Chapter-10

LIGHT-REFLECTION AND REFRACTION

SUB TOPIC: Introduction, Light, Reflection of light, Laws of reflection, Image formed by a plane mirror, Types of spherical mirrors.

VERY SHORT QUESTIONS: (1 MARK)

1. If the angle between the incident ray and mirror is 30^0, then find the angle of refraction.
2. What are the two laws of reflection?
3. Which spherical mirror is also called as a diverging mirror? Show with the help of a diagram.
4. What is the magnification for the image formed by a plane mirror?
5. The distance between the object and a plane mirror is 7.5 cm. Find the distance between the object and the image.
6. Name the mirror that can give an erect and enlarged image of an object.
7. What are the values of angle of incidence and angle of reflection for normal incidence of light on a plane mirror?
8. Define real image?
9. Name the rear view mirror used in vehicles?
10. What is the focal length of a plane mirror?
11. Define reflection.

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

12. Differentiate between real and virtual image.
13. State the two laws of reflection. If the angle between the incident ray and the mirror is 65^0 then find the angle of reflection.
14. What are the two types of spherical mirrors? Show the converging and diverging nature of the mirrors with the help of diagrams.
15. Write any three characteristics of image formed by a plane mirror.
16. Define the following terms: (Any three)
    a. Incident ray
    b. Reflected ray

c. Angle of incidence

d. Angle of reflection

17. Write the properties of light.

LONG ANSWER TYPE QUESTIONS :(5 MARKS)

18. a. State the two laws of reflection.

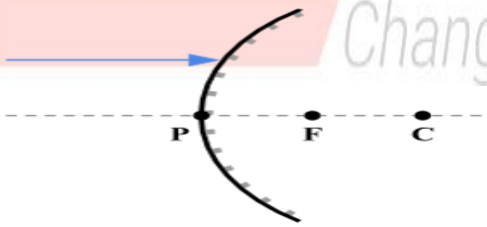
b. Can it be applied to all kind of reflecting surfaces?

c. A ray of light is incident normally on the surface of a plane mirror. Draw a figure to show the reflected ray.

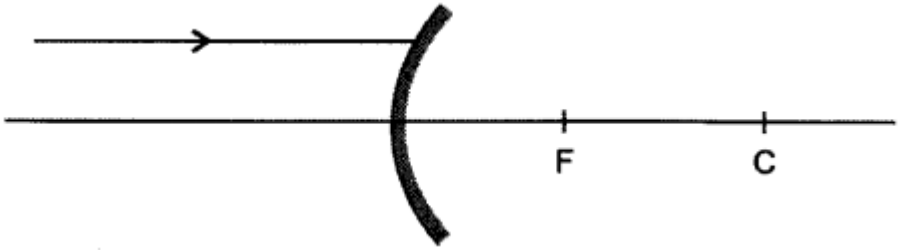
SUB TOPIC: Terms related to spherical mirror. Rules for drawing ray diagrams. Formation of image by a concave mirror.

I. VERY SHORT QUESTIONS: (1 MARK)

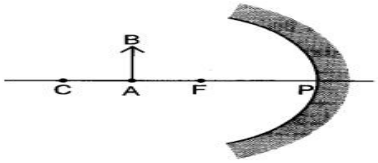
19. A mirror has focal length +10 cm. What type of mirror is it?
20. Image distance for a spherical lens is negative. What do the negative sign signify?
21. Where will the image be formed by a convex mirror if object is placed between infinity and pole of the mirror?
22. Define pole.
23. Define centre of curvature.
24. Define radius of curvature.
25. Define principal focus of a spherical mirror.
26. Define focal length of a spherical mirror.
27. Write the relationship between the focal length and the radius of curvature of a spherical mirror.
28. The radius of curvature of a convex mirror is 30 cm. Find its focal length.
29. The focal length of a concave mirror is 13 cm. Find the radius of curvature.
30. The focal length of a convex mirror is 22 cm. Find its radius of curvature.
31. The radius of curvature of a concave mirror is 21 cm. Find the focal length.
32. Draw the reflected ray.



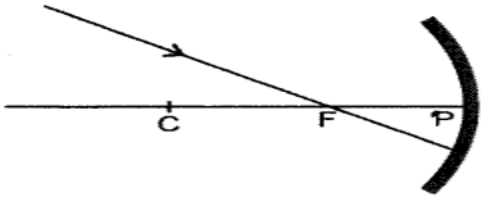
33. Complete the ray diagram.



34.



