S. S. College, Jehanabad

(A constituent college of Magadh University Bodhgaya)

Course B.Sc(H) Physics

Subject : Optics

Faculty : Mr. M. K. Singh (Department of Physics, S. S. college)

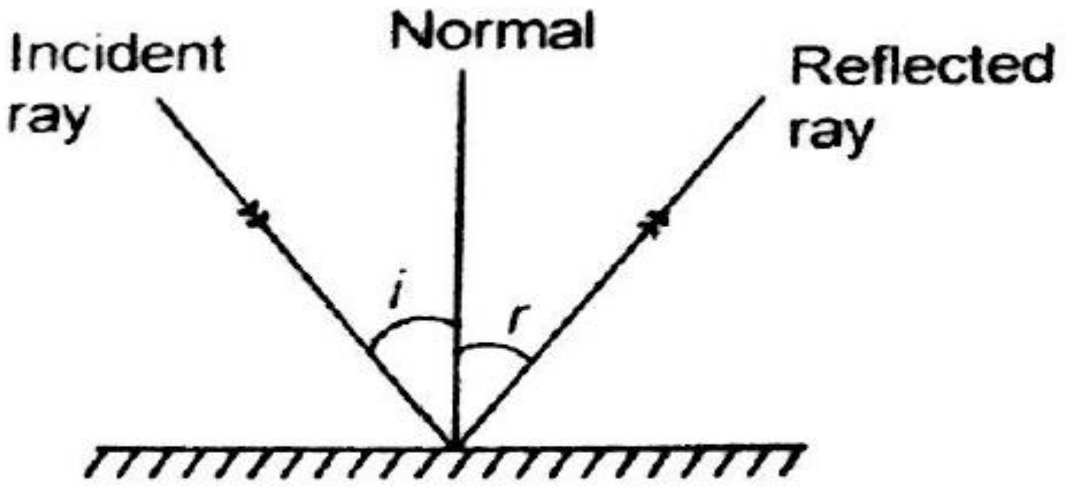
Topic : Geometric Optics

Ray optics or geometrical optics is based on following law

1. Law of rectilinear propagation of light. This law states that the light travel in straight lines in homogenous media.
2. Law of independence of light rays. It states that rays do not disturb each other,

Laws of Reflection at Smooth Surfaces

1. The incident ray, the reflected ray and the normal to the reflecting surface at the point of incidence all lie in same plane.
2. The angle of reflection r is equal to angle of incidence i i.e., $\angle i = \angle r$.

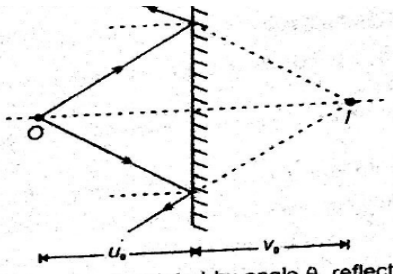


A ray moving along normal always retraces its path.

ve if $i = 0 \Rightarrow r = 0$

Plane Mirror

1. The image is laterally inverted i.e. has front back reversed.
2. The magnification is unity.
3. $|u_0| = |v_0|$
4. $\frac{du}{dt} = -\frac{dv}{dt}$, i.e. speed of object with respect to mirror is equal to speed of image with respect to mirror and if object is at rest and mirror is moving with velocity x towards object then the velocity of image will be 2x.



5. Keeping incident ray fixed, if a plane mirror is rotated by angle θ, reflected ray rotates by an angle 2θ.
6. If three mutually perpendicular mirrors are placed adjacent to each other then for a person standing in front of them.

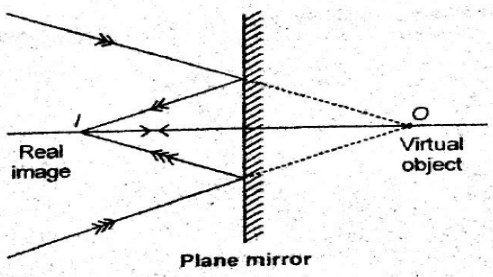
   Total number of images formed = 7
7. For two mirrors inclined at an angle 'θ'. Number of images formed by the mirrors for an object are

   (a) $\frac{360}{\theta} - 1$ if $\frac{360}{\theta}$ = even number

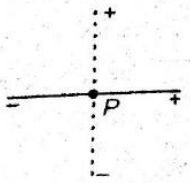
   (b) $\frac{360}{\theta} - 1$, when $\frac{360}{\theta}$ = odd and object is placed symmetrically.

   (c) $\frac{360}{\theta}$, when $\frac{360}{\theta}$ = odd and object is placed unsymmetrically.
8. If a clock show x hrs, y min, z sec when seen in a plane mirror, true time is $(11 - x)$hrs, $(59 - y)$min, $(60 - z)$second.
9. If converging rays are incident on a plane mirror, real image is obtained.

   The point at which the converging rays would converge if mirror were abscent is known as position of virtual object.



Cartesian Sign Convention



1. All distances are measured from the pole or optical centre.
2. Distances measured in the direction of incident rays are taken as positive.
3. Distances measured in the direction opposite to that of the incident rays are taken as negative.
4. Distances above the principal axis are taken as positive.
5. Distance below the principal axis are taken as negative.
6. Focal lengths of convex lens/mirror is taken to be positive and concave lens/mirror is taken to be negative.