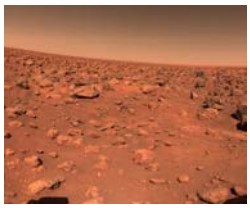


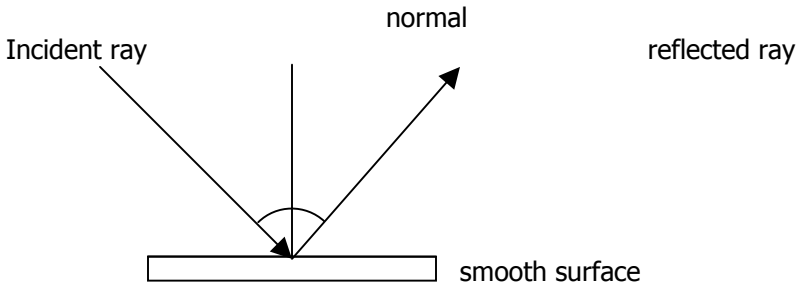
Mars 1

Law of Reflection

Introduction

If an object does not give off its own light, it must reflect light in order to be seen. Whenever light strikes the surface of an object, some of the light is reflected back to our eyes so that the object can be seen. This same principle applies to radar beams, an invisible part of the electromagnetic spectrum. The microwaves that the radar unit emits will hit an object and the energy is reflected back from the object to an antenna. The antenna functions much like our eyes in that the antenna captures the reflected microwaves and our eyes capture the reflected light.

Reflection is light bouncing off a surface. Light is said to be reflected when the angle at which light initially strikes a surface is equal to the angle at which light bounces off the same surface. This is known as the Law of Reflection. Basically what this means is that reflection involves two rays—an incoming ray or incident ray and an outgoing ray or reflected ray. The two rays are at identical angles but on opposite sides of the normal which is an imaginary line perpendicular to the surface. Observe the following diagram.



incidence angle of the incident ray = incidence angle of the reflected ray

Objective: To investigate reflection of light for plane mirrors demonstrating the Law of Reflection.

Note: This activity will work better in a darkened room.
Caution: Do not point the laser at anyone's eyes

Materials

Flat plane mirror
Laser or pen flashlight
Plain white paper (notebook size)
Metric Ruler
Protractor
Drawing Compass
Pencil or Pen
Clay or block of wood to support mirror upright

Part I

Procedure

1. Place the sheet of paper on a flat surface.
2. Draw a horizontal line across the middle of the paper.
3. Locate the center of the horizontal line and draw a vertical line to the top of the paper at this point. Place a dot at the top of this line and label **Point B.**
4. Support the mirror so that it stands at the top edge of the paper and is centered with the vertical line.
5. Draw a dot on the right hand side of the paper 5 centimeters from the point of intersection of the horizontal and vertical lines. Label this dot **Point A.**
6. Direct a beam of light from **Point A** to the mirror, focusing the beam to the top of the vertical line at **Point B.**
7. Notice the reflected ray. Have your partner put a dot at the point of intersection for the beam of light and the horizontal line. Label this **Point C.**
8. Use the metric ruler to draw lines to connect **Point A** and **C** to **Point B,** creating the angle **ABC.**
9. With the protractor measure the angle **ABC.**
10. The vertical line divides the angle into two equal angles. Measure each angle.

Questions

1. What is the measurement of angle ABC?_____

2. Does the sum of the two angles measured equal the total measurement of angle ABC?_____

3. Does your data verify the law of reflection within the limits of marginal error? _____

Part II

Procedure

1. Repeat steps 1 and 2 from the procedure for Part I.
2. Support the mirror so that it stands at top edge of the paper and is centered.
3. Find the center of the horizontal line and measure 5 centimeters to the right of the paper. Place a dot and label **Point A.**
4. Direct a beam of light from **Point A** to the mirror. At the point where the beam of light hits the mirror, have your partner make a dot on the paper and label **Point B.**
5. Notice the reflected ray. Have your partner put a dot at the point of intersection for the beam of light and the horizontal line. Label this **Point C.**
6. Use the metric ruler to draw lines to connect **Points A** and **C** to **Point B**, creating the angle **ABC.**
7. With the protractor measure the angle **ABC.**
8. Follow math procedures for bisecting angle **ABC**.
9. Measure the two angles that have been produced.

Questions

1. Does the appearance of the constructed angle in Part II agree with the image of angle ABC in Part I?_____

2. Does your data in this part verify the law of reflection within the limits of experimental error?_____

3. For the angle drawn in Part II, label the lines that indicate the incident ray, the reflective ray, the normal, and identify which angle is the angle of incidence and the angle of reflection.

Conclusion for Part I and Part II

1. What is the relationship between the angle of incidence and the angle of reflection?
   _____

2. If a radar beam was aimed at the mirror instead of the flashlight or laser, would you obtain the same results? Explain your answer.
   _____

3. If radar was aimed at a target on Mars and the angle of incidence and reflection were the same, how would you describe the target on Mars?
   _____