35. Redraw



36. Where is the image formed if the object is placed between focus and pole of a concave mirror?
37. Where is the image formed if the object is placed at focus of a concave mirror?
38. Where is the image formed if the object is placed between focus and 2f of a concave mirror?
39. Where is the image formed if the object is placed at 2f of a concave mirror?
40. Where should we keep the object in front of a concave mirror to get an image of same size?
41. Where should we keep an object in front of a concave mirror so that the image formed will be virtual and erect?
42. Define linear magnification of a mirror?
43. Where should we keep the object in front of a concave mirror to get a real, inverted and magnified image?
44. An object 5.0 cm high is placed in front of a concave mirror of linear magnification 2. What is the height of the image formed by themirror
45. Name type of mirror used in solar furnaces?
46. At what distance from a can cave mirror of focal length 20 cm, should an object be placed to obtain a real image of same size?

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

47. Draw ray diagrams to describe the nature, position and relative size of the image formed by a concave mirror for the object

    (I) When the object is placed between the center of curvature and the focus of the concave mirror.

(II) When the object is placed between the pole and the focus of the concave mirror?

48. The magnification produced by a spherical mirror is positive. Explain whether the image formed by the mirror is erect or inverted?

49. The magnification produced by a spherical mirror is negative. Explain, whether the image formed by the mirror is erect or inverted?

50. Write three uses of concave mirror. Also state the position of the object in all those cases.

51. Write in which direction the reflected rays will go when the incident ray

i. Is parallel to the principal axis.

ii. Passes through the focus.

iii. Passes through the centre of curvature.

52. What type mirror is used by dentist to examine teeth of a patient?

53. Name the physical quantity which remains the same when light travels from one medium to another?

54. A ray of light passing through center of curvature of a concave mirror reflects back along the same path. Why?

LONG ANSWER TYPE QUESTIONS :(5 MARKS)

55. It is desired to obtain an erect image of an object using concave mirror of focal length 12 cm.

i. What should be the range of the object distance?

ii. Will the image smaller or larger than the object?

iii. Draw a ray diagram to show the formation of image in this case.

iv. Where will the image of the object be if it is placed at 24 cm in front of the mirror?

SUB TOPIC: Ray diagrams (Image formed by a concave and convex mirror), Uses of spherical mirrors

I VERY SHORT QUESTIONS: (1 MARK)

56. Focal length of plane mirror is

a. At infinity

b. Zero

c. Negative

d. None of these

57. Image formed by plane mirror is

a. Real and erect

b. Real and inverted

c. Virtual and erect

d. Virtual and inverted

58. A concave mirror gives real, inverted and same size image if the object is placed
    a. At F
    b. At infinity
    c. At C
    d. Beyond C
59. Power of the lens is -40, its focal length is
    a. 4m
    b. -40m
    c. -0.25m
    d. -25m
60. A concave mirror gives virtual, refract and enlarged image of the object but image of smaller size than the size of the object is
    a. At infinity
    b. Between F and C
    c. Between P and F
    d. At E
61. In optics an object which has higher refractive index is called
    a. Optically rarer
    b. Optically denser
    c. Optical density
    d. Refractive index
62. The optical phenomena, twinkling of stars, is due to
    a. Atmospheric reflection
    b. Total reflection
    c. Atmospheric refraction
    d. Total refraction
63. Convex lens focus a real, point sized image at focus, the object is placed
    a. At focus
    b. Between F and 2F
    c. At infinity
    d. At 2F
64. The unit of power of lens is
    a. Meter
    b. Centimeter
    c. Dioptre

d. M^{-1}

65. The radius of curvature of a mirror is 20cm the focal length is

a. 20cm

b. 10cm

c. 40cm

d. 5cm

66. Write two uses of concave mirror.

67. Why is a convex mirror used as rear view mirror in vehicles?

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

68. Draw the Following ray diagrams :

When the object is placed

1. At Infinity
2. Beyond C
3. At C of a concave mirror

69. Draw the Following ray diagrams :

When the object is placed

1. between C and F
2. at F
3. between F and C of a concave mirror.

70. Write three reasons for using a convex mirror as rear view mirror in vehicles.

71. Draw ray diagrams when the object is placed

1. At infinity
2. Between C and Pole of a convex mirror
3. Write the nature of the image formed in both the cases.

LONG ANSWER TYPE QUESTIONS :(5 MARKS)

72. a) State the sign conventions for reflection of light by spherical mirrors?

b) State three uses of a concave mirror?

SUB TOPIC: Sign conventions for reflection by spherical mirrors.
Mirror Formula and Magnification.

