

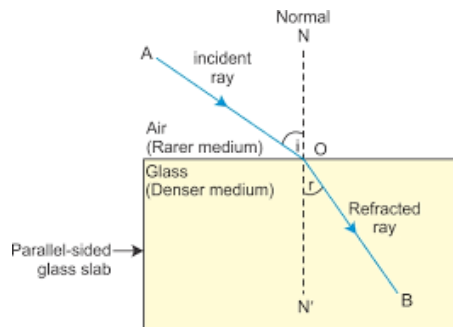
Light

1. What is Refraction of light?

Ans. The change in direction of path of light when it passes from one optically transparent medium to another, is called refraction of light.

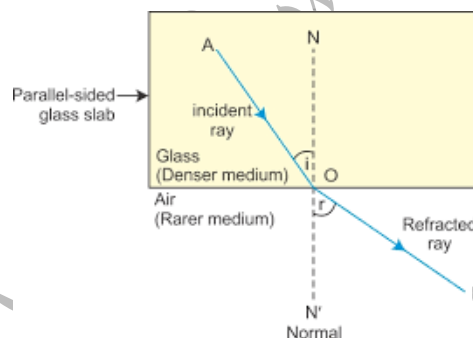
2. What happen when a ray of light travels from a rarer to denser medium?

Ans. When a ray of light passes travels from rarer to denser medium it bends toward the normal.



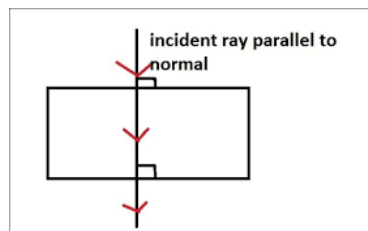
3. What happen when a ray of lights travels from denser to rarer medium?

Ans. When a ray of light travels from denser to rarer medium it bends away from the normal.



4. What happen when a ray of lights falls normally on the surface of the surface separating the two media?

Ans. When a ray of light falls normally on through surface separating two media it passes un-deviated.



5. What is Incident ray?

Ans. The ray o light falling on the surface separating the two media, is called Incident Ray.

6. What is Refracted Ray?

Ans. The ray of light is travelling in the other medium in the changed direction is called Refracted Ray.

7. What is Normal?

Ans. The perpendicular drawn on the surface separating the two media at the point where the incident ray strikes it i.e. at the point of incidence is called the Normal.

8. What is Angle of Incidence?

Ans. The angle between the incident ray and the normal is called Angle of Incidence. It is denoted by "i".

9. What is Angle of Refraction?

Ans: The angle between Refracted Ray and the Normal is called Angle of Refraction. It is denoted by "r".

10. Laws of Refraction of Light

Ans. Laws of refraction state that:

- The incident ray refracted ray, and the normal to the interface of two media at the point of incidence all lie on the same plane.
- The ratio of the sine of the angle of incidence to the sine of the angle of refraction is a constant. This is also known as Snell's law of refraction.

$$\frac{\sin i}{\sin r} = \text{Constant}$$

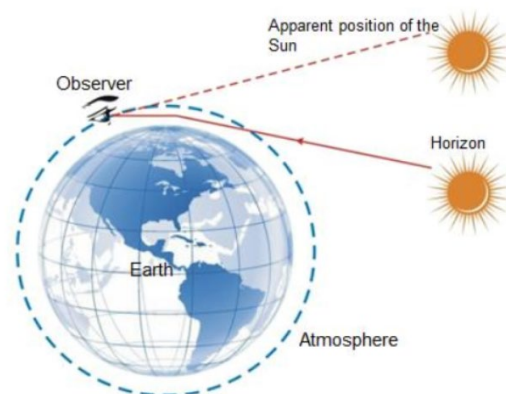
11. What are the causes of Refraction?

