

Previous Years

Examination Questions

1 Mark Questions

- Define the power of a lens. Write its SI unit. **2018C**
- A concave lens of refractive index 1.5 is immersed in a medium of refractive index 1.65. What is the nature of the lens?
All India 2015
- When an object is placed between f and $2f$ of a concave mirror, would the image formed be (i) real or virtual and (ii) diminished or magnified? **Delhi 2015C**
- A biconvex lens made of a transparent material of refractive index 1.25 is immersed in a water of refractive index 1.33. Will the lens behave as a converging or a diverging lens? Give reason. **All India 2014**
- A biconvex lens made of a transparent material of refractive index 1.5 is immersed in a water of refractive index 1.33. Will the lens behave as a converging or a diverging lens? Give reason.
All India 2014
- A convex lens is placed in contact with a plane mirror. A point object at a distance of 20 cm on the axis of this combination has its image coinciding with itself. What is the focal length of the lens? **All India 2014**
- Write the relationship between angle of incidence i , angle of prism A and angle of minimum deviations δ_m for a triangular prism. **Delhi 2013**
- When red light passing through a convex lens is replaced by light of blue colour, how will the focal length of the lens change? **All India 2013C**
- How does focal length of a lens change when red light incident on it is replaced by violet light? Give reason for your answer.
Foreign 2012
- Under what condition, does a biconvex lens of glass having a certain refractive index act as a plane glass sheet when immersed in a liquid? **Delhi 2012**
- For the same value of angle of incidence, the angles of refraction in three media A , B and C are 15° , 25° and 35° respectively. In which medium, would the velocity of light be minimum? **All India 2012**
- When monochromatic light travels from one medium to another, its wavelength changes but frequency remains the same. Explain. **Delhi 2011**
- The refractive index of diamond is much greater than that of glass. How does a diamond cutter make use of this fact?
All India 2011C
- If a ray of light propagates from a rarer to a denser medium, how does its frequency change? **All India 2011C**
- State the criteria for the phenomenon of total internal reflection of light to take place. **Delhi 2011, 2010**
- A lens behaves as a converging lens in air and a diverging lens in water ($\mu = 4/3$). What will be the condition on the value of refractive index (μ) of the material of the lens? **Delhi 2011C**
- A converging lens axially in contact with a diverging lens; both the lenses being of equal focal lengths. What is the focal length of the combination? **All India 2010**
- A glass lens of refractive index 1.45 disappears when immersed in a liquid. What is the value of refractive index of the liquid? **Delhi 2010**
- Calculate the speed of light in a medium whose critical angle is 30° . **Delhi 2010**

20. Two thin lenses of power $+6D$ and $-2D$ are in contact. What is the focal length of the combination? All India 2010
21. Two thin lenses of power $+4D$ and $-2D$ are in contact. What is the focal length of the combination? All India 2010
22. Two thin lenses of power $+5D$ and $-2.5D$ are in contact. What is the focal length of the combination? All India 2010

2 Marks Questions

23. Calculate the radius of curvature of an equi-concave lens of refractive index 1.5, when it is kept in a medium of refractive index 1.4, to have a power of $-5D$? Delhi 2019

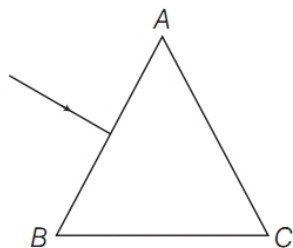
24. An equilateral glass prism has a refractive index 1.6 in air. Calculate the angle of minimum deviation of the prism, when kept in a medium of refractive index $4\frac{\sqrt{2}}{5}$. Delhi 2019

25. Under what conditions does the phenomenon of total internal reflection take place? Draw a ray diagram showing how a ray of light deviates by 90° after passing through a right-angled isosceles prism. All India 2019

26. A beam of light converges at a point P . Draw ray diagrams to show where the beam will converge if (i) a convex lens and (ii) a concave lens is kept in the path of the beam. All India 2019

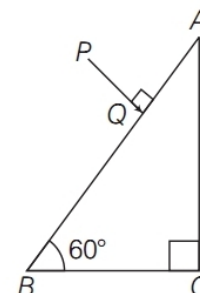
27. State with the help of a ray diagram, the working principle of optical fibres. Write one important use of optical fibres. All India 2019

28. The figure shows a ray of light falling normally on the face AB of an equilateral glass prism having refractive index $3/2$, placed in water of refractive index $4/3$.



