10^{Th} Class

➢ RESISTANCE:

1. **Definition:**
   - Resistance is the opposition offered by a substance to the flow of electric current through it.
   - It is measured in ohms (Ω).
2. **Factors Affecting Resistance:**
   - ❖ **Length:** Longer conductors have higher resistance.
   - ❖ **Cross-sectional Area:** Greater cross-sectional area reduces resistance.
   - ❖ **Temperature:** For most conductors, resistance increases with temperature.
   - ❖ **Material:** Different materials have different resistivities, affecting their resistance.
3. **Mathematical Relationship:**
   - $R = \rho \times L/A$
   - Where R is resistance, ρ is resistivity, L is length, and A is cross-sectional area.

➢ CONDUCTORS, INSULATORS, AND SEMICONDUCTORS:

1. **Conductors:**
   - Materials with low resistance that allow the easy flow of electric current.
   - Examples include metals like copper, silver, and aluminum.
2. **Insulators:**
   - Materials with high resistance that inhibit the flow of electric current.
   - Examples include rubber, glass, and plastic.
3. **Semiconductors:**
   - Materials with intermediate resistance whose conductivity can be altered.
   - Examples include silicon and germanium.

➢ PRACTICAL APPLICATIONS:

1. **Electrical Wiring:**
   - Conductors with low resistance, such as copper wires, are used for electrical wiring to minimize energy loss.
2. **Resistors:**
   - Resistors are components designed to introduce specific amounts of resistance into circuits.

- They are used to control current, voltage, and power in electronic circuits.

3. **Heating Elements:**
   - Devices like electric heaters and toasters use materials with high resistance to generate heat when current passes through them.
4. **Temperature Sensors:**
   - Certain materials exhibit a predictable change in resistance with temperature, making them useful for temperature sensing applications.

➢ OHM'S LAW AND RESISTANCE:

1. **Ohm's Law:**
   - States that the current flowing through a conductor is directly proportional to the voltage applied across it, provided the temperature remains constant.
   - $V=I\times R$, where V is voltage, I is current, and R is resistance.
2. **Resistivity (Specific Resistance):**
   - Resistivity (ρ) is a property of materials that quantifies their resistance per unit length and cross-sectional area.
   - It is measured in ohm-meter ($\Omega \cdot m$).

➢ SAFETY CONSIDERATIONS:

1. **Overheating:**
   - High resistance can lead to overheating in electrical circuits, causing damage or fire hazards.
   - Proper sizing of conductors and use of suitable materials are essential for safety.
2. **Insulation:**
   - Insulators are used to prevent accidental contact with live conductors, reducing the risk of electric shock.

Understanding resistance is fundamental to understanding how electricity behaves in circuits and materials. It plays a crucial role in the design, operation, and safety of electrical systems and devices.