

Conductivity

These notes are your ultimate revision weapon to revise Conductivity . We've distilled years of previous exam questions (PYQs) into one powerful, concise resource. Everything you need to know, nothing you don't.

- **PYQs, Decoded:** All key concepts from past exams, organized and simplified.
- **Revise in Record Time:** Short, precise, and designed for last-minute review.
- **Focus on What Matters:** Master high-probability topics and boost your confidence.

Electrical Conductivity of Materials

1. Conductors (Metals)

- **Order of Conductivity:** Silver > Copper > Gold > Aluminium > Iron
- **Practical Applications:**
 - **Copper** is the most common material for electrical wires, despite silver being a better conductor, due to its lower cost and practical availability.
 - **Copper** is preferred over iron for applications like lightning conductors because it is a better conductor and is more resistant to oxidation (rusting).

2. Superconductors

- **Definition:** A material that exhibits two key properties:
 - **Zero Electrical Resistance:** It can conduct electricity without any energy loss.
 - **Zero Permeability (Meissner Effect):** It expels magnetic fields from its interior.

- **Temperature Dependence:**

- Originally discovered at temperatures close to **absolute zero** (-273.15°C or 0 K).
- **High-Temperature Superconductors:** A class of materials, often **ceramic oxides** containing elements like Mercury (Hg), Thallium (Tl), Barium (Ba), Calcium (Ca), and Copper oxide (CuO), that achieve superconductivity at higher (though still very cold) temperatures.
- The highest recorded superconducting temperature is **288 K** (15°C), achieved under extreme pressure using a compound of hydrogen, carbon, and sulphur.

- **Significance:** Achieving practical **room-temperature superconductivity** is a major scientific goal, as it would eliminate power loss during electrical transmission, saving enormous amounts of energy.

3. Semiconductors



- **General Properties:**

- Their electrical conductivity is **between that of conductors and insulators**.
- Conduction occurs through the movement of both **electrons (negative charge)** and **holes (positive charge carriers)**.
- They have a **negative temperature coefficient of resistance**, meaning their **resistance decreases when temperature increases**. This is because heating provides energy, freeing more electrons and creating more holes, thereby increasing conductivity.
- At **absolute zero (0 K)**, a semiconductor has **infinite resistance** and acts as a perfect insulator because no electrons have enough energy to conduct current.

- **Common Materials:**

- The most important elemental semiconductors are **Silicon (Si)** and **Germanium (Ge)**.
- **Silicon** is the most widely used material for transistors and electronic devices because it can withstand higher temperatures than germanium.
- **Germanium** (which can be recovered from burnt coal, or *Jhama*) was a crucial material in the development of early transistors.

Know More About Conductivity:

- [Conductivity – Old Year Questions](#)
- [Conductivity One Liner Questions & Answers](#)

