***EXPERIMENT # 5***

***“To determine the variation of photoelectric effect with intensity of light***

***APPARATUS***

* ***Voltmeter***
* ***Micrometer***
* ***Power supply***
* ***Meter rod***
* ***photoelectric effect apparatus***

***BASIC PRINCIPLE:***

When light is allowed to fall on the surface of metal it ejects the electron from the metal surface.

***THEORY***

In the photon explanation of the photoelectric effect, photons, carrying an energy can free electrons from the surface of a material if the photon energy is greater than the work function W of the material. The work function is the minimum energy required to release an electron from the material. When an electron in a material absorbs a high enough energy photon, it gains enough kinetic energy to escape from the substance. This is called the photoelectric effect. Einstein’s theory predicts that the kinetic energy E of the electron once it has escaped from the material is directly proportional to the photon's frequency.

***Mathematical Form***

I=1/(d)2

Here I=intensity of light

d= distance between metal surface and light source

***Procedure***

1. when the current is allowed to pass through the closed circuit and also the bulb is kept on.
2. Then the beam of light is striking on the surface of metal due to which the electrons are ejected which depends upon the threshold frequency.
3. Also one of the terminal is concave in order to focus it on single point.
4. So when the electrons are ejected the electric field is applied and the electrons passes through micrometer.
5. Then the deflection will be show by micrometer/
6. When you are moving the bulb near to the surface of metal then more electron will be ejected and micrometer will show large deflection and vice versa.
7. Note the readings and find the intensity of light at different position.

***CIRCUIT DIAGRAM:***

***Diagram

Description automatically generated***

***Calculations***

When Voltage is 100

|  |  |  |  |
| --- | --- | --- | --- |
| S NO | d | Micro ampere  µA | I=1/d^2 |
| 1. | 50 | 1.5 | 4×10^-4 |
| 2. | 45 | 2.1 | 4.9×10^-4 |
| 3. | 40 | 2.2 | 6.25×10^-4 |
| 4. | 35 | 2.3 | 8.1×10^-4 |
| 5. | 30 | 2.5 | 1.11×10^-3 |
| 6. | 25 | 2.8 | 2×10^-3 |
| 7. | 20 | 3 | 2.5×10^-3 |

When Voltage is 150

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S NO | d | Micro ampere  µA | D^2 | I=1/d^2 |
| 1. | 50 | 4.9 | 2500 | 4×10^-4 |
| 2. | 45 | 5.1 | 2025 | 4.9×10^-4 |
| 3. | 40 | 5.5 | 1600 | 6.25×10^-4 |
| 4. | 35 | 5.9 | 1225 | 8.1×10^-4 |
| 5. | 30 | 6.5 | 900 | 1.11×10^-3 |
| 6. | 25 | 7.2 | 500 | 2×10^-3 |
| 7. | 20 | 9 | 400 | 2.5×10^-3 |

when Voltage is 180

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S NO | D | Micro ampere  µA | D^2 | I=1/d^2 |  |  |
| 1. | 50 | 9.1 | 2500 | 4×10^-4 |  |  |
| 2. | 45 | 9.5 | 2025 | 4.9×10^-4 |  |  |
| 3. | 40 | 10.1 | 1600 | 6.25×10^-4 |  |  |
| 4. | 35 | 11.1 | 1225 | 8.1×10^-4 |  |  |
| 5. | 30 | 12.5 | 900 | 1.11×10^-3 |  |  |
| 6. | 25 | 14.5 | 500 | 2×10^-3 |  |  |
| 7. | 20 | 18.1 | 400 | 2.5×10^-3 |  |  |