

Light – Reflection

1) Laws of reflection

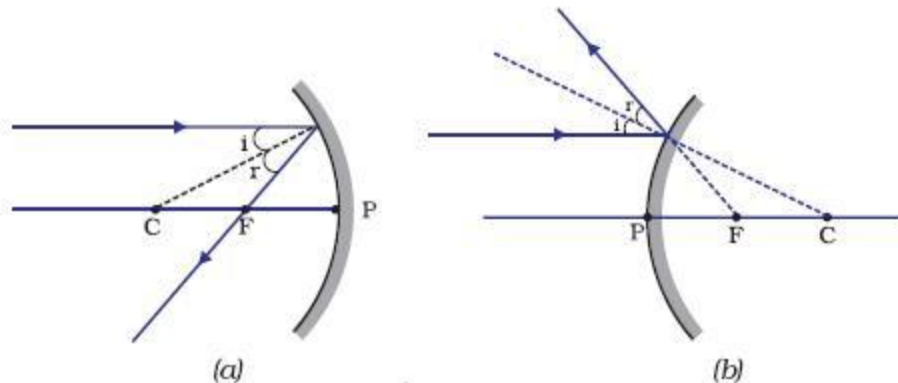
- The angle of reflection = the angle of refraction
- The incident ray, normal to the mirror, and the refracted ray – all lie in same plane

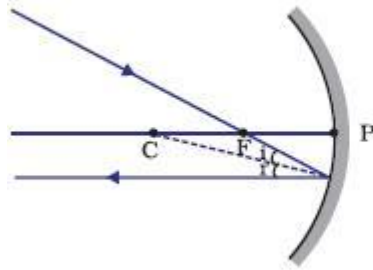
2) Spherical mirror

- Concave mirror – reflecting surface is curved inwards, faces towards centre of curvature
- Convex mirror – reflecting surface is curved outwards
- Back of the mirror is shown shaded
- Centre of curvature (C) – centre of the spherical mirror that forms a part of the concave or convex mirrors; it is not a part of the mirror.
- Pole (P) – centre of the reflecting surface of a spherical mirror
- Principal axis – the line passing through centre of curvature and the pole; it is normal to the mirror
- Aperture – the diameter of the reflecting surface of spherical mirror
- Radius of curvature (R) – It is the distance between the centre of curvature and pole of the spherical mirror; it is twice the focal length; $R = 2f$

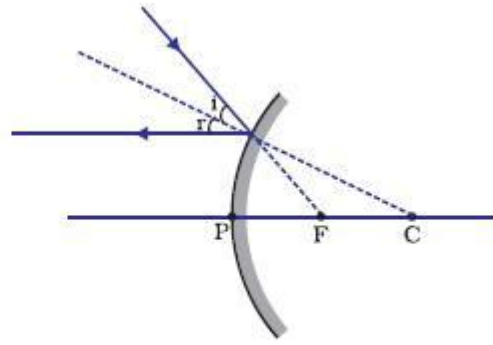
3) Ray diagrams of concave and convex mirrors

- Parallel to the principal axis
- through the principal focus
- through the centre of curvature
- incident obliquely to the principal focus

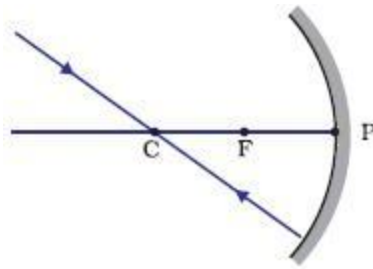




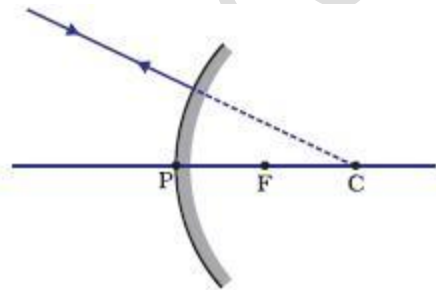
(a)



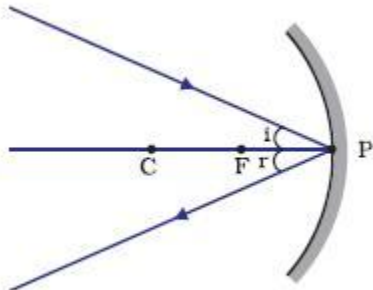
(b)



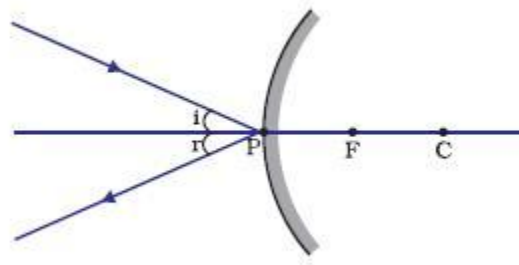
(a)



(b)



