Dr. Supriya Kumari
Deptt. of Physics
J.N. College, Madhubani.

Photodiode

It is a p-n junction diode fabricated with a transparent window so that light can fall on its junction. Its symbolic representation is shown in fig. 1.

Fig. 1 :- Symbolic representation of a photodiode

As shown in fig. 2, a resistance R is connected in series with a reverse biased photodiode. The voltage is kept slightly less than the breakdown voltage. When no light is incident on the junction, a small reverse saturation current flows through the junction. This reverse current is due to thermally generated electron-hole pairs and is called dark current. When the photodiode is illuminated with light photons of energy $h\nu$ greater than the energy gap E_g of the semiconductor, additional electron-hole pairs are generated in or near the depletion region due to the absorption of photons. Due to the electric

field of the junction, electrons get collected on n- side and holes on p- side giving rise to an emf. This sets up a photocurrent in the circuit. The magnitude of the photocurrent is proportional to the intensity of incident light.

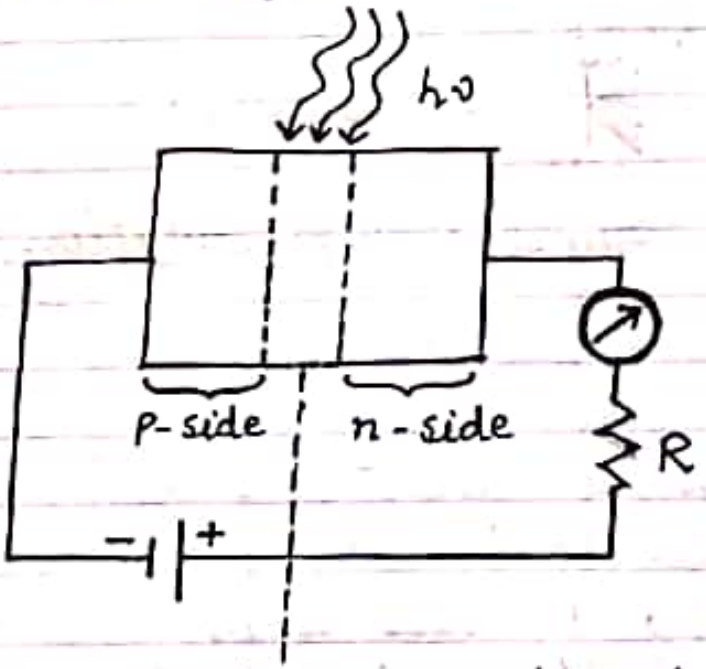

Fig.2 :- A reverse biased photodiode illuminated with light.

When a photodiode is illuminated with light photons of energy $h\nu > E_g$, and increasing intensities I_1, I_2, I_3, etc, the value of reverse saturation current increases in intensity of incident light, as shown in fig.3. Hence, a measurement of the change in the reverse saturation current

on illumination can give the values of light intensity.

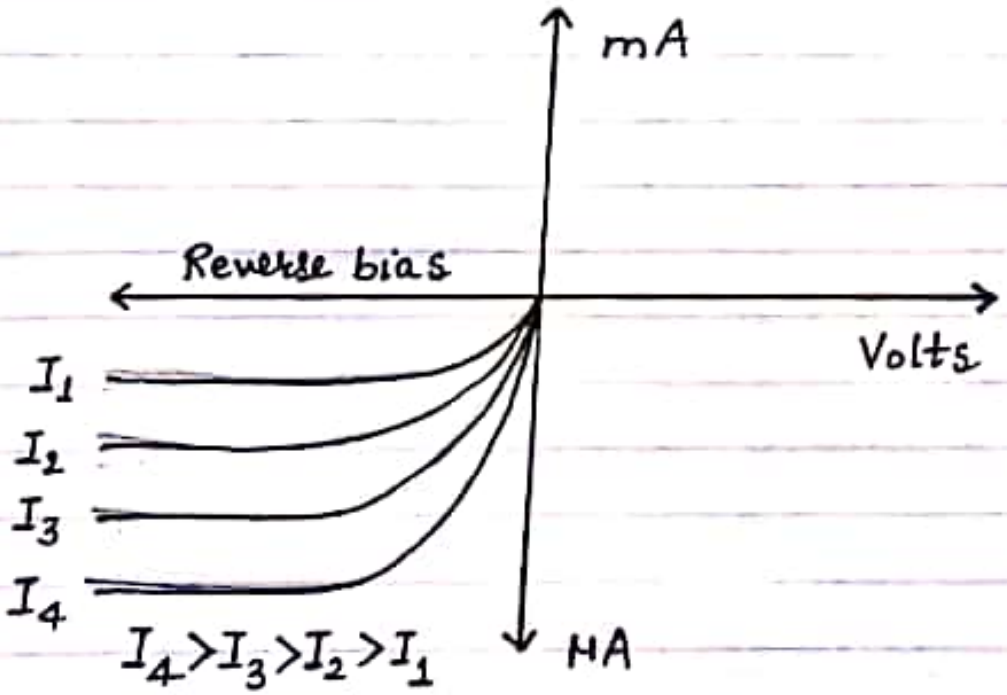

Fig.3 :- Reverse bias currents through a photodiode when illuminated with different intensities.

Uses of photodiodes :-

1.) In detection of optical signals.
2.) In demodulation of optical signals.
3.) In light-operated switches.
4.) In speed reading of computer punched cards
5.) In electronic counters.