Will this ray suffer total internal reflection on striking the face AC ? Justify your answer. 2018

29. A ray PQ incident normally on the refracting face BA is refracted in the prism BAC made of material of refractive index 1.5. Complete the path of ray through the prism. From which face will the ray emerge? Justify your answer. All India 2016

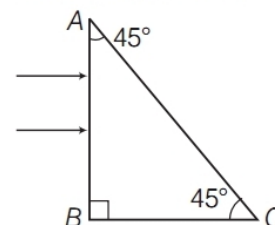


30. Use the mirror equation to show that an object placed between F and $2F$ of a concave mirror produces a real image beyond $2F$. All India 2015

31. How does the refractive index of a transparent medium depend on the wavelength of incident light used? Velocity of light in glass is 2×10^8 m/s and in air is 3×10^8 m/s. If the ray of light passes from glass to air, calculate the value of critical angle. Foreign 2015

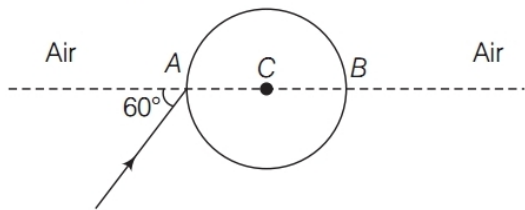
32. An equiconvex lens of focal length f is cut into two identical plane convex lenses. How will the power of each part be related to the focal length of the original lens? A double convex lens of $+5D$ is made of glass of refractive index 1.55 with both faces of equal radii of curvature. Find the value of its radius of curvature. Foreign 2015

33. Two monochromatic rays of light are incident normally on the face AB of an isosceles right-angled prism ABC . The refractive indices of the glass prism for the two rays 1 and 2 are respectively 1.35 and 1.45. Trace the path of these rays after entering through the prism. All India 2014



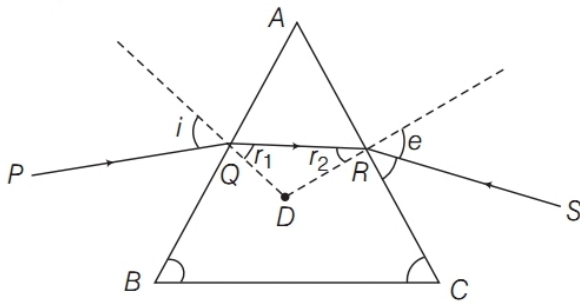
34. A ray of light falls on a transparent sphere with centre C as shown in the figure. The ray emerges from the sphere parallel to the line AB . Find the angle of refraction of A if

the refractive index of material of sphere is $\sqrt{3}$. **Foreign 2014**

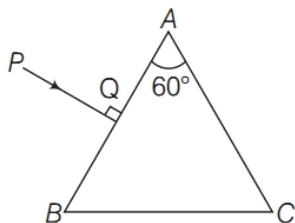


35. Figure shows a ray of light passing through a prism. If the refracted ray QR is parallel to the base BC , show that

- (i) $r_1 = r_2 = A/2$ and
 (ii) Angle of minimum deviation,
 $\delta_m = 2i - A$ **Foreign 2014**



36. A ray PQ is incident normally on the face AB of a triangular prism of refracting angle of 60° made of a transparent material of refractive index $2/\sqrt{3}$ as shown in the figure. Trace the path of the ray as it passes through the prism. Also, calculate the angle of emergence and angle of deviation. **Delhi 2014C**



37. A convex lens of focal length f_1 is kept in contact with a concave lens of focal length f_2 . Find the focal length of the combination. **All India 2013**

38. When monochromatic light travels from a rarer to a denser medium, explain the following giving reasons.

- (i) Is the frequency of reflected and refracted light same as the frequency of incident light?

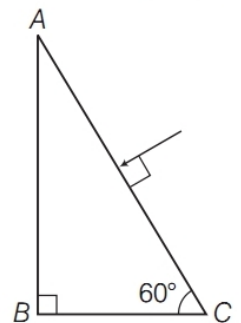
(ii) Does the decrease in speed imply a reduction in the energy carried by light wave? **Delhi 2013**

39. (i) Write the necessary conditions for the phenomenon of total internal reflection to occur.

(ii) Write the relation between the refractive index and critical angle for a given pair of optical media. **Delhi 2013**

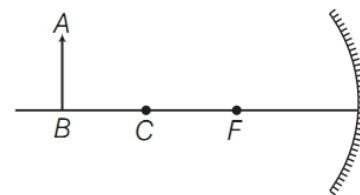
40. A convex lens of focal length 25 cm is placed coaxially in contact with a concave lens of focal length 20 cm. Determine the power of the combination. Will the system be converging or diverging in nature? **Delhi 2013**

41. Trace the path of a ray of light passing through a glass prism ABC as shown in the figure. If the refractive index of glass is $\sqrt{3}$, then find out the value of the angle of emergence from the prism. **Foreign 2012**



42. A ray of light incident on an equilateral glass prism ($\mu_g = \sqrt{3}$) moves parallel to the base line of the prism inside it. Find the angle of incidence for this ray. **Delhi 2012**

43. An object AB is kept in front of a concave mirror as shown in the figure.



- (i) Complete the ray diagram showing the image formation of the object.
 (ii) How will the position and intensity of the image be affected if the lower half of the mirror's reflecting surface is painted black? **All India 2012**

44. (i) Plane and convex mirrors are known to produce virtual images of the objects. Draw a ray diagram to show

how, in the case of convex mirrors, virtual objects can produce real images.