Ans. The cause of refraction of light is as follows:

- The frequency of the refracted ray remains constant.
- Due to partial reflection and absorption of light at the interface, the intensity of the refracted ray will be less than the incident ray.
- When the light crosses the boundary between two different media, deviation of light occurs, resulting in refraction such that there is a change in wavelength and speed of light.

12. What is the main reason behind Early Sunset and Late Sunrise?

Ans. Before Sunrise and after sunset the upper atmosphere layers are warmer than the layers near the earth surface. So, the atmosphere near the earth's surface are denser than those above. When the sun is just below the horizon, the light from the sun, while coming towards the earth, suffers refraction from the rarer to a denser layer and so it bends towards the normal at each refraction. Due to continuous bending of light rays at different successive layers the sun can be seen when its actual position is just below the horizon, as a result the sun is seen in advance, a few minutes before it rises above the horizon in the morning. Similarly, in evening the sun is seen delayed by 3 to 4 minutes longer above the horizon after the sunset.



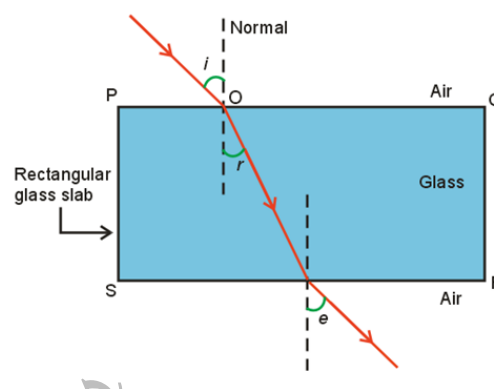
13. How can we see Mirage in a Desert?

Ans. Mirages are most common in deserts. They happen when light passes through two layers of air with different temperatures. The desert sun heats the sand, which in turn heats the air just above it. The hot air bends light rays and reflects the sky. When you see it from a distance, the different air masses colliding with each other act like a mirror. The desert ahead seems to have become a lake but it is actually a reflection of the sky above.

14. Explain the refraction of light through a glass-slab with neat ray diagram.

Ans. On entering into the glass medium light ray bends towards the normal that is light ray gets refracted on entering the glass medium. After getting refracted this ray now travels through the glass slab and comes out of the glass slab by refraction from the other interface boundary. Since ray goes from glass medium to air it again gets refracted and bends away from normal. The incident ray and the emergent ray are parallel to each other.

" i " is the angle of incidence, r is the angle of refraction and e is the angle of emergence. Angle of incidence and angle of emergence are equal as emergent ray and incident ray are parallel to each other. When a light ray is incident normally to the interface of two media then there is no bending of light ray and it goes straight through the medium.



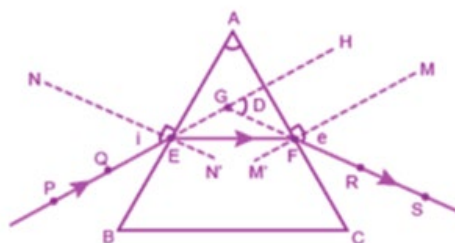
15. What is Prism?

Ans. A prism is a transparent medium bounded by five plane surfaces with triangular cross section. Two opposite surfaces of a prism are identical and parallel triangle. While the other three surfaces are rectangle and inclined on each other.

16. How refraction of light through Prism?

Ans. In the figure above, A is the angle of the prism.

- As per Snell's law, light travelling from a rarer medium to a denser medium bends towards the normal, and vice versa. Glass is denser than air, and thus, when a ray of light falls on the surface of the prism, it bends towards the normal. According to the diagram, ray PE falls on the surface of the prism and bends towards the normal NE.



PE - Incident ray
EF - Refracted ray
FS - Emergent ray
A - Angle of the prism
 $\angle i$ - Angle of incidence
 $\angle r$ - Angle of refraction
 $\angle e$ - Angle of emergence
 $\angle D$ - Angle of deviation

- Then, while moving from the glass to air, the emergent ray FS bends away from the normal.
- $\angle HDS$ is the angle of deviation which tells us how much the emergent ray has deviated from the incident ray. When the angle of incidence is equal to the angle of emergence, the angle of deviation is minimum.
- According to the figure, $\angle PEN = \angle MES$ and $\angle HDS$ is thus the angle of minimum deviation. The refracted ray EF is parallel to side BC in this case.

