the $50\ \Omega$ resistor is 0.50 V

[1]

(ii) Calculate the e.m.f. E of the power supply.

$$E = \dots \text{V} \quad [3]$$

(iii) The LED emits blue light of wavelength $4.7 \times 10^{-7}\text{ m}$.

Estimate the number of blue light photons emitted from the LED per second

$$\text{number of photons per second} = \dots \text{s}^{-1} \quad [2]$$

- (c) An identical LED is connected in a circuit designed by a student, as shown in Fig. 4.3.

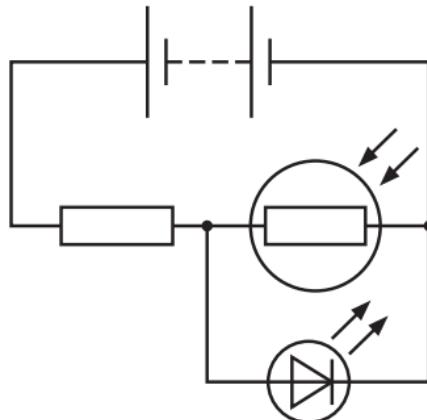


Fig. 4.3

The LED is very close to and facing the light dependent resistor (LDR).
The circuit is taken into a dark room.

The student thought that the LED would switch on. Instead, the LED was found to repeatedly switch on and off.

Explain this behaviour of the LED in the circuit.

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[2]