Chapter Fifteen

Electronics

- **Introduction:**
- Electronics is the branch of science and engineering, which is closely related to the science of electricity.
- Through electronics, we gt products such as television, radio, computer, DVD player, VCD player and the tape recorder.
- Electronics and electricity both deal with electric current, but each field uses the current in a different way from the other.
- Electricity deals with electric current mainly in the form of energy.
- This energy is used to operate electric equipments such as the electric bulb and the electric motor.
- But in electronics, the current flows through special devices called electron devices which change the current into signals.
- In short, in electronics, the electric current is used in the form of signals.

Terms used in electronics:

- **Amplification:**
- This strengthens a weak signal to give rise to a strong one.
- Amplification is done by a device called an amplifier.

Alternating current:

- This is an electric current, whose direction of flow keeps on reversing.
- In short, such a current does not flow in one direction.

Direct current:

- This is an electric current that always flows in one direction only.

Electron devices:

- They are used to change the character of an electric current in some ways.

Rectification:

- This refers to the changing of alternating current to direct current.

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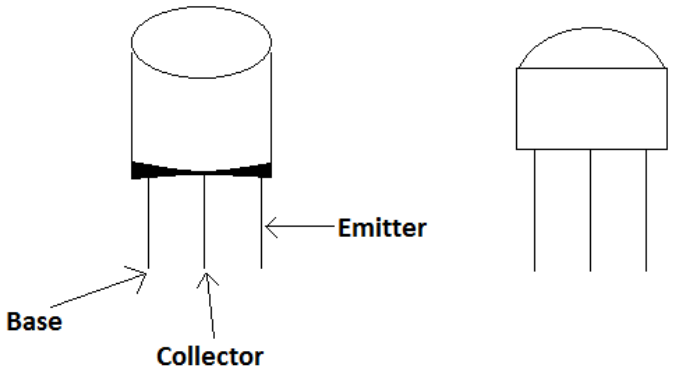
Oscillation:

- This refers to the changing of direct current to a signal of a desired frequency.

Transistor:

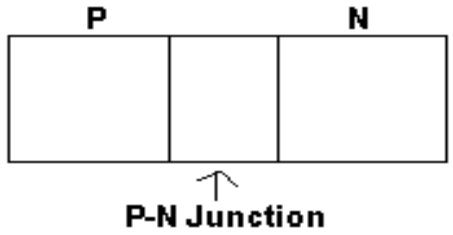


- This is a semi-conductor device, which has three terminals and used for amplification or as an amplifier.
- Transistors are used to operate devices such as radios and televisions.
- The transistor is the fundamental building block that is used in the construction of the circuits, that operate the computer, the mobile phone, the television set and other electronic devices.
- A transistor has three main parts and these are:
  (I) The emitter (negative lead).
  (II) The base.
  (III) The collector (positive lead).
- The diagrams just drawn show some examples of transistors.

Types of semi-conductors:

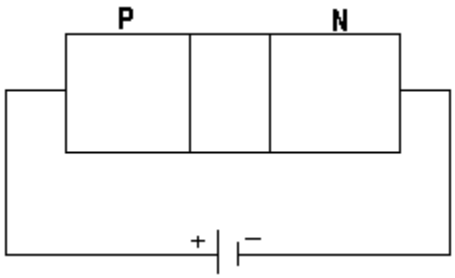
- There are two types and these are:
  (I) The N – type.
  (II) The P – type.

The P-N junction:



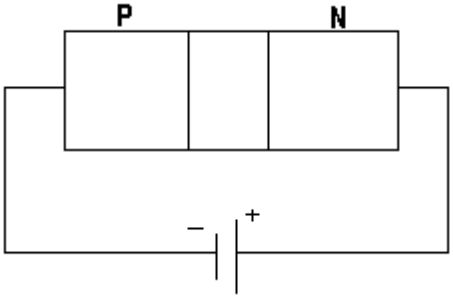
- This is a boundary or junction formed between a P-type and an N-type semi-conductor when they are melted together.
- The P-type semiconductor has more positive charges called holes, than negative charges or electrons.
- On the other hand, the N-type semiconductor contains more negative charges (electrons) than positive charges or holes.
- Even though the P-type and the N-type semiconductors are conductive, the P-N junction is non conductive.
- By the manipulation of this nonconductive layer, the P-N junction can be used as a diode.
- A diode is a device which allows current to flow in only one direction but not in the opposite direction.

Forward Bias:



- If the positive terminal of a battery is connected to the P-side and the negative terminal is connected to the N-side, then the P-N junction is said to be forward biased.

Reverse Bias:



- On the other hand, if the battery is connected with the negative terminal to the P-side, and the positive terminal to the N-side, then the P-N junction is said to be reversed biased.

Types of transistors:

- There are two types of standard transistors, and these are:
  (I) THE NPN transistor.
  (II) The PNP transistor.
- Every transistor is made up of both the P-type material and the N-type material.
- These two types of transistors already mentioned are generally referred to as biopolar transistors or junction transistors.
- This is due to the fact that they always consist of a thin piece of semiconductor material, which may be the P-type or the N-type semiconductor placed between the thick layers of the opposite type.
- For example a P-type semiconductor, is always placed between two thick layers of the N-type semiconductor.
- In a similar manner, an N-type semiconductor is always placed between two thick layers of the P-type semiconductor.
- In a junction transistor, one of the outside layers is the emitter and the other the collector.
- The middle layer is the base.
- The place where the emitter joins the base is called the emitter junction, and the place where the base joins the collector is called the collector junction.