2020

B.Sc. (Hons) Part - III

Sub – Physics (Honours) Paper – X

Total Marks – 65 Time – 6 hours

Group – A

Answer any one of the following questions.

40 x 1 = 40

1. (a) Draw a curve connecting refractive index (μ) of the material of the prism and wavelengths (λ) of the light using given experimental data.
(b) Hence find $\frac{d\mu}{d\lambda}$ at a wavelength 550 nm.

Table 1 – Reading of telescope for direct rays

Vernier constant = 20”

Vernier name	Direction of observation	Telescope readings	
		Main scale	Vernier scale
A	L to R	129°	35
	R to L	129°	35
B	L to R	309°	29
	R to L	309°	30

Table 2 – Reading of telescope with prism at minimum deviation for each line of known source

Vernier constant = 20”

Colour and wavelength (in nm) of the line	Vernier name	Direction of observation	Telescope readings	
			Main scale	Vernier scale
Red 667.8	A	L to R	89° 40’	7
		R to L	89° 40’	6
	B	L to R	269° 20’	59
		R to L	269° 20’	57
Yellow 587.6	A	L to R	89° 40’	51
		R to L	89° 40’	57
	B	L to R	269° 40’	43
		R to L	269° 40’	49

Green 501.6	A	L to R	90° 0’	9
		R to L	90° 0’	11
	B	L to R	270° 0’	1
		R to L	270° 0’	3
Blue I 492.2	A	L to R	90° 20’	12
		R to L	90° 20’	15
	B	L to R	270° 20’	7
		R to L	270° 20’	3
Blue II 447.1	A	L to R	90° 40’	0
		R to L	90° 40’	1
	B	L to R	270° 20’	51
		R to L	270° 20’	54

Given : Angle of prism = 60°

2. (a) Draw a curve connecting square of the diameters of rings and ring numbers using given data of a Newton’s ring experiment.
(b) Hence find the radius of curvature of the plano-convex lens used in the experiment.

Table 1 – Determination of diameter of the rings

Least count =0.001 cm

Ring no.	Observation starts from	Reading of microscope for the			
		Left edge of ring		Right edge of ring	
		Main scale (mm)	Circular scale	Main scale (mm)	Circular scale
5	L to R	50	59	47	10
	R to L	50	23	46	78
6	L to R	50	73	46	98
	R to L	50	36	46	65
7	L to R	50	83	46	86
	R to L	50	50	46	54
8	L to R	50	97	46	71
	R to L	50	62	46	42
9	L to R	51	08	46	60
	R to L	50	73	46	29
10	L to R	51	17	46	49
	R to L	50	83	46	20

11	L to R R to L	51 50	25 93	46 46	38 10
12	L to R R to L	51 51	47 05	46 45	29 99
13	L to R R to L	51 51	56 15	46 45	22 89
14	L to R R to L	51 51	66 24	46 45	10 80
15	L to R R to L	51 51	75 30	46 45	03 70
16	L to R R to L	51 51	83 40	45 45	95 64
17	L to R R to L	51 51	90 47	45 45	84 55
18	L to R R to L	52 51	00 55	45 45	77 47
19	L to R R to L	52 51	10 65	45 45	69 41
20	L to R R to L	52 51	34 80	45 45	61 33

Wavelength of the light used = 589.3 nm

3. Using a set of given experimental data
   (a) Determine the number of rulings per meter of a plane diffraction grating

   (b) Hence find the wavelength of an unknown line.

Table 1 – To determine the angle of diffraction of known line

Vernier constant = 30” wavelength of the light used = 589.3 nm

Order no.	Vernier name	Direction of observation	Reading of telescope at			
			Left side		Right side	
			Main scale	Vernier scale	Main scale	Vernier scale
1	A	L to R	206°	8	199° 20’	2
		R to L	206°	5	199° 20’	0
	B	L to R	26°	11	19° 20’	0
		R to L	26°	13	19° 20’	1

2	A	L to R	209° 20’	18	195° 40’	25
		R to L	209° 20’	16	195° 40’	26
	B	L to R	29° 20’	19	15° 40’	28
		R to L	29° 20’	22	15° 40’	32
3	A	L to R	212° 40’	31	192° 20’	18
		R to L	212° 40’	28	192° 20’	19
	B	L to R	32° 40’	24	12° 20’	22
		R to L	32° 40’	26	12° 20’	19

Table 1 – To determine the angle of diffraction of unknown line

Vernier constant = 30”

Order no.	Vernier name	Direction of observation	Reading of telescope at			
			Left side		Right side	
			Main scale	Vernier scale	Main scale	Vernier scale
1	A	L to R	202° 20’	15	196°	18
		R to L	202° 20’	7	196°	20
	B	L to R	22° 20’	14	16°	20
		R to L	22° 20’	11	16°	21
2	A	L to R	205° 20’	18	193°	3
		R to L	205° 20’	16	193°	1
	B	L to R	25° 20’	19	13°	0
		R to L	25° 20’	22	13°	2
3	A	L to R	208° 40’	5	189° 40’	25
		R to L	208° 40’	5	189° 40’	22
	B	L to R	28° 40’	10	9° 40’	30
		R to L	28° 40’	9	9° 40’	25

Group - B

Answer any five of the following questions

5 x 5 = 25

1. Why is the central spot dark in case of Newton's ring ?

2. Why do you focus spectrometer for parallel rays in $D - \lambda$ experiment?

3. Explain why non-localize fringes are formed in Fresnel biprism whereas we get localize fringes in Newton ring experiment.

4. Define specific rotation of an optically active substance. Does it depend on the concentration of the active substance in a solution? Explain.

5. What will happen in the Fraunhofer diffraction pattern of a double slit if (a) the width of each slit is increased gradually and (ii) red light is used instead of sodium light.

6. What will happen in the fringe pattern of a Fresnel biprism if (a) refractive index of the material of the biprism and (b) angle of the biprism are increased.

7. What is the difference between for and while loops in C programming?
