INSTRUCTION MANUAL FOR
PLANK'S CONSTANT APPARATUS

Plank's constant apparatus has been designed to determine the value of Plank's constant 'h' by a photo cell.

Apparatus Used :

Photo emissive cell mounted in a box provided with a wide slit D.C. Power Supply, set of filters, filter stand, light source etc.

Formula Used : $$h = \frac{e\,(V_2 - V_1)\,\lambda_1\lambda_2}{c(\lambda_1 - \lambda_2)}$$

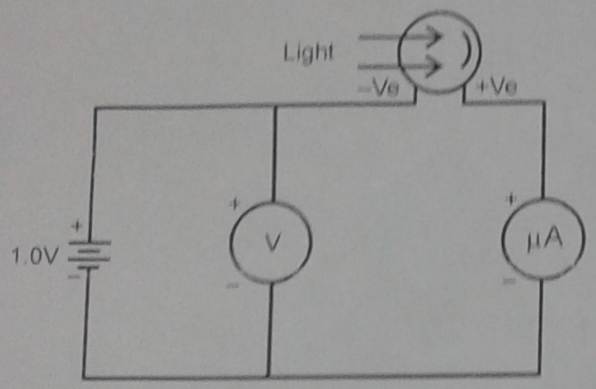

Fig - 1

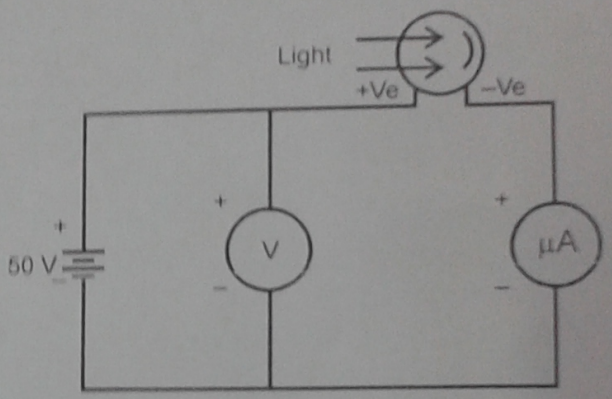

Fig - 2

e	=	Electronic charge
V_2	=	Stopping potential * corresponding to wave length 2
V_1	=	Stopping potential * corresponding to wave length 1
c	=	Velocity of light.

* Minimum negative potential applied to anode to reduce the photo electric current to zero.

For Plank's Constant :

(i) Keep the left hand side switch on the panel towards sensitive side and right hand side switch towards 1.0 V side. Switch on the unit. Now set the μA reading to zero with the help of potentiometer marked with zero adjust.

(ii) The circuit connections are made as shown in diagram (Fig - 1). Be careful about the polarity shown in diagram.

(iii) A light source is arranged. The light is allowed to fall on the tube. The distance between tube and light source is adjusted such that there is a deflection of about 8 to 10 div. in μA. Now a suitable filter (say green) of known wave length is placed in the path of light (in the slit provided) say it is with wave length λ_2.

(iv) A deflection is observed in the micro-ammeter. This deflection corresponds to the zero anode potential.

(v) A small -ve potential is applied on the anode. This voltage is recorded with the help of voltmeter provided (1.0 volts range).

(vi) The negative anode potential is gradually increased in steps and each time corresponding deflection is noted till the micro-ammeter deflection reduces to zero and this is stopping potential V_2 corresponding to filter with wave length λ_2.

(vii) The experiment is repeated after replacing the green filter with blue and red filters. Say with wave length λ_2 and λ_3 respectively and stopping potential V_1 and V_3 are noted.

(viii) Taking negative anode potential on x-axis and corresponding deflections in micro-ammeter on y-axis, graphs are plotted for different filters.

(ix) By using above values Plank's Constant 'h' is calculated by the formula given. Standard values of e, c and wave length of standard filters are given below.

e = 1.6×10^{-19} coulombs

c = 3×10^{8} m/sec. = 3×10^{10} cm/sec

Wave length of green filter λ_3 = 5645×10^{-10} ±2% meter.
Wave length of red filter λ_1 = 6143×10^{-10} ±2% meter.
Wave length of blue filter λ_2 = 5265×10^{-10} ±2% meter.

For Photo Cell Characteristics :

(i) Keep the left hand side switch towards normal and right hand side switch towards 50 volts side.

(ii) The circuit connections are made as shown in the diagram (fig - 2).

(iii) Light is allowed to fall on the tube.

(iv) A small +ve potential is applied on the anode and corresponding reading of micro ammeter is noted.

(v) The potential is gradually increased in steps and each time corresponding reading in Micro ammeter is noted.

(vi) A graph is plotted by taking V on x-axis and μA on y-axis.