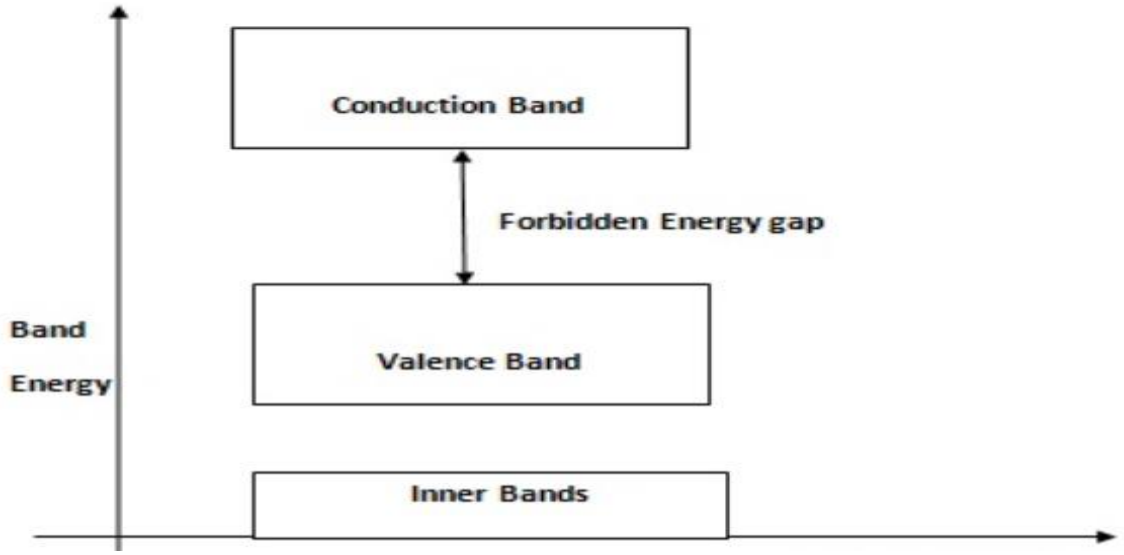
**Energy Band Theory**

According to the theory of Bohr, each shell from an atom includes a separate quantity of energy at dissimilar levels. This theory mainly gives details about the communication of electrons among the inside shell and outside shell. According to the theory of energy band, the energy bands are classified into three types which include the following.




- Valence band
- Forbidden energy gap
- Conduction band

**Valance Band**

The flow of electrons within the atoms in fixed energy levels however the energy of the electron in the inner shell is superior to the outer shell of electrons. The electrons which are present within the outer shell are named as valance Electrons.

These electrons include a sequence of energy levels which form an energy band named as valence band. This band includes the maximum occupied energy.

**Conduction Band**

The valence electrons are attached loosely toward the nucleus at room temperature. Some of the electrons from valence electrons will leave the band freely. So these are called free electrons because they flow toward the neighboring atoms.

These free electrons will conduct the flow of current within a conductor which is known as conduction electrons. The band which includes electrons is named as conduction band and the occupied energy of this will be the less.

**Forbidden Gap**

The forbidden gap is the gap between the conduction band and the valence band. This band is forbidden one without energy. Therefore there is no electron flow in this band. The flow of electrons from the valence to conduction will pass through this gap.

If this gap is greater, then the electrons in the valence band are strongly bound toward the nucleus. At the present, in order to drive the electrons out from this band, a little outside force is necessary, which is equivalent to the forbidden energy gap. In the following diagram, the two bands, as well as a forbidden gap is illustrated below. Based on the gap size, the semiconductors, conductors, and insulators are formed.

