

Chapter: 11

Q.1 Name the following

6

- 1 State the type of mirror used in the following :
Periscope.

Ans Plane mirror

- 2 State the type of mirror used in the following :
Head lamps of a car.

Ans Concave mirror.

- 3 State the type of mirror used in the following :
Floodlights.

Ans Concave mirror

- 4 State the type of mirror used in the following :
Shaving mirror.

Ans Concave mirror

- 5 State the type of mirror used in the following :
Street lights.

Ans Convex mirror.

- 6 State the type of mirror used in the following :
Kaleidoscope.

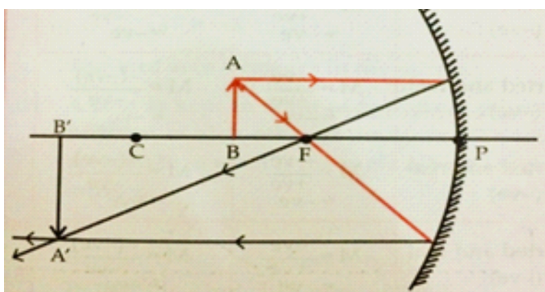
Ans Plane mirror

Q.2 Answer the following.

14

- 1 Draw ray diagrams for the cases of images obtained in concave mirrors.
When object is between centre of curvature and focus.

Ans

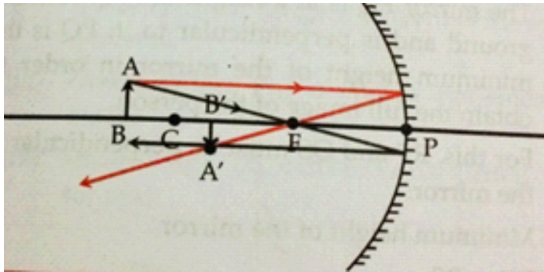


Position of the image: Beyond C

Nature of the image : Real, Inverted and magnified

- 2 Draw ray diagrams for the cases of images obtained in concave mirrors.
When object is at centre of curvature.

Ans

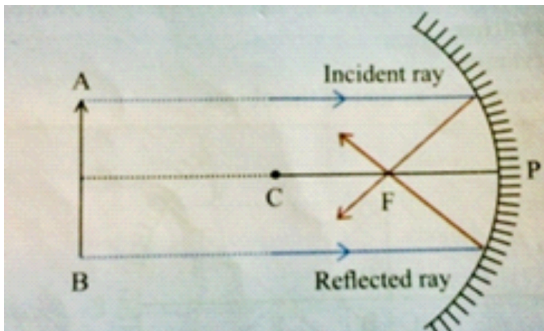


Position of the image: At C

Nature of the image : Real, Inverted and same size as object

- 3 Draw ray diagrams for the cases of images obtained in concave mirrors.
When object is beyond centre of curvature.

Ans



Position of the image: Between F and C

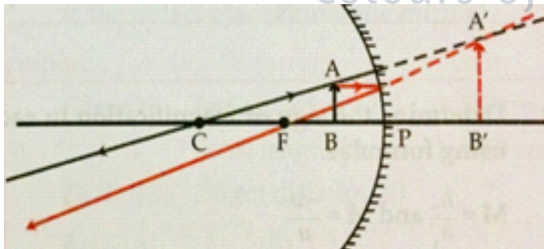
Nature of the image : Real, Inverted and diminished

- 4 If a spherical mirror breaks, what type of mirrors are the individual pieces?

- Ans
- i. If a spherical mirror breaks, each individual piece is still a mirror.
 - ii. There is no change in the radius of curvature or focal length as the reflecting surface is same.
 - iii. Hence, each piece will continue to behave like a spherical mirror.

- 5 Draw ray diagrams for the cases of images obtained in concave mirrors.
When object is between focus and pole

Ans

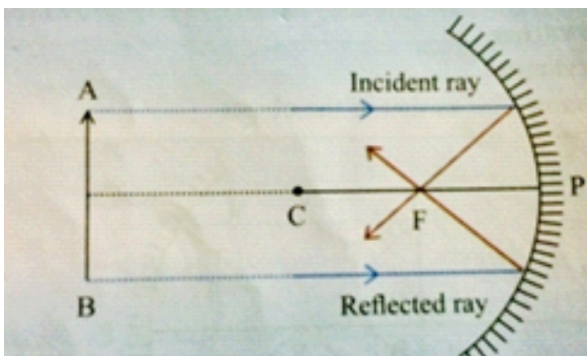


Position of the image: behind the mirror

Nature of the image : Virtual, Erect, and magnified

- 6 Draw ray diagrams for the cases of images obtained in concave mirrors.
When object is at infinity.

