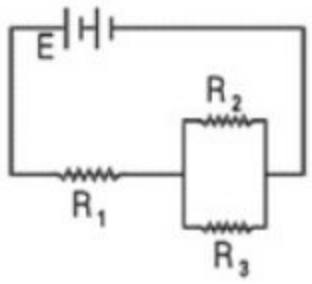
Board – CBSE	Class – 12th	Chapter – Current Electricity

Q.1. Two mangnan wires whose lengths are in the ratio 1: 2 and whose resistances are in the ratio 1: 2 are connected in series with a battery. What will be the ratio of drift velocities of free electrons in the two wires?

Q.2. Three identical resistors $R_1 R_2$ and R_3 are connected to a battery as shown in the figure. What will be the ratio of voltages across R_1 and R_2. Support your answer with calculations. [2:1]



Q.3. What are ohmic and non-ohmic resistors? Give one example of each?

Q.4. A meter bridge is in balance condition. Now if the galvanometer and cell are interchanged, the galvanometer shows no deflection. Give a reason.

Q.5. The storage battery of a car has an emf of 12 V. If the internal resistance of the battery is 0.4Ω, what is the maximum current that can be drawn from the battery?

Q.6. A battery of emf 10 V and internal resistance 3Ω is connected to a resistor. If the current in the circuit is $0.5\ A$, what is the resistance of the resistor? What is the terminal voltage of the battery when the circuit is closed?

Q.7. (a) Three resistors 1Ω, 2Ω, and 3Ω are combined in series. What is the total resistance of the combination?

(b) If the combination is connected to a battery of emf 12 V and negligible internal resistance, obtain the potential drop across each resistor.

Q.8. (a) Three resistors 2Ω, 4Ω and 5Ω are combined in parallel. What is the total resistance of the combination?

(b) If the combination is connected to a battery of emf 20 V and negligible internal resistance, determine the current through each resistor, and the total current drawn from the battery.

Q.9. At room temperature $\left(27.0^{\circ}C\right)$ the resistance of a heating element is 100Ω. What is the temperature of the element if the resistance is found to be 117Ω, given that the temperature coefficient of the material of the resistor is $1.70\times10^{-4\,\circ}C^{-1}$

Q.10. A negligibly small current is passed through a wire of length 15 m and uniform cross section $6.0\times10^{-7}\ m^2$, and its resistance is measured to be 5.0Ω. What is the resistivity of the material at the temperature of the experiment?

Q.11. (a) In a metre bridge, the balance point is found to be at 39.5 cm from the end A, when the resistor Y is of 12.5Ω. Determine the resistance of X. Why are the connections between resistors in a Wheatstone or meter bridge made of thick copper strips?
(b) Determine the balance point of the bridge above if X and Y are interchanged.
(c) What happens if the galvanometer and cell are interchanged at the balance point of the bridge? Would the galvanometer show any current?

Q.12. A storage battery of emf 8.0 V and internal resistance 0.5Ω is being charged by a 120 V dc supply using a series resistor of 15.5Ω. What is the terminal voltage of the

battery during charging? What is the purpose of having a series resistor in the charging circuit?

Q.13. In a potentiometer arrangement, a cell of emf 1. 25 V gives a balance point at 35. 0 cm length of the wire. If the cell is replaced by another cell and the balance point shifts to 63. 0 cm, what is the emf of the second cell?

Q.14. The number density of free electrons in a copper conductor estimated in Example 3. 1 is $8.5\times10^{20}\ m^{-3}$. How long does an electron take to drift from one end of a wire 3. 0 m long to its other end? The area of cross-section of the wire is $2.0\times10^{-6}\ m^{2}$ and it is carrying a current of 3. 0 A.

Q.15. (a) Six lead-acid type of secondary cells each of emf 2. 0 V and internal resistance 0. 015Ω are joined in series to provide a supply to a resistance of 8. 5Ω. What are the current drawn from the supply and its terminal voltage?
(b) A secondary cell after long use has an emf of 1. 9 V and a large internal resistance of 380Ω. What maximum current can be drawn from the cell? Could the cell drive the starting motor of a car?

Q.16. Two wires of equal length, one of Aluminium and the other of copper have the same resistance. Which of the two wires is lighter? Hence explain why Aluminium wires are preferred for overhead power cables. ($\rho_{Al} = 2.63\times10^{-8}\Omega m$, $\rho_{Cu} = 1.72\times10^{-8}\Omega m$,, Relative density of $Al = 2.7$, of $Cu = 8.9$.)

Q.17. (a) A steady current flow in a metallic conductor of non-uniform cross- section. Which of these quantities is constant along the conductor: current, current density, electric field, drift speed?

(b) Is Ohm's law universally applicable for all conducting elements? If not, give examples of elements which do not obey Ohm's law.

(c) A low voltage supply from which one needs high currents must have very low internal resistance. Why?

(d) A high tension (HT) supply of, say, $6kV$ must have a very large internal resistance. Why?

Q.18. (a) Alloys of metals usually have (greater/less) resistivity than that of their constituent metals.

(b) Alloys usually have much (lower/higher) temperature coefficients of resistance than pure metals.

(c) The resistivity of the alloy manganin is nearly independent of/increases rapidly with increase of temperature.

(d) The resistivity of a typical insulator (e.g., amber) is greater than that of a metal by a factor of the order of $\left(10^{22}/10^{3}\right)$.

Q.19. The emf of a cell is always greater than its terminal voltage. Why? Give a reason.

Q.20. Define the term 'Mobility' of charge carriers in a conductor. Write its S.I. unit.

Q.21. Define the term 'drift velocity' of charge carriers in a conductor and write its relationship with the current flowing through it.

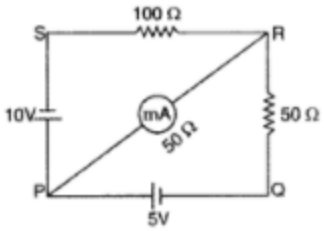
Q.22. Two metallic wires of the same material have the same length but cross-sectional area is in the ratio 1: 2. They are connected

(i) in series and

(ii) in parallel. Compare the drift velocities of electrons in the two wires in both the cases (i) and (ii).

Q.23. Define current sensitivity and voltage sensitivity of a galvanometer. Increasing the current sensitivity may not necessarily increase the voltage sensitivity of a galvanometer. Justify.

Q.24. The network PQRS, shown *m* the circuit diagram, has the batteries of 5V and 10 *V* and negligible internal resistance. A milliammeter of 50Ω resistance is connected between *P* and *R*. Calculate the reading in the milliammeter.



Q.25. State the principle of a potentiometer. Describe briefly, with the help of a circuit diagram, how this device is used to compare the emf's of two cells.

Q.26. Write the expression for the current in a conductor of cross-sectional area *A* in terms of drift velocity.