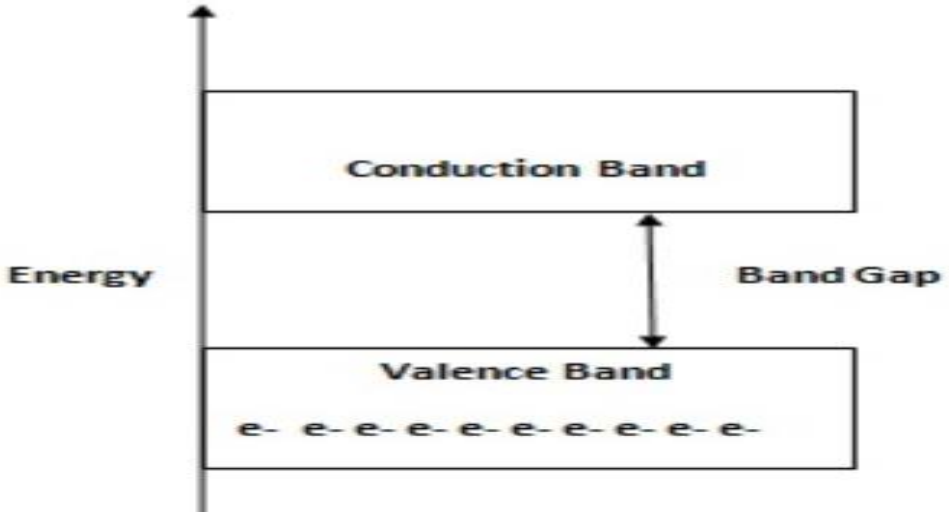
**Types of Energy Bands**

The energy bands are classified into three types namely

- Insulators
- Semiconductors
- Conductors

**Insulators**

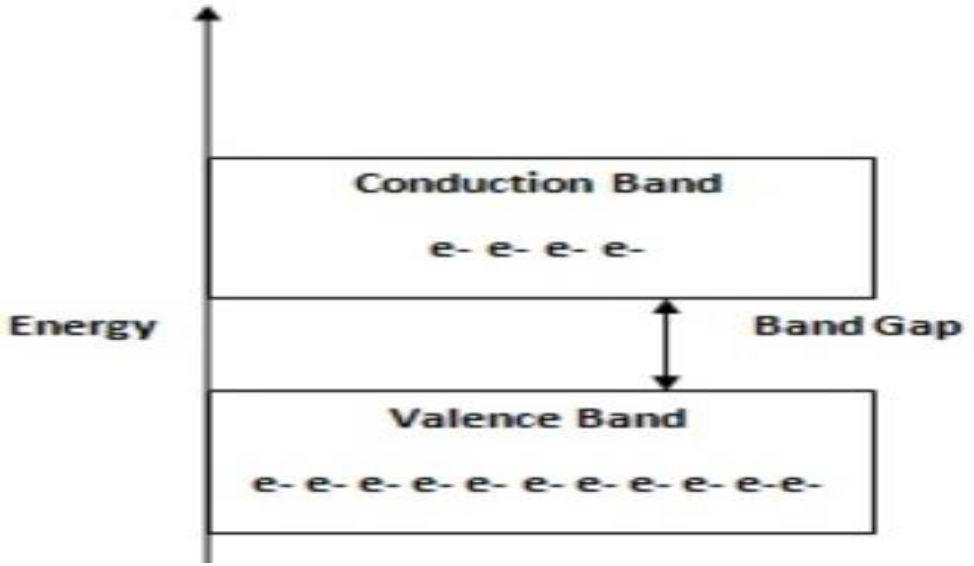
The best examples of an insulator are wood and glass. These insulators do not permit the flow of electricity to flow through them. The insulators have extremely low conductivity & high resistivity. In the insulator, the energy gap is extremely high that is 7eV. The material cannot perform due to the electrons flow from the bands like valence to the conduction is unfeasible.




The main characteristics of insulators mainly include the energy gap like forbidden is extremely large. For some types of insulators, when the temperature rises, they may illustrate some transmission.

**Semiconductors**

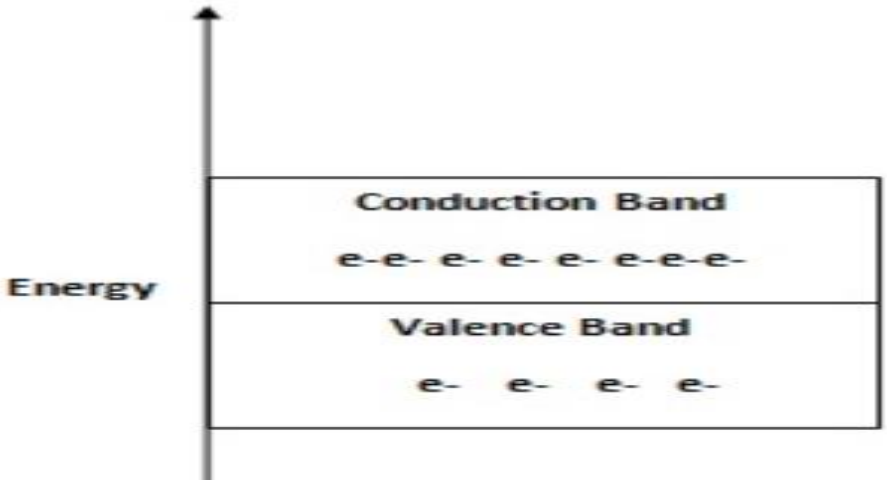
The best examples of semiconductors are Silicon (Si) & Germanium (Ge) which are the most used materials. The electrical properties of these materials lie among semiconductors as well as insulators. The following images show the semiconductor's energy band diagram wherever the conduction band can be vacant & the valence band is totally filled however the forbidden gap among these bands is minute that is 1eV. The forbidden gap of Ge is 0.72eV and Si is 1.1eV. Therefore, semiconductor needs little conductivity.




The main characteristics of semiconductors mainly include the energy gap like forbidden is extremely small. When the temperature of the semiconductor increases, the conductivity will decrease.

**Conductors**

The conductor is a type of material where the prohibited energy gap vanishes like the valence band as well as conduction band turns into extremely close that they partly cover. The best examples of conductors are Gold, Aluminum, Copper, and Gold. The free electrons' availability at room temperature is huge. The energy band diagram of the conductor is shown below.




The main characteristics of conductors mainly include the energy gap like forbidden will not exist. The energy bands like valance as well as conduction will get overlapped. The availability of free electrons for conduction is ample. The conduction will increase once the small number of voltage increases.