

# Conductors and Insulators

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## A. Conductors and Insulators

### 1. Conductors

- a. All atoms are constantly subjected to very small external electrical forces. For some substances such as metals these naturally occurring forces are enough to free loosely bound orbital electrons. Free electrons can migrate in random fashion throughout the substance. Substances with this characteristic make good conductors. Although all metals are good conductors, silver is best.
- b. Copper wire is considered a good conductor. Electrical energy is transferred through conductors by free electrons that migrate from atom to atom. Each electron moves a short distance to the neighboring atom. There it replaces (one or more) electrons by forcing them out of their orbits. Replaced electrons repeat the process until the movement is transmitted throughout the conductor. If a large number of electrons move in a material following the application of force, the conductive qualities of that material are good. A good conductor has low opposition or resistance to electron flow or current.

### 2. Insulators

- a. In contrast to good conductors, some substances (rubber, glass, and dry wood) have very few free electrons. In these materials, large amounts of energy are needed to break electrons loose. They are poor conductors, nonconductors or insulators. Actually there is no sharp dividing line between conductors and insulators as electron motion is known to exist to some extent in all matter. Electricians simply use the best conductors as wires to carry current and the poorest conductors as insulators to prevent loss of current.

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## 3. Semiconductors

- a. Carbon can be considered a semiconductor. It conducts less than metal but more than insulators. In this group are germanium and silicon, commonly used for transistors and other components requiring semiconductors.
- b. The following table lists, in order, the best conductors and insulators.

Table 1	
Conductors and Insulators	
Conductors	Insulators
Silver	Dry air
Copper	Glass
Aluminum	Mica
Zinc	Rubber
Brass	Asbestos
Iron	Bakelite

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## 4. PRACTICE:

- 1 Put the following in the order of best conductor to worst conductor: Rubber, Aluminum, Silver, Glass?
2. What makes a good conductor?