

## FlexiPrep

### Electric Currents in Conductors, Mechanism of Current Flow in a Conductor (For CBSE, ICSE, IAS, NET, NRA 2022)

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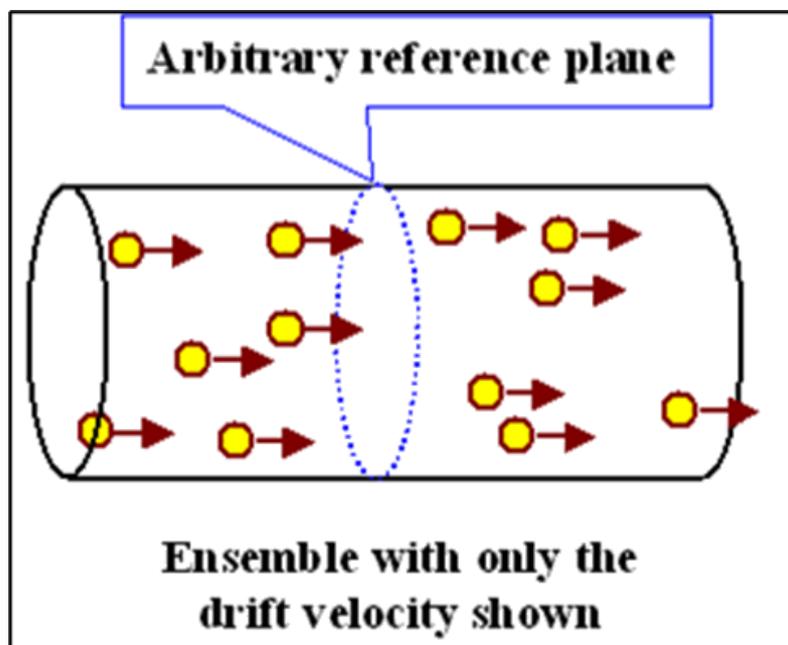
#### Electric Currents in Conductors

- Electrical Conductors are most important part of our lives.
- The entire power grid is made up of electrical conductors and insulators.
- Recently we've added another term, 'semiconductors' to this.

#### About an Electric Current

- Imagine a body, invariably made up of atoms.
- The atoms are made of electrons, protons, and neutrons.
- If being loosely connected, electrons are able to move freely inside the body, which is called electrical current.
- Under normal condition, the electrons are moving randomly inside the body and hence the net electric current is zero since they all cancel each other out.
- The application of an electric field around the body is also another way to cause movement in electrons but the catch is that the electric field does not influence everything.
- This is where the distinction between electrical conductors and insulators comes in electricity.
- The electric field can cause the electrons to move around.
- Through this influence on electrons, we can give a net direction to the motion of the electrons.
- This is how we generate an electric current.

