1.

An incident ray makes an angle of 35° with the surface of a plane mirror. What is the angle of reflection ?
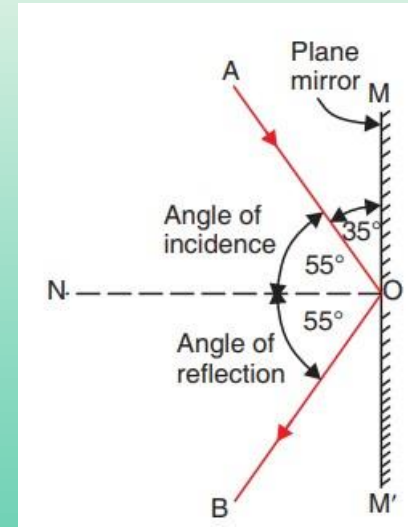
Solution.

the incident ray makes an angle of 35° with the surface of the mirror , so the angle of incidence is not 35°.

The angle of incidence is the angle between incident ray and normal.

So, in this case, the angle of incidence will be 90° – 35°= 55°.

Since the angle of incidence is 55 degrees, therefore,

the angle of reflection is also 55 degrees.

2.

The rear view mirror of a car is a plane mirror. A driver is reversing his car at a speed of 2 m/s. The driver sees in his rear view mirror, the image of a truck parked behind his car. The speed at which the image of the truck appears to approach the driver will be : (a) 1 m/s (b) 2 m/s (c) 4 m/s (d) 8 m/s

Solution.

when the car reverses at a speed of 2 m/s, then the image will also appear to move towards the mirror at the same speed of 2 m/s. So, the speed at which the image of truck appears to approach the car driver will be 2 m/s + 2 m/s = 4 m/s.

3.
A ray of light is incident normally on a plane mirror. What will be the :
(a) angle of incidence ?
(b) angle of reflection

4.
What is the difference between a real image and a virtual image ? Give one example of each type of image.

5.
What is lateral inversion ? Explain by giving a suitable example.

6.
What is meant by 'reflection of light' ? Define the following terms used in the study of reflection of light by drawing a labelled ray-diagram : (a) Incident ray (b) Point of incidence (c) Normal (d) Reflected ray (e) Angle of incidence (f) Angle of reflection

7.
What type of image/images are formed by :
(a) a convex mirror ?
(b) a concave mirror ?

8.
Name the spherical mirror which can produce a real and diminished image of an object.

9.
Name the spherical mirror which can produce a virtual and diminished image of an object.

10.
(a) Draw a labelled ray diagram to show the formation of image of an object by a convex mirror. Mark
clearly the pole, focus and center of curvature on the diagram.
(b) What happens to the image when the object is moved away from the mirror gradually ?
(c) State three characteristics of the image formed by a convex mirror.

11.
(a) Draw a labelled ray diagram to show the formation of image in a convex mirror when the object is at
infinity. Mark clearly the pole and focus of the mirror in the diagram.
(b) State three characteristics of the image formed in this case.
(c) Draw diagram to show how a convex mirror can be used to give a large field of view.

12.
An object is kept at a distance of 5 cm in front of a convex mirror of focal length 10 cm. Calculate the position and magnification of the image and state its nature.

13.
Draw a diagram to represent a convex mirror. On this diagram mark principal axis, principal focus F and the center of curvature C if the focal length of convex mirror is 3 cm.

14.
According to the "New Cartesian Sign Convention" for mirrors, what sign has been given to the focal length
of :
 (i) a concave mirror ?
(ii) a convex mirror ?

15.
Describe the New Cartesian Sign Convention used in optics. Draw a labelled diagram to illustrate this sign convention.

16.
If the magnification of a body of size 1 m is 2, what is the size of the image ?

17
State the relation between object distance, image distance and focal length of a spherical mirror (concave mirror or convex mirror).

18.
Write down a formula for the magnification produced by a concave mirror. (a) in terms of height of object and height of image (b) in terms of object distance and image distance.

19.
If an object of 10 cm height is placed at a distance of 36 cm from a concave mirror of focal length 12 cm, find the position, nature and height of the image.

20.
A converging mirror forms a real image of height 4 cm of an object of height 1 cm placed 20 cm away from the mirror : (i) Calculate the image distance. (ii) What is the focal length of the mirror ?

21.
 (a) An object is placed just outside the principal focus of concave mirror. Draw a ray diagram to show how the image is formed, and describe its size, position and nature.