- (ii) Why are convex mirrors used as side view mirrors in vehicles? **Delhi 2012C**

45. (i) Draw a ray diagram for a convex mirror showing the image formation of an object placed anywhere in front of the mirror.

- (ii) Use this ray diagram to obtain the expression for its linear magnification.

All India 2012C

46. How does focal length of a lens change when red light incident on it is replaced by violet light? Give, reason for your answer.

Foreign 2012

47. Two thin lenses of power -4 D and 2 D are placed in contact coaxially. Find the focal length of the combination.

All India 2012C

48. Draw a ray diagram to show the image formation by a concave mirror.

When the object is kept between its focus and the pole. Using this diagram, derive the magnification formula for the image formed. **Delhi 2011**

49. A beam of light converges at a point P . A concave lens of focal length 16 cm is placed in the path of this beam 12 cm from P .

Draw a ray diagram and find the location of the point at which the beam would now converge. **All India 2011C**

50. The radii of curvature of the faces of a double convex lens are 10 cm and 15 cm . If focal length of the lens is 12 cm , find the refractive index of the material of the lens.

Delhi 2010

51. A biconvex lens has a focal length $\frac{2}{3}$ times the radius of curvature of either surface. Calculate the refractive index of lens material. **Delhi 2010**

52. Find the radius of curvature of the convex surface of a plano-convex lens, whose focal length is 0.3 m and the refractive index of the material of the lens is 1.5 . **Delhi 2010**

53. The following table gives the values of the angle of deviation for different values of the angle of incidence for a triangular prism.

Angle of incidence	33°	38°	42°	52°	60°	71°
Angle of deviation	60°	50°	46°	40°	43°	50°

- (i) For what value of the angle of incidence, is the angle of emergence likely to be equal to the angle of incidence itself?

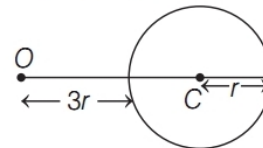
- (ii) Draw a ray diagram showing the passage of a ray of light through this prism when the angle of incidence has the above value.

Delhi 2010C

3 Marks Questions

54. (i) An object is placed in front of a converging lens. Obtain the conditions under which the magnification produced by the lens is (a) negative and (b) positive

- (ii) A point object is placed at O in front of a glass sphere as shown in figure.



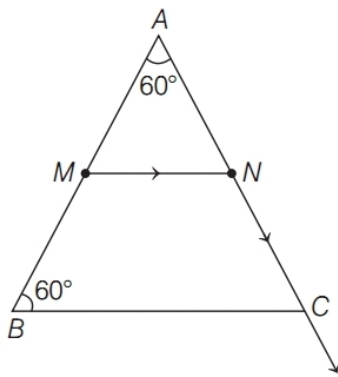
Show the formation of image by the sphere. **CBSE 2022 (Term-II)**

55. An equiconvex lens forms a two times enlarged real image when an object is kept 16 cm from it. The lens is cut into two identical plano-convex lenses. If the object is again kept 16 cm in front of one of these lenses, then find the nature and position of the image formed.

CBSE 2022 (Term-II)

56. A ray is incident on a prism of material of refractive index $\sqrt{2}$ at point M such that it grazes along NC after emerging from the prism as shown in the figure.

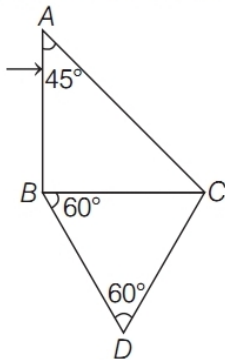
CBSE 2022 (Term-II)



Find

- (i) the critical angle for the prism
- (ii) the angle of refraction at face AB .

57. (i) Write two necessary conditions for total internal reflection.
 (ii) Two prisms ABC and DBC are arranged as shown in figure.

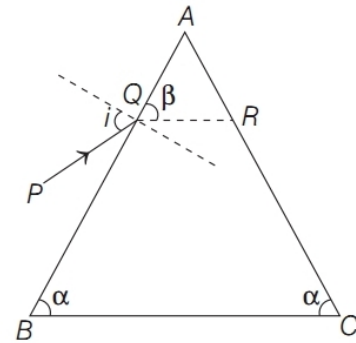


The critical angle for the two prisms with respect to air are 41.1° and 45° , respectively. Trace the path of the ray through the combination.

CBSE 2022 (Term-II)

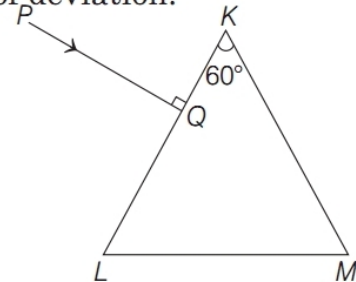
58. A screen is placed 80 cm from an object. The image of the object on the screen is formed by a convex lens placed between them at two different locations separated by a distance 20 cm. Determine the focal length of the lens. Delhi 2020
59. Two objects P and Q when placed at different positions in front of a concave mirror of focal length 20 cm, form real images of equal size. Size of object P is three times size of object Q . If the distance of P is 50 cm from the mirror, find the distance of Q from the mirror. All India 2020
60. A ray of light incident on the face AB of an equilateral triangular prism makes an angle of incidence i and is deviated by

angle β as shown in the figure. Show that in the position of minimum deviation $\angle\beta = \angle\alpha$. Also find out the condition, when the refracted ray QR suffers total internal reflection.



