Pre-Lab Report

Lab section:

Name & Surname:

Table #:

***Before the Lab** complete this page YOURSELF! Hand it in in the first 5 min. of the session PERSONALLY!*

You MUST justify your answers and show all steps. NO COPYCAT answers, or NO credits!

Please read the relevant presentation on PHYS LAB Website.

Q1. Write down the relation between focal length and radius of curvature for a mirror.

Q2. Write down the relation between focal length and radius of curvature for a lens.

(3rd Question is on the next page!)

Q3. Write down the index of refraction formula for a prism.

Q4. What is the definition of index of refraction and what is the unit of it?

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Complete this report YOURSELF except DATA taking parts! Use a pencil for plots only and a pen for the rest! **Show your work clearly, NO COPYCAT analysis allowed, or NO credits!**

OBJECTIVE : To study the law of reflection, principles of mirrors, lenses, and prism by ray tracing.

THEORY : In this experiment you will be tracing the light rays reflected or refracted from various optical elements and determine some relevant quantities of these elements. Here are some crucial points you may need.

- In a plane mirror the incident and reflected angles with respect to the normal are equal

- Focal lengths of concave and convex mirrors are simply half the radius of curvature for the respective surface.

$$f = \frac{R}{2}$$

- Focal length and the radius of curvature of a lens is related through the following expression:

$$\frac{1}{f} = (n-1)\frac{2}{R}$$

where n is the index of refraction.

- We can calculate the index of refraction of the transparent material a prism made of as following:

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

where A is the prism angle at the corner that the light rays are refracted and D_{min} is the minimum angle of deviation between the incident and the refracted rays.

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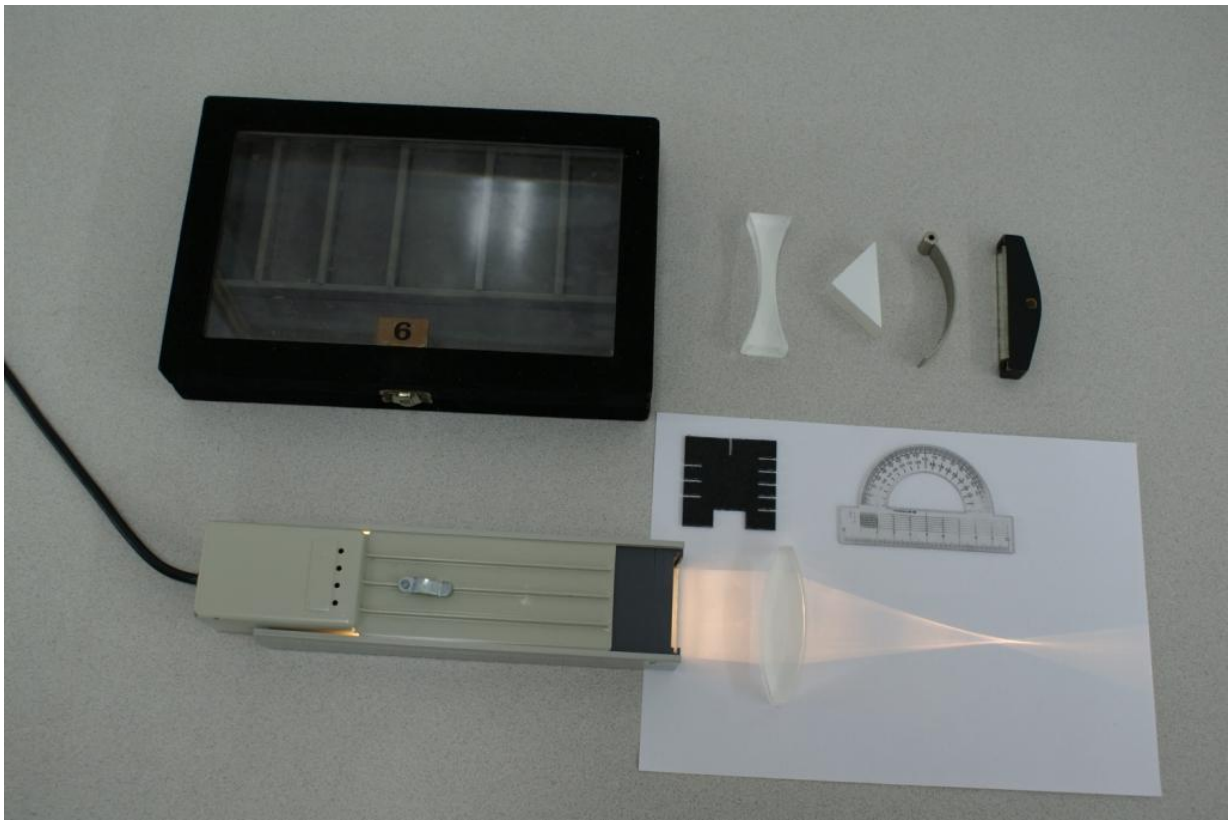
APPARATUS : Ray box, lens, mirror and prism set, ruler, protractor.



PROCEDURE :

1. For each of the following experiments, place the optical element and light source on a different sheet of paper. Draw the outline of the optical element, paths of incident, reflected, and refracted rays as needed.
2. You will determine the radii of curvatures using the Chord Method. First draw at least two chords on the curved (circular) outline of the elements. Then draw perpendicular bisectors to each of the chords. The center of the circle is where the bisectors intersect. You can determine the radius by measuring the perpendicular distance between the intersection point and any point on the curved outline.
3. Show your Chord Method Analysis on the back of each corresponding sheet.
4. In case of the prism, determine the minimum angle of deviation D_{min} and then the index of refraction for the material of the prism.

PART – 1: REFLECTION

A) Plane Mirror :

Incident ray angle θ_i = ...

Reflected ray angle θ_r = ...

B) Concave – Converging Mirror:

Focal Length of the mirror f_{EV} = ...

Radius of the mirror (From Chord Method) R = ...

Focal length of the mirror (From Chord Method) f_{CV} = ...

% difference in focal lengths = ...

C) Convex – Diverging Mirror:

Focal Length of the mirror f_{EV} = ...

Radius of the mirror (From Chord Method) R = ...

Focal length of the mirror (From Chord Method) f_{CV} = ...

Thickness of the mirror x = ...

% difference in focal lengths = ...

PART – 2: REFRACTION

D) Convex – Converging Lens :

Refraction Index n = ...

Focal Length of the lens f_{EV} = ...

Radius of the convex lens (From Chord Method) R = ...

Focal length of the convex lens (From Chord Method) f_{CV} = ...

% difference in focal lengths = ...

E) Concave – Diverging Lens:

Refraction Index n = ...

Focal Length of the lens f_{EV} = ...

Radius of the concave lens (From Chord Method) R = ...

Focal length of the concave lens (From Chord Method) f_{CV} = ...

% difference in focal lengths = ...

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F) Prism:

Minimum deviation between incident and refracted rays	D_{min}	=	.....
Prism angle	A	=	.....
Index of Refraction	n_{EV}	=	.....
True Value for the Index of Refraction	n_{TV}	=	.....
% difference for n		=	.....

Consult to the resources for this experiment from PHYS LAB Website:

PHYL202 Intro

Presentation #3

PHYL202 Lab Book