VERY SHORT QUESTIONS: (1 MARK)

73. Write the mirror formula.

74. When light falls on a smooth polished surface, most of it

(a) is reflected in the same direction

(b) is reflected in different directions

(c) is scattered

(d) is refracted into the second medium

75. If an incident ray passes through the focus, the reflected ray will

(a) pass through the pole
(b) be parallel to the principal axis
(c) retrace its path
(d) pass through the centre of curvature

76. Magnifying power of a concave lens is
(a) always > 1
(b) always < 1
(c) always = 1
(d) can have any value

77. The image formed by a convex lens can be
(a) virtual and magnified
(b) virtual and diminished
(c) virtual and of same size
(d) virtual image is not formed

78. A point object is placed at a distance of 20 cm from a convex mirror of focal length 20 cm. The image will form at:
(a) at infinity
(b) at focus
(c) at the pole
(d) behind the mirror

79. Focal length of a concave mirror is
(a) negative
(b) positive
(c) depends on the position of object
(d) depends on the position of image

80. Which mirror can produce a virtual, erect and magnified image of an object?
(a) Concave mirror
(b) Convex mirror
(c) Plane mirror
(d) Both concave and convex mirrors

81. If the image is formed in front of the mirror, then the image distance will be
(a) positive or negative depending on the size of the object
(b) neither positive nor negative
(c) positive
(d) negative

82. A ray of light that strikes a plane mirror PQ at an angle of incidence of 30^{o}, is reflected from the plane mirror and then strikes a second plane mirror QR placed at right angles to the first mirror. The angle of reflection at the second mirror is:

(a) 30°
(b) 45°
(c) 60°
(d) 90°

83. An object is placed at 100 mm in front of a concave mirror which produces an upright image (erect image). The radius of curvature of the mirror is:

(a) Less than 100 mm

(b) Between 100 mm and 200 mm

(c) Exactly 200 mm

(d) More than 200 mm

84. Which position of the object will produce a magnified virtual image, if a concave mirror of focal length 15 cm is being used?

(a) 10 cm

(b) 20 cm

(c) 30 cm

(d) 35 cm

85. A concave mirror produces a magnification of +4. The object is placed:

(a) At the focus

(b) Between focus and centre of curvature

(c) Between focus and pole

(d) Beyond the centre of curvature

86. Two big mirrors A and B are fitted side by side on a wall. A man is standing at such a distance from the wall that he can see the erect image of his face in both the mirrors. When the man starts walking towards the mirrors, he finds that the size of his face in mirror A goes on increasing but that in mirror B remains the same:

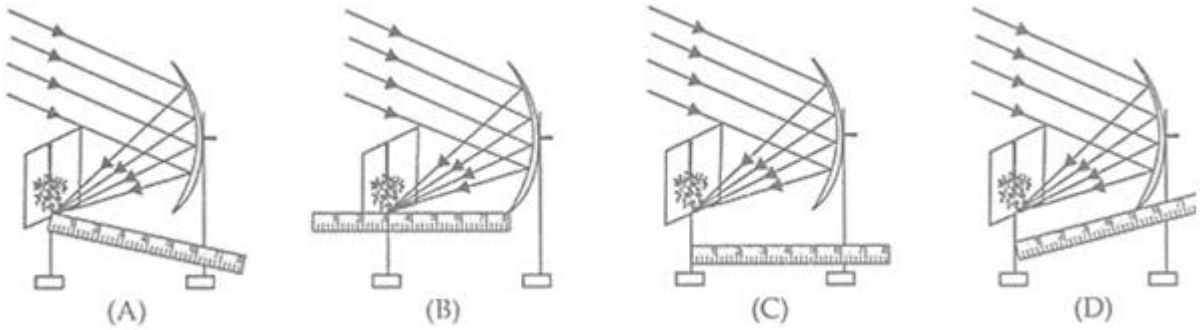
(a) Mirror A is concave and mirror B is convex

(b) Mirror A is plane and mirror B is concave

(c) Mirror A is concave and mirror B is plane

(d) Mirror A is convex and mirror B is concave

87. Four students A, B, C and D performed the experiment to determine the focal length of a concave mirror by obtaining the image of a distant tree on a screen. They measured the distances between the screen and the mirror as shown in the diagrams given below:



The correct way to measure accurate focal length of the mirror is:

(a) A

(b) B

(c) C

(d) D

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

88. An object 4 cm in size is placed at a distance of 25 cm from a concave mirror of focal length 15 cm. Find the position, nature and height of the image.

