

4th year

Physics students Final Exam (Experimental Physics) Date: 21 / 7 /2020

Answer the following questions

Exp. (1)

- Use the downward experimental data to calculate the ratio e/m by using the magnetron method.
- What is the difference between the coil you use in this experiment and that in Thompson's?
- Does the magnetic field do a work on the electron beam?
Explain clearly.

Where: $N= 250$ turns, $r_a= 0.6$ cm, $L= 6$ cm, $D=6.5$ cm

Note: use the following values for $V_a=10,15,20, 25$ (V)

Magnetron

Va=5V		Va=10V		Va=15V		Va=20V		Va=30V	
I _s (A)	I _a (mA)	I _s (A)	I _a (mA)	I _s (A)	I _a (mA)	I _s (A)	I _a (mA)	I _s (A)	I _a (mA)
0	0.232	0	0.315	0	0.331	0	0.346	0	0.355
0.5	0.225	0.5	0.31	0.5	0.331	0.5	0.345	0.5	0.355
0.8	0.22	1	0.30692	1	0.331	1	0.345	1	0.355
1	0.214	1.2	0.30246	1.5	0.331	1.5	0.345	1.5	0.355
1.3	0.20325	1.5	0.29466	2	0.326	2	0.3424	2	0.355
1.5	0.185	2	0.25731	2.3	0.31937	2.3	0.33906	2.5	0.34723
2	0.156	2.5	0.229	2.5	0.31379	2.5	0.33	3	0.337
2.5	0.126	3	0.206	3	0.297	3	0.319	3.5	0.326
3	0.106	3.5	0.182	3.5	0.28	3.5	0.304	4	0.315
3.5	0.09	4	0.165	4	0.266	4	0.286	4.2	0.306
4	0.08	4.2	0.15104	4.2	0.26	4.2	0.28	4.4	0.301
		4.4	0.14509	4.4	0.2523	4.4	0.277	4.5	0.298
				4.5	0.249	4.5	0.275		

Exp. (2)

- a) Using the given data to determine the refractive index of the prism for different wavelengths.
- b) Verify Cauchy's formula and determine A, B
- c) Is the refractive index of the material depends on the wave length? Explain

($\lambda_{\text{yellow}}=579$ nm, $\lambda_{\text{green}}=546.1$ nm, $\lambda_{\text{blue}}=435.8$ nm, $\lambda_{\text{violet}}=407.8$ nm).

Cauchy

λ nm	$1/\lambda^2$ m ⁻²	D	n
580	2.97265E12	38.2	1.51183
546	3.3544E12	38.5	1.51526
435	5.28471E12	39.1	1.52208
405	6.09663E12	39.5	1.5266

Exp. (3)

- a) Using the given data to determine the first excitation state potential of the argon gas inside the Frank-Hertz experiment?

Note: use the following values for $V_f=3.5V$, $V_{GA}=12$.

- b) What's the effect of varying V_f to be (3, 3.5, 4 and 4.5 V) on the I-V curve? Does this effect on the argons first excitation energy?
- c) What happen if the argon gas exchanged with Hg atoms ?

V volt	I * 10 ⁻⁹ A
14	.11
16	.5
17	.52
18	.41
20	.11
22	0
24	0
26	.4
28	1
30	.86
32	.05
34	0
36	0
38	.7
40	1
42	1
1	.4
46	.4
48	0
50	0
52	.7
54	1

Exp. (4)

- Using the given data determine radius of oil droplet in million oil drop experiment ?
- Calculate the total charge and on droplets for applied voltage 0,50 100, 150 and 200 V and explain what Robert million deduce from these results w.r.t the charge of electron ?
- What happen if the polarity of the two plates are reversed during the falling of oil drops?

$$V_1=0.0032\text{m/s at } V=0\text{v}$$

$$\rho_{\text{oil}}=981\text{Kg/m}^3, \rho_{\text{air}}=1.18\text{Kg/m}^3,$$

$$d=5\times 10^{-5}\text{m}$$

$$\eta=1.83\times 10^{-5}\text{ Kg/m.s}$$

V(v)	ts	Q c
50	4.7	
100	1.87	
150	1.77	
200	1.1	

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