# CHAPTER 3
# Current Electricity

**Q.1. What is the drift velocity of electrons? How does it elucidate the flow of electrical current within a conductor?**
**Ans.** When electrons are subjected to an electric field, they do move randomly, but they slowly drift in one direction, in the direction of the electric field applied. The net velocity at which these electrons drift is known as the drift velocity.

**Q.2. Describe the conductivity of a conductor. Elaborate on how a metallic conductor's conductivity changes in relation to temperature.**
**Ans.** The conductivity of a conductor is a measure of its ability to conduct electricity. It is also reciprocal of the resistivity of the conductor. The SI unit of conductivity is Siemens Per Meter (S/m). The electrical conductivity of a metallic conductor will decrease with an increase in temperature.

**Q.3. What is the rationale behind utilising alloys in the creation of standard resistance coils?**
**Ans.** Alloys have (i) a low value of temperature coefficient, and the resistance of the alloy does not vary much with a rise in temperature. (ii) high resistivity, so even a smaller length of material is sufficient to design high standard resistance.

**Q.4.How does the mobility of electrons in a conductor change, if the potential difference applied across the conductor is doubled, keeping the length and temperature of the conductor constant?**
**Ans.** Mobility is defined as the magnitude of drift velocity per unit electric field.
$\mu = v_d/E = eE\tau/mE = e\tau/m$
$\mu \, \alpha \, \tau$ At constant temperature and length, there is no change in relaxation time i.e., $t \propto 1/T$
Also, it does not depend on potential differences. Hence, on changing the potential difference, there is no change in mobility of electrons.

**Q.5 What are the advantages of the Wheatstone Bridge method of measuring resistances over other methods?**
**Ans.** The advantages of the Wheatstone Bridge method of measuring resistances are:

- It is a null point method; hence, the result is free from the effect of extra resistances in the circuit.

- As it is a null point method, it is easier to detect a small change in deflection.

**Q.6. Explain the factors on which internal resistance of a cell depends?**
**Ans.** The factors on which internal resistance of a cell depends are:

- **Concentration of Electrolyte:** Less ionic the electrolyte or higher the concentration of electrolyte, greater is the internal resistance.
- **Surface Area of Electrodes:** Larger the surface area of electrodes, less is the internal resistance.
- **Temperature of Electrolyte:** Higher the temperature, less is the internal resistance.
- **Distance between Electrodes:** More the distance between the electrodes, the greater is the internal resistance.

**Q.7. If a current I passes through two wires of identical length and radius—one made of nichrome and the other of copper—connected in series, which wire experiences greater heating? Justify your answer.**
Ans.

Nichrome wire gets heated up more.
Heat dissipated in a wire is given by

$$H = I^2Rt$$

$$H = I^2 \frac{\rho l}{A} t \quad \left(\because R = \frac{\rho l}{A}\right)$$

Here, radius is same, hence area ($A$) is same. Also, current ($I$) and length ($l$) are same.

$\therefore \quad H \propto \rho$

But $\quad \rho_{nichrome} > \rho_{copper}$

$\therefore \quad H_{nichrome} > H_{copper}$

**Q.8. A battery of emf 2V and internal resistance 0.1Ω is being charged by a current of 5A. What will be the direction of current inside the battery? What is the potential difference between the terminals of the battery?**
**Ans.** During charging a battery the current inside the battery flows from the positive to the negative terminal of the battery, so the terminal potential difference is greater than the emf

$V = E + Ir = 2 + 5 \times 0.1$

$V = 2.5V$