6

(a)

A light-dependent resistor (LDR) is connected to a variable resistor R_1 and a fixed resistor R_2, as shown in Fig. 6.1.

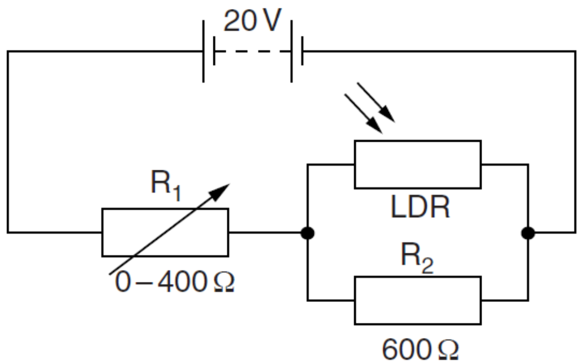

Fig. 6.1

When the light intensity is varied, the resistance of the LDR changes from 5.0 kΩ to 1.2 kΩ.

(i)

For the maximum light intensity, calculate the total resistance of R_2 and the LDR.

total resistance = ... Ω [2]

(ii)

Fig 6.2 shows the circuit when the LDR is removed.

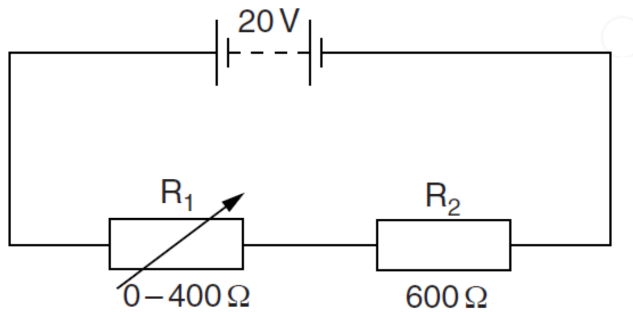

Fig. 6.2

The resistance of R_1 is varied from 0 to 400 Ω in the circuits of Fig. 6.1 and Fig. 6.2. State and explain the difference, if any, between the minimum potential difference across R_2 in each circuit. Numerical values are not required.

……………………………………………………………………………………………………..

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…………………………………………………………………………………………………… [3]

(b)

In Fig. 6.3, XZ is a uniform metre wire and has a resistance of 10.0 Ω. E is a power supply of electromotive force (e.m.f.) 2.0 V with negligible internal resistance. The resistor R_1 has a resistance of 15.0 Ω and the resistor R_2 has a resistance of 5.0 Ω.

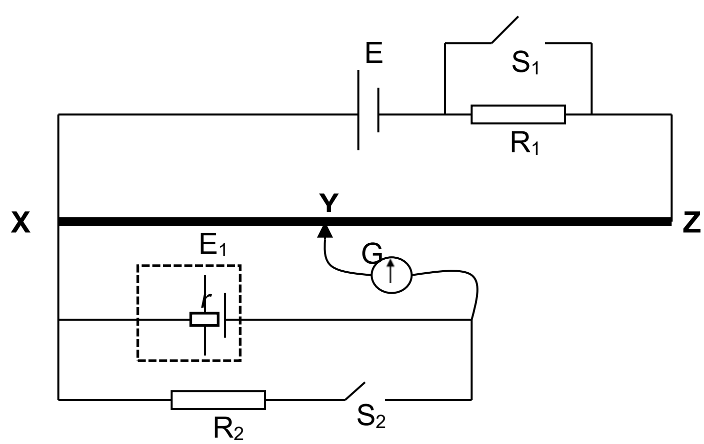

Fig. 6.3

With both switches S_1 and S_2 open, length YZ is 37.5 cm when galvanometer G registers null deflection.

When S_1 and S_2 are closed, length YZ is 90.0 cm when galvanometer G registers null deflection.

(i)

Show that the e.m.f. of cell E_1 is 0.50 V.

[3]

(ii)

Determine the internal resistance r of cell E_1.

r = ………………………………Ω [3]

[Total: 11]