KITE VICTERS ONLINE CLASS 15-12-2020

PHYSICS - X-PART-5 CLASS 37

Worksheet (14-12-20)

1. An object is placed in front of a concave mirror 40 cm away from it. If its focal length is 80 cm, locate the position of image and its nature

The distance of the object from the mirror u = - 40 cm
The distance to the image from the mirror v = ?
The focal length of the mirror f = - 80 cm

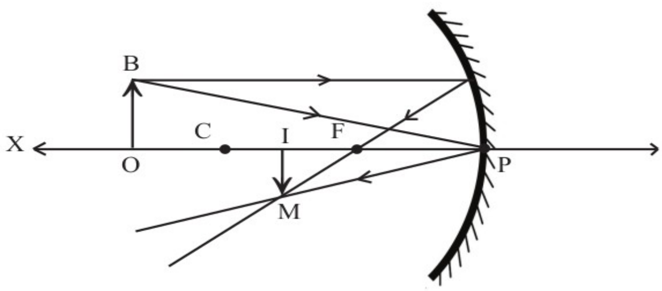
$$v = uf/(u-f)$$
$$= (-40 \times -80) / (-40 + 80)$$
$$= (3200) / (40)$$
$$v = 80 \text{ cm}$$

Nature of the image

erect and virtual

Magnification

Magnification is the ratio of height of the image to the height of the object. It is the number that indicates how many times the size of the object is the size of the image.



The figure shows the image formation when an object is placed beyond the centre of curvature C. The ray parallel and close to the principal axis has been considered. In the figure OBP and IMP are similar triangles according to the concept of similarity. Let s write down the ratio of corresponding sides of similar triangles.

$$IM/IP = OB/OP$$

In the figure, IM = h_i , OB = h_o , IP = v, OP = u. On substituting in the above equation we get $h_i / h_o = v/u$. On writing this equation in accordance with the New Cartesian Sign Convention we get h_o = positive , h_i = negative, u = negative, v = negative.

that is $$-h_i / h_o = -v/-u$$

$$-h_i / h_o = v/u$$

But $$m = h_i / h_o$$

Hence $$m = h_i / h_o = -v/u$$

Magnification is $m = h_i / h_o = -v/u$

Height of the object = h_o
Height of the image = h_i
Position of the object = u
Position of the image = v
Magnification is $m = h_i / h_o = -v/u$

1. When an object of height 6 cm is placed in front of a concave mirror at a distance 10 cm away from it , an image is obtained 16 cm away, on the same side. Find out the height of image and magnification.

Distance to object $u = -10$ cm
Distance to image $v = -16$ cm
Height of object $h_o = +6$ cm
Height of image $h_i = ?$
Magnification is $m = -v/u$

$$m = -(-16/-10)$$
$$= -1.6$$

Magnification is $m = h_i / h_o$

$$h_i = m \times h_o$$

Height of image $h_i = -1.6 \times 6 = -9.6$ cm

Nature of the image

Real and inverted

Worksheet

1. An object is placed 8 cm away in front of a concave mirror of focal length 5 cm. Find out the position of image and magnification.