Ans



Position of the image: At F

Nature of the image : Real, Inverted and highly diminished

- 7 Three mirrors are created from a single sphere. Which one of the following – pole, centre of curvature, radius

of curvature, principal axis – will be common to them and which will not be common?

- Ans** i. Terms that will be common to all three – centre of curvature, radius of curvature.
ii. Terms that will **not** be common to all three – pole, principal axis.

Q.3 Solve Numerical problems

3

- 1** An object of height 7 cm is kept at a distance of 25 cm in front of a concave mirror. The focal length of the mirror is 15 cm. At what distance from the mirror should a screen be kept so as to get a clear image? What will be the size and nature of the image?

Ans Given : Object height (h_1) = 7 cm,
object distance (u) = -25 cm,
focal length (f) = -15 cm.

To find : i. Image distance (v)
ii. Size of the image (h_2)
iii. Nature of the image

Formulae : i. $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$
ii. $M = \frac{h_2}{h_1} = -\frac{v}{u}$

Calculation: From formula (i),

$$\begin{aligned}\frac{1}{-15} &= \frac{1}{v} + \frac{1}{-25} \\ \therefore \frac{1}{v} &= \frac{1}{25} + \frac{1}{-15} \\ &= \frac{-15 + 25}{-(25 \times 15)} \\ &= -\frac{10}{375}\end{aligned}$$

$$\therefore v = -37.5 \text{ cm}$$

i.e., image is formed at a distance of 37.5 cm from the mirror on left side.

Hence, the image formed is **real**.

From formula (ii),

$$\begin{aligned}\frac{h_2}{h_1} &= -\frac{v}{u} \\ \therefore \frac{h_2}{7} &= -\frac{(-37.5)}{(-25)}\end{aligned}$$

$$\begin{aligned}\therefore h_2 &= \frac{37.5 \times 7}{25} \\ h_2 &= -10.5 \text{ cm},\end{aligned}$$

Hence, size of the image is 10.5 cm. Negative sign indicates that the image is **inverted**.

- i. Distance of image = **37.5 cm**
ii. Size of the image = **10.5 cm**
iii. Nature of the image formed is **inverted and real**.

Q.4 Answer the following

6

- 1** Why does obtaining the image of the sun on a paper with the help of a concave mirror burn the paper?

- Ans** i. Concave mirror is a focusing mirror. The parallel rays of light incident on this mirror are converged at the principal focus.
ii. When this mirror is arranged such that it forms a point image of the sun on a paper, the mirror collects all the sunrays onto that point on paper.
iii. The convergence of heat from the sun at a single point on the paper, burns the paper.

- 2** Why are the mirrors fitted on the outside of cars convex?

- Ans** i. In convex mirrors, the image of an object is erect and smaller.
ii. It remains erect but becomes smaller and smaller when the mirror is taken away from the object.
iii. As a result, we can see the images of the surroundings in the mirror.
iv. By using convex mirror on the outside of cars, driver can get an erect, diminished and clear view (image) of the vehicles coming from behind.
Hence, the mirrors fitted on the outside of cars are convex.