All India 2019

61. A triangular prism of refracting angle 60° is made of a transparent material of refractive index $2/\sqrt{3}$. A ray of light is incident normally on the face KL as shown in the figure. Trace the path of the ray as it passes through the prism and calculate the angle of emergence and angle of deviation.

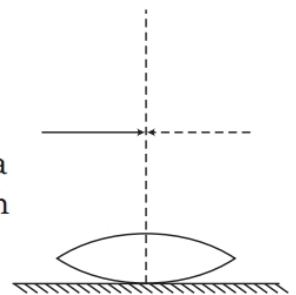


All India 2019

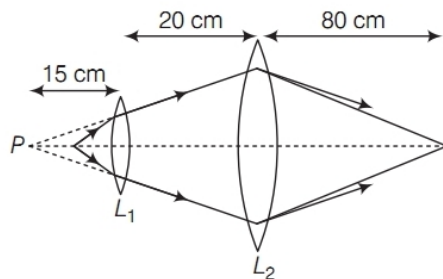
62. (i) With the help of a ray diagram, show how a concave mirror is used to obtain an erect and magnified image of an object.
 (ii) Using the above ray diagram, obtain the mirror formula and the expression for linear magnification.

2018C

63. A symmetric biconvex lens of radius of curvature R and made of glass of refractive index 1.5, is placed on a layer of liquid placed on the top of a plane mirror as shown in the figure. An optical needle with its tip on the principal axis of



the lens is moved along the axis until its real, inverted image coincides with the needle itself. The distance of the needle from the lens is measured to be x . On removing the liquid layer and repeating the experiment, the distance is found to be y . Obtain the expression for the refractive index of the liquid in terms of x and y . **2018**



- 64.** (i) Monochromatic light of wavelength 589 nm is incident from air on a water surface. If μ for water is 1.33, find the wavelength, frequency and speed of the refracted light.
- (ii) A double convex lens is made of a glass of refractive index 1.55 with both faces of the same radius of curvature. Find the radius of curvature required, if the focal length is 20 cm. **All India 2017**
- 65.** (i) A ray of light incident on face AB of an equilateral glass prism, shows minimum deviation of 30° . Calculate the speed of light through the prism.
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- (ii) Find the angle of incidence at face AB , so that the emergent ray grazes along the face AC . **Delhi 2017**
- 66.** (i) Calculate the distance of an object of height h from a concave mirror of radius of curvature 20 cm, so as to obtain a real image of magnification 2. Find the location of image also.
- (ii) Using mirror formula, explain why does a convex mirror always produce a virtual image? **Delhi 2016**
- 67.** In the following diagram, an object O is placed 15 cm in front of a convex lens L_1 of focal length 20 cm and the final image is formed at I at a distance of 80 cm from the second lens L_2 . Find the focal length of the lens L_2 . **Delhi 2015**

- 68.** (i) A mobile phone lies along the principal axis of a concave mirror. Show with the help of a suitable diagram, the formation of its image. Explain why magnification is not a uniform?
- (ii) Suppose the lower half of the concave mirror's reflecting surface is covered with an opaque material. What effect this will have on the image of the object? Explain. **Delhi 2014**
- 69.** A convex lens of focal length 20 cm is placed coaxially with a convex mirror of radius of curvature 20 cm. The two are kept at 15 cm from each other. A point object lies 60 cm in front of the convex lens. Draw a ray diagram to show the formation of the image by the combination. Determine the nature and position of the image formed. **All India 2014**
- 70.** A convex lens of focal length 20 cm is placed coaxially with a concave mirror of focal length 10 cm at a distance of 50 cm apart from each other. A beam of light coming parallel to the principal axis is incident on the convex lens. Find the position of the final image formed by this combination. Draw the ray diagram showing the formation of the image. **All India 2014**
- 71.** Define the term critical angle for a pair of media. A point source of monochromatic light S is kept at the centre of the bottom of a cylinder of radius 15.0 cm. The cylinder contains water (refractive index $4/3$) to a height of 7.0 cm. Draw the ray diagram and calculate the area of water surface through which the light emerges in air. **Delhi 2013C**

72. A small bulb (assumed to be a point source) is placed at the bottom of a tank containing water to a depth of 80 cm. Find out the area of the surface of water through which light from the bulb can emerge. Take the value of the refractive index of water to be $4/3$. **Delhi 2013C**

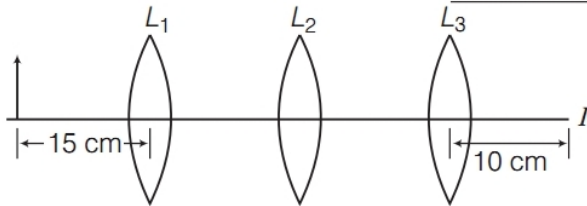
73. Define power of a lens. Write its units. Deduce the relation $\frac{1}{f} = \frac{1}{f_1} + \frac{1}{f_2}$ for two thin lenses kept in contact coaxially.

Foreign 2012

74. You are given three lenses L_1 , L_2 and L_3 each of focal length 10 cm. An object is kept at 15 cm in front of L_1 as shown. The final real image is formed at the focus I of L_3 .

Find the separation between L_1 , L_2 and L_3 .

All India 2012



75. Draw a ray diagram to show the formation of the image of an object placed on the axis of a convex refracting surface of radius of curvature ' R ', separating the two media of refractive indices μ_1 and μ_2 ($\mu_2 > \mu_1$). Use this diagram to deduce the relation $\mu_2/v - \mu_1/u = \mu_2 - \mu_1/R$, where u and v represent respectively the distance of the object and the image formed. **Delhi 2012 C**

76. A convex lens made up of a glass of refractive index 1.5 is dipped in

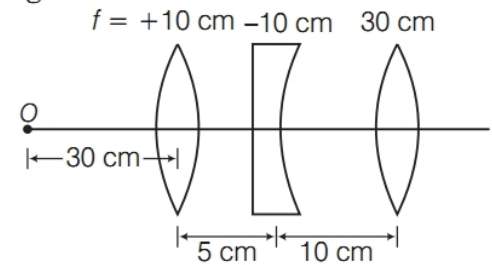
- (i) a medium of refractive index 1.65
- (ii) a medium of refractive index 1.33
 - (a) Will it behave as a converging lens or a diverging lens in the two cases?
 - (b) How will its focal length change in the two media? **All India 2011**

77. Use the mirror equation to show that

- (i) An object placed between f and $2f$ of a concave mirror produces a real image beyond $2f$.
- (ii) A convex mirror always produces a virtual image independent of the location of the object.

(iii) An object placed between the pole and focus of a concave mirror produces a virtual and enlarged image. **All India 2011**

78. Find the position of the image formed of the object O by the lens combination given in the figure.



Foreign 2011

79. A converging lens has a focal length of 20 cm in air. It is made of a material of refractive index 1.6. It is immersed in a liquid of refractive index 1.3. Calculate its new focal length. **All India 2011**

80. State the necessary conditions for producing total internal reflection of light. Draw ray diagrams to show how specially designed prisms make use of total internal reflection to obtain inverted image of the object by deviation of rays

- (i) through 90° and
- (ii) through 180° . **All India 2011**

81. With the help of a suitable ray diagram, derive a relation between the object distance (u), image distance (v) and radius of curvature R for the convex spherical surface when a ray of light travels from a rarer to denser medium. **Delhi 2011C**

82. A ray of light is incident on one face of a glass prism and emerges out from the other face. Trace the path of the ray and derive an expression for refractive index of the glass prism. **Delhi 2011C**

83. The image obtained with a convex lens is erect and its length is four times the length of the object. If the focal length of the lens is 20 cm, calculate the object and image distances. **All India 2010**

84. A convex lens is used to obtain a magnified image of an object on a screen 10 cm from the lens. If the magnification is 19, find the focal length of the lens.

All India 2010

85. An illuminated object and a screen are placed 90 cm apart. Determine the focal length and nature of the lens required to produce a clear image on the screen, twice the size of the object. **All India 2010**

86. (i) How is the focal length of a spherical mirror affected when the wavelength of the light used is increased?
 (ii) A convex lens has 20 cm focal length in air. What is its focal length in water? (Refractive index of air-water = 1.33, refractive index of air-glass = 1.5). **Foreign 2010**

87. (i) How is the focal length of a spherical mirror affected when it is immersed in water?
 (ii) A convex lens has 10 cm focal length in air. What is its focal length in water? (Refractive index of air-water = 1.33, refractive index of air-glass = 1.5). **Foreign 2010**

88. An object of 3 cm height is placed at a distance of 60 cm from a convex mirror of focal length 30 cm. Find the nature, position and size of the image formed. **All India 2010C**

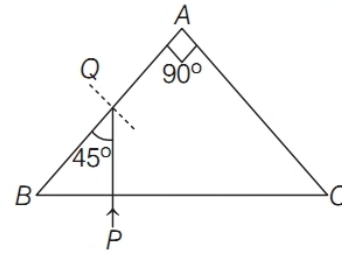
89. An object of 2 cm height is placed at a distance of 30 cm from a convex mirror of focal length 15 cm. Find the nature, position and size of the image formed. **All India 2010C**

90. (i) Draw a ray diagram to show image formation when the concave mirror produces a real, inverted and magnified image of the object.
 (ii) Obtain the mirror formula and write the expression for the linear magnification.

5 Marks Questions

91. (i) Draw the ray diagram showing refraction of ray of light through a glass prism. Derive the expression for the refractive index μ of the material of prism in terms of the angle of prism A and angle of minimum deviation δ_m .

