

OPERATING INSTRUCTIONS

Refraction of Particles Apparatus No. 72702-3

1. Introduction

This apparatus is designed to test Newton's particle theory of light and Snell's Law for the index of refraction. Snell's Law defines what happens when light traveling through air (or any other medium) reaches an interface with another medium. For any particular such interface, the ratios of the incident angle and the angle of refraction are constant. Proving this for a simple particle model helps to support a particle model for light.

2. Description

The apparatus consists of a vacuum-molded plastic ramp. A grooved launcher and a large (22mm) ball bearing are included.

Not supplied, but required for this experiment, are masking tape, two sheets of white paper, and two sheets of soft carbon paper. All paper should be standard size, 8" x 11".

3. Operation

Place the ramp on a smooth, hard surface, such as a level bench or table. The ramp must be level for reliable results. Test it by placing the ball down at several different spots on the ramp. It should not roll. If necessary, slide folded paper under the edge of the ramp to level it.

Tape a piece of white paper to the surface of the ramp. Tape a second piece of white paper to the table at the base of the ramp with its edge parallel to the bottom edge of the first sheet. Cover each sheet of white paper with a sheet of carbon paper placed face down. The carbon paper should be the softest grade available.

Select a fixed height on the launcher from which you will release the steel ball, and mark the point with a piece of tape placed on the edge of the launcher. The tape should not interfere with the ball's path, but should indicate the correct height for future trials. Position the launcher near the rear of the ramp; the launcher may be aimed at any convenient angle to the front of the ramp that will enable the ball to stay on the ramp and leave a trace on the paper. Release the ball from the selected height. Remove the carbon paper and label the track left by the ball on each sheet "a."

Repeat the experiment several times, labeling each track "b," "c," and so forth. After obtaining several sets of data, consider the changes seen in the behavior of the ball. Is there any change in its acceleration as it moves from the ramp to the table? Is there any change in its direction? Measure the angles before and after the ball rolled down the ramp to support your conclusions.

Now, consider the ball to be a "particle" of light moving from one medium, the ramp, to another medium, the table top. Consider the sharp incline on the ramp to be the interface between the two media. What do your results indicate about the particle nature of light? What conclusions can you reach about Snell's Law? List and explain them.

4. Maintenance

The Refraction of Particles Apparatus needs no special maintenance. If any difficulty develops, contact Central Scientific Company, giving all details of the problem. Do not return this apparatus without written authorization from Central Scientific Company.

Written 3/88