Date _____

Expt. No. 8 Page No. _____

TOPIC: Advanced Material Analysis Through Quantum Physics

AIM:

Determination of Planck's Constant

Determination of 'Work-function' of given metal

Study of Photoelectric Effect

FORMULAE USED :

The work function can be expressed in terms of frequency as,

$$w = h\nu_0$$

Work functions for some metals :

Metal	Work function (eV)
Pt	6.4
Ag	4.7
Na	2.3
K	2.2
Cs	1.9

According to Einstein, the photoelectric effect should obey the equation:

$$h\nu = KE + W$$

$$h\nu = eV_s + W$$

$$V_s = \frac{h}{e}\nu - \frac{W}{e}$$

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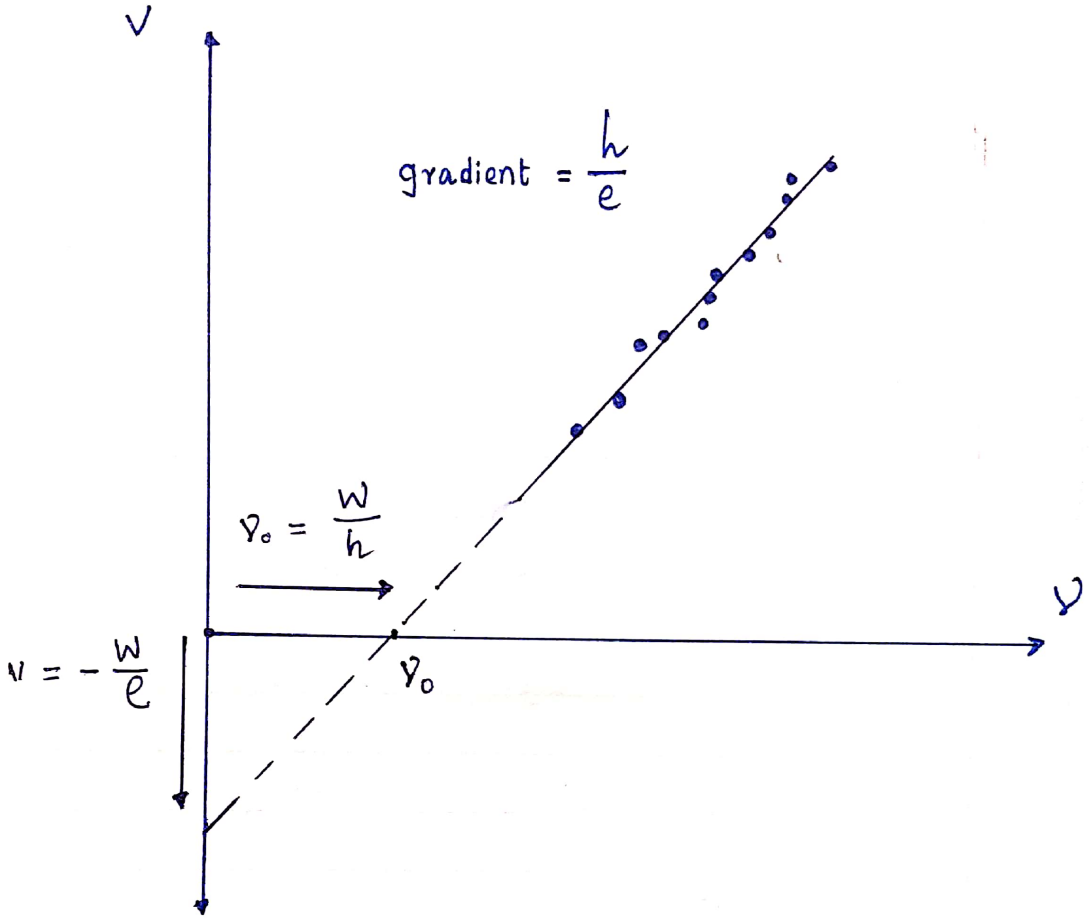
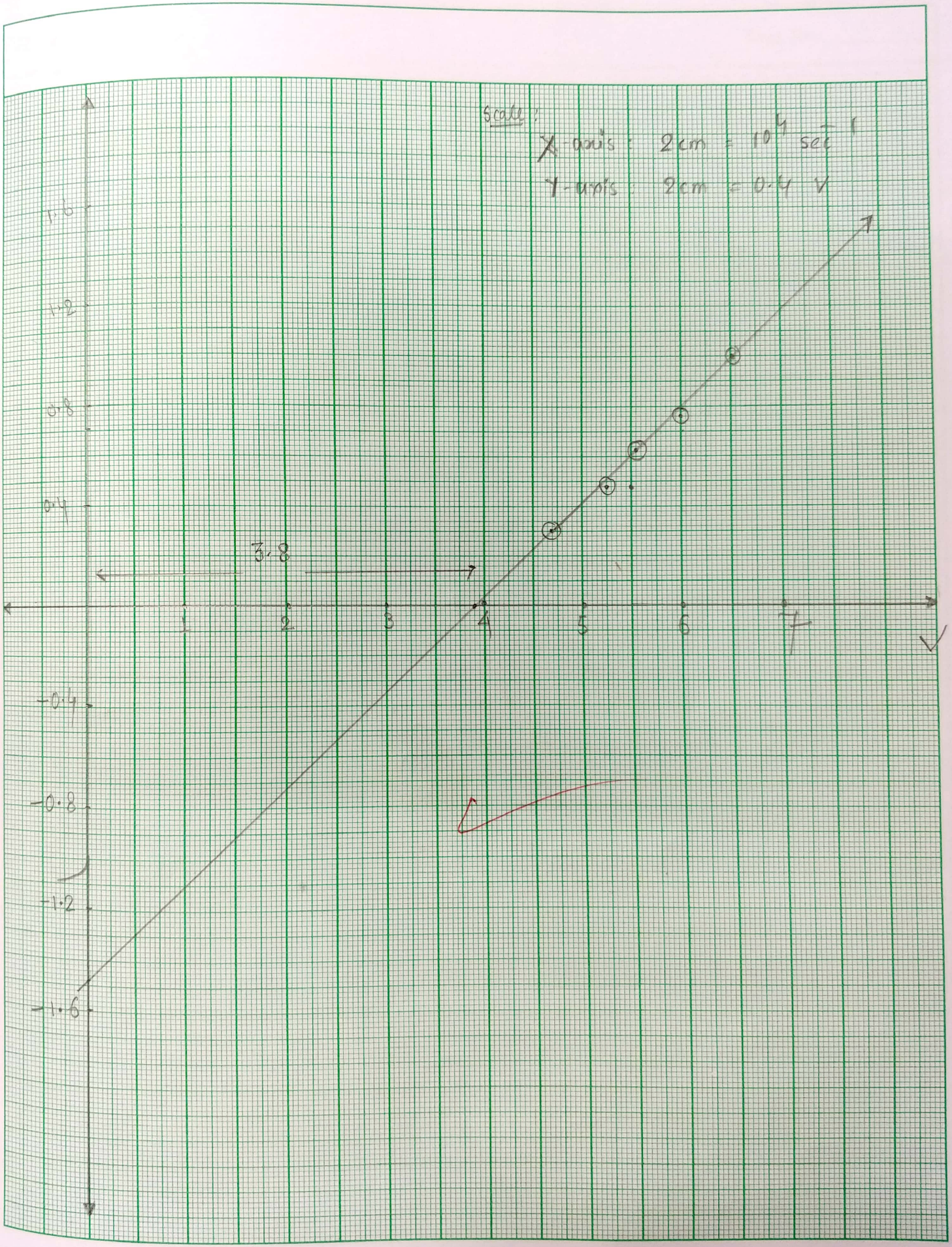

