EXPERIMENT NO.9

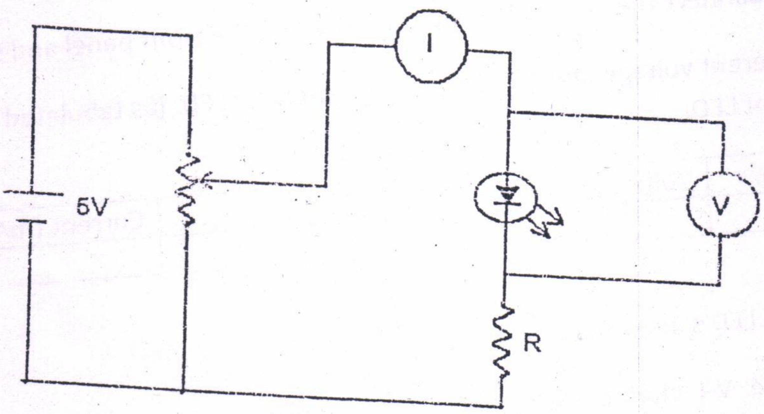
Aim: To determine the value of Planck's constant.

Theory: Max Planck first proposed the idea that light was emitted in discrete packets, or quanta in order to avoid the infamous ultra-violet catastrophe. With one problem resolved other questions soon followed. Primarily, how big was a given packet? It was subsequently determined that the energy of a given photon is given by the equation :

$$E = h\nu \qquad (1)$$

Where E is the energy of the photon and ν is its frequency and h is Planck's constant.

The objective of this experiment is to determine Planck's constant using light emitting diodes (LED's) by observing the ***"reverse photo-electric effect"*** .



In semiconductors, the electrons behave much as they do in metal.in the sense that all valence electrons are shared among all the atoms in the lattice. Each orbital of each atom can be thought of as a band extending across the crystal lattice. Lower filled band is known as valence band and upper empty band is known as conduction band. Valence and conduction bands are separated by band gap. LED's are basically PN junctions. In the PN junctions the bands don't always line up and there exist a barrier potential. If a bias voltage is passes across the diode, which is equal or greater than the difference in energy of the bands, i.e. the barrier potential, then the bands will line up and the current will flow. During this process when an electron falls on hole and energy is released in the form of a photon. The energy of this photon is equal to the band gap energy of the diode. It follows that if the linear portion of the voltage equals the barrier potential, then energy of the photons emitted should be the same as the energy of a given electron. Since

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