PHYSICS

BOOKS - KUMAR PRAKASHAN KENDRA PHYSICS (GUJRATI ENGLISH)

RAY OPTICS AND OPTICAL INSTRUMENTS

Section A Questions Answers

1. Write a short note on light.

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2. Mention two main points about light.

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3. What is linear expansion of light ? Explain ray of light and beam of light.

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4. What is reflection of light ? Explain laws of reflection

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5. Discuss sign convention of distances for reflection by spherical mirror and refraction by spherical lens.

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6. Give types of mirror.

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7. Define following for curved mirrors (1) Radius of curvature (2) Centre of curvature (3) Pole (4) Principle axis (5) Aperture (6) Principle focus (7) Focal plane (8) Focal length (9) Paraxial Rays

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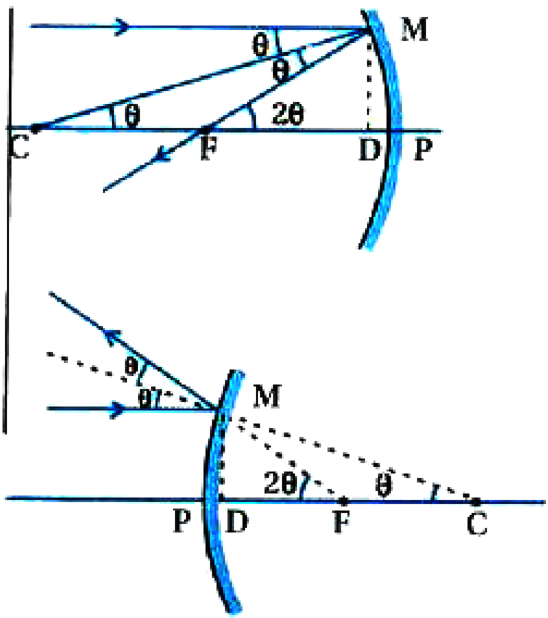
8. Give relation between focal length and radius of curvature for spherical mirror.



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9. What is image ? Explain its types.

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10. How is it convenient to obtain image by reflection from spherical mirror ?

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11. Explain the ray diagram for image obtained for concave mirror by considering three rays.

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12. Obtain mirror equation for the real image obtained by concave mirror.

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13. Give object and image distances, type, size and magnification for object placed in front of spherical mirror.

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14. What is linear magnification ? Obtain equation of linear magnification for concave mirror.

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15. What is refraction of light ? Explain laws of refraction.

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16. Only draw a figure which explains the reflection and refraction of light.

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17. What is optically denser and optically rarer medium ?

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18. Clear the meanings of optical density and mass density.

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19. What is absolute refractive index ? On what factor does it depend.

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20. Write two definitions and equations of relative refractive index.

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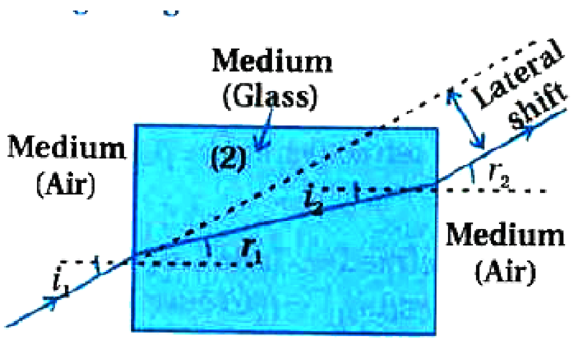
21. Explain lateral shift for the refraction from rectangular glass slab.



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22. Obtain the relation between the real depth and apparent depth of bottom of tank filled with water when observed from air.

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23. Actually Sun is visible before Sunrise and after Sun set for some time. Explain this.

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24. Explain internal reflection and total internal reflection.

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25. Explain experiment which represents the total internal reflection.

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26. Where the phenomena of total internal reflection can be observed ?

Watch Video Solution

27. Why mirage formation is seen in deserts at the summer time?

Watch Video Solution

28. Why the brilliance of diamond is observed ?

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29. Explain the phenomena of total internal reflection in right angle prism.

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30. Explain principle, construction and working of optical fibre.

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31. Explain the refraction by two transparent spherically curved surface.

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32. Obtain the relative between object distance and image distance in terms of refractive index of medium and radius of curvature for spherically curved surface.

