

Answer script upload link: <https://forms.gle/rgTtBJszhDwLHxp46>

**ASUTOSH COLLEGE**  
(Affiliated to University of Calcutta)  
**Semester 3- Examination**  
**Physics-Honours (practical)**  
**Paper-CC7**  
**Full Marks-30**  
**Time- 2Hrs**

**Answer any one question**

**1. To verify Stefan's law of radiation from measurement of temperature of a torch bulb filament.**

(a) Circuit Diagram and working formula with proper explanation of symbols. (2+6)

(b) From the filament temperature (T) and power dissipation in filament data (P) data given

Calculate  $\log_{10}P$  and  $\log_{10}T$  and complete the table.

Plot  $\log_{10}P$  and  $\log_{10}T$ , and determine the slope of the curve, and verify Stefan's law.

Calculate maximum percentage error from the plot (5+8+2+2)

Number of observations	Filament Temperature (T) in K	Power dissipation in filament (P) in mW	$\log_{10} P$	$\log_{10} T$
1	960	294		
2	1040	352		
3	1100	414		
4	1160	480		
6	1260	624		
7	1300	702		
8	1440	928		
9	1580	1178		
10	1660	1344		
11	1700	1564		
12	1780	1750		
13	1800	1872		
14	1880	2072		
15	1940	2280		
16	2000	2640		

(c) Why do we pay extreme care in measurement of Draper resistance in this experiment? (2)

(d) Can you explain how the wavelength of radiated light will vary, if we increase the power dissipation in filament of an incandescent light bulb by increasing the voltage drop across the filament based on Stefan's law of radiation? (2)

(e) Can you make a comment on whether or not the filament of an incandescent light bulb is a perfect black body based on your part-(d) answer? (1)

**2. Determination of specific charge of electron :****(a)** Working formula (with explanations of the symbols used) (6)**(b)**

Number of observations	Position of the magnet (D) in cm	Spot deflection (y) in cm	Y deflection voltage (V) in Volts	Angle of deflection ( $\theta$ ) in Degrees	$yV_Y$	$(\tan \theta)^2$
1	25	0.4	0.5	20		
2	22	0.5	1.9	27		
3	19	0.5	3.0	37		
4	17	0.7	4.2	45		
5	15	1.0	6.8	55		
6	13	1.4	9.3	65		

Calculate spot deflection (y) times deflection voltage (V) and  $(\tan \theta)^2$  from the given table (4)Plot  $(\tan \theta)^2$  vs  $(yV_Y)$  (7)

Determine the slope of the plot (4)

Determine specific charge of electron from the slope using given information (4)

Given :

Earths magnetic field (H)  $0.381 \mu$  Tesla

Cathod ray tube distance between plates (d) =2.8 cm

Length of plates (l) = 3.1 cm

Distance between screen and plates (edge) (L)=14.5 cm

**(c)** Suppose magnetic field (B) points in x-direction, and E in z-direction, a positively charged particle at rest is released from the origin: what path will it follow? (Explain)

(5)

### 3. Determination of planks constant by Led

(a) Working formula (with explanations of the symbols used) and circuit diagram (4+2)

(b) Plot Voltage(V) vs Current data (I) for different colours of LED from the table given below and determination of knee voltage for each Led

Calculate of planks constant for all four cases (15+4)

Number of Observations	Red Led		Yellow Led		Green Led		Blue Led	
	Voltage (V)	Current ( $\mu\text{A}$ )	Voltage (V)	Current ( $\mu\text{A}$ )	Voltage (V)	Current ( $\mu\text{A}$ )	Voltage (V)	Current ( $\mu\text{A}$ )
1	1.40	0	1.44	0	1.80	0	1.98	0
2	1.44	1	1.55	1	1.92	1	2.23	1
3	1.54	6	1.64	6	2.01	6	2.30	4
4	1.68	50	1.75	43	2.17	49	2.40	24
5	1.74	100	1.81	83	2.26	100	2.48	72
6	1.84	200	1.90	197	2.41	200	2.58	168
7	1.94	350	2.01	331	2.58	339	2.65	260
8	2.02	450	2.11	486	2.76	504	2.75	402
9	2.08	550	2.22	647	2.97	701	2.83	519
10	2.18	700	2.29	763	3.07	800	2.99	753
11	2.23	800	2.40	937	3.27	1004	3.08	892
12	2.37	1009	2.50	1095	3.36	1108	3.21	1085
13	2.50	1202	2.60	1261	3.45	1196	3.32	1258
14	2.67	1493	2.72	1460	3.67	1419	3.44	1450
15	2.78	1588	2.79	1566	3.76	1512	3.54	1612
16	2.83	1752	2.92	1784	3.84	1601	3.63	1742
17	2.92	1890	3.00	1920	4.07	1850	3.77	1978

(c) Which type of semiconducting materials are used to fabricate Light Emitting Diodes and why. (Explain) (5)