89. 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. Calculate the image distance. What is the focal length of the mirror?

90. A 4.5 cm needle is placed 12 cm away from a convex mirror of focal length 15 cm. Give the location of the image and the magnification. Describe what happens as the needle is moved farther from the mirror.

91. An arrow 2.5 cm high is placed at a distance of 25 cm from a diverging mirror of focal length 20 cm. Find the nature, position and size of the image formed.

92. The image formed by a convex mirror of focal length 20cm is a quarter of the object. What is the distance of the object from the mirror?

93. Find the size, nature and position of image formed by a concave mirror, when an object of size 1cm is placed at a distance of 15cm. Given focal length of mirror is 10cm.

94. An object 2cm high is placed at a distance of 16cm from a concave mirror, which produces 3cm high inverted image. What is the focal length of the mirror? Also, find the position of the image.

95. An erect image 3 times the size of the object is obtained with a concave mirror of radius of curvature 36cm. What is the position of the object?

96. A 2.5cm candle is placed 12 cm away from a convex mirror of focal length 30cm. Give the location of the image and the magnification.

97. An object is placed in front of a concave mirror of focal length 20cm. The image formed is 3 times the size of the object. Calculate two possible distances of the object from the mirror.

98. The image formed by a convex mirror is virtual, erect and smaller in size. Illustrate with figure.

99. A concave mirror produces a real image 10mm tall, of an object 2.5mm tall placed at 5cm from the mirror. Calculate focal length of the mirror and the position of the image.

100. An object is placed at a large distance in front of a convex mirror of radius of curvature 40cm. How far is the image behind the mirror?

101. An object is placed 15cm from a convex mirror of radius of curvature 90 cm. Calculate positions of the image and its magnification.

102. The image formed by a convex mirror of focal length 30cm is a quarter of the object. What is the distance of the object from the mirror?

103. When an object is placed at a distance of 60cm from a convex mirror, the magnification produced is 1/2. Where should the object be place to get a magnification of 1/3?

104. An object is placed 18cm front of a mirror. If the image is formed at 4cm to the right of the mirror. Calculate its focal length. Is the mirror convex or concave? What is the nature of the image? What is the radius of curvature of the mirror?

105. A convex mirror used for rear view on an automobile has a radius of curvature of 3m. If a bus is

located at 5m from this mirror, find the position, nature and magnification of the image.

106. An object 3cm high is held at a distance of 50cm from a diverging mirror of focal length 25cm. Find the nature, position and size of the image formed.

107. A converging mirror of focal length 20cm forms an image which is two times the size of the object. Calculate two possible distances of the object from the mirror.

108. The linear magnification of a convex mirror of focal length 15cm is 1/3. What is the distance of the object from the focus of the mirror?

109. The focal length of a convex mirror is 12.5 cm. How far is its centre of curvature (I) from the pole (ii) from the focus?

110. Find the focal length of a concave mirror that produces four times larger real image of an object held at 5cm from the mirror.

111. An object is held at 30cm in front of a convex mirror of focal length 15cm. At what distance from the convex mirror should a plane mirror be held so that images in the two images coincide with each other?

112. Draw any three ray diagrams to show how the size and nature of image of an object change when it moves from centre of curvature of concave mirror towards the pole of the mirror.

LONG ANSWER TYPE QUESTIONS :(5 MARKS)

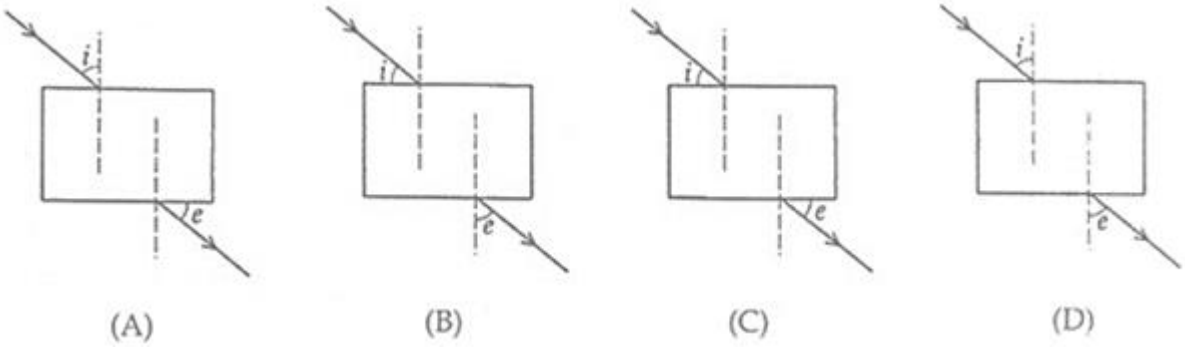
113. An object 2 cm in size is placed 30 cm in front of a concave mirror of focal length 15 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image? What will be the nature and the size of the image formed? Draw a ray diagram to show the formation of the image in this case.

