## Answer on Question 51841, Physics, Optics

1. Diopter is the unit of:
a) linear magnification
b) power of lens
c) inverse of object distance from lens
d) inverse of image distance from lens

## Answer:

Diopter is the unit of measurement of the power of lens.
Thus, the correct answer is b) power of lens
2. In an experiment involving the convex lens which of the following is not correct?
a) images must always be sharply focused
b) the tip of object pin must be at the same height as the centre of lens
c) images obtained must always be magnified
d) parallax error must be avoided

## Answer:

In an experiment, we must find the rough focal length of the given convex lens by focusing a sharp, clear and inverted image, so the statement a) is correct. Also, the tip of object pin must be at the same height as the centre of lens and parallax error must be avoided. Thus, statements b) and d) are correct. But the images which we obtain not always be magnified, if we, for example, change the divergence or convergence of light in an experiment involving the convex lens. We can use a double convex lens for example, and the ray diagram will looks like for this case:


Thus, the answer is c) images obtained must always be magnified.
3. Describe the image of a candle positioned 20 cm in front of a concave mirror of focal length 30 cm .
a) virtual, inverted, 12 cm behind mirror and magnified 3 times
b) real, inverted, 12 cm in front of mirror and diminished 3 times
c) virtual, erect, 60 cm behind mirror and magnified 3 times
d) real, erect, 60 cm in front of mirror and diminished 3 times

## Solution:

Let's use the mirror equation:

$$
\begin{gathered}
\frac{1}{d_{\text {object }}}+\frac{1}{d_{\text {image }}}=\frac{1}{f^{\prime}} \\
\frac{1}{20 \mathrm{~cm}}+\frac{1}{d_{\text {image }}}=\frac{1}{30 \mathrm{~cm}}, \\
\frac{1}{d_{\text {image }}}=-\frac{1}{60 \mathrm{~cm}} \\
d_{\text {image }}=-60 \mathrm{~cm} .
\end{gathered}
$$

The sign minus means that the image is virtual and 60 cm behind mirror. Let's get the magnification of the concave mirror:

$$
m=-\frac{d_{\text {image }}}{d_{\text {object }}}=-\frac{(-60 \mathrm{~cm})}{20 \mathrm{~cm}}=3
$$

We can see that the magnification is positive, so the image is upright (erect) and magnified 3 times.

Answer: c) virtual, erect, 60 cm behind mirror and magnified 3 times.