17. What is Dispersion of Light?

Ans. When white light is passed through a prism, it splits into different colours. This is called Dispersion of Light.

18. What is the cause of dispersion of white light as it passes through a prism?

Ans. Dispersion occurs due to the different degrees of refraction experienced by different colours of light. Light of different colours may travel with the same speed in a vacuum, but they travel at different speeds in some refracting medium. The speed of violet light is relatively lower than that of red light. Therefore, the refractive index of the medium is largest for violet light and the refractive index is least for red light (in the visible spectrum). As a result, the refraction or bending of violet coloured light is the maximum and that of red coloured light is minimum. This difference in the extent of bending of different colours of light results in the dispersion of white light into its constituent colours as they emerge from a prism.

19. Write the example of Refraction.

Ans.

- Formation of a rainbow is an example of refraction as the sun rays bend through the raindrops resulting in the rainbow.
- Prism is also an example of refraction.

20. What is Curved Mirror?

Ans. A curved Mirror is that mirror whose reflecting surface is the part of a hollow sphere of glass.

The inside surface of a hollow sphere of glass is "bent-in" or "Concave" but the outside surface of a hollow sphere of glass is "bulging-out" or "Convex".

21. Curved mirror are how many types?

Ans. Curved Mirror are two types

- a. Concave Mirror
- b. Convex Mirror

22. Draw a diagram of Concave Mirror and Convex Mirror

Ans.



23. What is Focus?

Ans. It is any point, where light rays parallel to the principal axis, will converge after reflecting from the mirror.

24. What is Pole?

Ans. Pole is the midpoint of a mirror. It's twice the focus.

25. What is Aperture?

Ans. It is a point from which the reflection of light actually happens.

26. What is Radius of Curvature?

Ans. It is the distance between Pole and the centre of curvature.

27. What is Centre of Curvature?

Ans. The Centre of Curvature of a spherical mirror is the point in the centre of the mirror which passes through the curve of the mirror and has the same tangent and curvature at that point.

28. What is Principal axis?

Ans. An imaginary line passing through the optical centre and the centre of curvature of the spherical mirror.

29. What is the use of Convex Mirror?

Ans. Convex mirrors are widely used for making magnifying glasses. In order to make a magnifying glass, two convex mirrors are placed back to back.

30. What are the uses of Concave Mirror?

Ans.

- Concave mirrors are used in optical instruments such as Ophthalmoscope. Ophthalmoscope consists of a concave mirror with a hole in the centre. The doctor focuses through the small hole from behind the concave mirror while a light beam is directed into the pupil of the patient's eye. This makes the retina visible and makes it easy for doctors to check.
- Concave mirrors are also used in making astronomical telescopes. In an astronomical telescope, a concave mirror of a diameter of 5 meters or more is used as the objective.
- Concave mirrors are widely used in headlights of automobiles and motor vehicles, torchlights, railway engines, etc. as reflectors. The light source is placed at the focus of the mirror, so after reflecting the light rays travel over a huge distance as parallel light beams of high intensity.
- Large concave mirrors are used to focus sunlight to produce heat in the solar furnace. They are also used in solar ovens to collect a large amount of solar energy in the focus of the concave mirror for heating, cooking, melting metals, etc.

31. What is the difference between Concave and Convex Mirror?

Ans.

