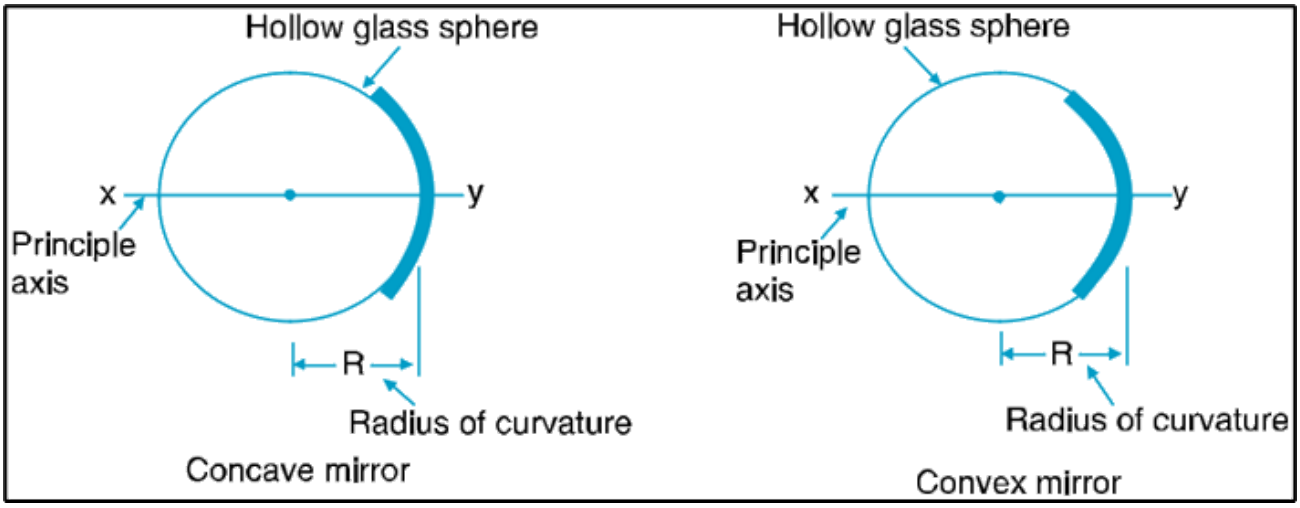
FlexiPrep

Science: Light Energy: Some Useful Terms to Understand Reflection at Spherical Mirror (For CBSE, ICSE, IAS, NET, NRA 2022)

Some Useful Terms to Understand Reflection at Spherical Mirror

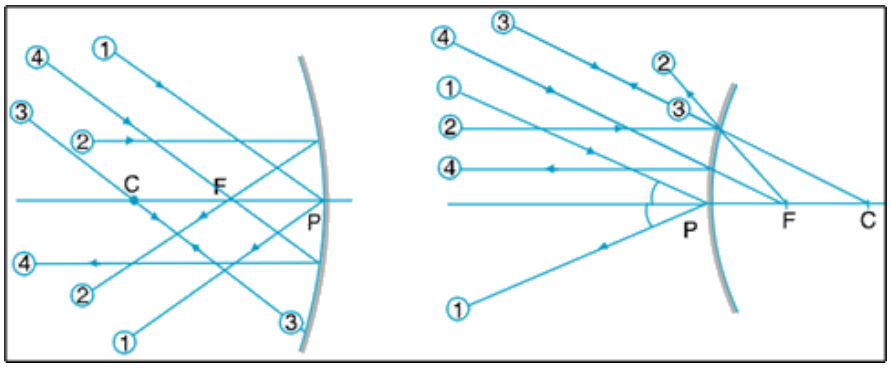


- **Pole (P)** : It is the midpoint of the spherical mirror. Point P is the pole.
- **Centre of curvature (C)** : It is the center of a hollow sphere of which the spherical mirror is a part. It can be determined by finding the point of intersection of two normal drawn at the spherical surface of the mirror. The point C is the center of curvature
- **Radius of curvature (R)** : It is the distance between the pole and center of curvature of the mirror. CF is the radius of curvature.
- **Principal axis**: It is an imaginary line joining the pole to the center of curvature. Extended line CP is the principal axis.
- **Principal focus (F)** : The rays of light parallel and closed to the principal axis of the mirror after reflection, either pass through a point (in concave mirror) or appear to be coming from a

point (in convex mirror) on the principal axis; this point is called principal focus of the mirror. Point F is the principal focus.

Rules for Image Formation by Spherical Mirror

- **Ray striking the pole**: The ray of light striking the pole of the mirror at an angle is reflected back at the same angle on the other side of the principal axis (Ray no 1) .
- **Parallel ray**: For concave mirror, the ray parallel to the principal axis is reflected in such a way that after reflection it passes through the principal focus. But for a convex mirror the parallel ray is so reflected that it appears to come from principal focus. (Ray no. 2) .
- **Ray through center of curvature**: A ray passing through the center of curvature hits the mirror along the direction of the normal to the mirror at that point and retraces its path after reflection (Ray no. 3) .
- **Ray through focus**: A ray of light heading towards the focus or incident on the mirror after passing through the focus returns parallel to the principal axis.



Uses of Mirrors

- Plane mirror is used in looking glasses, in construction of kaleidoscope, telescope, sextant, and periscope etc. for seeing round the corners, as deflector of light etc.
- Concave minor is used as a reflector in searchlight, head light of motor cars and projectors etc. , for converging solar radiation in solar cookers, in flood lights to obtain a divergent beam of light to illuminate buildings, in reflecting telescopes etc.
- Convex mirror is used as a rear-view mirror in motor cars, buses and scooters, as safety viewers at dangerous corners and on upper deck of double decker buses etc.

Sign Convention

- All distances are measured from the pole of the mirror.

- The distances measured in the direction of incident light, are taken as positive.
- The distances measured in opposite direction of incident light, are taken as negative.
- The distances above the principal axis are taken positive, whereas those below it are taken as negative.

Mirror Formula

When an object is placed at $2f$ (center of curvature) the image is formed at $2f$. If f be the focal length of the concave mirror, u distance of object and v the distance of image, then

$$u = -2f$$

And

$$v = -2f$$

And f can be given as,

$$\frac{1}{f} = \frac{1}{-2f} + \frac{1}{-2f}$$

Or

$$\frac{1}{f} = \frac{1}{v} = \frac{1}{u}$$

This is called mirror formula and it can also be verified for convex mirror.