ASSIGNMENT
CURRENT ELECTRICITY
Class 12

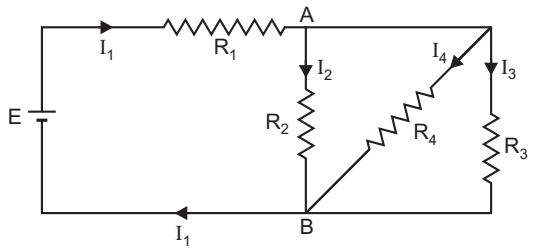
1. State Ohm's law. Give two conditions under which it is valid? A cell of unknown emf E and internal resistance r, two unknown resistances R_1 and R_2 ($R_2 > R_1$) and a perfect ammeter are given. The current in the circuit is measured in five different situations: (i) Without any external resistance in the circuit, (ii) With resistance R_1 only, (iii) With resistance R_2 only, (iv) With both R_1 and R_2 used in series combination and (v) With R_1 and R_2 used in parallel combination. The current obtained in the five cases are 0.42A, 0.6A, 1.05A, 1.4A, and 4.2A, but not necessarily in that order. Identify the currents in the five cases listed above and express E, R_1 and R_2. in terms of r .

2. Derive the formula for the equivalent EMF and internal resistance for the parallel combination of two cells with EMF E_1 and E_2 and internal resistances r_1 and r_2 respectively. What is the corresponding formula for the series combination? Two cells of EMF 1V, 2V and internal resistances 2 ohm and 1 ohm respectively are connected in (i) series, (ii) parallel. What should be the external resistance in the circuit so that the current through the resistance be the same in the two cases? In which case more heat is generated in the cells?

3. (a). State Kirchhoff's rules for an electric network. Using Kirchhoff's rules, obtain the balance condition in terms of the resistances of four arms of Wheatstone bridge. (Delhi 2013)

(b). In meter bridge experimental set up, shown in the figure, the null point 'D' is obtained at a distance of 40 cm from end A of the meter bridge wire. If a resistance of 10 ohm is connected in series with R_1, null point is obtained at AD = 60 cm. Calculate the values of R_1 and R_2.

4. In the circuit shown, R_1 = 4 ohm ,R_2 = R_3 =15 ohm , R_4 =30 ohm and E = 10 V. Calculate the equivalent resistance of the circuit and the current in each resistor.



5. (a). Define the terms (i) drift velocity, (ii) relaxation time.
(b).A conductor of length L is connected to a dc source of emf E. If this conductor is replaced by another conductor of same material and same area of cross-section but of length
3L, how will the drift velocity change?