114. It is desired to obtain an erect image of an object, using a concave mirror of focal length 20cm.
(i) What should be the range of distance of the object from the mirror?
(ii) Will the image be bigger or smaller than the object?
(iii) Draw a ray diagram to show the image formation in this case.

SUB TOPIC: Refraction of light. Activity based on Refraction, Refraction through a glass slab

VERY SHORT QUESTIONS: (1 MARK)

115. A student does the experiment on tracing the path of a ray of light passing through a rectangular glass slab for different angles of incidence. He can get a correct measure of the angle of incidence and the angle of emergence by following the labeling indicated in figure:



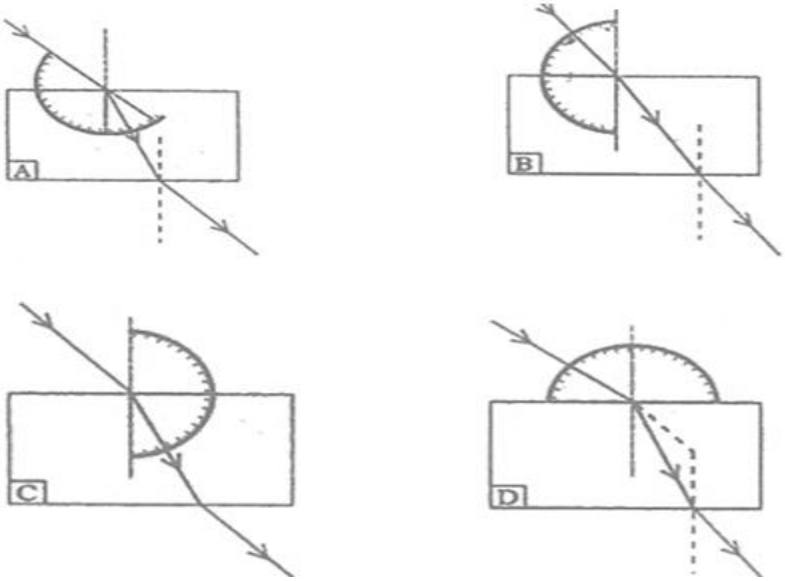
(a) A

(b) B

(c) C

(d) D

116. A student traces the path of a ray of light passing through a rectangular slab.



For measuring the angle of incidence, he must position the protractor in the manner shown in the figure:

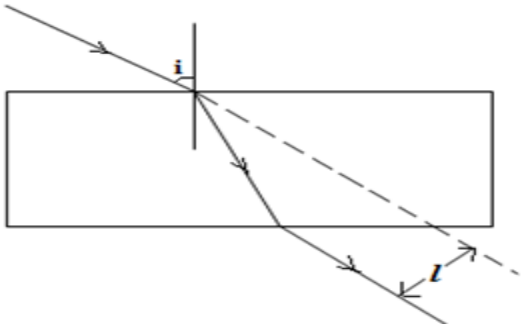
(a) A

(b) B

(c) C

(d) D

117. A student traces the path of a ray of light passing through a rectangular slab for three different values of angle of incidence (∠i) namely 30°, 45° and 60°. He extends the direction of incident ray by a dotted line and measures the perpendicular distance 'l' between the extended incident ray and the emergent ray.



He will observe that:

(a) 'l' keeps on increasing with increase in angle of incidence

(b) 'l' keeps on decreasing with increase in angle of incidence

(c) 'l' remains the same for all three angles of incidence

(d) 'l' is the maximum for ∠i = 45° and is less than this value for ∠i = 30° and ∠i = 60°.

118. Define lateral displacement.
119. Define refraction.
120. What are the two laws of refraction?
121. Define Snell's law.
122. Why does a ray of light bend when it travels from optically rarer medium to optically denser medium?

LONG ANSWER TYPE QUESTIONS :(5 MARKS)

123. With a well labeled diagram, Show refraction through a glass slab.
124. With the help of diagram show the following conditions:
    i. Light ray goes from optically rarer to optically denser medium.
    ii. Light ray goes from optically denser to optically rarer medium.
    iii. Light ray falls normally on a glass slab.