 (b) If the object is moved further away from the mirror, what changes are there in the position and size of the image ?

22.
What is meant by 'refraction of light' ? Draw a labelled ray diagram to show the refraction of light.

23.
Light enters from air into a glass plate having refractive index 1.50. What is the speed of light in glass ? (The speed of light in vacuum is $3×10^8$ m/ s–1).

Solution

Refractive index of glass $=$ $\dfrac{\text{Speed of light in air}}{\text{Speed of light in glass}}$

or Speed of light in glass $=$ $\dfrac{3 \times 10^8}{1.50}$ ms^{-1}

$= \mathbf{2 \times 10^8}$ ms^{-1}

24.
The refractive indices of kerosene, turpentine and water are 1.44, 1.47 and 1.33, respectively. In which of these materials does light travel fastest ?

Solution

Refractive index $=$ $\dfrac{\text{Speed of light in air}}{\text{Speed of light in medium}}$

$$\text{Speed of light in medium} = \frac{\text{Speed of light in air}}{\text{Refractive index}}$$

out of kerosene, turpentine and water, water has the lowest refractive index of 1.33. So, the light will have maximum speed in water or light will travel fastest in water.

26.
State and explain the laws of refraction of light with the help of a labelled diagram.

27.
What is meant by the refractive index of a substance ?

28. . **A 1 cm high object is placed at a distance of 2f from a convex lens. What is the height of the image formed ?**

29. What is a lens ? Distinguish between a convex lens and a concave lens. Which of the two is a converging lens : convex lens or concave lens ?

30.
Draw a ray diagram to show the formation of a real magnified image by a convex lens.

31.
Describe with the help of a ray diagram the nature, size and position of the image formed when an object is placed in front of a convex lens between focus and optical centre. State three characteristics of the image formed.

32.
An object is placed at a distance equal to 2f in front of a convex lens. Draw a labelled ray diagram to show the formation of image. State two characteristics of the image formed.

33.
Where must the object be placed for the image formed by a converging lens to be : (a) real, inverted and smaller than the object ? (b) real, inverted and same size as the object ? (c) real, inverted and larger than the object ? (d) virtual, upright and larger than the object ?

34.
Write the formula for a lens connecting image distance (v), object distance (u) and the focal length (f). How does the lens formula differ from the mirror formula ?

35.
What is the nature of the image formed by a convex lens if the magnification produced by the lens is +3 ?

36.
Describe the nature of image formed when an object is placed at a distance of 30 cm from a convex lens of focal length 15 cm.

37.
A small object is so placed in front of a convex lens of 5 cm focal length that a virtual image is formed at a distance of 25 cm. Find the magnification.

38.
An object is placed at a distance of 100 cm from a converging lens of focal length 40 cm. (i) What is the nature of image ? (ii) What is the position of image ?

39.
An object 5 cm high is held 25 cm away from a converging lens of focal length 10 cm. Find the position, size and nature of the image formed. Also draw the ray diagram.

40
If the image formed by a lens is always diminished and erect, what is the nature of the lens ?

41.
A ray of light is going towards the focus of a concave lens. Draw a ray diagram to show the path of this ray of light after refraction through the lens.

42.
An object lies at a distance of 2f from a concave lens of focal length f. Draw a ray-diagram to illustrate the image formation.

43.
Give the position, size and nature of image formed by a concave lens when the object is placed : (a) anywhere between optical center and infinity. (b) at infinity.

44.
The lens A produces a magnification of, – 0.6 whereas lens B produces a magnification of + 0.6. (a) What is the nature of lens A ? (b) What is the nature of lens B ?

45.
A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens ? Draw the ray-diagram.

46.
An object is placed 20 cm from (a) a converging lens, and (b) a diverging lens, of focal length 15 cm. Calculate the image position and magnification in each case.

47.
Define 1 dioptre power of a lens.

48.
Which type of lens has (a) a positive power, and (b) a negative power ?

49.
The focal length of a convex lens is 25 cm. What is its power ?

50.
The optician's prescription for a spectacle lens is marked + 0.5 D. What is the : (a) nature of spectacle lens ? (b) focal length of spectacle lens ?

51.
A convex lens of power 5 D and a concave lens of power 7.5 D are placed in contact with each other. What is the : (a) power of this combination of lenses ? (b) focal length of this combination of lenses ?

52.

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