

COMBINED WORKSHEET-1 (Current Electricity)

1. Find the current flowing through a copper wire of length 0.2m, area of cross section 1mm^2 , when connected to a battery of 4V. Given that electron mobility= $4.5\times 10^{-6}\text{ m}^2/\text{V}\cdot\text{s}$ and charge on electron= $1.6\times 10^{-19}\text{C}$. The number density of electron in copper is $8.5\times 10^{28}\text{ m}^{-3}$.
2. An aluminum wire of diameter 2.5 mm is connected in series with a copper wire of diameter 1.6 mm. A current of 2.0A is passed through them. Find:
 - a. Current density in aluminum wire.
 - b. Drift velocity of electron in copper wire.

Given the number density of conduction electrons in copper is 10^{29} m^{-3} .

3. A battery of emf 6V and internal resistance 1 ohm is connected to a resistor. If the current in the circuit is 0.5A, what is the resistance of resistor? What is the terminal voltage of the battery when the circuit is closed?
4. Three cells of emf 2.0V, 1.8V and 1.5V are connected in series. Their internal resistances are 0.05 ohm, 0.7 ohm and 1 ohm respectively. If this battery is connected to an external resistance of 4 ohm, calculate:
 - a. The total current flowing in the circuit.
 - b. The potential difference across the terminals of the cells of emf 1.5V while in use.
5. Four identical cells each of emf 2V are joined in parallel providing supply of current to external circuit consisting of two 15 ohm resistors joined in a parallel. The terminal voltage of the cells as read by an ideal voltmeter is 1.6V, Calculate the internal resistance of each cell.
6. The charge flowing in a conductor varies with time as $q=2t-6t^2+10t^3$, where q is in coulomb and t in second. Find:
 - a. The initial current
 - b. The time after which the value of current reaches a maximum value.
 - c. The maximum or minimum value of current.
7. The resistance of a platinum wire of platinum resistance thermometer at the ice point is 5 ohm and at steam point is 5.23 ohm. When thermometer is inserted in a hot bath, the resistance of the platinum wire is 5.795 ohm. Calculate the temperature of the bath.
8. The resistance of a conductor at 20°C is 3.15 ohm and at 100°C is 3.75 ohm. Determine the temperature coefficient of resistance of the conductor. What will be the resistance of the conductor at 0°C ?
9. The following graph shows the variation of terminal potential difference V, across a combination of three cells in series to a resistor, versus the current I.
 - a. Calculate the emf of each cell.
 - b. For what current I, will the power dissipation of the circuit be maximum?

