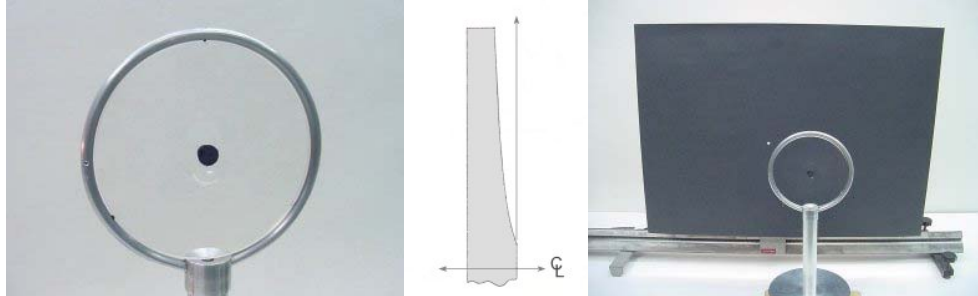


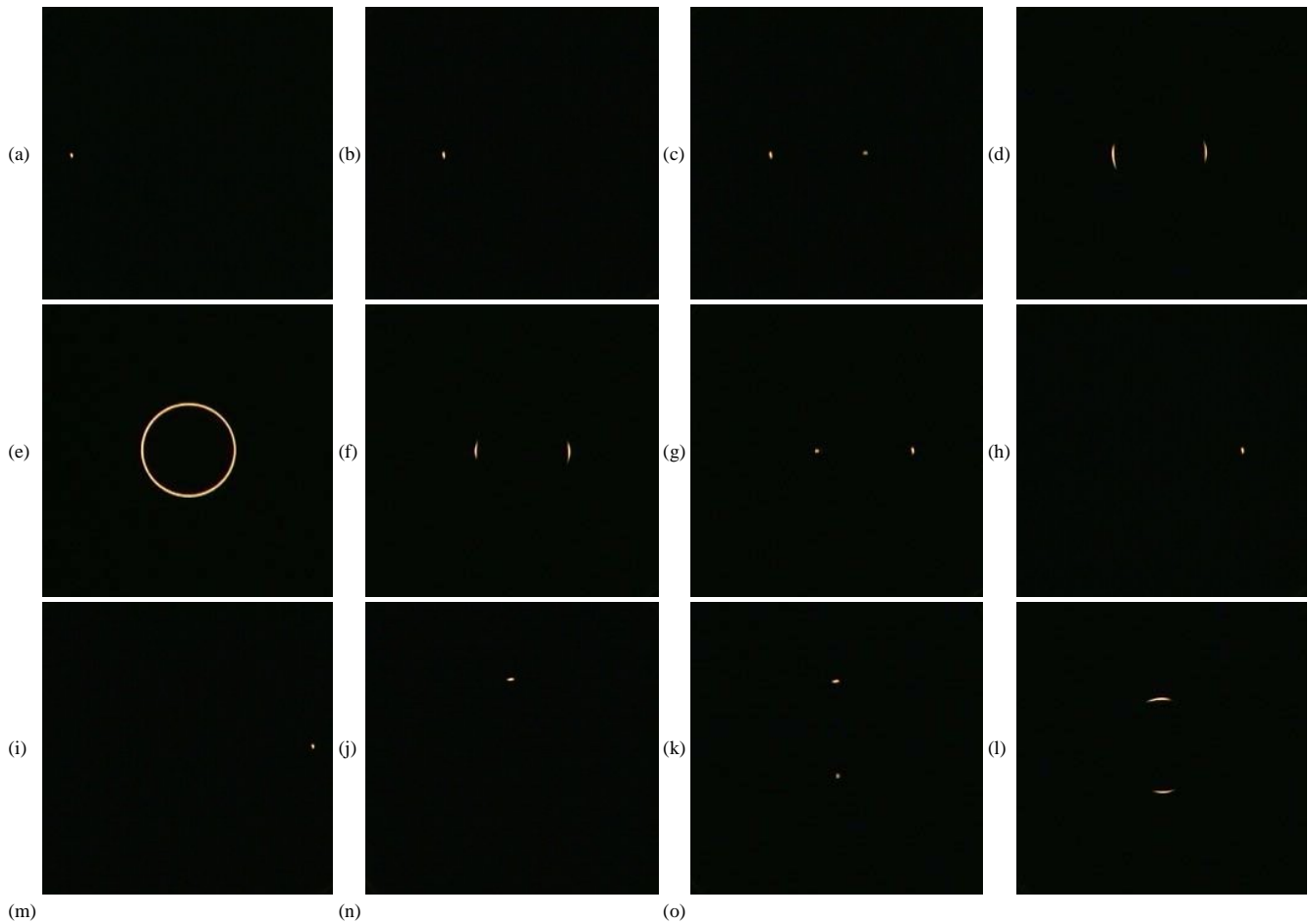
Question #257

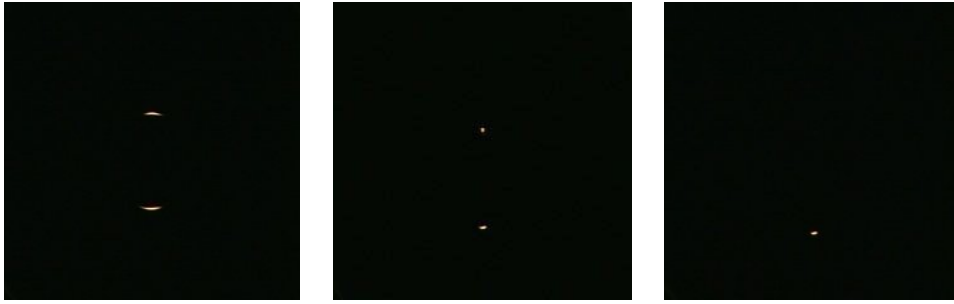
The optical lens shown in the photograph at the left above is an optically correct model of a gravitational lens created by a massive star or other celestial object. The shape of the surface of the lens is seen in the drawing in the center figure. Note that the lens is planar on one side and convex on the other side, but the shape of the surface is exponential, with the thickest part near the center of the lens. The thickness of the lens is limited near the very center, the central region is flat in the region where light from immediately behind the massive star would be eclipsed.

The photograph at the right shows the optical system to be used in this question. A small circular light can be moved across the screen behind the lens, simulating the passage of a second star behind the massive star that is acting as the gravitational lens.



Now suppose that a star passes behind the gravitational lens, moving from left to right, so that it moves in a plane containing the moving star, the gravitational lens star, and the observer, here a video camera. When the star begins its motion, it can be seen by the observer as a small point of light at the left of the picture, seen as picture (a) in the array below. This array of pictures shows a number of possible photographs of the moving star as it traverses from left to right across the lens.





N.B.: These photographs may be distorted by the choice of height and width of your browser; for example, picture (e) is actually a circle. To remove this distortion it may be necessary to cut and paste these pictures into a drawing program.

The question this week is to select which of the above pictures will be part of the video of the "moving star" as it passes directly behind the "black hole" represented by the gravitational lens, and to arrange them in the proper order in which they will be seen as the star moves from left to right.

The order will include:

- (a)
- (b)
- (c)
- (d)
- (e)
- (f)
- (g)
- (h)
- (i)
- (j)
- (k)
- (l)
- (m)
- (n)
- (o)

Click here for [Answer #257](#) after October 2, 2006.

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For questions and comments regarding the *Question of the Week* contact [Dr. Richard E. Berg](#) by e-mail or using phone number or regular mail address given on the [Lecture-Demonstration Home Page](#).