Sl. No.	Differentiating Property	Concave Mirror	Convex Mirror
1	Meaning and Other Names	<ul style="list-style-type: none">Concave means rounded or hollowed like the interior of a circle or sphereAlso called as a converging mirror.	<ul style="list-style-type: none">Convex means rounded or curved like the exterior of a circle or sphere.Also called as a fish eye or diverging mirror.
2	Structure	<ul style="list-style-type: none">The mirror coating of the concave mirror is on the outside of the spherical surface.In concave mirrors, the centre of curvature and the reflecting surface fall on the same side of the mirror.	<ul style="list-style-type: none">The mirror coating of the convex mirror is on the inside of the spherical surface.In convex mirrors, the centre of curvature and the reflecting surface fall on the opposite side of the mirror.
3	Position of the Focus	<ul style="list-style-type: none">Focus lies in front of the mirror i.e. focal length, is positive.	<ul style="list-style-type: none">The focus lies behind the mirror i.e. focal length is negative.
4	Image Properties	<ul style="list-style-type: none">The image formed by a concave mirror is real, inverted and enlarged (except when the object is between P and F where the image is virtual, erect and enlarged).	<ul style="list-style-type: none">The image formed by a convex mirror is virtual, erect and diminished.
5	Image Projection	<ul style="list-style-type: none">An image can be projected on a screen as they are real.	<ul style="list-style-type: none">Image cannot be projected on a screen as they are virtual.
6	Usage	<ul style="list-style-type: none">They are used in reflecting telescopes, shaving mirrors, torchlights, etc. as they give a magnified image of the objects.	<ul style="list-style-type: none">Convex mirrors are used as side view or rear-view mirrors in vehicles as they cover a wider area of view.

32. What is Real Image?

Ans. If the reflected rays actually meet at a point the image is real.

A real image can be obtained on a screen.

33. What is Virtual Image?

Ans. If the reflected rays appear to meet at a point when produced backwards the image is Virtual.

Virtual Image cannot be taken on a screen.

34. What is the difference between Real Image and Virtual Image?

Ans.

Real Image	Virtual Image
A real image is formed when the reflected rays actually meet at a point	A virtual image is formed when the reflected rays meet on producing them backwards
It is inverted	It is upright.
It can be obtained on a screen.	It cannot be obtained on a screen.

35. Formation of different type of Images by Concave Mirror

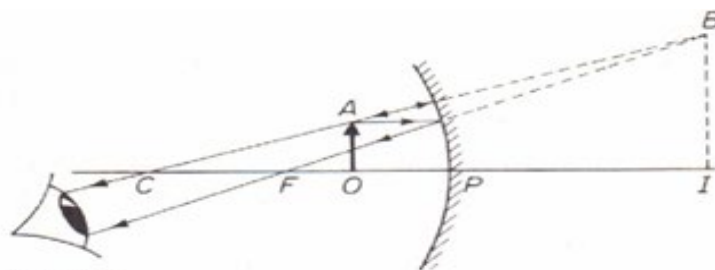


Fig. 22.4.

OBJECT BETWEEN F and P

the image is,

- (1) Behind the mirror
- (2) Virtual
- (3) Erect
- (4) Larger than object

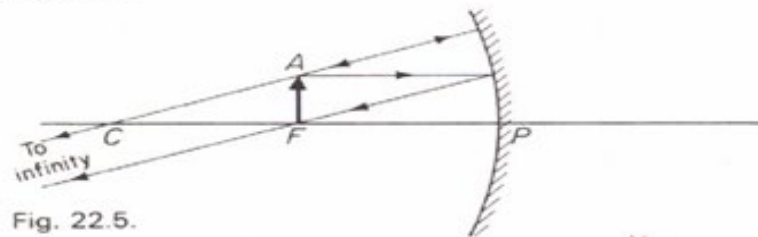


Fig. 22.5.

OBJECT AT F

the image is at infinity

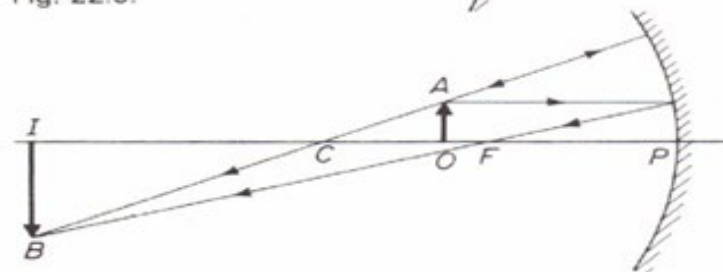


Fig. 22.6.

