Answer on Question #46345 – Physics – Other

Question.

Describe the image of a candle positioned 20cm in front of a concave mirror of focal length 30cm

virtual, inverted, 12cm behind mirror and magnified 3 times
real, inverted, 12cm in front of mirror and diminished 3 times
virtual, erect, 60cm behind mirror and magnified 3 times
real, erect, 60cm in front of mirror and diminished 3 times

Given:

$S_1 = 20\ cm$

$F = 30\ cm$

Solution.

Let use the mirror equation:

$$\frac{1}{S_1} + \frac{1}{S_2} = \frac{1}{F}, where$$

S_1 is the distance from the object to the mirror;

S_2 is the distance from the mirror to the object;

F is the focal length.

If $S_1 < F$ the mirror equation will be the following:

$$\frac{1}{S_1} - \frac{1}{S_2} = \frac{1}{F}$$

So,

$$\frac{1}{S_2} = \frac{1}{S_1} - \frac{1}{F}$$

Calculate:

$$\frac{1}{S_2} = \frac{1}{20} - \frac{1}{30} = \frac{1}{60} \rightarrow S_2 = 60\ cm$$

You can see the concave mirror diagram, where $S_1 < F$ on Fig.1.

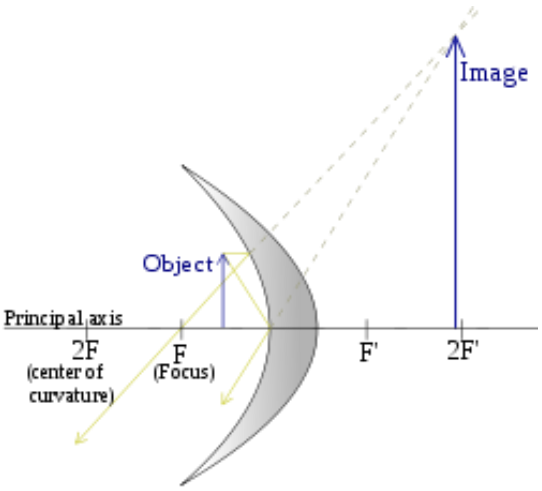

Fig. 1. The concave diagram, where object is between focal point and mirror.4

So, the image is virtual, erect and behind mirror.

By definition the magnification of lens is given by:

$$M = -\frac{S_2}{S_1} = \frac{F}{F - S_1}$$

Calculate:

$$M = \frac{30}{10} = 3$$

So, our image is magnified 3 times.

Thus, the image is virtual, erect, 60cm behind mirror and magnified 3 times.

Answer.

virtual, erect, 60cm behind mirror and magnified 3 times