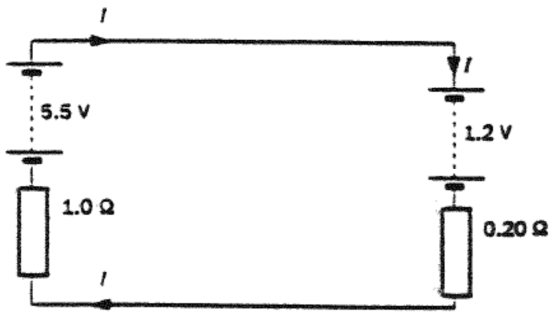
TUTORIAL QUESTIONS DC CIRCUITS

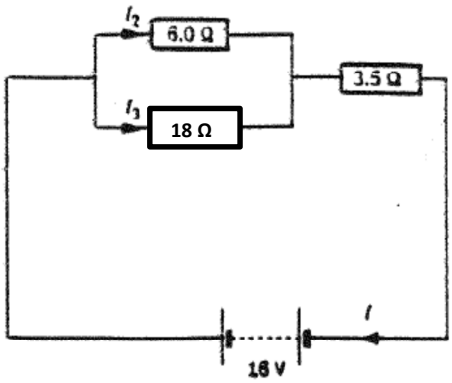
Question 1

A battery charger works by passing a current through a rechargeable cell in the reverse direction to normal current flow. The diagram below shows a particular charger being used to recharge a cell of e.m.f. 1.2 V and internal resistance 0.2 Ω. If the e.m.f. of the battery charger is 5.5 V, and its internal resistance is 1.0 Ω, calculate the current through the rechargeable cell.



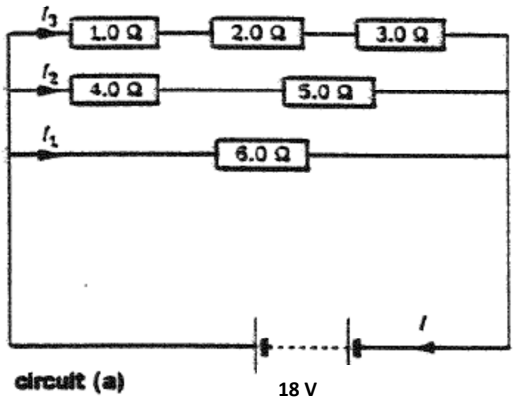
Question 2

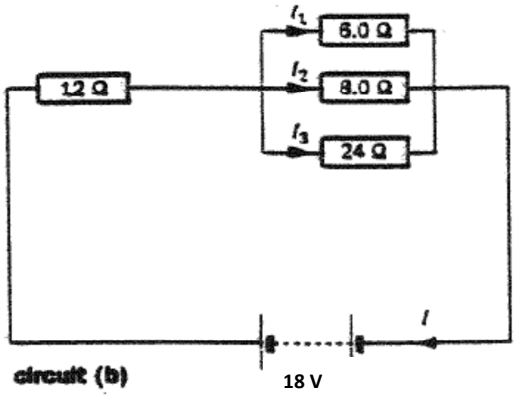
For the circuit shown below, calculate the:
a) effective resistance of the parallel group
b) total circuit resistance
c) total current (I)
d) potential difference (V_1) across the parallel group
e) potential difference (V_2) across the 3.5 Ω resistor
f.) currents (I_2 AND I_3)



Question 3

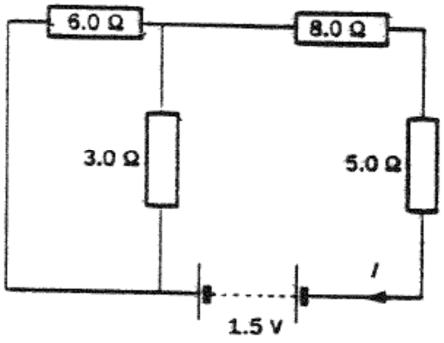
For each of the circuits (a) and (b) below, calculate the unknown currents



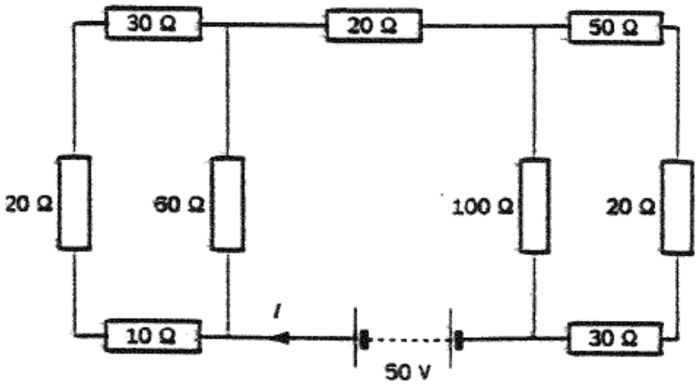


Question 4

Calculate the total current flowing in each of the resistor networks shown.