(ii) A ray of light PQ enters an isosceles right angled prism ABC of refractive index 1.5 as shown in figure.



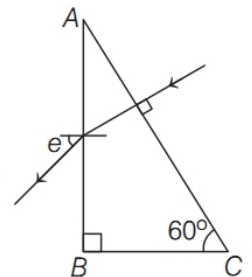
(a) Trace the path of the ray through the prism.
 (b) What will be the effect on the path of the ray, if the refractive index of the prism is 1.4? **All India 2020**

92. (i) Two thin lenses are placed co-axially in contact. Obtain the expression for the focal length of this combination in terms of the focal lengths of the two lenses.

(ii) A converging lens of refractive index 1.5 has a power of 10 D. When it is completely immersed in a liquid, it behaves as a diverging lens of focal length 50 cm. Find the refractive index of the liquid. **All India 2020**

93. (i) Define the term focal length of a mirror. With the help of a ray diagram, obtain the relation between its focal length and radius of curvature.

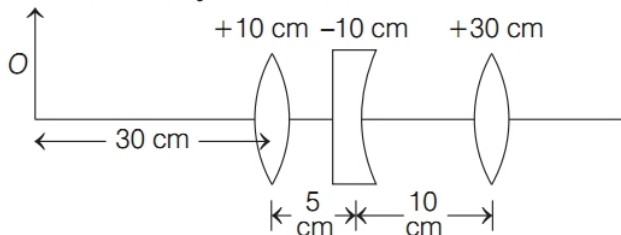
(ii) Calculate the angle of emergence (e) of the ray of light incident normally on the face AC of a glass prism ABC of refractive index $\sqrt{3}$.



How will the angle of emergence change qualitatively, if the ray of light emerges from the prism into a liquid of refractive index 1.3 instead of air? **Delhi 2020**

94. (i) Under what conditions the phenomenon of total internal reflection of light is observed? Obtain the relation between the critical angle of incidence and the refractive index of the medium.

- (ii) Three lenses of focal lengths $+10$ cm, -10 cm and $+30$ cm are arranged coaxially as in the figure given below. Find the position of the final image formed by the combination.



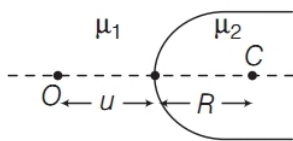
All India 2019

95. (i) When a convex lens of focal length 30 cm is in contact with a concave lens of focal length 20 cm, find out if the system is converging or diverging.
- (ii) Obtain the expression for the angle of incidence of a ray of light which is incident on the face of a prism of refracting angle A so that it suffers total internal reflection at the other face. (Given the refractive index of the glass of the prism is μ).

All India 2019

96. (i) Derive the mathematical relation between refractive indices μ_1 and μ_2 of two media and radius of curvature R for refraction at a convex spherical surface. Consider the object to be a point source lying on the principal axis in rarer medium of refractive index μ_1 and a real image formed in the denser medium of refractive index μ_2 . Hence, derive lens maker's formula.
- (ii) Light from a point source in air falls on a convex spherical glass surface of refractive index 1.5 and radius of curvature 20 cm. The distance of light source from the glass surface is 100 cm. At what position is the image formed? **All India 2016**

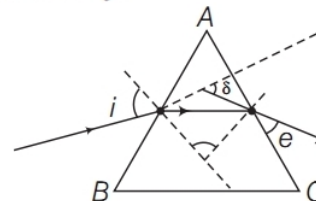
97. (i) A point object O is kept in a medium of refractive index



μ_1 in front of a convex spherical surface of radius of curvature R which separates the second medium of refractive index μ_2 from the first one, as shown in the figure. Draw the ray diagram showing the image formation and deduce the relationship between the object distance and the image distance in terms of μ_1, μ_2 and R .

- (ii) When the image formed above acts as a virtual object for a concave spherical surface separating the medium μ_2 from μ_1 ($\mu_2 > \mu_1$), draw this ray diagram and write the similar [similar to (i)] relation. Hence, obtain the expression for the lens maker's formula. **All India 2015**

98. (i) A ray PQ of light is incident on the face AB of a glass prism ABC (as shown in the figure) and emerges out of the face AC . Trace the path of the ray. Show that $\angle i + \angle e = \angle A + \angle \delta$ where, δ and e denote the angle of deviation and angle of emergence respectively.



Plot a graph showing the variation of the angle of deviation as a function of angle of incidence. State the condition under which $\angle \delta$ is minimum.

- (ii) Find out the relation between the refractive index (μ) of the glass prism and $\angle A$ for the case, when the angle of prism (A) is equal to the angle of minimum deviation (δ_m). Hence, obtain the value of the refractive index for angle of prism $A = 60^\circ$.

Delhi 2015

99. (i) A point object is placed in front of a double convex lens (or refractive index $\mu = \mu_2/\mu_1$ with respect to air) with its spherical faces of radii of

curvature R_1 and R_2 . Show the path of rays due to refraction at first and subsequently at the second surface to obtain the formation of the real image of the object.

