LAB 27, PLANE MIRRORS & THE *FREAQUOUT*

Name ________________________ Period_____

According to the laws of reflection, (1) the incident ray, the reflected ray, and the normal to the reflecting surface lie in the same plane and (2) the angle of incidence is equal to the angle of reflection. This experiment is designed to enable you to verify both laws. The image of an object that is viewed in a plane mirror is a virtual image. It is the same size as the object, reversed left and right, and appears to be as far behind the mirror as the object is in front of the mirror. A ray diagram can be an aid in understanding how the image of an object is formed by a plane mirror. By constructing ray diagrams, the characteristics of images formed by plane mirrors can be verified.

PART I, OBJECTIVE:

After completing this experiment, you should understand the laws of reflection and be able to interpret image formation by plane mirrors in terms of these laws.

PROCEDURE:

1. Laws of reflection:

Draw a line **MN** across the middle of a sheet of paper. Place the mirror on the line **MN** so that the edge of its reflecting surface coincides with **MN**. The mirror must stand vertically.

Place a pen point at some point **P**, as indicated in Figure 27-1, about 3 or 4 cm from the front of the mirror. Lay a straightedge or ruler on the paper, at **A** for example, far enough from the point **P** so that the angle **AOD** will be 30^{o} or more.

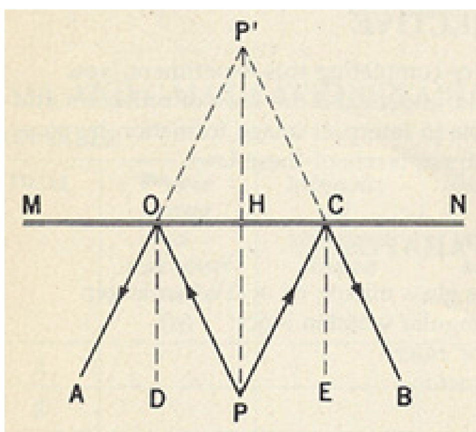

Figure 27-1

Sight along the edge of the ruler at the image of the pen point **P** as you see it in the mirror. Then draw a line along the edge of the ruler. In the same manner, locate a second sightline for the pen point **P**, but from an entirely different angle, from **B** for example.

Then remove the mirror and extend the two sightlines until they meet at the point **P'**. AII lines extending behind **MN** should be dashed lines.

Draw the lines **PO** and **PC**, which represent incident rays of light from the pin to the mirror.

Draw the lines **OD** and **CE** perpendicular to the mirror line **MN**. Measure the distances **HP** and **HP'** to the nearest millimeter.

Measure the angle of incidence **POD** and the angle of reflection **AOD** to the nearest 0.5^{o}. Also measure the angle of incidence **PCE** and the angle of refection **BCE**. Record these pairs of measurements in the data table.

2. Formation of images:

As before, draw a line **MN** across the middle of a sheet of paper and place the mirror on the line. In front of the mirror and not less than 4 cm from it, draw a scalene triangle. The sides of the triangle should be between 4 cm and 7 cm long. See Figure 27-2.

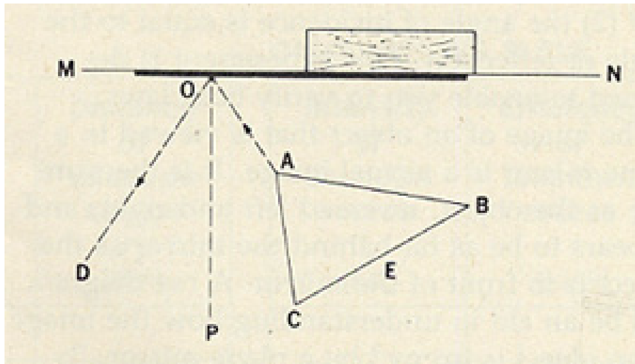

Figure 27-2

Place a pen point at one of the vertices of the triangle, at **A** for example, and locate two sightlines for the image of the pen. Label both of these sightlines **A**.

Without moving the mirror, proceed to locate two sightlines for the image of the pin at **B**. Also locate two sightlines for the image of the pin at **C**. If necessary the mirror may be moved from side to side along the line **MN** to permit a better view, but its reflecting surface must always coincide with the line **MN**.

Remove the mirror and extend the two sightlines for **A** until they intersect behind the mirror, using dashed lines behind the mirror line. Label this point of intersection **A'**; it is the image of **A**.

Join **A** and **A'**; measure the distance of each from the mirror line. Record the distances on the lines.

In the same manner, extend the sightlines for **B** until they meet at **B'** to form the image of **B**.

Join **B** and **B'**, and measure their distance from the mirror line. Extend the sightlines for **C** until they meet at **C'**. Measure the distances of **C** and **C'** from the mirror line. **A'**, **B'**, and **C'** with dashed lines to the triangle **A'B'C'**.

Measure the sides of the triangle **ABC** and write the measurement along the respective sides.

Measure the sides of the image of the triangle **A'B'C'** and write their lengths along the respective sides.

Submit the completed drawing, properly labeled and identified, as part of your laboratory report.

Data Table

Lenght of the Line PH	____**mm**	**Angle POD**	____**o**	**Angle PCE**	____**o**
Lenght of the Line P'H	____**mm**	**Angle AOD**	____**o**	**Angle BCE**	____**o**
Error	____**mm**	**Error**	____**o**	**Error**	____**o**

QUESTIONS for PART I:

1. Why is it impossible to form real images with a plane mirror?

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2. Why are ordinary plane mirrors coated on the back instead of the front. When would such a back coating be undesirable?

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3. To take a clear picture of an image in a plain mirror, should the camera be focused on the image or on the surface of the mirror.

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4. Why must the mirror in this experiment be perpendicular to the table for best results.

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5. What error is introduced by the thickness of mirror.

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PART II, THE FREAQUOUT: *This is neat party game.*

The eye can be fooled! Each person will perform the Freaquout on her own paper.

Have a partner SIGN HER NAME IN LARGE FONT SIZE across the middle of this page. With a partner's help, use a book to block your view of the signature. Hold the mirror such that you can see the signature only in the mirror. Now trace over the signature with your pen. Har, har, har! **FREAQUOUT**!

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CRITIQUE: