Section A

I. Multiple Choice Questions:

1. Which of the following is NOT a property of light?

a) Light travels in a straight line
b) Light is a form of energy
c) Light travels faster in water than in air
d) Light can be reflected

2. What image is formed by a concave mirror when an object is placed beyond its focus?

a) Virtual, erect, and diminished
b) Virtual, inverted, and magnified
c) Real, inverted, and diminished
d) Real, inverted, and magnified

3. A convex mirror always forms an image that is:

a) Real, inverted, and diminished
b) Real, erect, and magnified
c) Virtual, erect, and diminished
d) Virtual, inverted, and magnified

4. What is dispersion of light?

a) Splitting of light into its components
b) Reflection of light on a surface
c) Refraction of light through a prism
d) Absorption of light by an object

5. What type of mirror is used in car headlights to produce a parallel beam of light?

a) Concave mirror b) Convex mirror c) Plane mirror d) None of the above

6. What happens when light passes through a convex lens?

a) It bends away from the optical axis
b) It bends toward the optical axis
c) It passes through without bending
d) It forms a virtual image at infinity

7. A rainbow is formed due to:

a) Reflection of light
b) Refraction and dispersion of light
c) Scattering of light
d) Absorption of light

8. The color of an object is determined by:

a) The wavelength of light it absorbs
b) The color of light it reflects
c) The color of light it emits
d) The wavelength of light it refracts

9. Which type of mirror is used in rear-view mirrors of vehicles?

a) Concave mirror b) Convex mirror

c) Plane mirror d) None of the above

10. Which of the following is true for a plane mirror?

a) It forms a real and inverted image b) It forms a real and upright image

c) It forms a virtual and upright image d) It forms a virtual and inverted image

11. In which of the following mediums does light travel the fastest?

a) Air b) Water c) Glass d) Vacuum

12. What type of mirror is used in a magnifying mirror for shaving or makeup?

a) Concave mirror b) Convex mirror

c) Plane mirror d) None of the above

13. Which of the following will cause a decrease in the intensity of light as it travels?

a) Reflection b) Scattering c) Refraction d) Dispersion

14. Which of the following best describes the nature of the image formed by a convex lens when the object is placed beyond 2F (twice the focal length)?

a) Virtual, upright, and magnified b) Real, inverted, and diminished

c) Real, upright, and magnified d) Virtual, inverted, and diminished

15. Which of the following is true about the focal point of a concave mirror?

a) It is behind the mirror b) It is in front of the mirror

c) It is at the surface of the mirror d) It is always at infinity

16. Which of the following best explains the reason we see the Sun as yellow instead of white?

a) Refraction of sunlight b) Scattering of sunlight

c) Absorption of sunlight d) Reflection of sunlight

17. In a convex lens, if the object is at the focus, where will the image form?

a) At infinity
b) At the focal point
c) At the center of curvature
d) At a distance beyond the focus

18. What does a convex lens do to parallel light rays?

a) It causes them to converge
b) It causes them to diverge
c) It passes them through without bending
d) It forms a virtual image

19. What type of lens is used in microscopes?

a) Concave lens b) Convex lens c) Bifocal lens d) Cylindrical lens

20. What does the term 'focal length' refer to in a lens?

a) The distance between the lens and the object
b) The distance between the lens and the image
c) The distance from the center of the lens to the focal point
d) The distance between the two focal points

21. Which of the following devices uses a concave mirror to focus light?

a) Flashlight
b) Rearview mirror
c) Car side mirror
d) Solar cooker

22. Which of the following is responsible for the formation of a mirage?

a) Reflection b) Refraction c) Diffraction d) Dispersion

23. What is the role of a biconvex lens in a magnifying glass?

a) It diverges light rays
b) It converges light rays to a point
c) It produces a diminished image
d) It reflects light rays

24. Which of the following is true about the image formed by a convex lens when the object is placed between the focal point and the lens?

a) The image is real and diminished
b) The image is virtual and magnified
c) The image is real and magnified
d) The image is virtual and diminished

25. What type of image does a concave lens form when an object is placed at any distance?

a) Virtual, diminished, and upright
b) Virtual, magnified, and inverted
c) Real, diminished, and upright
d) Real, magnified, and inverted

26. What is the focal length of a concave lens?

a) Positive b) Negative c) Zero d) Infinite

27. What is the effect of increasing the angle of incidence in refraction?

a) The light ray bends less
b) The light ray bends more
c) The light ray slows down
d) The light ray speeds up

28. What happens when a ray of light strikes a convex mirror at the focal point?

a) The light ray is reflected back to the focus
b) The light ray passes straight through the mirror
c) The light ray diverges and never meets
d) The light ray is reflected parallel to the principal axis

29. When light passes through a prism, the angle of deviation depends on:

a) The angle of incidence
b) The thickness of the prism
c) The refractive index of the prism
d) The color of the light

30. The focal length of a convex lens is:

a) Positive b) Negative c) Zero d) Infinite

31. Which of the following types of lens is thicker at the edges than in the middle?

a) Convex lens b) Concave lens c) Biconvex lens d) Plano-convex lens

32. Which of the following is the correct sequence of colors in the visible spectrum, from longest to shortest wavelength?

a) Violet, blue, green, yellow, orange, red
b) Red, orange, yellow, green, blue, violet
c) Green, yellow, orange, red, blue, violet
d) Red, green, blue, yellow, violet, orange

33. Lateral shift varies inversely to:

a) Wavelength b) Refractive index c) Incident angle d) None of these

34. The twinkling of stars is due to the effect of

a) Refraction b) Reflection c) Absorption d) All of these

Section B

II. Fill in the blanks:

(a) Water is optically_____ than air.

(b) Air is optically _____ than glass.

(c) When a ray of light travels from water to air, it bends _____ the normal.

(d) When a ray of light travels from air to glass, it bends _____the normal.

(e) When white light passes through a prism, it _____.

(f) The splitting of white light into its constituent colors is called _____.

(g) A _____ mirror is obtained on silvering the outer surface of a part of a hollow glass sphere.

(h) Radius of curvature of a spherical mirror is _____its focal length.

(i) The angle of incidence for a ray of light passing through the center of curvature of a spherical mirror is _____.

(j) A _____ mirror always forms a virtual image.

(k) A concave mirror forms a virtual image for an object placed _____.

(l) Bouncing off of light in all directions after falling on an object is called _____.

(m) A rainbow in the sky is a result of the dispersion of light by the drops of water which act like_____

(n) _____ mirror can be used to see a much larger area than the area covered by a plane mirror.

(o) In astronomical telescopes, a larger_____ mirror is used to collect light from objects like stars and planets.

(p) A person 1 m in front of a plane mirror seems to be _____ m away from his image.

(q) If you touch your _____ ear with your right hand in front of a plane mirror, it will be seen in the mirror that your right ear is touched with _____.

Section C

IV. Short answer questions

Q1. How does the speed of light determine the optical density of a medium?

Q2. Which is optically denser: water or air? Give reason.

Q3. A ray of light falls normally on a glass slab. What is the angle of incidence?

Q4. What is the spectrum and dispersion of light?

Q5. What is a spherical mirror?

Q6. How is the focal length of a spherical mirror related to its radius of curvature?

Q7. State two uses of a concave mirror.

Q8. State two uses of a convex mirror.

Q9. Name the kind of mirror used to obtain:

(a) a real and enlarged image,

(b) a virtual and enlarged image,

(c) a real and diminished image, and

(d) a virtual and diminished image.

Q10. What is a real image? What are its characteristics.

Q11. What is a virtual image? What are its characteristics?

Q12. Convex Mirror Image Formation

1. At infinity
2. Between infinity and pole of mirror

Q13. Explain why a coin placed at the bottom of a beaker containing water appears raised.

Q14. Why does the sky at sunset and sunrise appear to be orange-red coloured?

Q15. If we pass a monochromatic ray of light through a prism, will it undergo dispersion and split into constituent colours?

Q16. How many images of a candle will be formed if it is placed between two parallel plane mirrors separated by 40 cm?

Q17. Which type of reflection of light, regular reflection or diffuse reflection, leads to the formation of images?

Q18. How are the two plane mirrors in a periscope arranged?

(a) With respect to one another?

(b) With respect to the sides of the tube?

Q19. What type of lens (convex or concave) is present in the human eye?

Q20. A wall reflects light and a mirror also reflects light. What difference is there in the way they reflect light?

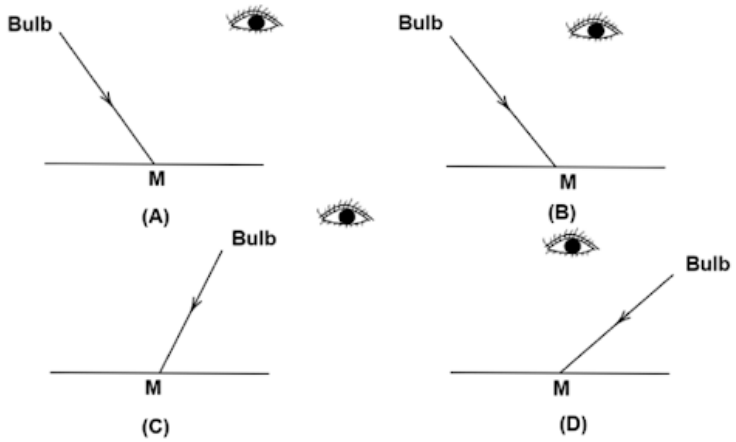
Q21. How many images of an object will be formed when the object is placed between two plane mirrors that are inclined at the following angles to one another?

(a) 120° (b) 45° (c) 180° (d) 60° (e) 90°

Q22. Explain why, when an object is placed between two plane mirrors inclined at an angle, then multiple images are formed.

Q23. A ray of light strikes a plane mirror XY at an angle of incidence of 65°, is reflected from this plane mirror and then strikes a second plane mirror YZ placed at right angles to the first mirror. What is the angle of reflection for the mirror YZ?

Q24. A tiny mirror M is fixed on a piece of cardboard placed on a table. The cardboard is illuminated by light from a bulb. The position of the eye with respect to the position of the bulb is shown in Fig. 16.2 as A, B, C, and D. In which position will the mirror be visible?



Q25. A small hole P is made in a piece of cardboard. The hole is illuminated by a torch as shown in Fig. 16.3. The pencil of light coming out of the hole falls on a mirror. At which point should the eye be placed so that the hole can be seen?

a) A b) B c) C d) D

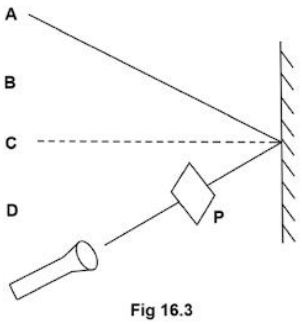
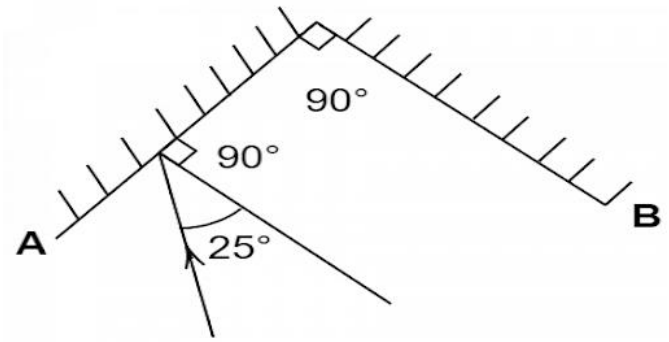


Fig 16.3

Q26. Two mirrors A and B are placed at right angles to each other as shown in Fig. 16.4. A ray of light incident on mirror A at an angle of 25° falls on mirror B after reflection. The angle of reflection for the ray reflected from mirror B would be

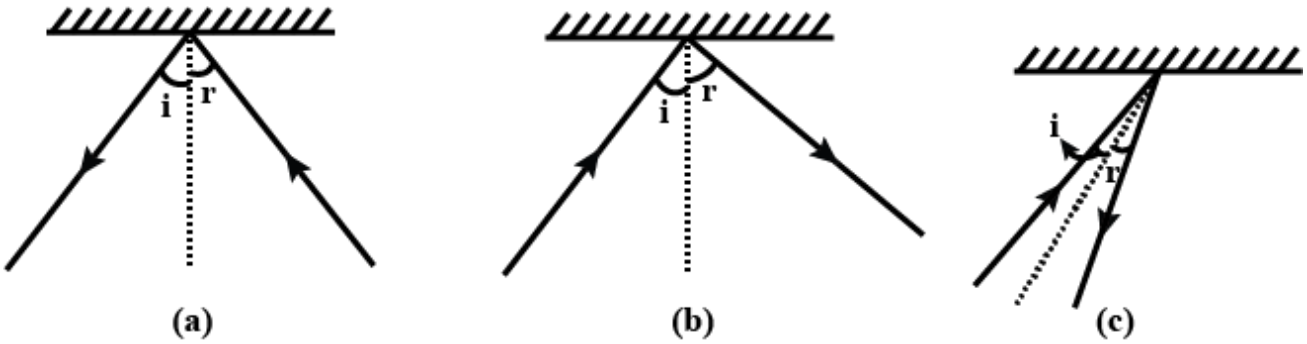
a) 25^0 b) 50^0 c) 65^0 d) 115^0



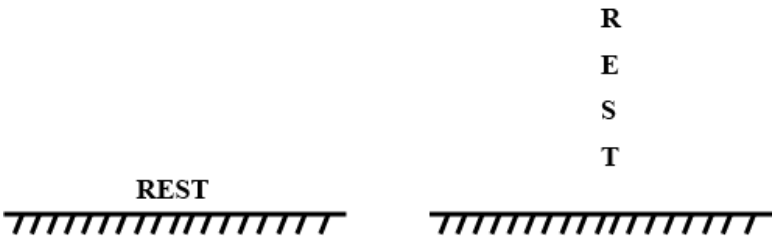
Q27. The distance between the object and its image formed by a plane mirror appears to be 24 cm. What is the distance between the mirror and the object?

Q28. Look at Fig. 16.7. Can the image of the child in it be obtained on a screen?

Q29. There is a mistake in each of the following ray diagrams given as Fig. 16.9 a, b, and c. Make the necessary correction(s).



Q30. Fig. 16.10 shows the word REST written in two ways in front of a mirror. Show how the word would appear in the mirror.



Section D

IV. Long Answer Question

Q1. Concave Mirror Image Formation

1. When the object is placed at infinity

2. When the object is placed beyond C (centre of curvature)

3. When the object is placed at C

4. When the object is placed between C and F (principal focus)

5. When the object is placed at F

6. When the object is placed between F and P (pole)

Q2. Give reasons for the following.

1. It is difficult to place a test-tube over an erect pencil looking at it through a glass slab.

2. Light bends towards the normal when it travels from air to water.

3. The dispersion of light occurs when it is passed through a prism

Q3. Differentiate between reflection of light and refraction of light.

Q4. State the characteristics of an image and draw a neat diagram when:

(a) The object is between F and 2F in the case of a convex lens.

(b) Object is beyond 2F in the case of a concave lens.

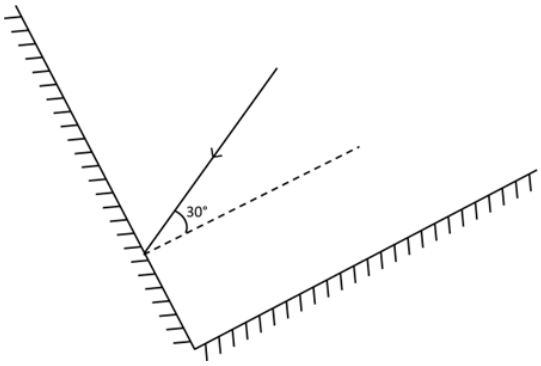
Q5. What information do you get about sunlight from the formation of a rainbow?

Q6. A man stands 10 m in front of a large plane mirror. How far must he walk before he is 5 m away from his image?

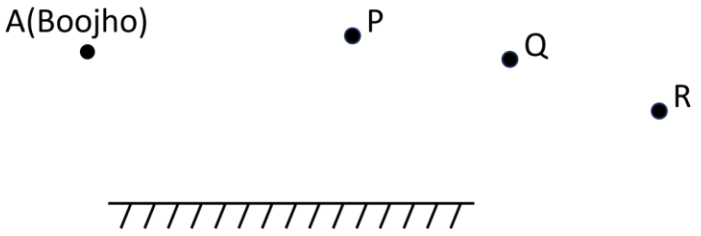
Q7. A student makes a device P by using three long and narrow strips of plane mirrors inclined at 60° to one another which enables him to see beautiful patterns made by pieces of coloured glass bangles. On the other hand, another student makes a device Q by using two plane mirrors arranged parallel to each other which helps him to see a football match clearly even when some very tall persons are sitting in front of him in the ground. What are P and Q?

