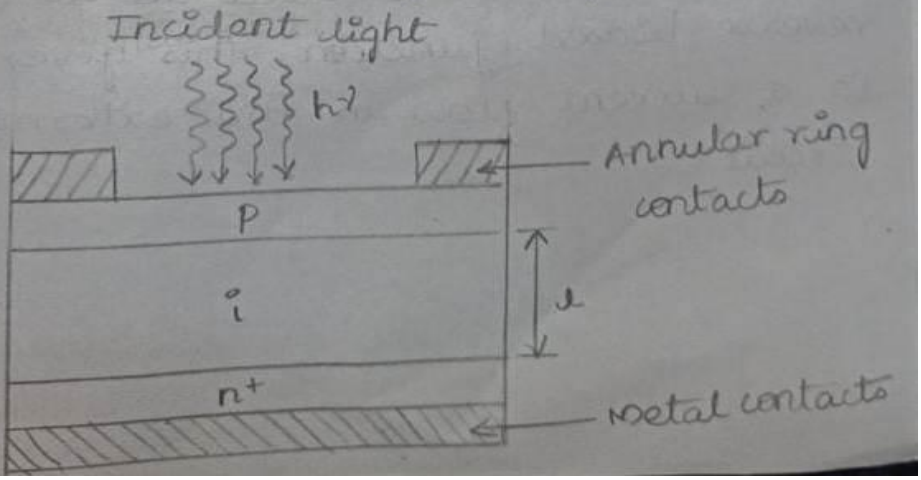
Photo Detectors:

Photo detectors are devices that absorb optical energy and convert it into electrical energy. The operation of photoelectric detectors is based on photoelectric effect where the absorption of photons by some materials based on external photoelectric effect. There are four main types of photo ~~detod~~ detectors, namely

* Photoconductors
* Photodiodes
* Pin diodes and
* Avalanche photodiodes

P-I-N Photo Diode

The p-i-n photodiode is a device that consists of p and n regions seperated by a very lightly doped intrinsic region (i). The cross sectional view of PIN-photodiode

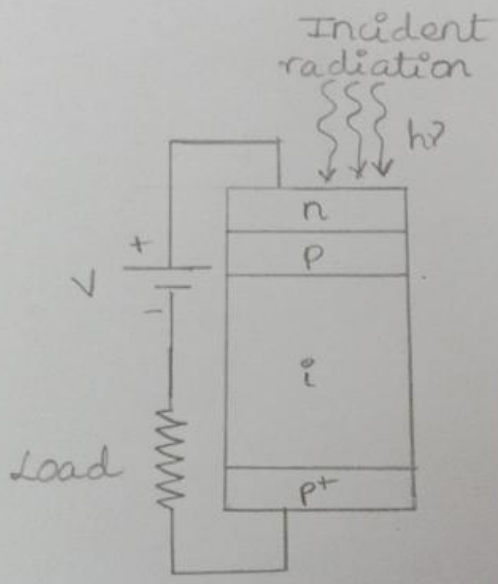


A sufficiently large reverse bias is applied across the device. Because of very low density of free carriers in the intrinsic region and its high resistivity, the applied bias appears almost entirely across the i-layer. The intrinsic layer in effect widens the depletion region and hence increases area available for capturing light.

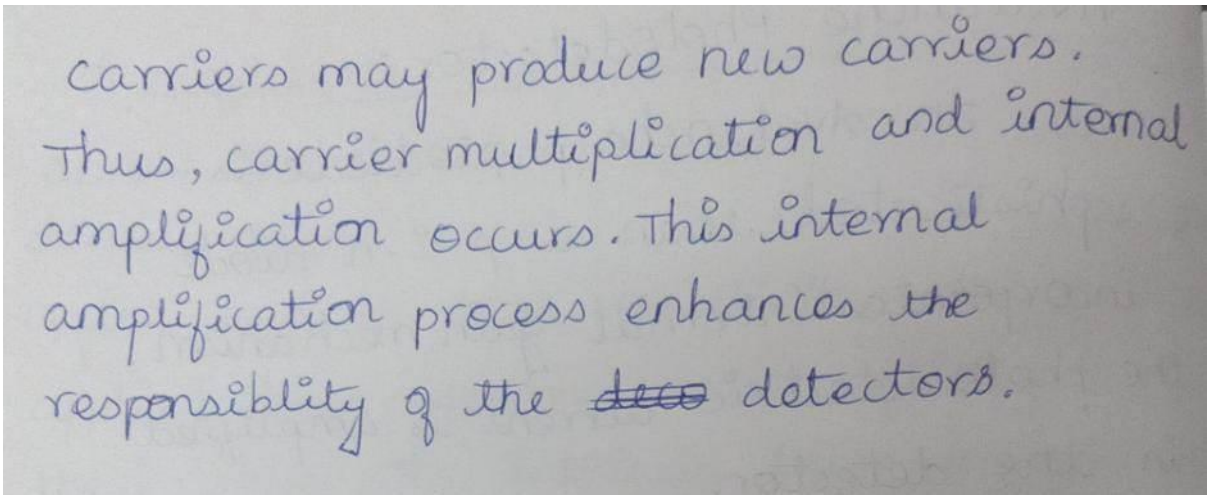
When an incident photon has energy greater than or equal to the band gap energy of the semiconductor material, an electron excited from valence band to conduction band. These photo carriers are mainly generated in the depletion region where most of the incident light is absorbed. The high electric field present in the depletion region causes the carriers to seperate and be collected ~~acc~~ across the reverse biased junction. This gives rise to a current flow in the external circuit.

Avalanche Photodetector:

An Avalanche photodiode is more sophisticated than a p-i-n diode and incorporates internal gain mechanism. So the photo-electric current is amplified within the detector.



The device is essentially a reverse-biased p-n junction that is operated at voltage close to the breakdown voltage. The photogenerated electrons and holes in the depletion layer, acquire sufficient energy from the field to liberate secondary electrons and holes within the layer by a process of impact-ionization. The secondary electron-hole pair drift in the opposite directions and together with the primary


carriers may produce new carriers. Thus, carrier multiplication and internal amplification occurs. This internal amplification process enhances the responsiblity of the ~~dccc~~ detectors.