

I. Objectives

1. Describe Saturn's rings.
2. Demonstrate why Saturn's rings are visible on Earth.

II. Introduction

Although Saturn's rings appear to be solid structures they are actually composed of billions of chunks of material ranging from house-sized boulders to baseball-sized rocks to sand-sized grains. They don't generate their own light, but we can still see them clearly, even with a pair of binoculars.

III. Materials

Water, spray bottles, flash lights, baby powder, paper towels.

IV. Theory

Light is not visible to us unless it is reflected into our eyes. In this lab we will simulate the behavior of the billions of chunks of rocks and dust in Saturn's rings, showing how small particles of powder and drops of water also reflect light.

V. Prelab Definitions

1. Cassini division
2. Encke gap
3. albedo
4. spoke
5. shepherding satellite
6. Kirkwood gap

VI. Prelab Questions

1. Describe the height, width, general appearance, Saturn's rings.
2. What position is Saturn in when its rings are most and least visible from Earth? Is the visibility of the rings dependent on the tilt of Saturn in relation to Earth, its distance from Earth or both? Explain your answer.
3. How were Saturn's rings discovered and by whom?
4. What information has the Cassini spacecraft provided about Saturn and its rings?

VII. Lab Procedure

1. Turn off the lights.
2. Place the flashlight about a meter from a wall. Shine the flashlight toward the wall.
3. Observe the flashlight beam.
4. Shake some baby powder into the flashlight beam.
5. Change the angle and position of the flashlight several times and observe the baby powder. If necessary, shake more powder into the beam.
6. Spray some water into the flashlight beam after the baby powder has settled.
7. Change the angle and position of the flashlight several times and observe the water. If necessary, spray more water into the beam.
8. Shake some baby powder and spray some water into the flashlight beam at the same time.
9. Change the angle and position of the flashlight several times and observe the baby powder and the water. If necessary, shake some more baby powder and spray more water into the beam.
10. Clean up all baby powder and water when finished.

VIII. Lab Discussion

1. How clearly could you detect the beam of light between the flashlight and the wall before the baby powder was shaken or the water was sprayed into the flashlight beam?
2. How clearly could you detect the light beam between the flashlight and the wall after the baby powder was shaken into the flashlight beam?
3. How clearly could you detect the light beam between the flashlight and the wall after the water was sprayed into the flashlight beam?

4. How clearly could you detect the light beam between the flashlight and the wall after the baby powder was shaken into and the water was sprayed into the flashlight beam? Were you able to see more or less of the light when only one of the two was used?

5. What does the powder do to the light that hits it? What does the water do to the light that hits it?

6. How did the beam angle and position affect your ability to detect the baby powder and the water? Were there some flashlight positions that made the powder and water more visible than others? Which ones? Why?

7. How is this demonstration related to Saturn's rings, or the rings of any other planet?