

Answer on Question 76173, Physics, Other

Question:

A 5 cm tall object is placed 12 cm in front of a convex mirror and produces an image 7 cm behind the mirror. Where is the focal point located?

Solution:

We can find the focal point distance from the mirror equation:

$$\frac{1}{d_o} + \frac{1}{d_i} = \frac{1}{f'}$$

here, $d_o = 12 \text{ cm}$ is the object distance, $d_i = -7 \text{ cm}$ is the image distance (the image distances for convex mirrors are always negative) and f is the focal point distance.

Then, from this formula we can find the focal point distance:

$$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{-d_i},$$
$$f = \frac{1}{\frac{1}{d_o} - \frac{1}{d_i}} = \frac{1}{\frac{1}{12 \text{ cm}} - \frac{1}{7 \text{ cm}}} = -16.8 \text{ cm}.$$

Also, from the magnification equation we can find the image height:

$$\frac{h_i}{h_o} = -\frac{d_i}{d_o},$$

here, $h_o = 5 \text{ cm}$ is the object height, h_i is the image height.

Then, we get:

$$h_i = -h_o \frac{d_i}{d_o} = -5 \text{ cm} \cdot \frac{(-7 \text{ cm})}{12 \text{ cm}} = 2.9 \text{ cm}.$$

Answer:

$f = -16.8 \text{ cm}$, $h_i = 2.9 \text{ cm}$.

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