Lab Report

Complete this report YOURSELF except DATA taking parts! This report will not be submitted (except the very last page), but you should carefully complete it as preparation for the applied exam.

Suggested Pre-Lab Questions

Q1. Write down the functional dependence of the index of refraction to the wavelength and comment on it. What does this dependence tell you about refraction of light? Give an example.

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Q2. What is the dimension for A and B in this expression? **Show your calculations below <u>explicitly or no credits</u>!**

Experiment

OBJECTIVE : To study the refraction of light by a glass prism, and to construct the dispersion curve for the prism.

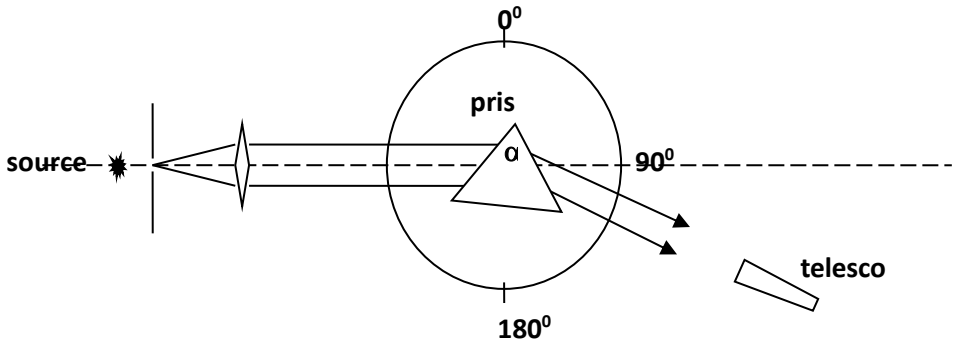
THEORY : Snell's law states that light at a specific wavelength refracts at an angle determined by

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

However, index of refraction varies as a function of wavelength. This is called dispersion and when you plot the index of refraction as a function of wavelength, the curve you obtain is called the dispersion curve for that material. The functional dependence of the index of refraction to the wavelength is given by the empirical relationship:

$$n = A + \frac{B}{\lambda^2}.$$

We can study the dispersion curve using a prism, since the light shining on a prism will separate into individual lines because of the dispersion phenomenon. If we use a spectral lamp, then the individual lines will belong to the spectrum of the element that the spectral lamp is made of. Orienting the prism until you get the minimum deviation angle between the incident and the refracted light rays for each spectral line will give you the data necessary to plot the dispersion curve for the material of the prism. Then you can calculate the index of refraction for each wavelength using the following expression:



$$n = \frac{\sin\left(\frac{D_{\min} + \alpha}{2}\right)}{\sin\left(\frac{\alpha}{2}\right)}$$

where α is the corner angle of the prism where the light is refracted.

EXP.4: The Prism Spectrometer

APPARATUS : Spectrometer, mercury lamp and its power supply, prism.

PROCEDURE :

1. Adjust the zero position of the spectrometer so that it is equal to the absolute zero. Align the collimator and the telescope such that you can see the slit clearly and sharply through the telescope. Next, adjust the cross-hair so that it is on the slit. Then, fix the telescope and rotate the body until the zero positions of the body and the telescope are aligned. Finally, fix the body and release the telescope to move freely.
2. Set the prism in the center of the prism table.
3. Using the white light source, place the prism in such a way that the light falls on both faces of the prism. Then measure the reflected ray from both side and calculate the angle A.
4. Using the mercury lamp as the light source, determine the angle of minimum deviation for all the lines in the mercury spectrum. Then calculate the refractive index of the prism corresponding to different wavelengths (colors).
5. On an ordinary graph paper, plot n versus $1/\lambda^2$ to obtain the dispersion curve.

DATA:

White light reflection:

Angle (left) θ_{left} = ...

Angle (right) θ_{right} = ...

Prism Angle α = ...