SUB TOPIC: Laws of Refraction. Refractive Index.

VERY SHORT QUESTIONS: (1 MARK)

125. Define refractive index.
126. Define relative refractive index of a medium?

    If refractive index of water for light going from air to water is 1.33,what will be the refractive index of air for light going from water to air?

127. The refractive indices of four media A, B, C and D are given in the following table:

Medium	A	B	C	D
Refractive Index	1.33	1.50	1.52	2.40

If light, travels from one medium to another, in which case the change in speed will be

(i) Minimum

(ii) Maximum?

128. The refractive index of diamond is 2.42. What is the meaning of this statement?

129. You are given kerosene, turpentine and water. In which of these does the light travel fastest?

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

130. Refractive index of two material medium X and Y are 1.3 and 1.5 respectively. In which of the two, would light travel faster?

131. Define refractive index?

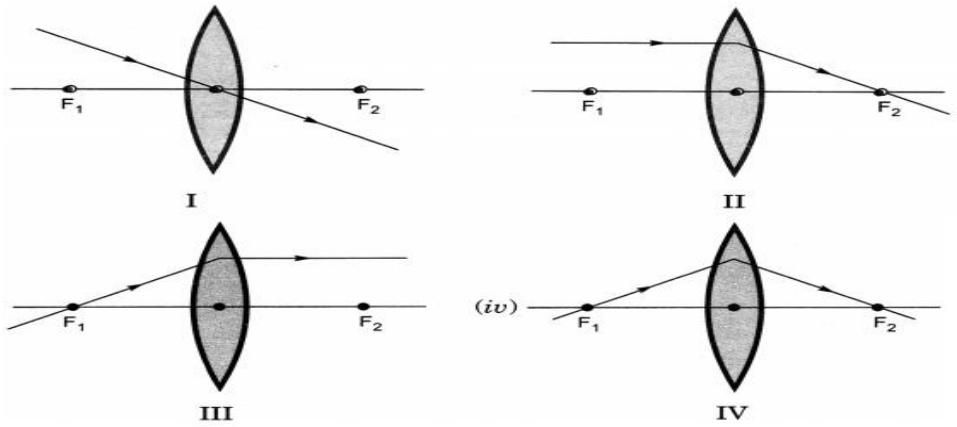
Why is the refractive index of a medium always greater than 1?

132. Light enters from air to glass having refractive index 1.50. What is the speed of light in the glass? The speed of light in vacuum is 3×10^8 ms^{-1}.

SUB TOPIC: Lens and its types.
Refraction by spherical lenses, image formation by lenses.
Rules for drawing ray diagrams.

VERY SHORT ANSWER TYPE QUESTIONS:

133. Name the type of lens which acts as a magnifying glass. Draw ray diagram to show the image formation by this type of lens?
134. What is the difference between a convex lens and a concave lens?
135. Where an object should be placed in front of a concave mirror of focal length 20 cm so as to obtain real image two times magnified?
136. A diverging lens has focal length of 20 cm. At what distance should an object from the lens be placed so that image is formed at 10 cm from the lens? What is the magnification produced by the lens?
137. Prove that if a ray of light enters a rectangular glass slab obliquely and emerges from the opposite face of the glass slab, the emergent ray will be parallel to the incident ray. Also show the lateral displacement.
138. Convex lens focus a real, point sized image at focus, the object is placed
139. a. At focus
    b. Between F and 2F
    c. At infinity
    d. At 2F
140. In optics an object which has higher refractive index is called
    a. Optically rarer
    b. Optically denser
    c. Optical density
    e. Refractive index
141. The diagrams showing the correct ray diagram is:



(a) II and III only
(b) I and II only
(c) I, II and III
(d) I, II and IV

(b) SHORT ANSWER TYPE QUESTIONS (3 MARKS)

142. A convex lens of focal length 10 cm is placed at a distance of 12 cm from a wall. How far from the lens should an object be placed so as to form its real image on the wall?

143. If an object of 7 cm height is placed at a distance of 12 cm from a convex lens of focal length 8 cm, find the position, nature and height of the image.

144. An object 4 cm high is placed at a distance of 10cm from a convex lens of focal length 20cm. Find the position, nature and size of the image.

145. 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.

146. Find the position and nature of the image of an object 5 cm high and 10 cm in front of a convex lens of focal length 6 cm.

147. Calculate the focal length of a convex lens, which produces a virtual image at a distance of 50 cm of an object placed 20 cm in front of it.

148. An object is placed at a distance of 100 cm from a converging lens of focal length 40 cm. What is the nature and position of the image?

