# PRACTICAL - 1

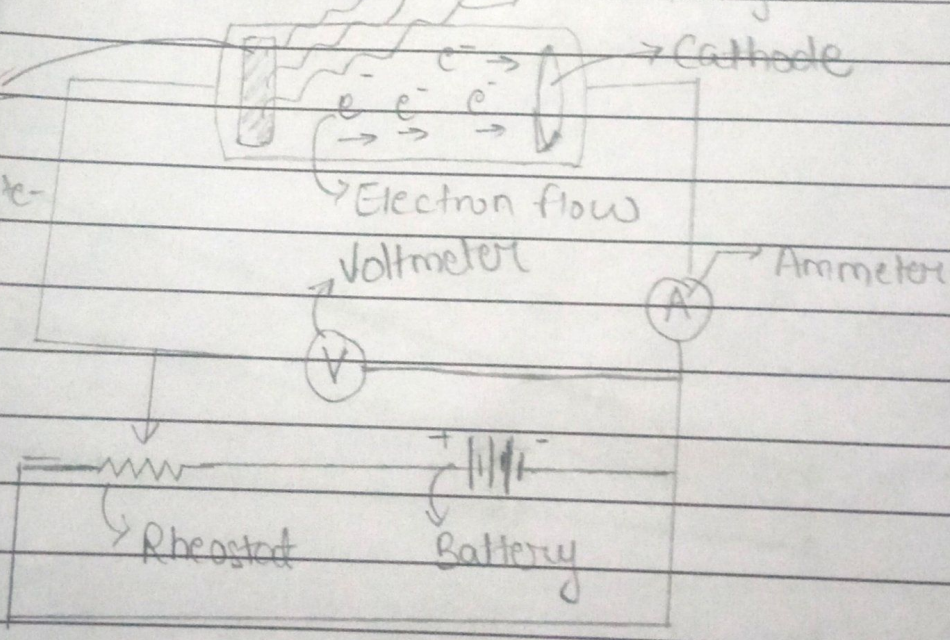
## Photoelectric (virtual)