Hence, obtain the lens maker's formula for a thin lens.

- (ii) A double convex lens having both faces of the same radius of curvature has refractive index 1.55. Find out the radius of curvature of the lens required to get the focal length of 20 cm.

All India 2014C

- 100.** Draw a ray diagram showing the formation of the image by a point object on the principal axis of a spherical convex surface separating two media of refractive indices μ_1 and μ_2 , when a point source is kept in rarer medium of refractive index μ_1 . Derive the relation between object and image distance in terms of refractive index of the medium and radius of curvature of the surface. Hence, obtain the expression for lens Maker's formula in the case of thin convex lens. **Delhi 2014C**

- 101.** (i) Draw a ray diagram to show refraction of a ray of monochromatic light passing through a glass prism. Deduce the expression for the refractive index of glass in terms of angle of prism and angle of minimum deviation.
- (ii) Explain briefly how the phenomenon of total internal reflection is used in fibre optics. **Delhi 2011**

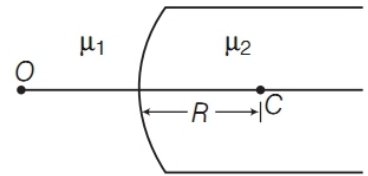
- 102.** (i) Obtain Lens Maker's formula using the expression, $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$

Here, the ray of light propagating from a rarer medium of refractive index (μ_1) to a denser medium of refractive index (μ_2) is incident on the convex side of spherical refracting surface of radius of curvature R .

- (ii) Draw a ray diagram to show that image formation by a concave mirror when the object is kept between its focus and the pole. Using this diagram, derive the magnification formula for the image formed.

Delhi 2011

- 103.** Figure shows a convex spherical surface with centre of curvature C separating the two media of refractive indices μ_1 and μ_2 . Draw a ray diagram showing the formation of the image of a point object O lying on the principal axis. Derive the relationship between the object and image distance in terms of refractive indices of the media and the radius of curvature R of the surface. **Delhi 2011**



Previous Years

Examination Questions

1 Mark Question

1. An astronomical telescope may be a refracting type or a reflecting type. Which of the two produces image of better quality? Justify your answer. All India 2020

2 Marks Questions

2. Draw the ray diagram of an astronomical telescope showing image formation in the normal adjustment position. Write the expression for its magnifying power. All India 2019
3. Explain two advantages of a reflecting telescope over a refracting telescope. 2018
4. Define the magnifying power of a compound microscope when the final image is formed at infinity. Why must both the objective and the eyepiece of a compound microscope have short focal lengths? Explain. Delhi 2017
5. A small telescope has an objective lens of focal length 150 cm and eyepiece of focal length 5 cm. What is the magnifying power of the telescope for viewing distance objects in normal adjustments. If this telescope is used to view a 100 m tall tower 3 km away, then what is the height of the tower formed by the objective lens. Delhi 2015
6. You are given two converging lenses of focal lengths 1.25 cm and 5 cm to design to compound microscope. If it is desired to have a magnification of 30, find out the separation between the objective and the eyepiece. All India 2015
7. Draw a schematic diagram of refracting telescope. Write its two important limitations. Delhi 2014C
8. Draw a ray diagram for the formation of image by a compound microscope. Write the

expression for total magnification when the image is formed at infinity. Delhi 2014C

9. Draw a ray diagram of a reflecting type telescope. State two advantages of this telescope over a refracting telescope. Delhi 2014 C
10. Draw a schematic arrangement of a reflecting telescope (Cassegrain) showing how rays coming from a distant object are received at the eyepiece. Write its two important advantages over a refracting telescope. Delhi 2013C
11. Define the magnifying power of a compound microscope. Why should both the objective and the eyepiece have small focal lengths in a microscope? Delhi 2010C

3 Marks Questions

12. Draw a labelled ray diagram showing the formation of an image by an astronomical refracting telescope in normal adjustment. Hence, obtain the expression for its magnifying power. CBSE 2022 (Term-II)
13. An optical instrument uses an objective lens of power 100 D and an eyepiece of power 40 D. The final image is formed at infinity when the tube length of the instrument is kept at 20 cm.
 - (i) Identify the optical instrument.
 - (ii) Calculate the angular magnification produced by the instrument.
14. Draw a labelled ray diagram of an astronomical telescope in the near point adjustment position. A giant refracting telescope at an observatory has an objective lens of focal length 15 m and an eyepiece of focal length 1.0 cm. If this telescope is used to view the moon, find the diameter of the image of the moon formed by the objective lens. The diameter of the moon is 3.48×10^6 m and the radius of lunar orbit is 3.8×10^8 m. Delhi 2019
15. (i) Draw a ray diagram depicting the formation of the image by an astronomical telescope in normal adjustment.

- (ii) You are given the following three lenses. Which two lenses will you use as an eyepiece and as an objective to construct an astronomical telescope? Give reason.

