

SARALA BIRLA PUBLIC SCHOOL

Birla Knowledge City, Mahilong, Ranchi

Session - 2021-22

Assignment - I



Class: XII

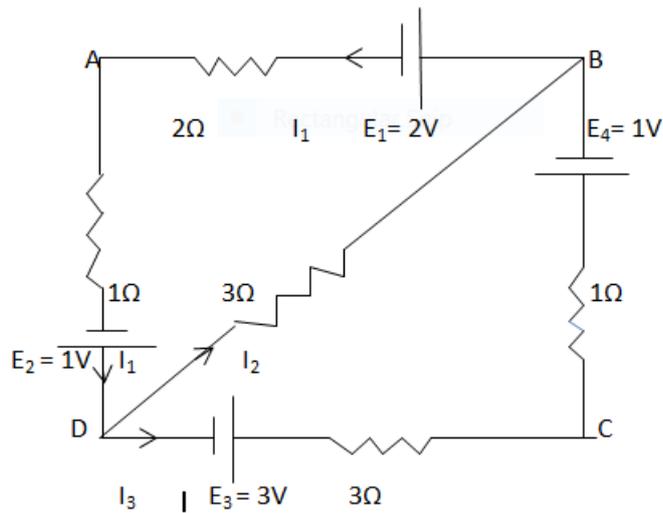
Subject: Physics

1. Explain the term 'drift velocity' of electrons in a conductor. Here obtain the expression for the current through a conductor in terms of 'drift velocity'.
2. Define relaxation time of the free electrons drifting in a conductor. How is it related to the drift velocity of free electrons? Use this relation to deduce the expression for the electrical resistivity of the material.
3. A cell of emf E and internal resistance r is connected across a variable resistor R . Plot a graph showing variation of terminal voltage V of the cell versus the current I . Using the plot, show how the emf of the cell and its internal resistance can be determined.
4. A wire whose cross-sectional area is increasing linearly from its one end to the other, is connected across a battery of V volts. Which of the following quantities remain constant in the wire?
 - (a) drift speed
 - (b) current density
 - (c) electric current
 - (d) electric fieldJustify your answer.
5. A parallel plate capacitor is charged by a battery to a potential. The battery is now disconnected and a dielectric slab is inserted to completely fill the space between the plates. How will (i) its capacitance, (ii) electric field between the plates, and (iii) energy stored in the capacitor be affected? Justify your answer giving necessary mathematical expressions for each case.
6. A parallel plate capacitor, each of plate area A and separation d between the two plates, is charged with charges $+Q$ and $-Q$ on the two plates. Deduce the expression for the energy stored in the capacitor.
7. Find the ratio of the potential difference that must be applied across the parallel and series combination of two capacitors C_1 and C_2 with their capacitances in the ratio 1:2, so that the energy stored in these two cases become the same.

or

Two capacitors of unknown capacitances C_1 and C_2 are connected first in series and then in parallel across a battery of 100 V. If the energy stored in the two combinations is 0.045 J and 0.25 J respectively, then determine the value of C_1 and C_2 . Also, calculate the charge on each capacitor in parallel combination.
8. A parallel plate capacitor of capacitance C is charged to a potential V by a battery. Without disconnecting the battery, the distance between the plates is tripled and a dielectric medium of $K = 10$ is introduced between the plates of the capacitor. Explain giving reasons, how will the following be affected
 - (i) Capacitance of the capacitor
 - (ii) Charge on the capacitor and
 - (iii) energy density of the capacitor?

9. (a) Two cells of emfs $2E$ and E and internal resistances $2r$ and r respectively are connected in parallel. Obtain the expression for the equivalent emf and the internal resistance of the combination.
- (b) Three identical cells, each of emf 2 V and unknown internal resistance are connected in parallel. This combination is connected to a $5\ \Omega$ resistor. If the terminal voltage across each cell is 1 V . What is the internal resistance of each cell?
10. (a) Draw the circuit diagram showing a Wheatstone bridge. Use Kirchhoff's law to obtain the balanced condition in terms of the values of the four resistances.
- (b) In the network shown, find the values of the currents I_1 , I_2 and I_3 .



or

State the principle of potentiometer. Draw a circuit diagram used to compare the emfs of two primary cells. Deduce the formula. How can the sensitivity of a potentiometer be increased?

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