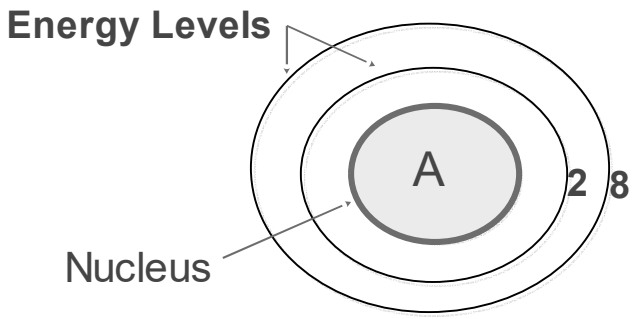
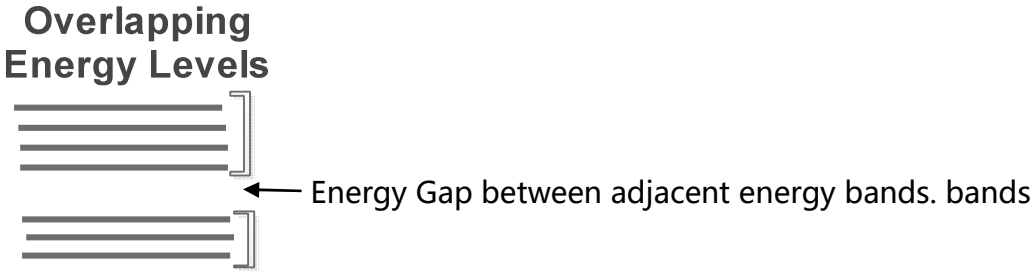
**Energy Bands Model**

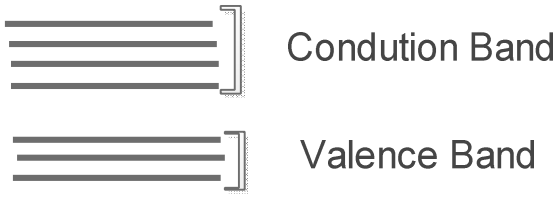
This model is used to explain why some materials conduct electricity while others do not. The concept of energy levels combining to form energy bands was introduced in 1928. From the structure of individual atom, the nucleus is surrounded by energy levels referred as shells or rings. Electrons have specific energy when they occupy specific ring or shell.




When many atoms come close together to combine and form bonds, the energy levels overlap. The shells (or rings) having similar energy levels overlap to form a continuous bands where electrons from their mother atoms are accommodated.




The nature of energy bands determine whether the material is an electrical insulators, semi-conductor or a conductor. The outer band is called conduction band because this is where the electrons that conduct electricity are accommodated. The inner band is called valence band. It is occupied by electrons that hold the atoms tightly in the bonds.




**Insulators**

All the electrons occupy the valence band. There is no electron in the conduction band.

The electrons require enough energy to move from the valence band into the conduction band. If the energy is provided through heat, insulators will melt or burn before their electrons moving from the valence band into conduction band. The energy gap is too big for the mobile electrons to move into the conduction band.

**Semi-conductors**

At normal physical conditions, they behave like insulators. The valence band is full and the conduction band is empty. They have a small energy gap and mobile electrons can easily migrate to the conduction band. The number of free electrons in the conduction band increases with temperature.

**Conductors**

A number of free electrons occupy the conduction even at low temperatures. Good electric conductors do not require their electrons to be excited to the conduction band.