Note:

1. In the derivation of Einstein's photo electric equation, we assumed that the electrons are emitted from the surface. So, KE of electrons seems to be same for a given surface.

However, in the case of inner elections, some extra energy has to be expensed in shifting elections from inner to surface.

↳ Hence, Kinetic energy of different photo electrons will be different.

[***maximum for surface electrons***].

The KE of electrons (photo electrons) depends upon:

i. Frequency of incident radiation
ii. Work function of the material surfaces.
iii. Position of electron (surface or interior).

As soon as the photoelectrons are emitted, the surface becomes positively charged. This Causes the increase in work function and hence decrease in kinetic energy of photoelectron.

Summary!! KE of elections emitted during P.E. effect could be different.

Failure of wave theory to explain photo electric effect:

1. **Concept of intensity:** According to wave theory, the intensity of radiation indicates its energy. If so, greater intensity should have greater energy and consequently it should provide greater Kinetic energy to the photo electrons. But the experimental fact shows that KE of election is independent of intensity of incident radiation.
   This observation is explained by the particle nature of photon (radiation).
2. **Concept of frequency:** According to wave theory, radiation of all frequencies should emit elections (provided intensity of radiation is sufficient to supply the emission energy). But the experimental fact shows that no photoemission takes place for a frequency below certain frequency (f_o), whatever be the intensity.
   This effect fails the wave nature and supports the particle nature of photon (radiation).
3. **Concept of time delay:** According to wave theory, when a radiation is exposed on a material, it gets spread over the surface. As a result, an electron should take Some time to accumulate sufficient energy for its emission. But experimental fact shows that the photoemission is an instantaneous process (*within* 10^{-8} *seconds*).
   This observation supports the particle nature of photon (radiation).

Photo Cell (OR Solar Cell)

A device used to convert light energy into electrical energy is called as photo cell (or photoelectric cell).

- It is based on photoelectric effect.

Photo cells have many applications such as: automatic switch of street lamp, automatic alarm (fire, thief) etc.

Applications of photoelectric effect:

1. **It is used in Photo cell.**
2. **It is used in automatic camera.**
3. **It is used in astronomy to detect the intensity of light coming from stars and to detect the temperature of stars.**