PHYSICS

BOOKS - PUNJAB BOARD PREVIOUS YEAR PAPERS

Refraction of Light and Lenses

Exercise

1. A 2.0 cm long needle is placed vertically at a distance 48 cm in front of a double convex

lens made of a material of refractive index 1.5 having radii of curvature as 20 cm and 30 cm. Find the height of image formed.

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2. A 3.0 cm long needle is placed vertically at a distance 50 cm in front of a double convex lens made of a material of refractive index 1.6 having radii of curvature as 30 cm of each surface. Find the height of image formed by the lens.

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3. A 5.0 cm long needle is placed vertically at a distance 20 cm in front of a double convex lens made of a material of refractive index 1.5 having radii of curvature as 10 cm of each surface. Find theheight of image formed.

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4. A ray of light of frequency of $5x10^{14}Hz$ is passed through a liquid the wavelength of

light measured inside the liquid is found to be $450x10^{-9}$ M. Calculate refractive index of the liquid

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5. A ray of monochromatic light travelling in vacuum with speed C, wavelength X and frequency u, enters into a medium of refractive index 1.5. What will be its new speed, wavelength and frequency ?

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6. For the same angle of incidence, the angle of refraction in three different media A, B and C are `15^@, 25^@ and 35^@ respectively. In which medium will the velocity of light be minimum ?

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7. Two lenses, one diverging of power 2D and the other converging of power

6Darecombinedtogether.Calculate the focal lengthand power of the combination.

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8. The radii of curvature of the faces of a double convex lens are 20 cm and 30 cm. Its focal length is 24 cm. What is the refractive index of the glass?

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9. A convex lens has 10 cm focal length in air.What is its focal length in water? (Refractive index of air-water is 1.33, refractive index for air glass = (1.5)

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10. If the critical angle for total internal reflection from medium to vacuum is 30°, then what is the velocity of light in the medium ?

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11. The radii of curvature of the faces of a double convex lens are 20 cm and 20 cm. Its focal length is also 20 cm. What is the refractive index of the glass?

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12. A convex lens has 12 cm focal length in air. What is its focal length in water? (Refractive

index of air-water is (1.33), refractive index for air-glass = (1.5).

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13. The radii of curvature of the faces of a double convex lens are 10 cm and 15 cm, Its focal length is 12 cm. What is the refractive index of the glass ?

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14. A convex lens has 20 cm focal length in air.What is its focal length in water? (Refractive index of air-water is 1.33, refractive index for air glass = 1.5).

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15. A concave lens is placed in contact with a convex lens of focal length 25 cm.The combination produces a real image at adistance of 80 cm, when an object is at a

distance of 40 cm. What is the focallength of concave lens ?

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16. A convex lens has 10 cm focal length in air.What is its focal length in water? (Refractive index of air-water is 1.33, refractive index for air glass = (1.5)

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17. A concave lens is kept in contact with convex lens of focal length 20 cm.The combination works as convex lens of focal length 50 cm. Find the power of concave lens.

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18. A convex lens is made of glass of refractive index 1.5. If radius of curvature of the each of its two surfaces is 20 cm, find the ratio of power , of lens when placed in air to its power,

when immersed inside a liquid of refractive index 1.25.

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19. A needle placed 45cm from a lens forms an image on the screen placed 90cm on the other side of the lens. What is the type of lens ? Find the focal length. If the length of needle is 5cm. What is the length of image ?

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20. A lens of focal length 12 cm produces a virtual image. The size of image is $1/3$ times the size of the object. What kind of lens it is ? Determine the positions of the object and the image.

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21. The image formed by the lens is erect and its length is three times the length of an object. If the focal length of the lens is 15 cm,

what kind of lens it is ? Calculate the object and image distance.

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22. A lens placed at a distance of 20 cm from an object produces a virtual image $2/3$ the size of the object. Find the position of the image, kind of the lens and its focal length.

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23. A needle placed 40 cm from a lens forms an image on a screen placed 80 cm on the other side of the lens. Identify the type of lens and determine its focal length. What is the size of the image, if the size of needle is 15 cm ?

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24. What is the focal lengthof the combination of a convex lens of focal length 30 cm in

contact with a concave lens of focal length 20 cm ? Is the system a converging or diverging lens ? Ignore thickness of the lenses.

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25. An object of size 5 cm is placed at distance of 25 cm in front of a convex lens of focal length 20 cm. Find the size and nature of image and its distance from the lens.

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26. An object of size 10 cm is placed at distance of 20 cm in front of aconcave lens of focal length 20 cm. Find the size and nature of image. Also find distance of image from the lens

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27. Two lenses of powers+15D and -5D are in contact with each other. What is the focal length of combination?

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28. If the focal length of a converging lens is 50 cm. What is the power of the Lens ?

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29. Define refractive index?

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30. State Snell's law of refraction of light.

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31. What is refraction of light?

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32. A convex lens made of a material of refractive index μ_1 , is kept in a medium of refractive index μ_2, Parallel rays of light are incident on the lens. Complete the pathof rays

of light emerging from the convex lens if $\mu_1 = \mu_2$.

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33. A convex lens made of a material of refractive index 'mu_1' is kept in a medium of refractive index μ_2, Parallel rays of light are incident on the lens. Complete the pathof rays of light emerging fromthe convex lens if $\mu_1 < \mu_2$.