**Aim:** To understand the phenomenon of the Photoelectric effect as a whole.

**Apparatus:** Material plate, Ammeter, Voltmeter, variable Power supply, light source.

**Virtual lab:** Amrita OLabs

**Diagram:**

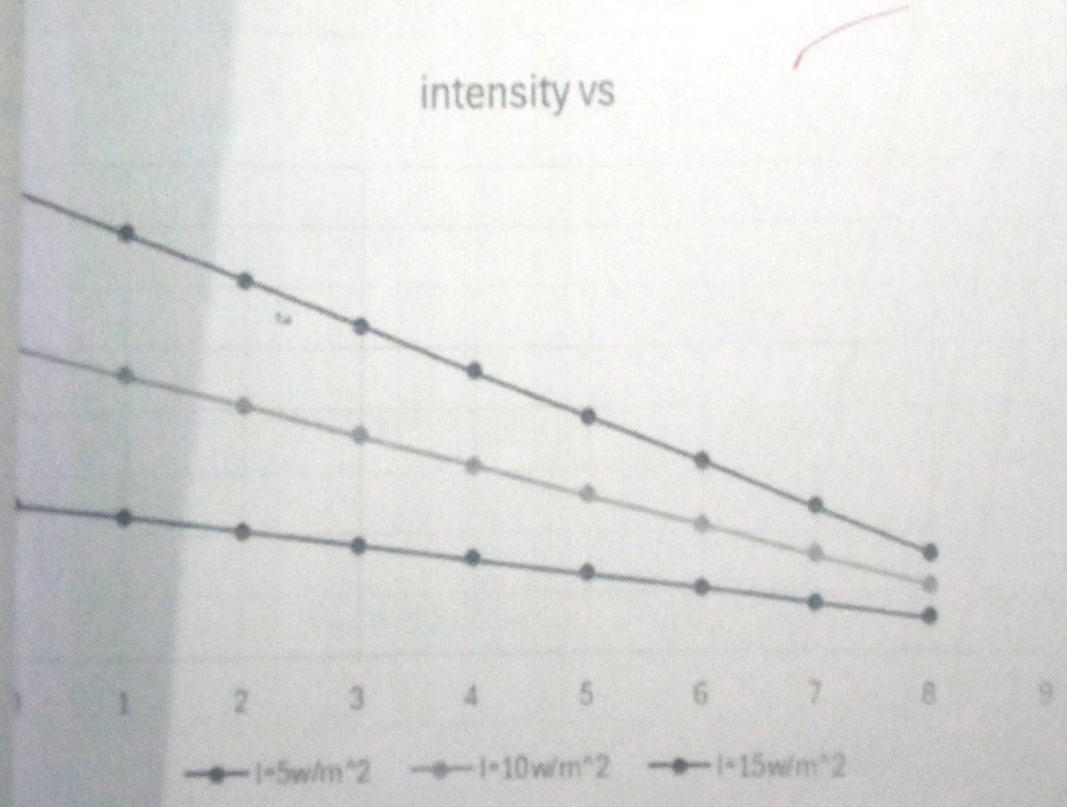



**Observation Table:**

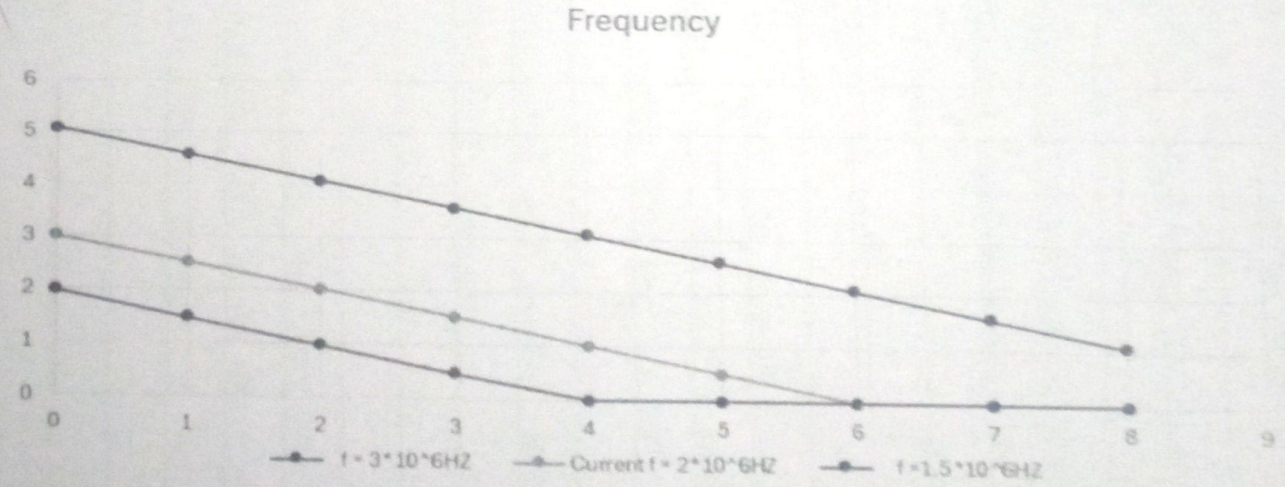
Table for intensity variation at constant frequency.

- Material: Sodium
- Plate area: 0.1
- Wavelength: 160 nm

| ov No | Voltag | current | | |
|---|---|---|---|---|
| | | I=5w/m^2 | I=10w/m^2 | I=15w/m^2 |
| 1 | 0 | 5.07 | 10.14 | 15.2 |
| 2 | 1 | 4.57 | 9.14 | 13.7 |
| 3 | 2 | 4.07 | 8.14 | 12.2 |
| 4 | 3 | 3.57 | 7.14 | 10.7 |
| 5 | 4 | 3.07 | 6.14 | 9.2 |
| 6 | 5 | 2.57 | 5.14 | 7.7 |
| 7 | 6 | 2.07 | 4.14 | 6.2 |
| 8 | 7 | 1.57 | 3.14 | 4.7 |
| 9 | 8 | 1.07 | 2.14 | 3.2 |



| Obv No | Voltage | | Current | |
|---|---|---|---|---|
| | (v) | f=3*10^6HZ | f=2*10^6HZ | f=1.5*10^6HZ |
| 1 | 0 | 5.07 | 3 | 1.96 |
| 2 | 1 | 4.57 | 2.5 | 1.46 |
| 3 | 2 | 4.07 | 2 | 0.96 |
| 4 | 3 | 3.57 | 1.5 | 0.46 |
| 5 | 4 | 3.07 | 1 | 0 |
| 6 | 5 | 2.57 | 0.5 | 0 |
| 7 | 6 | 2.07 | 0 | 0 |
| 8 | 7 | 1.57 | 0 | 0 |
| 9 | 8 | 1.07 | 0 | 0 |



Observation from graph

On increasing intensity at constant frequency, photocurrent increases.

On frequency variation at constant frequency, photocurrent increases & more negative potential increases required to stop photocurrent)

Result:

1. The phenomenon of photoelectric effect is studied
2. A graph is plotted b/w photocurrent and applied photovoltage for various frequencies at constant intensities at constant frequency.
3. A graph is plotted b/w photocurrent and applied photoelectric for various frequencies at constant intensity
4. ~~graph~~

Procedure

1. Start the virtual lab simulation using the link below and connect all the connections given in the diagram.
2. Select ~~the~~ area of material wavelength intensity of incident light
3. ~~Select area of Metal~~
4. Switch on the light source
5. Measure the reverse current for various reverse voltages
6. Plot the current-voltage graph and determine the shield voltage
7. Repeat the experiment by varying the intensity for particular wavelength of incident light

## Theory

The photoelectric effect is the phenomenon where $e^-$ are ejected from a material, typically a metal when it is exposed to light or other electromagnetic radiation. It was observed by Henrich Hertz in 1887 and explained by Albert Einstein in 1905, providing crucial evidence for the particle nature of light

(i) Threshold frequency is the minimum frequency of light (or EM radiation) required to emission of $e^-$ from a material

(ii) Energy of ejected $e^-$ depends on the frequency of the light, not is intensity.

(iii) Emission of electrons occurs immiediety when the light frequency is above the threshold.

Einstein's explanation of the photoelectric effect earned him the Nobel Prize in 1921.

The kinetic energy (K.E) of emitted $e^-$ is given by

$$K.E = hf - \phi$$

C

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