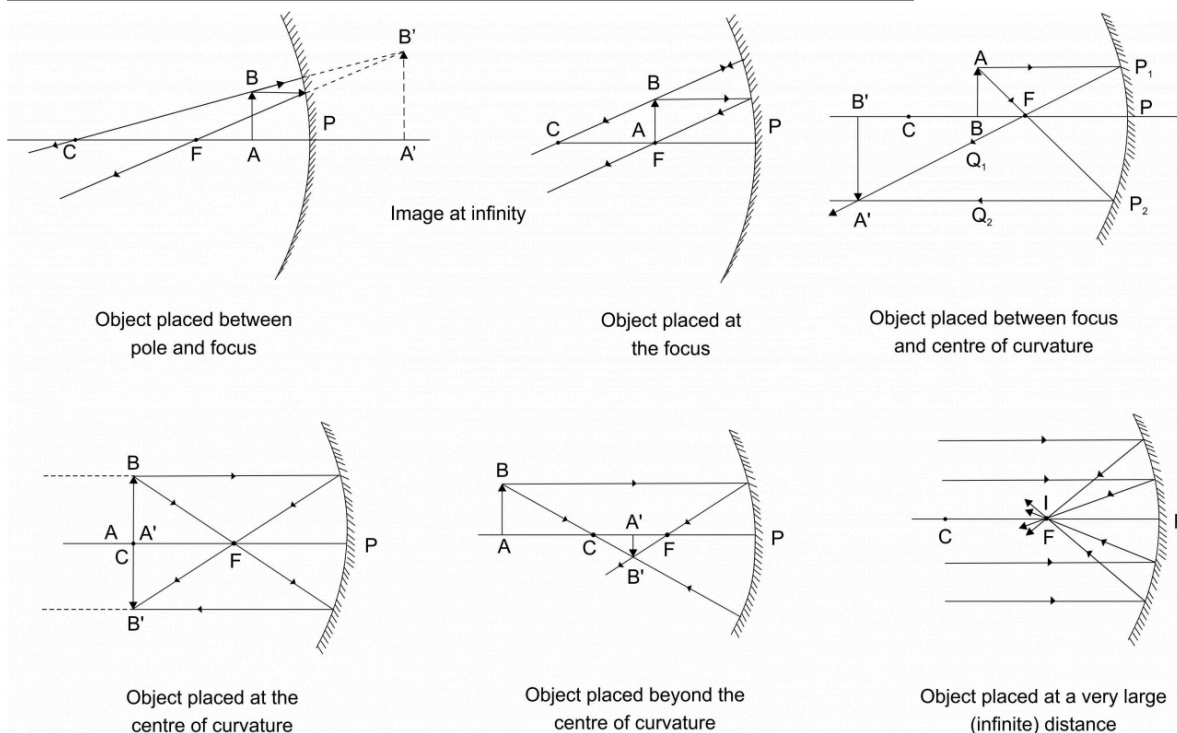
Q.5 Extra data (Not to be Use)

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- 1** Draw ray diagrams for the cases of images obtained in concave mirrors as described in the table.

No.	Position of the object	Position of the image	Nature of the image	Size of the image
1.	Between pole and focus	Behind the mirror	Erect, virtual	Magnified
2.	At the focus	At infinity	Inverted, real	Very large

Ans



C : Centre of curvature of the mirror

P : Pole of the mirror

A'B' : Image of the object

F : Principal focus of the mirror

AB : Object

I : Point image of the object

Q.6

Answer the following in detail

- 1 Complete the given table of the difference between a plane mirror, a concave mirror and a convex mirror with respect to the type and size of images produced?

5

Mirror	Position of object	Type of Image	Size of image
Plane mirror	At all positions	.....	Same as the object
Concave mirror	Between pole and focus	.....	.....
Concave mirror	.....	The reflected rays travel parallel to each other forming a real and inverted image at infinity.	Very large
Concave mirror	Between focus and centre of curvature	.....	Magnified
Concave mirror	.....	The reflected rays meet in front of mirror, below the principal axis forming a real and inverted image at the centre of curvature	.....
Concave mirror	.....	The reflected rays meet in front of mirror, below the principal axis forming a real and inverted image between the focus and centre of curvature.	Diminished
Concave mirror	.....	The rays travelling parallel to the principal axis meet each other at a single point on principal axis in front of mirror. Thus, the image formed is real .	Point image
Convex mirror	At all positions	.....	Diminished

Ans

Mirror	Position of object	Type of Image	Size of image
Plane mirror	At all positions	Image formed in plane mirror is at same distance from the mirror as the object, but behind the mirror. Thus, image formed is virtual and erect .	Same as the object
Concave mirror	Between pole and focus	The rays coming from the object gets reflected and do not meet each other, but if extended behind the mirror, they meet at a point forming a virtual and erect image.	Magnified
Concave mirror	At the focus	The reflected rays travel parallel to each other forming a real and inverted image at infinity.	Very large
Concave mirror	Between focus and centre of curvature	The reflected rays meet in front of mirror, below the principal axis forming a real and inverted image beyond the centre of curvature.	Magnified
Concave mirror	At the centre of curvature	The reflected rays meet in front of mirror, below the principal axis forming a real and inverted image at the centre of curvature	Same as the object
Concave mirror	Beyond the centre of curvature	The reflected rays meet in front of mirror, below the principal axis forming a real and inverted image between the focus and centre of curvature.	Diminished
Concave mirror	At infinite distance	The rays travelling parallel to principal axis meet each other at a single point on principal axis in front of mirror. Thus, the image formed is real .	Point image
Convex	At all positions	The rays coming from the object get reflected and never meet each other, but if extended behind the	Diminished

mirror		mirror, they meet at a point forming a virtual and	
		erect image.	