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34. A convex lens made of a material of refractive index μ_1 is kept ih a medium of refractive index μ_2, Parallel rays of light are incident on the lens. Complete the path of rays of light emerging fromthe convex lens if $\mu_1 > \mu_2$.

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35. Define critical angle for total internal reflection.

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36. Define critical angle for total internal reflection.

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37. State Snell's law of refraction of light.

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38. Name the type of lens whichalways produces virtual and erect image.

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39. What is total internal reflection, state the necessary conditions for it ? Find a relation between refractive index and critical angle.

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40. Write the conditions for total internal reflection to takeplace?

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41. Prove the Relation : ${}^{a}\mu_{b} = \frac{1}{{}^{b}\mu_{a}}$

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42. How will you explain twinkling of stars?

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43. State Snell's law of refraction of light.

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44. When does Snell's law in refraction fail ?

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45. Explain the phenomenon of refraction at a plane surface seperating two transparent

media and show that $\mu_{=} c / v$, where letters have their usual meanings.

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46. The sun appears before the sun rise and after sun set for few minutes, why?

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47. A concave mirror andaconvex lens are held in water. What changes if any, do you expect in

their respective focal lengths as compared to their values in air.

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48. To a fish under water, the man appears as tall or small standing at the bank of a lake. Give reason.

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49. What is total internal reflection of light ? What are essential conditions of it ? Explain the formation of mirage using this phenomena.

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50. What is total internal reflection, state the necessary conditions for it ? Find a relation between refractive index and critical angle.

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51. What is total internal reflection, state the necessary conditions for it ? Find a relation between refractive index and critical angle.

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52. Write the conditions for total internal reflection to takeplace?

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53. The sun is seen a little before it rises and for a short while after it sets. Explain, why ?

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54. What are optical fibres ? Give their one use

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55. Derive the relation between refractive index of the medium and critical angle.

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56. What are optical fibres ? Explain with the help of diagram on what principle does it work ?

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57. Write the conditions for total internal reflection to takeplace?

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58. What is total internal reflection of light ? What are the two essential conditions for total internal reflection to take place ?

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59. Write the conditions for total internal reflection to takeplace?

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60. Derive the relation:- $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ when light undergoes refraction fromoptically rarer to optically denser medium at curved surface.

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61. Derive the relation:- $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ when light undergoes refraction fromoptically rarer to optically denser medium at curved surface.

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62. Derive the relation:- $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ when light undergoes refraction fromoptically rarer to optically denser medium at curved surface.

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63. What is total internal reflection of light ? What are the two essential conditions for total internal reflection to take place ?

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64. What is total internal reflection of light ? What are the two essential conditions for total internal reflection to take place ?

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65. Why does a diamond sparkle?

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66. Derive Lens formula for $\left[\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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67. Define critical angle for total internal reflection.

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68. Derive the relation:- $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ when light undergoes refraction fromoptically rarer to optically denser medium at curved surface.

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69. Derive Lens formula for $\left[\frac{1}{v} - \frac{1}{u} = \frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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70. Derive the relation:- $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ when light undergoes refraction fromoptically rarer to optically denser medium at curved surface.

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71. A convex lens made of a material of refractive index μ_1 is kept ih a medium of refractive index μ_2, Parallel rays of light are incident on the lens. Complete the path of

rays of light emerging fromthe convex lens if $\mu_1 > \mu_2$.

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72. Derive the relation:- $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ when light undergoes refraction fromoptically rarer to optically denser medium at curved surface.

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73. Derive expression for the lens maker's formula i.e.: $\frac{1}{f} = (\mu - 1)\left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ where the letters have their usual meanings

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74. Derive the relation:- $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ when light undergoes refraction fromoptically rarer to optically denser medium at curved surface.

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75. Derive the relation:- $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ when light undergoes refraction fromoptically rarer to optically denser medium at curved surface.

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76. What is total internal reflection, state the necessary conditions for it ? Find a relation between refractive index and critical angle.

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77. Derive the relation:- $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ when light undergoes refraction fromoptically rarer to optically denser medium at curved surface.

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78. What is the relation between focal length and radius of curvature of a concave mirror? What is focal length of a plane mirror?

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79. By giving sign-conventions, derive the lens formula relating object distance, image distance and focal length for a thin convex lens. Draw a ray diagram to show the formation of image of an object placed between optical centre and focus of a convex lens.

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80. Derive Lens formula for $\left[\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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81. Derive Lens formula for $\left[\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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82. Derive Lens formula for $\left[\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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83. Derive the relation:- $\frac{\mu_2}{v}-\frac{\mu_1}{u}=\frac{\mu_2-\mu_1}{R}$ when light undergoes refraction fromoptically rarer to optically denser medium at curved surface.

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84. Derive Lens formula for $\left[\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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85. Derive Lens formula for $\left[\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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86. Define power of a lens

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87. Derive Lens formula for $\left[\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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90. Derive Lens formula for $\left[\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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91. Derive Lens formula for $\left[\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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92. Derive Lens formula for $\left[\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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93. Derive Lens formula for $\left[\frac{1}{v}-\frac{1}{u}=\frac{1}{f}\right]$ a thin convex Lens, using ray diagram for the formation of a real image by Convex Lens.

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