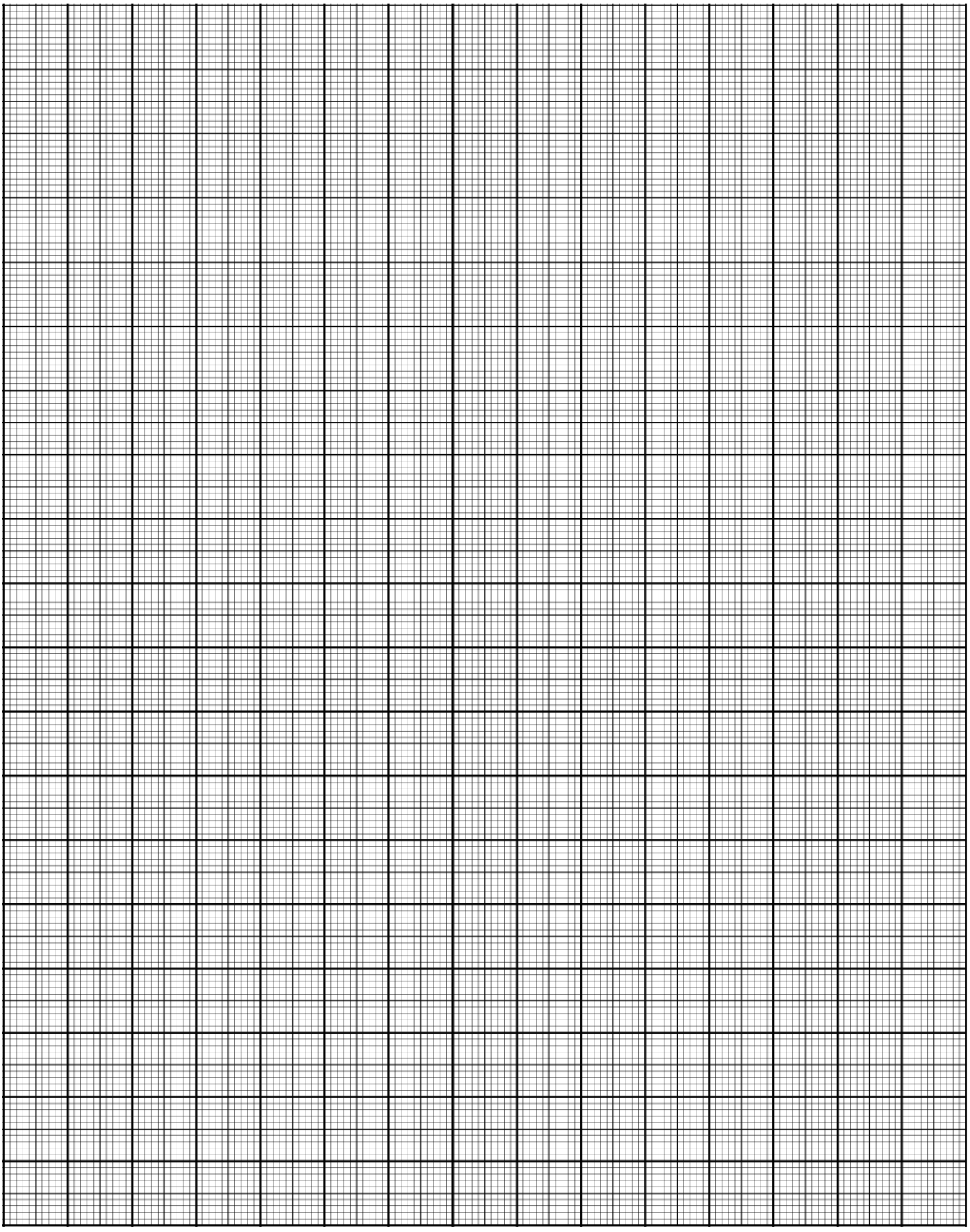
Measurements for the Mercury spectrum:

COLOR	λ **(A°)**	θ	D_{min} (*show your calculations*)
Yellow-1	5790		
Yellow-2	5769		
Green	5460		
Blue (weak)	4916		
Blue	4358		
Violet-1	4077		
Violet-2	4046		

CALCULATIONS:

COLOR	$1/\lambda^2$ ( )	$n = \frac{Sin[(\alpha + D_{min})/2]}{Sin(\alpha/2)}$	*n* (result)
Yellow-1			
Yellow-2			
Green			
Blue (weak)			
Blue			
Violet-1			
Violet-2			

PLOT: n versus $1/\lambda^2$



From the graph, choose two SLOPE POINTS other than data points,

SP_1 : (;)

SP_2 : (;)

RESULTS:

Notation	Calculations (show each step)	Result
A =	. . . . .	. . . . .
	. . . . .	
B =	. . . . .	. . . . .
	. . . . .	

Post-Lab Report

Aim of the experiment:

Suggestions for possible solutions to the problems experienced during the experiment:

Conclusion:

I have completed this experiment myself as specified in the lab sheet and as explained by the lab instructor.

Name & Surname:

Student ID:

Lab Section:

Table #:

Date:

Signature of the student

As the instructor of this Lab Section I confirm that the student has participated in and completed this experiment on time.

Stamp of the PHYS Labs and signature of the instructor

This page serves as proof of the fact that the student participated in and completed the experiment, only if it is submitted in time and accepted by the Lab instructor. The student and the instructor shall sign it along with the stamp of the Physics Laboratories.