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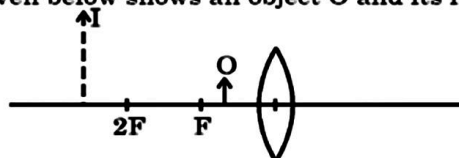
Chapter 10 : Light – Reflection and Refraction

1. The laws of reflection hold true for :
(a) plane mirrors only (b) concave mirrors only
(c) convex mirrors only (d) all reflecting surfaces 1
2. When an object is kept within the focus of a concave mirror, an enlarged image is formed behind the mirror. This image is :
(a) real (b) inverted
(c) virtual and inverted (d) virtual and erect 1
3. It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm. 3
(i) What should be the range of the object distance in the above case?
(ii) Will the image be smaller or larger than the object? Draw a ray diagram to show the formation of image in this case.
(iii) Where will the image of this object be, if it is placed 24 cm in front of the mirror?
4. (i) A lens produces a magnification of -0.5. Is this a converging or diverging lens? If the focal length of the lens is 6 cm, draw a ray diagram showing the image formation in this case. 5
(ii) A girl was playing with a thin beam of light from a laser torch by directing it from different directions on a convex lens held vertically. She was surprised to see that in a particular direction, the beam of light continues to move along the same direction after passing through the lens. State the reason for her observation. Draw a ray diagram to support your answer.
5. (i) On entering in a medium from air, the speed of light becomes half of its value in air. Find the refractive index of that medium with respect to air?
(ii) A glass slab made of a material of refractive index n_1 is kept in a medium of refractive index n_2 .
A light ray is incident on the slab. Draw the path of the rays of light emerging from the glass slab, if (i) $n_1 > n_2$ (ii) $n_1 = n_2$ (iii) $n_1 < n_2$

6. Differentiate between a glass slab and a glass prism. What happens when a narrow beam of (i) a monochromatic light, and (ii) white light passes through (a) glass slab and (b) glass prism? 3
7. Draw a ray diagram in each of the following cases to show the formation of image, when the object is placed :
 (i) between optical centre and principal focus of a convex lens.
 (ii) anywhere in front of a concave lens.
 (iii) at $2F$ of a convex lens.
 State the signs and values of magnifications in the above mentioned cases (i) and (ii). 5
8. An object 4.0 cm in size, is placed 25.0 cm in front of a concave mirror of focal length 15.0 cm.
 (i) At what distance from the mirror should a screen be placed in order to obtain a sharp image?
 (ii) Find the size of the image.
 (iii) Draw a ray diagram to show the formation of image in this case. 5
9. What happens after refraction, when :
 (i) a ray of light parallel to the principal axis passes through a concave lens ?
 (ii) a ray of light falls on a convex lens while passing through its principal focus ?
 (iii) a ray of light passes through the optical centre of a convex lens ? 3
10. (a) A concave mirror of focal length 10 cm can produce a magnified real as well as virtual image of an object placed in front of it. Draw ray diagrams to justify this statement.
 (b) An object is placed perpendicular to the principal axis of a convex mirror of focal length 10 cm. The distance of the object from the pole of the mirror is 10 cm. Find the position of the image formed. 5

11. (a) Define the following terms :
 (i) Power of a lens
 (ii) Principal focus of a concave mirror
 (b) Write the relationship among the object distance (u), image distance (v) and the focal length (f) of a
 (i) Spherical lens
 (ii) Spherical mirror
 (c) An object is placed at a distance of 10 cm from optical centre of a convex lens of focal length 15 cm. Draw a labelled ray diagram to show the formation of image in this case. 5

12. The diagram given below shows an object O and its image I.



Without actually drawing the ray diagram, state the following :

- (i) Type of lens (Converging / Diverging)
 (ii) Name two optical instruments where such an image is obtained.
 (iii) List three characteristics of the image formed if this lens is replaced by a concave mirror of focal length 'f' and an object is placed at a distance 'f/2' in front of the mirror. 3
13. (a) A security mirror used in a big showroom has radius of curvature 5 m. If a customer is standing at a distance of 20 m from the cash counter, find the position, nature and size of the image formed in the security mirror.
 (b) Neha visited a dentist in his clinic. She observed that the dentist was holding an instrument fitted with a mirror. State the nature of this mirror and reason for its use in the instrument used by dentist. 5
14. Rishi went to a palmist to show his palm. The palmist used a special lens for this purpose.
 (i) State the nature of the lens and reason for its use.
 (ii) Where should the palmist place/hold the lens so as to have a real and magnified image of an object ?
 (iii) If the focal length of this lens is 10 cm and the lens is held at a distance of 5 cm from the palm, use lens formula to find the position and size of the image. 5

15. A concave mirror is used for image formation for different positions of an object. What inferences can be drawn about the following when an object is placed at a distance of 10 cm from the pole of a concave mirror of focal length 15 cm ?

- (a) Position of the image
 (b) Size of the image
 (c) Nature of the image

Draw a labelled ray diagram to justify your inferences. 3

16. The refractive index of a medium 'x' with respect to a medium 'y' is $\frac{2}{3}$ and the refractive index of medium 'y' with respect to medium 'z' is $\frac{4}{3}$. Find the refractive index of medium 'z' with respect to medium 'x'. If the speed of light in medium 'x' is $3 \times 10^8 \text{ ms}^{-1}$, calculate the speed of light in medium 'y'. 3

17. Draw ray diagram in each of the following cases to show what happens after reflection to the incident ray when
- (a) it is parallel to the principal axis and falling on a convex mirror.
 - (b) it is falling on a concave mirror while passing through its principal focus.
 - (c) it is coming oblique to the principal axis and falling on the pole of a convex mirror.
- 3

18. (a) Draw a labelled ray diagram to show the path of a ray of light incident obliquely on one face of a glass slab.
- (b) Calculate the refractive index of the material of a glass slab. Given that the speed of light through the glass slab is $2 \times 10^8 \text{ m/s}$ and in air is $3 \times 10^8 \text{ m/s}$.
- (c) Calculate the focal length of a lens, if its power is -2.5 D . 5

19. (a) Define the principal focus of a concave mirror. It is desired to obtain an erect image of an object using a concave mirror of focal length 12 cm. What should be the range of the object distance in the above case ?
- (b) Why do we prefer a convex mirror as a rear-view mirror in vehicles ? List two reasons. 3

20. An object is kept at a distance of 30 cm in front of a concave mirror of focal length 20 cm. Use mirror formula to determine the position and magnification of the image produced. 3

21. An object is kept at a distance of 18 cm in front of a convex lens of focal length 12 cm. Use lens formula to determine the image distance and magnification of the image produced. 3