149. A convex lens produces an inverted image magnified three times of an object at a distance of 15 cm from it. Calculate focal length of the lens.

150. An object placed 4 cm in front of a converging lens produces a real image 12 cm from the lens. What is the magnification of the image? What is the focal length of the lens? Also draw the ray diagram to show the formation of the image.

151. A lens of focal length 20 cm is used to produce a ten times magnified image of a film slide on a

screen. How far must the slide be placed from the lens?

152. Determine how far an object must be placed in front of a converging lens of focal length 10 cm in order to produce an erect image of linear magnification 4.

153. A convex lens of focal length 6 cm is held 4 cm from a newspaper, which has print 0.5 cm high. By calculation, determine the size and nature of the image produced.

154. A convex lens of focal length 0.10 m is used to form a magnified image of an object of height 5 mm placed at a distance of 0.08 m from the lens. Find the position, nature and size of the image.

155. An erect image 2 cm high is formed 12 cm from a lens, the object being 0.5 cm high. Find the focal length of the lens.

156. The filament of a lamp is 80 cm from a screen and a converging. lens forms an image of it on a screen, magnified three times. Find the distance of the lens from the filament and the focal length of the lens.

157. An object 2 cm tall is placed on the axis of a convex lens of focal length 5 cm at a distance of 10 cm from the optical centre of the lens. Find the nature, position and size of the image formed. Which case of image formation by convex lenses is illustrated by this example?

158. A converging lens of focal length 5 cm is placed at a distance of 20 cm from a screen. How far from the lens should an object be placed so as to form its real image on the screen?

159. 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.

160. At what distance should an object be placed from a convex lens of focal length 18 cm to obtain an image at 24 cm from it on the other side? What will be the magnification produced in this case?

161. The magnification produced by a spherical lens is +2.5. What is the nature of image and lens?

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

163. What is the nature of the image formed by a convex lens if the magnification produced by a convex lens is –0.5?

164. What is the position of image when an object is placed at a distance of 10 cm from a convex lens of focal length 10 cm?

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

166. At what distance from a converging lens of focal length 12 cm must an object be placed in order that an image of magnification 1 will be produced?

167. A concave lens produces an image 20 cm from the lens of an object placed 30 cm from the lens. Calculate the focal length of the lens.

168. The magnification of a spherical lens is +0.5. What is the nature of lens and image?

169. Q.28. If an object is placed at a distance of 50 cm from a concave lens of focal length 20 cm, find the position, nature and height of the image.

170. An object is placed at a distance of 4 cm from a concave lens of focal length 12 cm. Find the position and nature of the image.

171. An object is placed at a distance of 50 cm from a concave lens produces a virtual image at a distance of 10 cm in front of the lens. Draw a diagram to show the formation of image. Calculate focal length of the lens and magnification produced.

172. A 50 cm tall object is at a very large distance from a diverging lens. A virtual, erect and diminished image of the object is formed at a distance of 20 cm in front of the lens. How much is the focal length of the lens?

173. 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.

174. An object 60 cm from a lens gives a virtual image at a distance of 20 cm in front of the lens. What is the focal length of the lens? Is the lens converging or diverging? Give reasons for your answer.

175. A concave lens of 20 cm focal length forms an image 15 cm from the lens. Compute the object distance.

176. A concave lens has focal length 15 cm. At what distance should the object from the lens be placed so that it forms an image at 10 cm from the lens? Also find the magnification produced by the lens.

177. Calculate the image distance for an object of height 12 mm at a distance of 0.20 m from a concave lens of focal length 0.30 m and state the nature and size of the image.

178. A concave lens has focal length of 20 cm. At what distance from the lens a 5 cm tall object be placed so that it forms an image at 15 cm from the lens? Also calculate the size of the image formed.

179. 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.

180. A 2.0 cm tall object is placed 40 cm from a diverging lens of focal length 15 cm. Find the position and size of the image.

181. Find the position and size of the virtual image formed when an object 2 cm tall is placed 20 cm from (a) diverging lens of focal length 40 cm and (b) converging lens of focal length 40 cm.

182. The magnification produced by a spherical lens is +0.75. What is the nature of image and lens?

183. The magnification produced by a spherical lens and a spherical mirror is +0.8. What is the nature of lens and mirror?

184. The magnification produced by a spherical lens and a spherical mirror is +2.0. What is the

nature of lens and mirror?

185. The lens A produces a magnification of –0.6 whereas lens B produces magnification of +0.6. What is the nature of lens A and B.

