

LAB 9. RAY OPTICS: APERTURES

Driving Question | Objective

How does light, which originates from a point source, travel? How will its rays pass through different openings?

Materials and Equipment

- Optics Track
- Aperture Reel
- Viewing Screen
- Light Source
- Ruler

Procedure

- Mount the light source on the optics track with the image of the cross at the 0 cm mark.
- Mount the white viewing screen somewhere not too far from the light source.
- Mount the aperture bracket somewhere between the screen and light source.

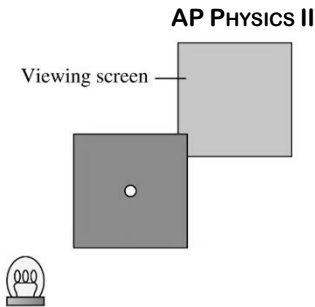


- Rotate the wheel to different aperture diameters. What happens to the light that makes it to the screen as the aperture diameter decreases? Is there ever a clear image on the screen?

As the aperture diameter increases, the light that ends up on the screen gets blurrier. Aperture diameter is proportional to the blurriness of the light on the screen.

- Rotate the light source to now have the Point Source facing the aperture and screen. Select any aperture diameter and vary the location of either the aperture or screen. In the table, record the distances of the aperture and screen from the light source as well as the diameters of the aperture and light circle on the screen.

Distance to Aperture	Distance to Screen	Diameter of Aperture	Diameter of Light on Screen
15 cm	25 cm	2.5 cm	4.5 cm
20 cm	35 cm	1.8 cm	2.4 cm
25 cm	45 cm	1.3 cm	2.5 cm



Analysis

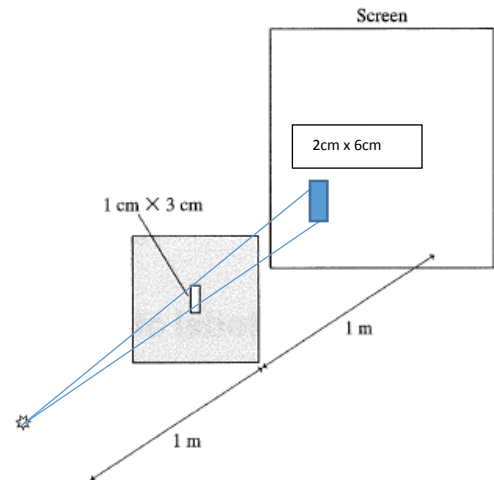
- ❓ 1. Is there any relationship of ratios you can determine from your data?

The ratio between the distance to aperture and distance to the screen is proportional, to the ratio between the diameter of the aperture and diameter of the light on the screen.

- ❓ 2. A point source of light illuminates a slit in an opaque barrier. On the screen, sketch the pattern of light that you expect to see. Let the white of the paper represent light areas; shade dark areas. Mark any relevant dimensions.

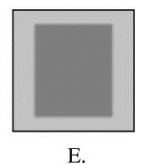
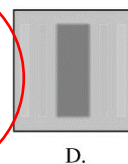
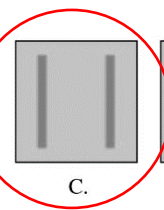
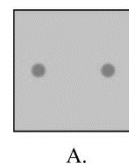
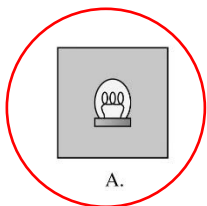
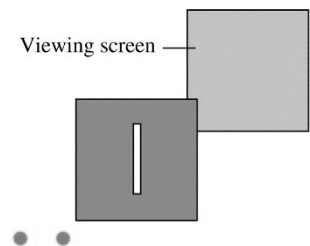
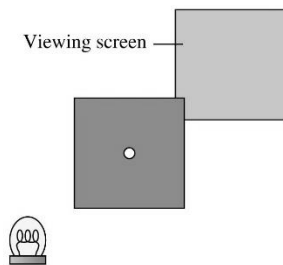
What will happen to the pattern of light on the screen if the slit width is reduced to 0.5 cm?

If we multiply the width of the slit by .5, then the width of the projection on the screen will also be multiplied by the same constant, of .5, and therefore be 1 cm.



- ❓ 3. The dark screen has a small hole. The lightbulb is the only source of light. What do you see on the viewing screen?

- ❓ 4. Two point sources of light illuminate a narrow vertical aperture in a dark screen. What do you see on the viewing screen?



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