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Photodiode Q-2(11) Paper IV

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.

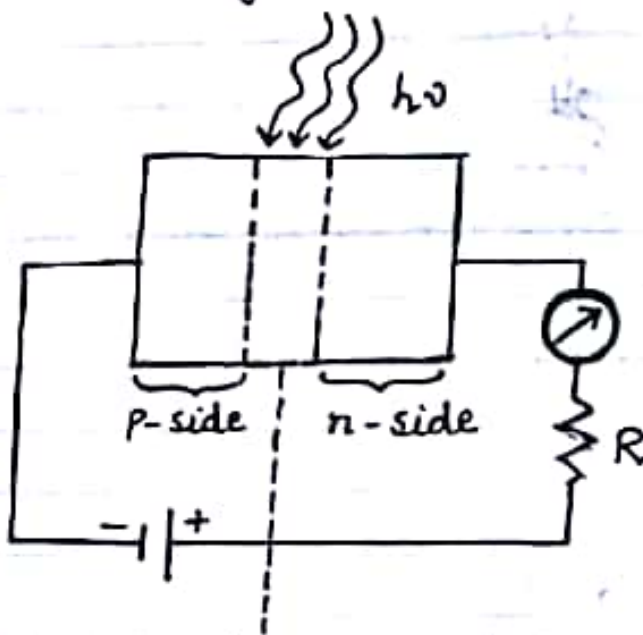


Fig. 2 :- A reverse biased photodiode illuminated with light.

When a photodiode is illuminated with light photons of energy $h\nu > E_g$, and increasing intensities I_1, I_2, I_3, \dots , 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.

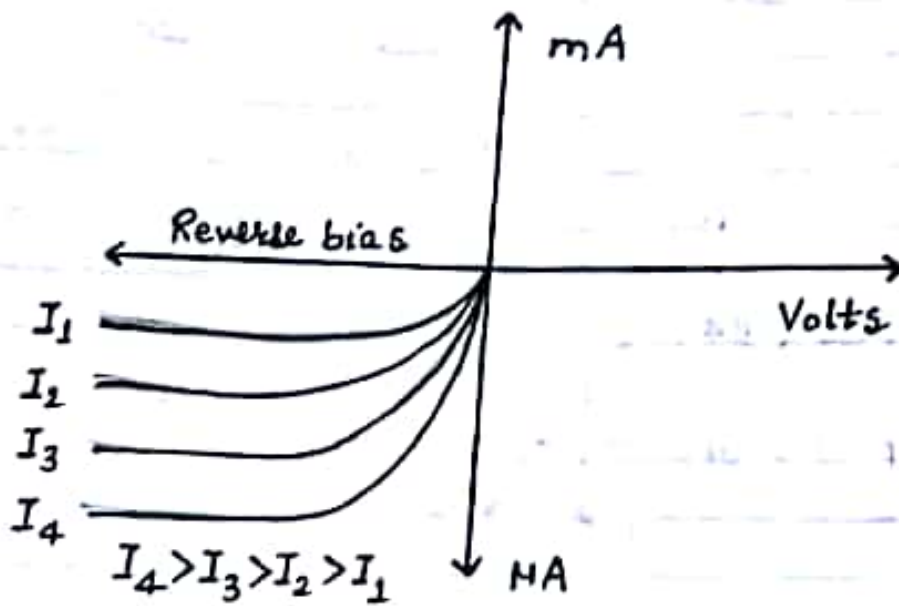


Fig.3 :- Reverse bias currents through a photodiode when illuminated with different intensities.

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.