186. An object is 2 m from a lens which forms an erect image one-fourth (exactly) the size of the object. Determine the focal length of the lens. What type of the lens is this?

187. A concave lens produces an image 20 cm from the lens of an object placed 30 cm from the lens. Calculate the power of the lens.

188. A convex lens is of focal length 10 cm. What is its power?

189. A person having a myopia eye uses a concave lens of focal length 50 cm. What is the power of the lens?

190. A thin lens has a focal length of –25 cm. What is the power of the lens and what is its nature?

191. A lens has a power of –2.5 D. What is the focal length and nature of the lens? Find the power of a concave lens of focal length 2 m.

192. A convex lens forms a real and inverted image of needle at a distance of 50 cm from the lens. If the image is of the same size as the needle, where is the needle placed in front of the lens? Also, find the power of the lens.

193. Two thin lenses of power +3.5 D and –2.5 D are placed in contact. Find the power and focal length of the lens combination.

194. A doctor has prescribed a corrective lens of power –1.5 D. Find the focal length of the lens. Is the prescribed lens is diverging or converging?

195. A concave lens of focal length 25 cm and a convex lens of focal length 20 cm are placed in contact with each other. What is the power of this combination? Also, calculate focal length of the combination.

196. A convex lens of focal length 20 cm is placed in contact with a concave lens of focal length 10 cm. What is the focal length and power of the combination?

197. An object is placed at a distance of 50 cm from a concave lens of focal length 30 cm. Find the nature and position of the image.

198. An object of height 2 cm is placed at a distance of 15 cm in front of a concave lens of power –10 D. Find the size of the image.

199. A convergent lens of power 8 D is combined with a divergent lens of power –10 D. Calculate focal length of the combination.

200. A concave lens is kept in contact with a convex lens of focal length 20 cm. The combination works as a converging lens of focal length 100 cm. Calculate power of concave lens.

201. Find the focal length and nature of lens which should be placed in contact with a lens of focal length 10 cm so that the power of the combination becomes 5 D.

202. A convex lens of power 3 D is held in contact with a concave lens of power – 1 D. A parallel beam of light is made to fall on the combination. At what distance from the combination will the bean get focused?

203. A convex lens of focal length 25 cm and a concave lens of focal length 10 cm are placed in close contact with each other.
a). What is the power of the combination?
b). What is the focal length of the combination?
c). Is this combination converging or diverging?

204. The power of a combination of two lenses X and Y is 5 D. If the focal length of lens X be 15 cm, then
a). Calculate the focal length of lens Y.

205. **B).** State the nature of the lens Y.

206. Two lenses A and B have focal lengths of +20 cm and – 10 cm, respectively.
A). What is the nature of lens A and lens B?

207. **b).** What is the power of lens A and lens B?

208. What is the power of the combination if lenses A and B are held close together?

209. A 5 cm high object is placed at a distance of 10 cm from a convex lens of focal length 15 cm. By drawing a ray diagram, find position, nature andsize of image.

210. A needle 4 cm high is placed in front of a lens. Image of the needle is real, inverted and 6 cm high when the distance between the needle and its image is 20 cm. Find the focal length of lens and also write the type ofthe lens.

211. Distinguish between real image and virtual image

212. List two uses of convex mirror?

213. State the two laws of refraction of light.

214. An object 4 cm high is placed at a distance of 27 cm in front of a convex lens of focal length 18 cm. find the position nature and size of the image formed?

215. A 4.0 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. If the distance of the object is 30 cm from the lens. Find the position, nature and size of the image. Also find its magnification.

216. A concave lens of focal length 20 cm forms an image at a distance of 10cm from the lens. What is the distance of the object from the lens? Also draw ray diagram?

217. The principle focus of a convex mirror lies at the back of themirror. Why?

218. HOTS

219. You have a spherical mirror. The image of an object placed in front of the mirror is virtual. If the position of the object is changed, the image remains virtual and erect. Is the spherical mirror concave or convex?

220. The following table gives the value of refractive indices of a few media.

221. Refractive indices of kerosene, turpentine and water are 1.44, 1.47 and 1.333 respectively. Through which of these media, light travels fast ?

222. In which of these four media is the speed of light (i) maximum and (ii) minimum ? Find refractive index of medium D with respect to medium A.

223. Explain with the help of a diagram, why a pencil partly immersed in water appears to be bent at the water surface?

224. You have a spherical mirror. The image of an object placed in front of the mirror is virtual. If the position of the object is changed, the image remains virtual and erect. Is the spherical

mirror concave or convex?