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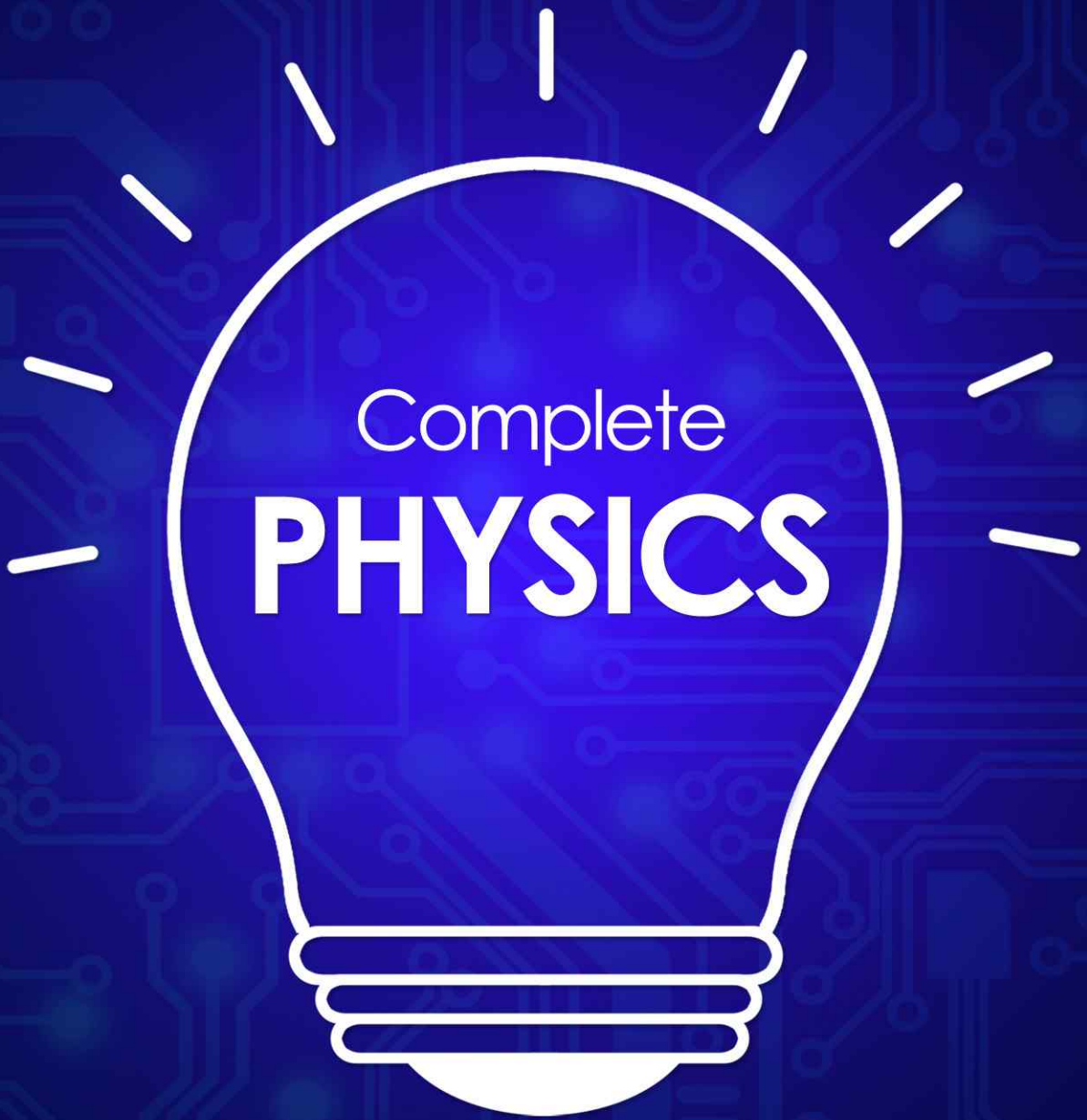


Complete PHYSICS

IIT-JEE · NEET · CBSE eBOOKS

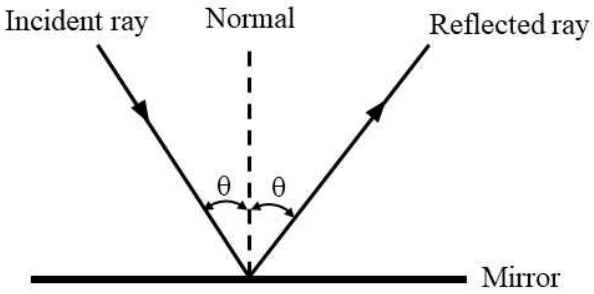
CLASS 11&12th

CLASS 12th

Ray Optics And Optical Instruments

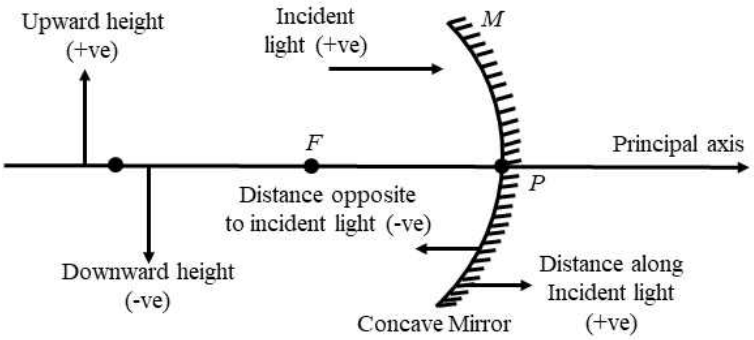
01. Reflection of Light by Spherical Mirrors

