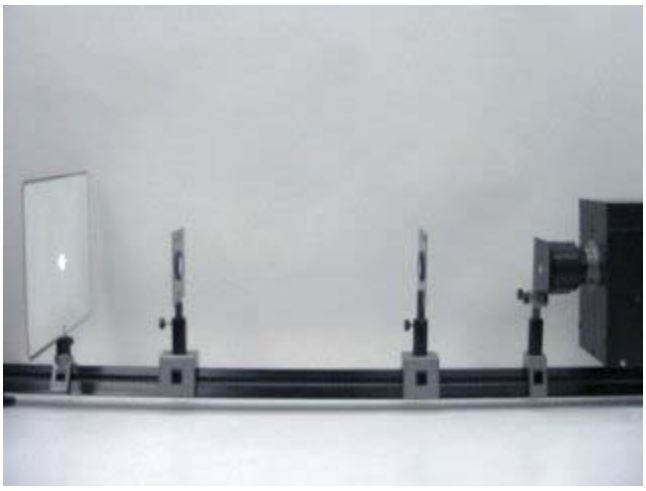
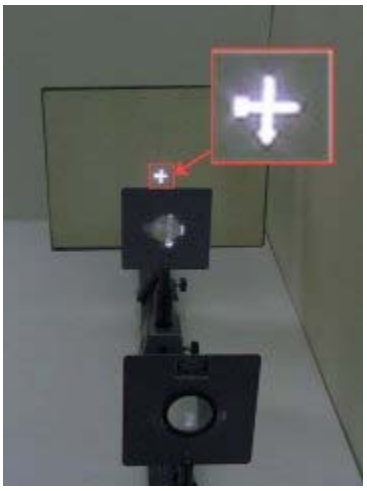
Answer #335

The answer is (a): the image in the two-lens case is exactly the same as the image in the single lens case, as can be seen in the photographs of the system and the image below. The photographs at the center and the right show the image and a more detailed close-up.





Click here for the ray solution, and here for the mathematical solution.

Question of the Week

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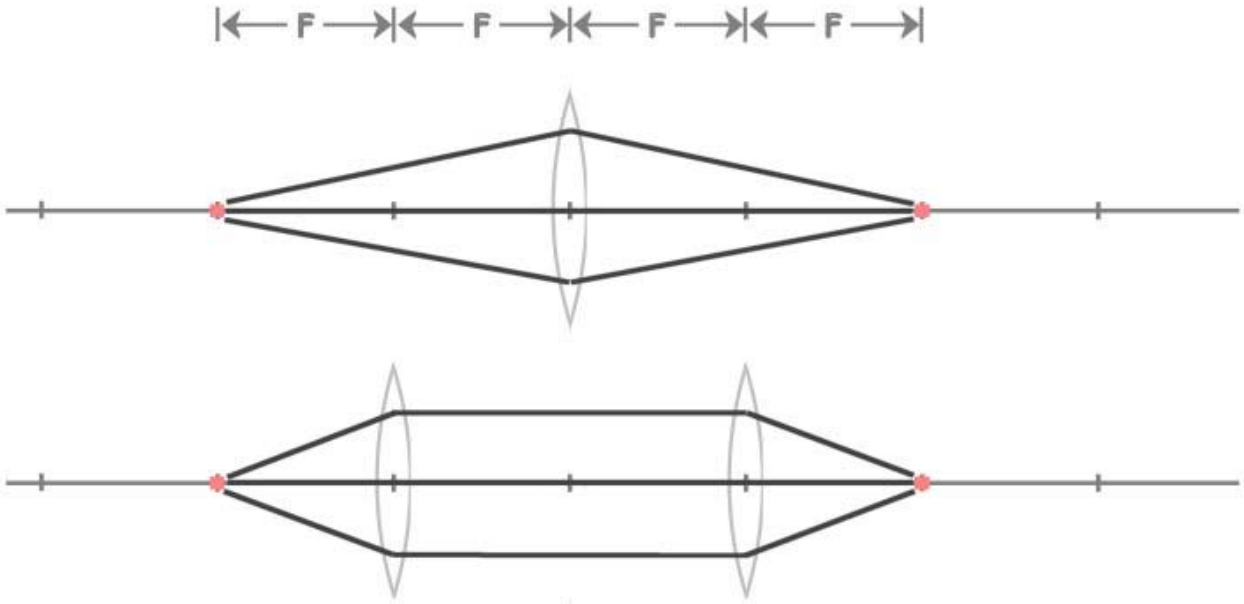
For questions and comments regarding the *Question of the Week* contact
Dr. Richard E. Berg by e-mail or using phone number or regular mail address

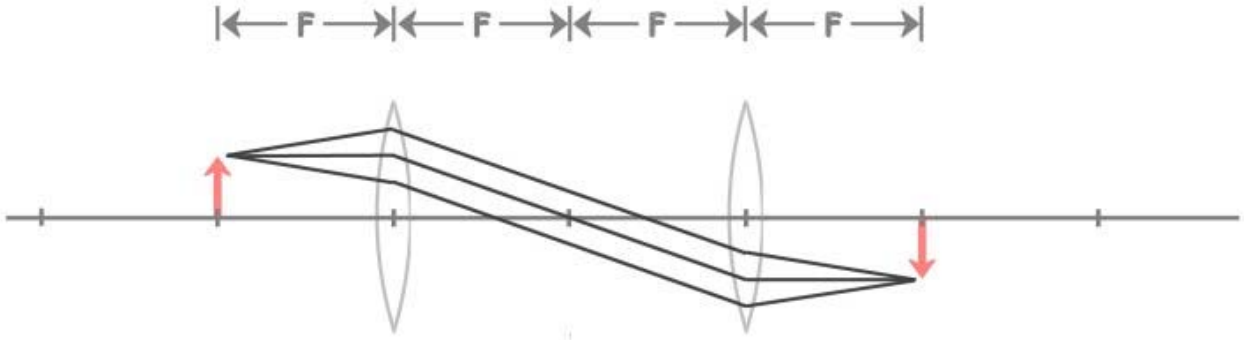
given on the Lecture-Demonstration Home Page.

Light ray solution for the two lens problem.

Here is a ray drawing showing how the focus is determined.



Here is a ray drawing showing why the image is inverted.



Notice that the optical arrangement is symmetrical; the existence of this symmetry is also a clue as to the location and the inversion of the image.

Question #335 Calculations

For the first image the image distance is equal to the focal length, so:

$$\frac{1}{I_1} = \frac{1}{F} - \frac{1}{O_1} = \frac{1}{F} - \frac{1}{F} = 0 \text{ , so } I_1 = \infty = O_2$$

For the second image:

$$\frac{1}{I_2} = \frac{1}{F} - \frac{1}{O_2} = \frac{1}{F} - \frac{1}{\infty} = 0 \text{ , so } O_2 = F$$

$$M = -\frac{I_2}{O_1} = -1,$$

so the image is the same size as the object but is inverted.