Network a



Network b

Question 5

The diagram below shows a light-dependent resistor (LDR) connected in series with a 10 kΩ resistor and a 12 V d.c. supply

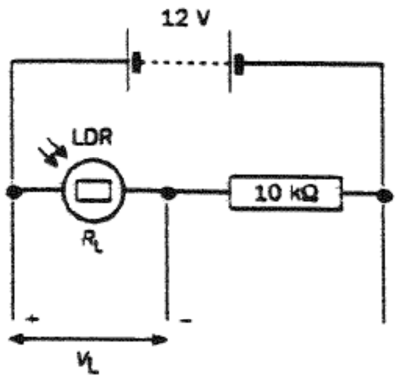
Calculate :-

a) the p.d. across the L.D.R (V_L) when

(i) it is dark, and has a resistance of 8.0 MΩ, and

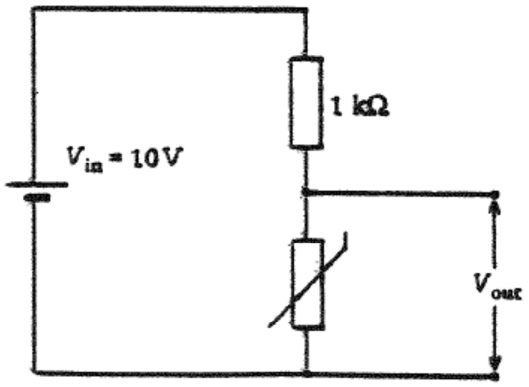
(ii) it is in bright light, and its resistance is 500 Ω.

b) the resistance of the LDR in lighting conditions which make $V_L = 4.0$ V



Question 6

A thermistor is used in the circuit shown in the figure below. Its resistance changes from 20 kΩ at 20 °C to 100 Ω at 60 °C. Calculate the V_{out} at these 2 temperatures.



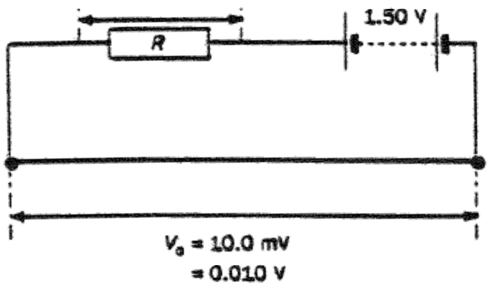
Question 7

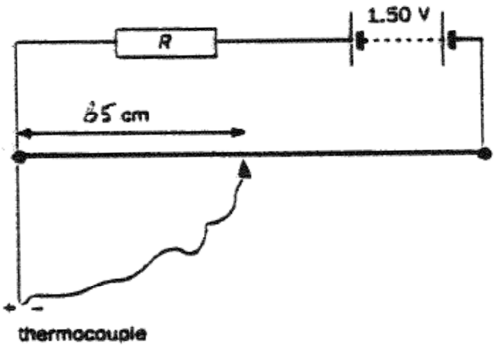
When a cell of e.m.f. (E) is connected to a slide-wire potentiometer, the balance length is found to be 64.0 cm. This cell is then replaced by a standard cell of e.m.f. 1.02 V, and a new balance length of 44.0 cm is obtained. Calculate the value of E.

Question 8

A potentiometer wire has a driver cell of e.m.f. 1.50 V and negligible internal resistance. If the 100 cm long slide-wire has a resistance of 2.00 Ω, calculate:

a) the value of the resistor which must be connected in series so that the p.d. across the wire is 10.0 mV
b) the e.m.f. (E) of a thermocouple if it is balanced against 65.0 cm of the potentiometer wire.





Question 9

In the circuit shown in Fig. 8.1, cell A has an e.m.f. of 2.0 V and negligible internal resistance. XY is a uniform wire of length 100cm and resistance 5.0Ω. Cell B has an e.m.f. of 1.5 V and internal resistance 0.80Ω.

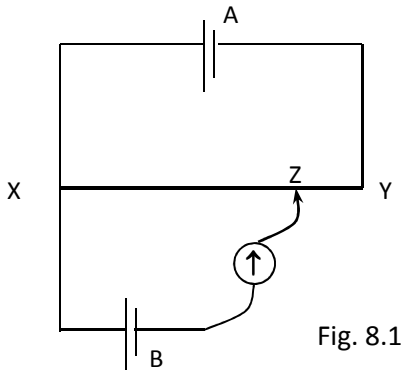


Fig. 8.1

Calculate the length of XZ required to produce zero deflection in the galvanometer
(i) in the circuit as shown in Fig. 8.1
(ii) when a 1.0 Ω resistor in placed in series with A.
(iii) when this resistor is removed from A and place in series with B.
(iv) when this resistor is placed in parallel with B.