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Reflection of light, Spherical mirrors, Mirror formula

XII- SCIENCE

SUBJECT : PHYSICS
CHAPTER NUMBER: 9
CHAPTER NAME : RAY OPTICS

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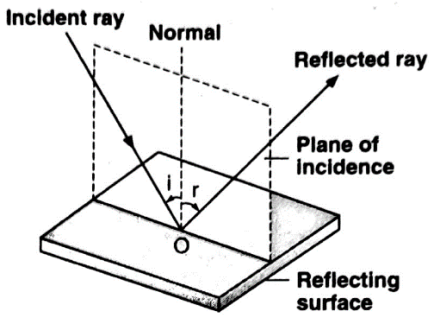
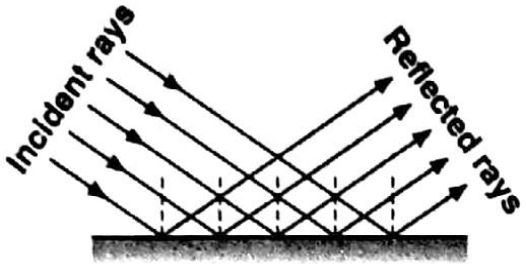
REFLECTION AT PLANE AND SPHERICAL SURFACES

- **LAWS OF REFLECTION**
- Reflection of light is the process of deflecting a beam of light. A light ray incident on a surface is described by an angle of incidence ($\angle i$). This angle is measured relative to a normal , a line perpendicular to the reflecting surface at the point of incidence (0). Similarly, the reflected ray is described by an angle of reflection ($\angle r$), also measured from the normal as shown in Fig.

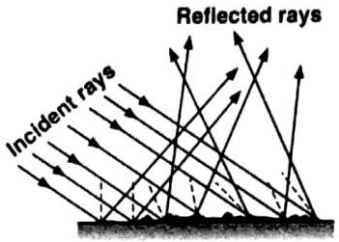


Laws of Reflection

- **Law 1 :** The incident ray, the reflected ray and the normal, all lie in the same plane, called the plane of incidence. The incident and reflected rays are on the opposite sides of the normal.
- **Law 2 :** The angle of incidence is always equal to the angle of reflection. That is, $\angle i = \angle r$
- **Regular and Irregular Reflection**



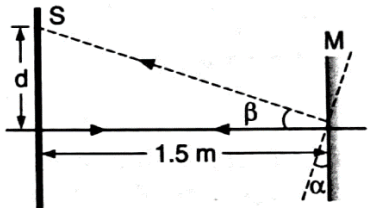
Reflecting surface is smooth and the reflected rays from parallel incident rays are also parallel.



Reflecting surface is rough and the reflected rays from parallel incident rays are not parallel.

NUMERICAL

- **Question-1:** Light incident normally on a plane mirror attached to a galvanometer coil retraces backwards as shown in Fig. A current in the coil produces a deflection of 3.5° of the mirror. What is the displacement of the reflected spot of light on a place 1.5 m away?
- **Solution:** If β is angle through which the reflected ray gets deflected when the minor M is deflected through an angle α, $\beta = 2\alpha$. As $\alpha = 3.5°$, $\beta = 2 \times 3.5° = 7°$
- Ifd is the displacement of the reflected spot of light on the screen S, then
- $\tan\beta = \frac{d}{1.5}$
- $\Longrightarrow$d= (1.5) tan 7° Thus, d=18.42 cm



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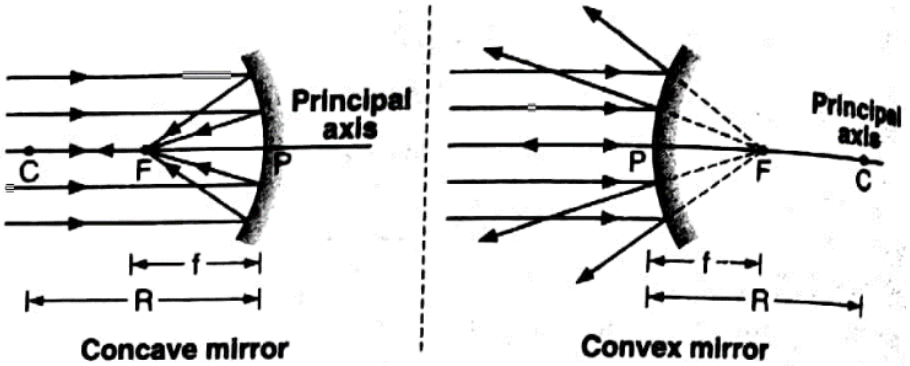
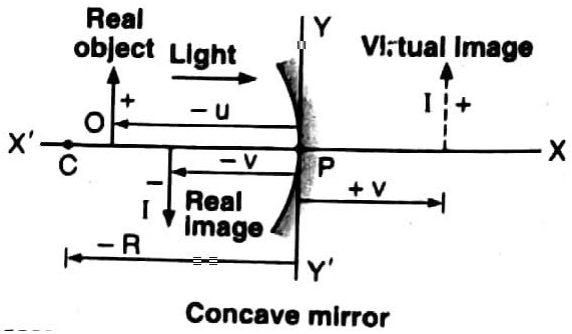
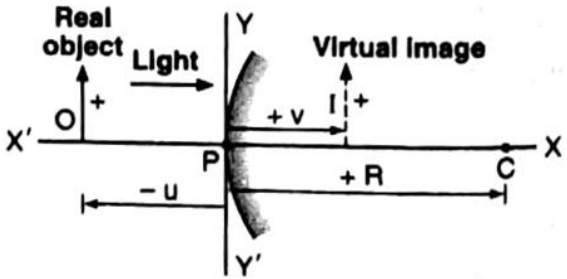
Reflection of Light by Spherical Mirrors



New Cartesian Sign Convention for Spherical Mirrors



Concave mirror



Convex mirror

		Negative (–)	Positive (+)
(i)	Radius of curvature, R	Concave	Convex
(ii)	Focal length, f	Concave	Convex
(iii)	Object distance, u	Real object	Virtual object
(iv)	Image distance, v	Real image	Virtual image
(v)	Magnification, $m\left(=-\frac{v}{u}\right)$	Real image	Virtual image

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