V
gradient = h/e
ν₀ = W/h
ν
ν = − W/e
ν₀

Sl. No.	Incident Photon wavelength (nm)	Incident photon wavelength	Stopping voltage (V)
1	460	6.521×10^{14}	1.0
2	500	6.0×10^{14}	0.75
3	540	5.55×10^{14}	0.64
4	570	5.26×10^{14}	0.47
5	635	4.72×10^{14}	0.30


Scale:
X-axis: 2cm = 10^{-4} sec
Y-axis: 2cm = 0.4 V
1.6
1.2
0.8
0.4
3.8
1
2
3
4
5
6
7
t
V
-0.4
-0.8
-1.2
-1.6

Expt. No. 8

Date

Page No.

CALCULATIONS:

y- intercept = $-w/e$

$-1.5\ V \times 1.6 \times 10^{-19} = -w$

$\therefore w = 2.4 \times 10^{-19}\ J$

X - intercept = w/h

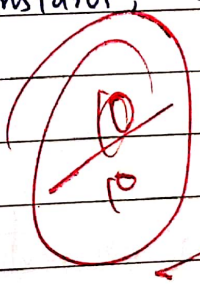
$h = \dfrac{2.4 \times 10^{-19}}{3.8 \times 10^{14}}\ J.s$

$= 6.32 \times 10^{-34}\ J.s.$

RESULT:

Work function = $2.4 \times 10^{-19}\ J$

planck's constant, $h = 6.32 \times 10^{-34}\ J\,s$



Viraaj
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