

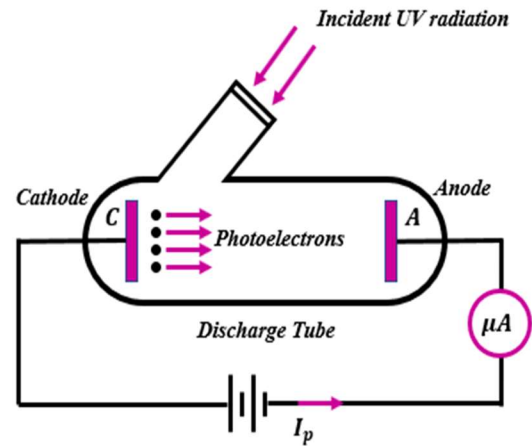
## Stopping potential / Cut-off potential:

If the negative terminal of the battery is connected to plate A (as in figure), electrons emitted at plate C, are repelled back by plate A. However, a few electrons manage to reach the plate A (due to large Kinetic energy). If the voltage is continuously increased, all the electrons can be stopped at particular voltage (Negative voltage).

**The minimum negative voltage (potential) which just stops the electrons on their path, making photoelectric current equal to zero is called as *Stopping potential*.**

If  $V_s$  (or  $V$ ) be the stopping potential, then

$$KE_{max} = \frac{1}{2} mv^2_{max} = eV_s$$



### Questions:

1. In an experiment in photoelectric effect, the stopping potential is found to be  $-3V$ . calculate the maximum kinetic energy and maximum velocity of photoelectrons.
2. If the kinetic energy of electrons is increased, how would the stopping potential change?
3. Work function (or threshold energy) is the characteristics (property) of material. Explain.
4. What happens to the kinetic energy of photoelectrons if the frequency of incident photon is increased?
5. What happens to the kinetic energy of photoelectrons if the work function of surface is increased?
6. The work function of a medium is less for surface electrons and is more for inner electrons. Explain your answer.
7. Which electron have larger kinetic energy: electrons emitted from surface or electrons emitted from inner region of medium?

## Laws of photoelectric effect:

1. The photo electric effect is an instantaneous process. "It is found that time lag between the incidence of radiation and emission of electron is less than  $10^{-8}$  seconds.
2. The photo electric effect cannot be observed if the energy of incident radiation is less the work function of the material surface

**\* P.E effect cannot be observed if frequency of radiation is less than threshold frequency of the material.**

**\* P.E effect cannot be observed if wave length of incident radiation is more than the threshold wavelength of the material.**

3. The number of photoelectrons (and hence **photo current**) depends on the intensity of radiation but is independent of frequency (**or energy or wavelength**) of the radiation.
4. (i) The kinetic energy of photo electrons emitted depends upon frequency of incident radiation but is independent of intensity of radiation.  
  
(ii) The stopping potential for photo electrons depends upon frequency of incident radiation but is independent of intensity of radiation.