Q8. State the two kinds of spherical mirrors and distinguish them with the aid of proper diagrams.

Q9. Two mirrors meet at right angles. A ray of light is incident on one at an angle of 30° as shown in Fig. 13.19. Draw the reflected ray from the second mirror.



Q10. Boojho stands at A just on the side of a plane mirror, as shown in Fig. 13.20. Can he see himself in the mirror? Also, can he see the image of objects situated at P, Q and R?



Q11. Boojho planned an activity to observe object A through pipes as shown in Fig., so that he could see objects which he could not directly see.

(a) How many mirrors should he use to see the objects?

(b) Indicate the positions of the mirrors in the figure.

(c) What must be the angle with respect to the incident light at which he should place the mirrors?

(d) Indicate the direction of the rays in the figure.

(e) If any of the mirrors are removed, will he be able to see the objects?

Q12. How is the phenomenon of reflection used in making a kaleidoscope? What are the applications of a kaleidoscope?

Q13. Mention against each of the following whether regular or diffused reflection will take place when a beam of light strikes. Justify your answer in each case.

(a) Polished wooden table

(b) Chalk powder

(c) Cardboard surface

(d) Marble floor with water spread over it

(e) Mirror

(f) Piece of paper

Q14. Draw separate diagrams for the formation of virtual image of an object by

(a) a concave mirror and

(b) a convex mirror.

State the difference of the two images.

Q15. The diagrams (Fig. 5.41) given below show two parallel rays 1 and 2 incident on:

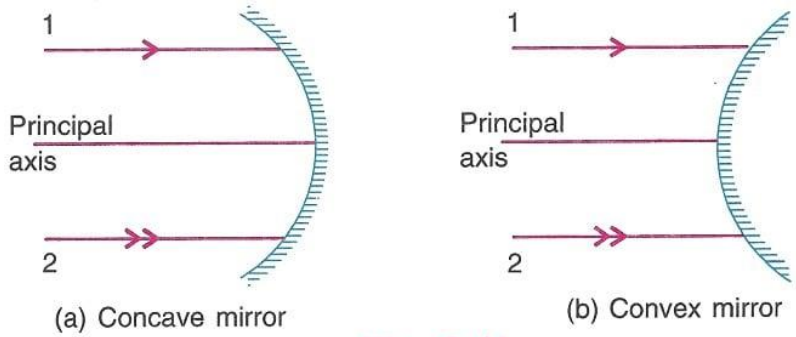


Fig. 5.41

(a) a concave mirror,

(b) a convex mirror.

Draw the reflected rays and mark the focus by the symbol F.

Q16. Complete the following diagrams in Fig. 5.42 by drawing the reflected rays for the incident rays 1 and 2 if F is the focus and C is the centre of curvature.

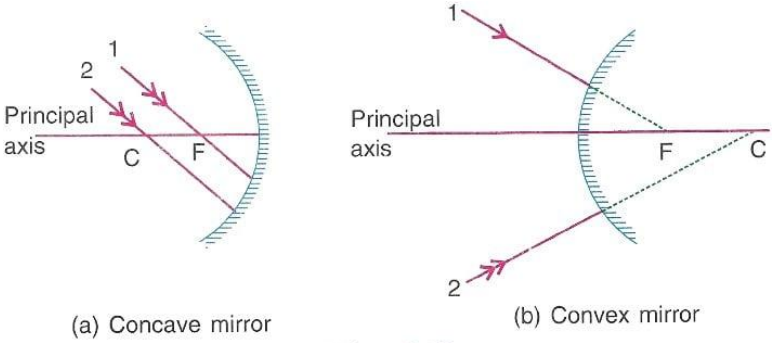


Fig. 5.42

Q17. Draw a ray diagram to show the formation of the image of an object placed at the centre of curvature of a concave mirror. State the position, size and nature of the image.

Q18. A driver uses a convex mirror as a rear-view mirror. Explain the reason with the help of a ray diagram.

Q19. Draw a ray diagram to show the formation of image of an object placed between the focus and centre of curvature of a concave mirror. State the position, size and nature of the image.

Q20. Draw a ray diagram to show the formation of the image of an object placed beyond the centre of curvature of a concave mirror. State the position, size and nature of the image.