

{ B.Sc Part II (Physics Hons) }
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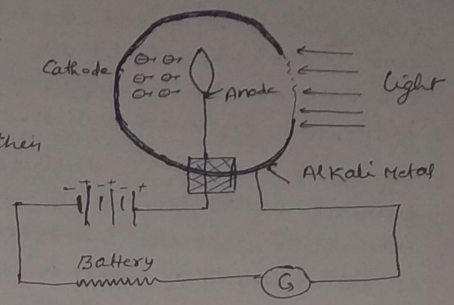
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Ques Describe the construction and working of three different types of photo-electric cells. Mention its applications. or write short notes on the following

(a) photo electric cells (b) photo conductive cell (c) photo voltaic cell

Ans (a) photo electric cell:-

The photo-emissive cells as shown in figure. It has a glass or quartz bulb whose internal surface is coated with thin layer of an alkali metal as Na, Cs etc. This layer is photosensitive and acts as anode. The cathode and the anode are connected to an external battery, resistance R and galvanometer G. When light of frequency higher than the threshold frequency is made to fall on the cathode of the cell, photo electrons are emitted from the cathode. These electrons move towards the anode and so a current flows in external circuit.



Thus a photo-emissive cell acts as a switch in electric circuits, i.e. flow of current can be started or stopped by light, hence such a cell is also called photo-resistance cell.

Photo emissive cells are of two types. In one type called vacuum type in which the bulb is kept evacuated, while in other type called gas filled type in which some inert gas as argon or neon is filled in the bulb. In a vacuum type cell, current starts immediately after the light is incident and it is proportional to the intensity of the incident light. Hence this cell is most suitable for photometry and in televisions. In gas filled type of cells the current is somewhat larger due to ionisation of the gas but it is not proportional to the intensity of light. This type of cell is used in cinematography and in the recording and reproduction of sound.

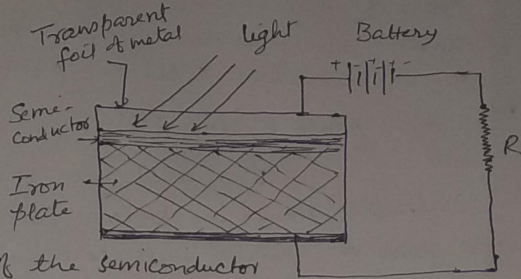


(11) Photo Conductive cell (Photo-conductive cells) :-

(2)

Photo-conductive cell is based on the principle that when light is incident on some semiconductor, as selenium, lead sulphide etc, its electrical resistance is reduced.

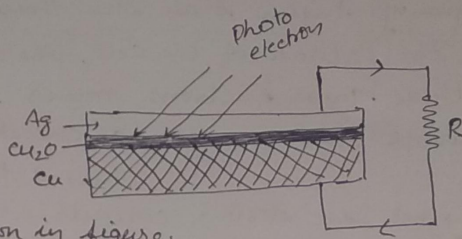
A thin layer of some semiconductor is placed below a transparent film of some metal is shown in the figure. This combination is fixed over an iron plate. When light is incident on the transparent film, the electrical resistance of the semiconductor layer is reduced, i.e. electrical conductance is increased. Hence a current starts flowing in the battery circuit connected between the iron plate and the transparent film. The current changes with change in its intensity of light with a time lag which is the main drawback of this cell, so it is rarely used.



(c) Photo-voltaic cell :-

Photo-voltaic cell

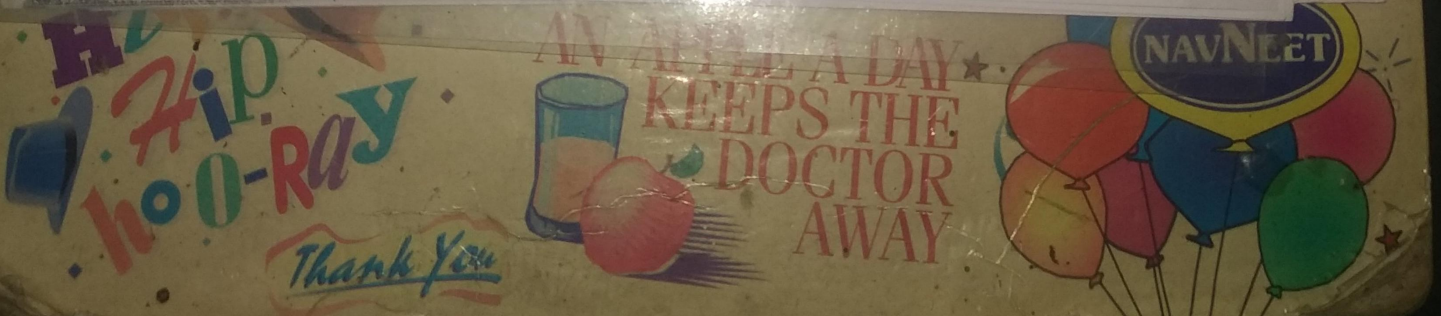
Consists of Cu plate coated with a thin layer of cuprous oxide. On this plate is laid a semiconductor transparent film of Ag shown in figure.



When external light is made to fall on the oxide layer, the electrons emitted from the layers move towards the Ag film. Then the Ag film becomes negatively charged and the Cu plate becomes positively charged. So the potential difference is generated between the two and current is set up in the external circuit whose value is proportional to the intensity of light. This cell supplies current without any external source of e.m.f (battery). It is useful for measuring the intensity of illumination.

Applications of Photo-electric cells :-

- The most important application of photoelectric cell is in the reproduction of sound in cinema, television and photo telegraphy. They are used to determine the capacity of solids & liquids.



The temperature of celestial body is also measured. (3)

- ② They are used in Automatic doors as an opening and closing the doors automatically
- ③ They are used in photo electric counters
- ④ They are used in automatic switches of street light
- ⑤ They are used in electric eye or the thief detector bell.
- ⑥ They are used in instruments measuring light illumination in exposure meters measuring duration of light falling on the photographic plates and in day light recorders
- ⑦ They are used to compare dark, white faces.
- ⑧ They may be used to sort out articles into different categories according to quality, so as photo electric sorters.
- ⑨ They are also used in space in obtaining electrical energy from sunlight during space travel. During day time sunlight is allowed to fall on the cell. The effective current so produced is used to charge the batteries of the plane which supply electricity during night. This type of batteries are called solar batteries

Hi
Hip
HOORAY
Thank You

AN APPLE A DAY
KEEPS THE
DOCTOR
AWAY