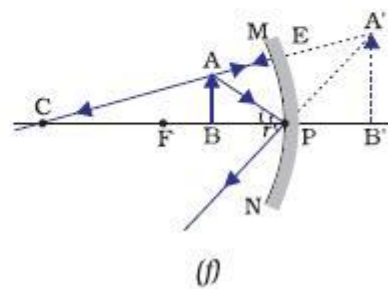
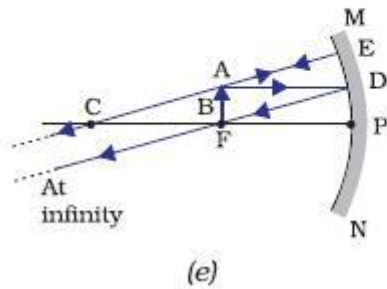
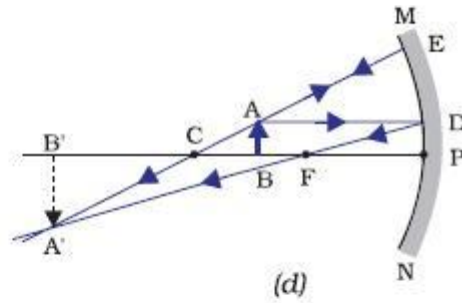
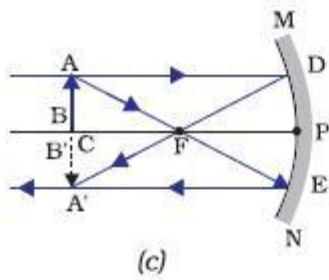
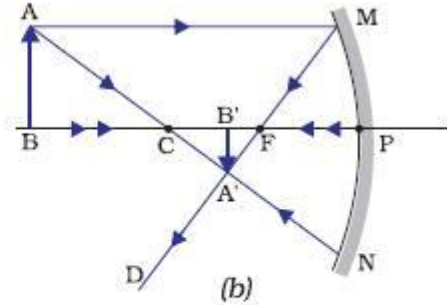
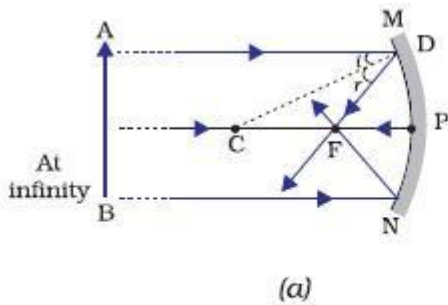
(a)



(b)

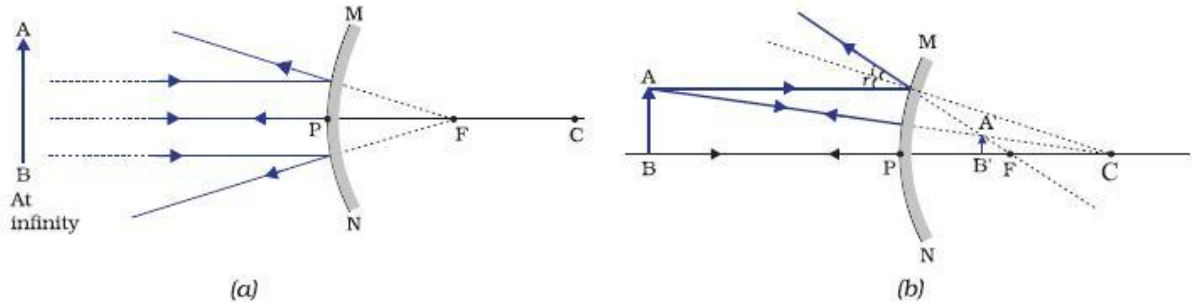
4) Image formation by concave mirror

- At infinity
- Beyond C
- At C
- Between C and F
- At F
- Between P and F



5) Image formation by convex mirror

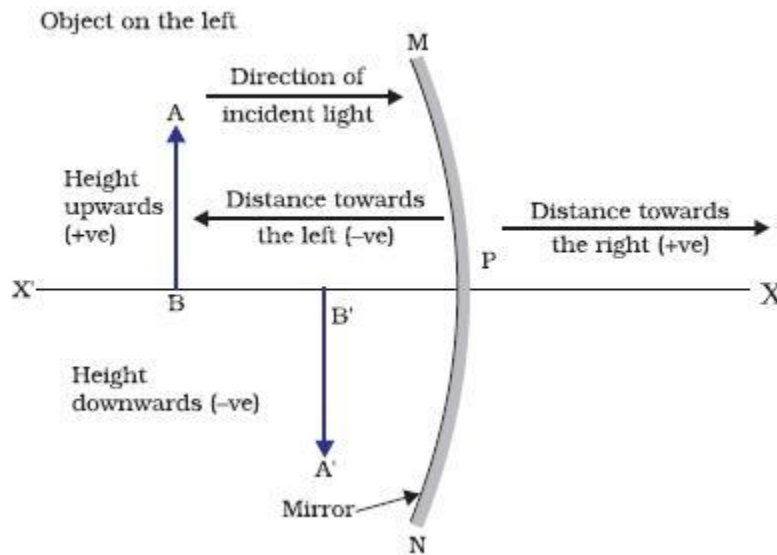
- At infinity
- Between infinity and the pole



6) Uses of concave mirrors and convex mirrors

- Uses of concave mirrors:
 - Torches
 - Search-lights
 - Vehicle headlights
 - Shaving mirrors
 - Dentist mirrors
 - Solar furnaces
- Uses of convex mirrors
 - Rear-view mirrors

7) New Cartesian Sign convention spherical mirrors



- Pole is taken as the origin
- X'X – Principal axis – the x-axis of the Cartesian coordinate system
- Object is placed to the left of the mirror
- All distances parallel to the principal axis are measured from the pole.
- Distance left to the mirror: negative (+X)
- Distance right to the mirror: positive (-X)
- Distance perpendicular to the principal axis: upward: positive (+Y) and downward: negative (-Y)

8) Mirror formula of spherical mirrors

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

9) Magnification of spherical mirrors

$$m = \frac{h'}{h} = -\frac{v}{u}$$