SARALA BIRLA PUBLIC SCHOOL

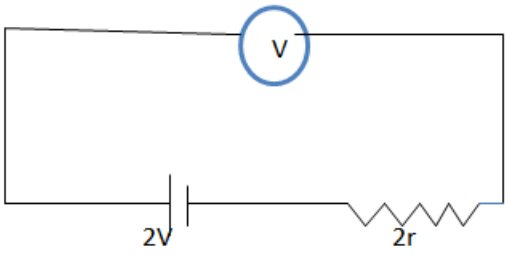
Birla Knowledge City, Mahilong, Ranchi

CLASS-XII (2020-21)

Sub: PHYSICS

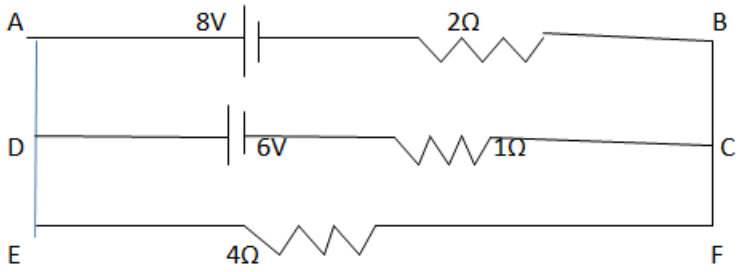
Assignment-4

1. Under what condition will the current in a wire be the same when connected in series and in parallel of n identical cells each having internal resistance r and external resistance R?
2. Two wires one of manganin and the other of copper have equal length and equal resistance. Which one of these wires will be thicker?
3. Plot a graph showing temperature dependence of resistivity for a typical semiconductor. How is this behaviour explained?
4. Two conducting wires X and Y of same diameter but different materials are joined in series across a battery. If the number density of electrons in X is twice that in Y, find the ratio of drift velocity of electrons in the two wires.
5. Two bulbs are rated (P_1, V) and (P_2, V). If they are connected (i) in series and (ii) in parallel across a supply V, find the power dissipated in the two combinations in terms of P_1 and P_2.
6. A set of 'n' identical resistors, each of resistance 'R' when connected in series have an effective resistance 'X'. When they are connected in parallel, their effective resistance becomes 'Y'. Find out the product of X and Y.
7. A voltmeter of resistance 998 ohm is connected across a cell of emf 2 V and internal resistance 2 ohm. Find the potential difference across the voltmeter and also across the terminals the cell. Estimate the percentage error in the reading of the voltmeter.

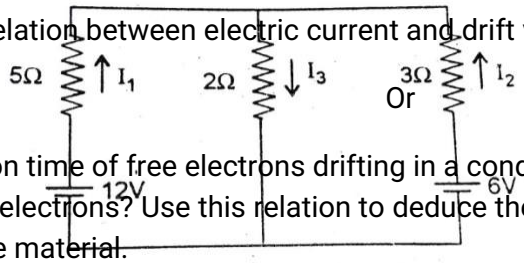


8. (a) Give reason:

(i) Why the connections between the resistors in a metre bridge are made of thick copper strips?
(ii) Why is it generally preferred to obtain the balance length near the mid-point of the bridge wire?
(b) Calculate the potential difference across the 4 ohm resistor in the given electrical circuit, using
Kirchhoff's rules.



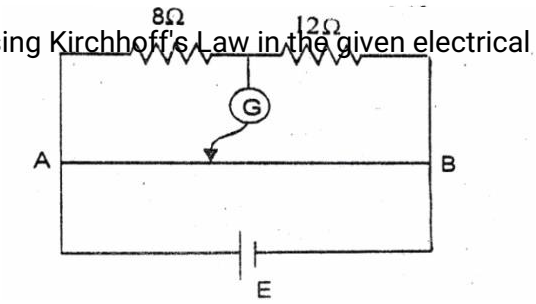
9. Establish a relation between electric current and drift velocity.



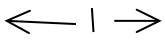
Or

Define relaxation time of 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.

10. Using Kirchhoff's Law in the given electrical network, calculate the values of I_1, I_2 and I_3.



11.

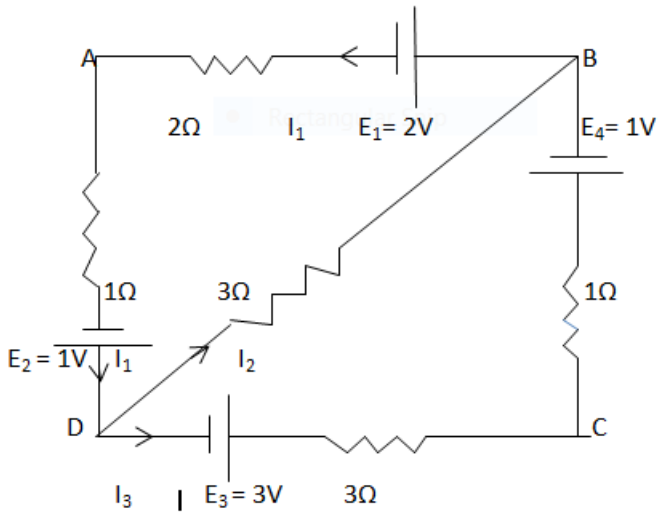


State the principle of working of a metre bridge.
In the meter bridge experiment, balance point was observed at J with AJ = l.
(i) The values of R and X were doubled and then interchanged. What would be the
new position of the balance point?
(ii) If the galvanometer and battery are interchanged at the balanced position, how

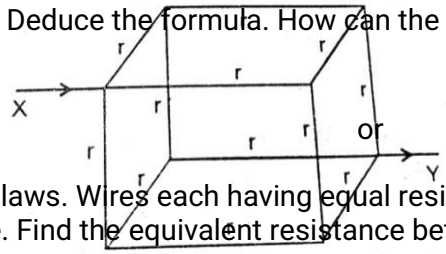
will the balance point get affected?

12. (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.



13. 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?



or

State Kirchhoff's laws. Wires each having equal resistance r are joined to form a cube as show in the figure. Find the equivalent resistance between the diagonally opposite points X and Y

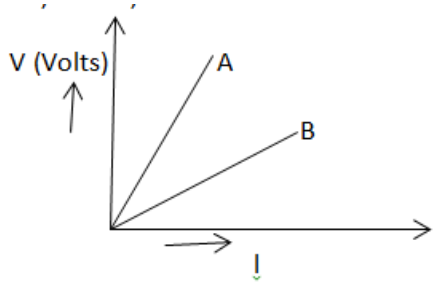
14. Draw the circuit diagram of a potentiometer which can be used to determine the internal resistance of a given cell of emf E. Describe a method to find the internal resistance of a primary cell.

or

(a) (i) State the principle on which a potentiometer works. How can a given potentiometer be made more sensitive?

(ii) In the graph shown below for two potentiometers, state with reason which of the two

potentiometer, A or B, is more sensitive.



(b) Two metallic wires P_1 and P_2 of the same material and same length but different cross-sectional areas, A_1 and A_2 are joined together and connected to a source of emf. Find the ratio of the drift velocities of free electrons in the two wires when they are connected (i) in series, and (ii) in parallel.