Physics (Current Electricity)

Section-A

1.Which of the following quantities do not change when a resistor connected to a battery is heated due to the current?

(A) drift speed (B) resistivity (B) resistance (D) no of electrons

2.As the temperature of a conductor increases, its resistivity and conductivity change. The ratio of resistivity to conductivity-

(A) increases (B) decreases (C) remains constant (D) may increase or decrease

3. Which of the following is the correct dimension formula of resistivity –

(A) $[M^{-1}L^{-3}T^{3}A^{2}]$ (B) $[ML^{3}T^{-3}A^{-2}]$ (C) $[ML^{-3}T^{3}A^{2}]$ (D) $[M^{-1}L^{3}T^{3}A^{2}]$

4. If a wire of resistance R is melted and re-casted to half of its length, then the new resistance of the wire will be
(A) R / 4 (B) R / 2 (C) R (D) 2 R

5. Resistivity of iron is 10 - 7 Ω-m. The resistance of an iron wire is 1 Ω. If its diameter

is halved and length doubled, the resistivity in Ω-m will be equal to

(A) 10^{-7} (B) 2×10^{-7} (C) 3×10^{-7} (D) 4×10^{-7}

Section-B

6. A cell of emf E and internal resistance r is connected to two external resistances R_1 and R_2 and a perfect ammeter. The current in the circuit is measured in four different situations :

(i) without any external resistance in the circuit
(ii) with resistance R_1 only
(iii) with R_1 and R_2 in series combination
(iv) with R_1 and R_2 in parallel combination

The currents measured in the four cases are 0.42 A, 1.05 A, 1.4 A and 4.2 A, but not necessarily in that order. Identify the currents corresponding to the four cases mentioned above.

7. In the figure a long uniform potentiometer wire AB is having a constant potential gradient along its length. The null points for the two primary cells of emfs E 1 and E2 connected in the manner shown are obtained at a distance of 120 em and 300 em from the end A. Find (i) E 1/E2 and (ii) position of null point for the cell E 1. How is the sensitivity of a potentiometer increased?

8.In the given circuit, assuming point A to be at zero apply Kirchhoff's rules to determine the potential at point B.

9. 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 balance point ?
(ii) If the galvanometer and battery are interchanged at the balance position, how will the balance point get affected ?

10. A voltage of 30 V is applied across a carbon resistor with first, second and third rings of blue, black and yellow colours respective y. Calculate the value of current, in mA, through the resistor.

11. Estimate the average drift speed of conduction electrons in a copper wire of cross-sectional area 1.0 × 10–7 m2 carrying a current of 1.5 A. Assume that each copper atom contributes roughly one conduction electron. The density of copper is 9.0 × 103 kg/m3,and its atomic mass is 63.5 u. (b) Compare the drift speed obtained above with, (i) thermal speeds of copper atoms at ordinary temperatures, (ii) speed of propagation of electric field along the conductor which causes the drift motion.

12. The resistance of the platinum wire of a platinum resistance thermometer at the ice point is 5 Ω and at steam point is 5.23 Ω. When the thermometer is inserted in a hot bath, the resistance of the platinum wire is 5.795 Ω. Calculate the temperature of the bath.

13. A network of resistors is connected to a 16 V battery with internal resistance of 1ohm, as shown in (a) Compute the equivalent resistance of the network. (b) Obtain the current in each resistor. (c) Obtain the voltage drops V_{AB}, V_{BC} and V_{CD}.

14. A 3 volt battery with negligible internal resistance is connected in a circuit as shown in the figure. The current I in the circuit will be

(a) 1 / 3 A (b) 1 A
(c) 1.5 A (d) 2 A

15. **The resistance of 20 cm long wire is 5 Ω. If it is stretched o 40 cm length, the new resistance in ohm is**
(a) 5 (b) 10 (c) 20 (d) 40