#### Mechanism of Current Flow in a Conductor

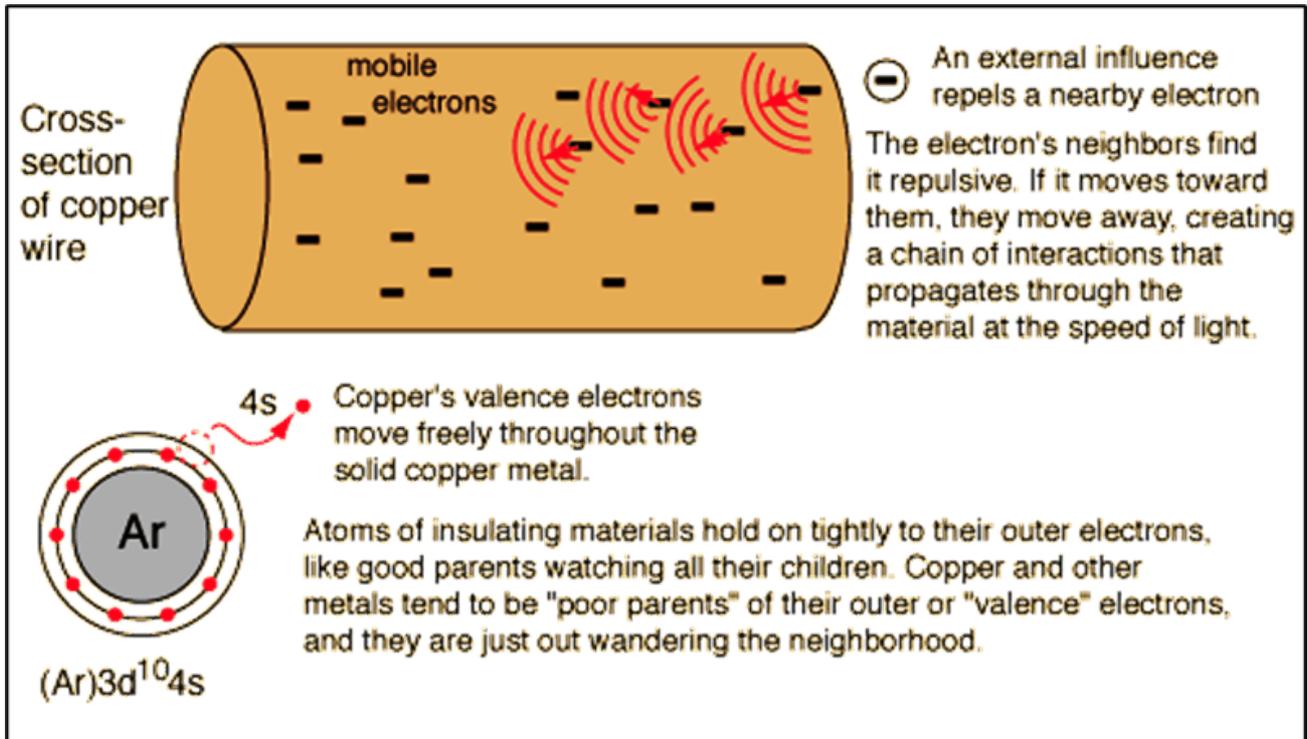


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- Flow of current in metals is due to preferential flow of free electrons. In the absence of any externally applied emf (by means of a battery) , the free electrons move randomly through the metal from one point to another giving zero net current.
- When connected to a battery, the free electrons get accelerated due to the electric field (set up by the battery) and they gain velocity and energy.
- Though, the passage is not smooth and the electrons collide with the lattice ion in which the ultimate gainer (of energy) is the ion.
- If we know the temperature of a body is related with the energy of vibrations of these ions, these collisions result in increase in temperature of the metal.
- The loss of energy of electrons in collision and their acceleration by the electric field, finally, results in drifting of electrons in a particular direction. (Although the actual motion of electrons is erratic, the overall effect is of drifting of electrons) .
- The motion of the conducting electrons in an electric field is thus a combination of the motion due to random collisions.

- When we consider all the free electrons, their random motion average to zero and make no contribution to the drift speed.
- So, the drift speed is only due to the effect of the electric field on the electrons.

## Conductors



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- Bodies in which the application of an electric field results in the generation of an electric current due to the movement of the electrons is called an Electrical Conductor.
- In such bodies, the electrons are free to move around inside the body and their random motion can be influenced by an electric field.
- Most **electrical conductors** are metals mainly because metals possess electrons in the outermost orbit where they are most loosely held and can move around easily.

- The wires supplying electricity to your houses are supplying fresh energetic electrons to your house for you to use.

### **Insulators**

- Some bodies do not possess free moving electrons like metals.
- Materials with fixed electrons such as plastics and rubber do not respond to the electric field at all.
- The electrons in these materials are not free to move around and generate an electric current.
- Such bodies are called Electrical Insulators.
- The plastic coating around the wire is an insulating material which prevents you from getting shocked by the electricity in the wire within.

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