Lenses	Power (D)	Aperture (cm)
L_1	3	8
L_2	6	1
L_3	10	1

All India 2017

- 16.** Draw a schematic ray diagram of reflecting telescope showing how rays coming from a distant object are received at the eyepiece. Write its two important advantages over a refracting telescope.

Delhi 2016, Foreign 2013

- 17.** (i) A giant refracting telescope has an objective lens of focal length 15 m. If an eyepiece of focal length 1.0 cm is used, what is the angular magnification of the telescope?
 (ii) If this telescope is used to view the moon, what is the diameter of the image of the moon formed by the objective lens? The diameter of the moon is 3.48×10^6 m and the radius of lunar orbit is 3.8×10^8 m.

All India 2015, 2011

- 18.** Which two of the following lenses L_1 , L_2 and L_3 will you select as objective and eyepiece for constructing best possible (i) telescope (ii) microscope? Give reason to support your answer. **Delhi 2015C**

Lens	Power (P)	Aperture (A)
L_1	6 D	1 cm
L_2	3 D	8 cm
L_3	10 D	1 cm

- 19.** (i) Draw a labelled ray diagram showing the formation of a final image by a compound microscope at least distance of distinct vision.

- (ii) The total magnification produced by a compound microscope is 20. The magnification produced by the eyepiece is 5. The microscope is focused on a certain object. The distance between the objective and eyepiece is observed to be 14 cm. If least distance of distinct vision is 20 cm. Calculate the focal length of the objective and the eyepiece. **Delhi 2014 C**

- 20.** Draw a labelled ray diagram of a refracting telescope. Define its magnifying power and write the expression for it.

Write two important limitations of a refracting telescope over a reflecting type telescope. **All India 2013**

- 21.** Draw a ray diagram showing the image formation by a compound microscope. Hence, obtain expression for total magnification when the image is formed at the infinity. **Delhi 2013**

- 22.** A compound microscope uses an objective lens of focal length 4 cm and eyepiece lens of focal length 10 cm. An object is placed at 6 cm from the objective lens. Calculate the magnifying power of the compound microscope. Also, calculate the length of the microscope. **All India 2011**

- 23.** Two convex lenses of focal length 20 cm and 1 cm constitute a telescope. The telescope is focused on a point which is 1 m away from the objective. Calculate the magnification produced and the length of the tube if the final image is formed at a distance 25 cm from the eyepiece. **Delhi 2011C**

- 24.** (i) Draw a neat labelled ray diagram of an astronomical telescope in normal adjustment. Explain briefly its working.

- (ii) An astronomical telescope uses two lenses of powers 10D and 1D. What is its magnifying power in normal adjustment? **All India 2010**

- 25.** (i) Draw a neat labelled ray diagram of a compound microscope. Explain briefly its working.

- (ii) Why must both the objective and the eyepiece of a compound microscope have short focal lengths? **All India 2010**

- 26.** Draw a schematic diagram of a reflecting telescope (Cassegrain). Write two important advantages that the reflecting telescope has over a refracting type. **Foreign 2010**
- 27.** Explain with the help of a ray diagram, the working of an astronomical telescope. The magnifying power of a telescope in its normal adjustment is 20. If the length of the telescope is 105 cm in this adjustment, find the focal lengths of the two lenses. **All India 2010C**

5 Marks Questions

- 28.** (i) Draw a labelled ray diagram showing the image formation of a distant object by refracting telescope. Deduce the expression for its magnifying power when the final image is formed at infinity.
- (ii) The sum of focal lengths of the two lenses of a refracting telescope is 105 cm. The focal length of one lens is 20 times that of the other. Determine the total magnification of the telescope when the final image is formed at infinity. **All India 2014**
- 29.** (i) Draw a labelled ray diagram to obtain the real image formed by an astronomical telescope in normal adjustment position. Define its magnifying power. **All India 2013**
- (ii) You are given three lenses of power 0.5 D, 4 D and 10 D to design a telescope.
- (a) Which lenses should be used as objective and eyepiece? Justify your answer.
- (b) Why is the aperture of the objective preferred to be large?
- 30.** Define magnifying power of a telescope. Write its expression.
A small telescope has an objective lens of focal length 150 cm and an eyepiece of

focal length 5 cm. If this telescope is used to view a 100 m high tower 3 km away, find the height of the final image when it is formed 25 cm away from the eyepiece.

Delhi 2012

- 31.** How is the working of a telescope different from that of a microscope?

The focal lengths of the objective and eyepiece of a microscope are 1.25 cm and 5 cm, respectively. Find the position of the object relative to the objective in order to obtain an angular magnification of 30 in normal adjustment. **Delhi 2012**

- 32.** Draw a ray diagram to show the working of a compound microscope. Deduce an expression for the total magnification when the final image is formed at the near point.

In a compound microscope, an object is placed at a distance of 1.5 cm from the objective of focal length 1.25 cm. If the eyepiece has a focal length of 5 cm and the final image is formed at the near point. Estimate the magnifying power of the microscope. **Delhi 2010**