OBJECT BETWEEN F and C

the image is,

- (1) Beyond C
- (2) Real
- (3) Inverted
- (4) Larger than object

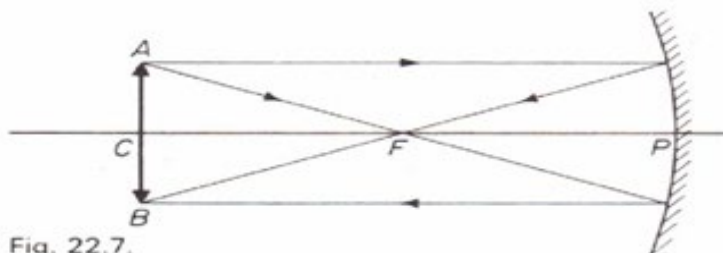


Fig. 22.7.

OBJECT AT C

the image is,

- (1) At C
- (2) Real
- (3) Inverted
- (4) Same size as object

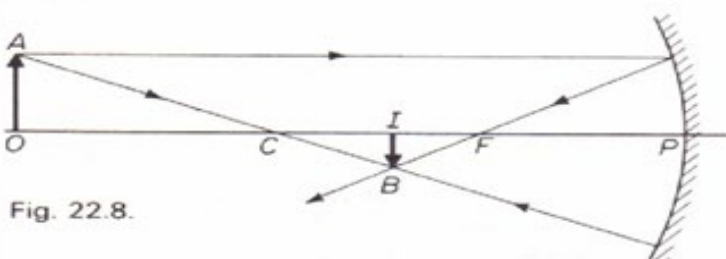
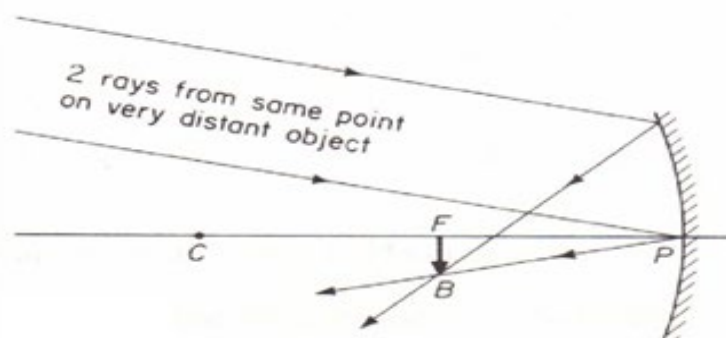


Fig. 22.8.

OBJECT BEYOND C

the image is,

- (1) Between C and F
- (2) Real
- (3) Inverted
- (4) Smaller than object



OBJECT AT INFINITY

the image is,

- (1) At F
- (2) Real
- (3) Inverted
- (4) Smaller than object

36. What are the rules for obtaining image formed by Convex Mirror?

Ans. Rule1. If the incident ray parallel to principal axis, then the refracted ray passes through focus (F).

Rule2. If the incident ray passes through the focus, the refracted ray becomes parallel to principal axis.

Rule3. A ray of light passing through the optical centre of lens passes through the lens undeviating.

Explanation:

Pos. of Object	Pos. of Image	Rel. size of Image	Nature of Image
At infinity	At F	Highly Diminished	Real & inverted
Beyond 2F	Between F & 2F	Diminished	Real & inverted
At 2F	At 2f	Same size	Real & inverted
Between 2F & F	Beyond 2F	Enlarged	Real & inverted
At F	At infinity	Highly enlarged	Real & inverted
B/w infinity & c	B/w infinity & c	Enlarged	Virtual & erect