The angle of reflection (angle between reflected ray and the normal to the reflecting surface) equals the angle of incidence (Angle between incident ray and the normal). Also that the incident ray. reflected ray lie in the same plane with normal to the reflecting surface.



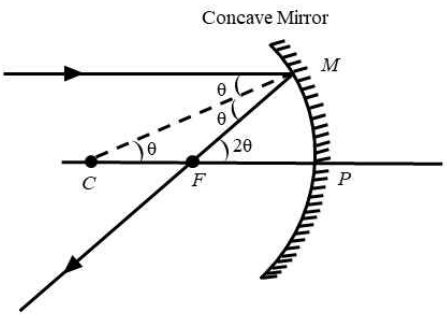
Geometric centre of a spherical mirror is called its pole while that of a spherical lens is called its optical centre.

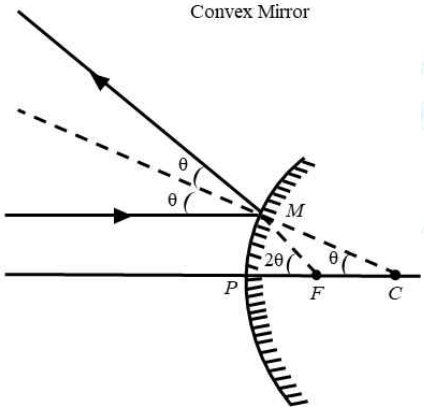
Sign Convention



P − Pole ; F − Focus ; C − Centre of Curvature
$PF = f$ = Focal length of mirror.
$CP = R$ = Radius of curvature of mirror.

02. Focal Length of Spherical Mirrors





To show $f = \frac{R}{2}$

Where, $f =$ Focal length

$=$ Distance between pole and principal focus

$R =$ Radius of curvature of mirror.

Form figure $\angle MCP = \theta$

$\angle MFP = 2\theta$

$$\tan\theta = \frac{MP}{CP};$$

$$\tan 2\theta = \frac{MP}{FP}$$

Considering when θ is small $\tan\theta \approx \theta$; $\tan 2\theta \approx 2\theta$

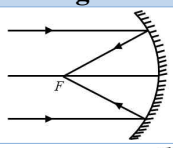
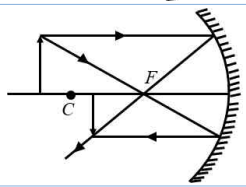
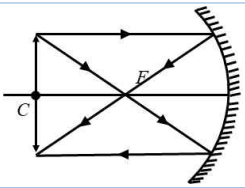
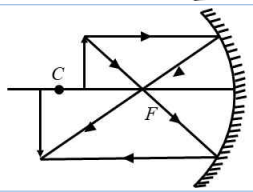
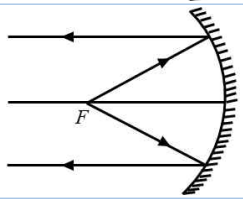
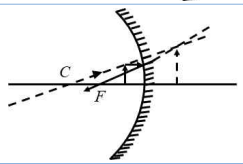
$$\therefore \quad \frac{MP}{FP} \approx \frac{2MP}{CP}$$

$$FP = \frac{CP}{2}$$

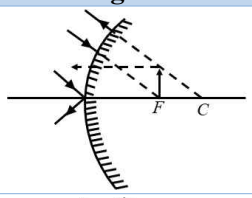
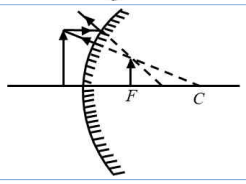
$$F = \frac{R}{2}$$

Location, size and nature of image formed by Spherical Mirrors

Concave Mirror

Position of object	Figure	Position of image	Nature of image
(i) At infinity		At the principal focus or in the focal plane	Real, inverted, extremely diminished in size
(ii) Beyond the centre of curvature		Between the principal focus and centre of curvature	Real, inverted and diminished
(iii) At the centre of curvature		At the centre of curvature	Real, inverted and equal to object
(iv) Between focus and centre of curvature		Beyond centre of curvature	Real, inverted and bigger than object
(v) At the principal focus		At infinity	Extremely magnified
(vi) Between the pole and principal focus		Behind the mirror	Virtual, erect and magnified

Convex Mirror

Position of object	Figure	Position of image	Nature of image
(i) At infinity		Appears at the principal focus	Virtual, erect and extremely diminished
(ii) Between infinity and the pole		Appears between the principal focus and the pole	Virtual, erect and diminished