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33. Explain how the image is formed by thin convex lens and derive $-\frac{1}{u}+\frac{1}{v}=(n_{21}-1)\left[\frac{1}{R_1}+\frac{1}{R_2}\right]$

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34. Obtain the equation of thin lens.

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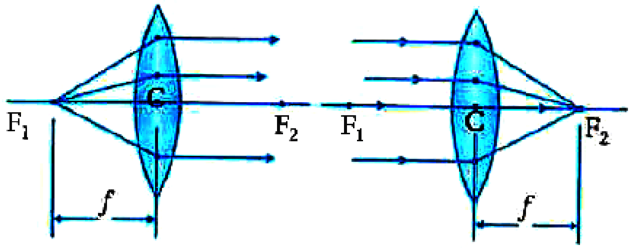
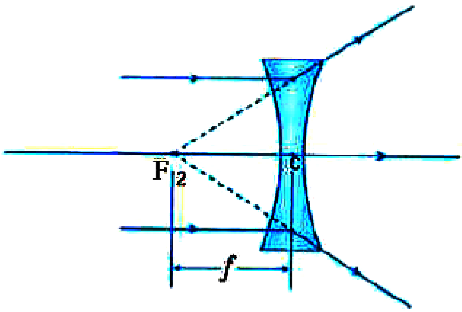
35. For more information about thin spherical lens, define :

(a) First principal focus (F_1)

(b) Second principal focus (F_2)

(c) Optical centre (C) (d) Focal length (f)





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36. Give object and image distances, type, size and magnification for object placed in front of thin lens.

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37. Explain first focal centre and second focal centre for lens.

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38. How is it convenient to obtain image by lens practically?

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39. Obtain the magnification by lens after giving its definition.

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40. Define power of lens, obtain its equation and write its SI unit.

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41. Obtain the equivalent focal length of combination of thin lenses placed in contact,

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42. Obtain the equation of power for combination of lenses.

Watch Video Solution

43. Obtain the equation of magnification of combination of lenses.

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44. Obtain the relation between incidence angle, emergence angle, prism angle and deviation angle for refraction through prism

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45. Derive i+e=A+δ for a triangular glass prism.

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46. Explain the minimum deviation angle for prism by graph of deviation angle versus incidence angle.

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47. Derive $D_m = A(n_{21} - 1)$ for thin prism.

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48. Explain dispersion of white light.

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49. Explain refractive index for light of different colours.

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50. Explain error of chromatic aberration.

Watch Video Solution

51. Explain dispersive and non-dispersive medium.

Watch Video Solution

52. Discuss the natural phenomena occured due to Sunlight.

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53. Write a note on rainbow.

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54. What is scattering of light ? And on which doe the scattering depend ?

Watch Video Solution

55. Why the sky is blue when we see it?

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56. Why does the Sun look reddish at the time of Sunrise and Sunset ?

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57. Why the Moon is seen reddish at the time of its rise and set ?

Watch Video Solution

58. Why clouds are seen to be of white colour ?

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59. Write the name of instruments developed by the use of properties of reflection and refraction of mirror, lens and prism.

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60. What is simple microscope ? Obtain the equation of magnification for the image formed at normal vision distance.

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61. Obtain the magnification for the image form at infinity for simple microscope.

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62. What is compound microscope ? Explain by figure of its construction.

Watch Video Solution

63. Obtain the equation of magnification for compound microscope.

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64. What is telescope ? Discuss the types of telescopes that are used in general.

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65. Explain the construction of refracting telescope by figure and obtain the equation of its magnification.

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66. Which are two main points important for astronomical telescope ?

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67. What are reflecting type of telescope ? Explain the advantages and disadvantages of reflecting telescopes as compared to refracting telescope and also give the solution.

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68. Write a note on Cassegrain telescope.

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Section A Try Yourself

1. Give range of wavelength of visible light.

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2. Give value of speed of light in free space.

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3. Give definition of ray and beam for light.

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4. "Angle made by incident ray with reflecting surface is incidence angle” convinced ?

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5. What are paraxial rays ?

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6. Define centre for convex mirror.

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7. By which type of mirror, image obtained is always erect ?

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8. Give definition of focal plane for concave mirror.

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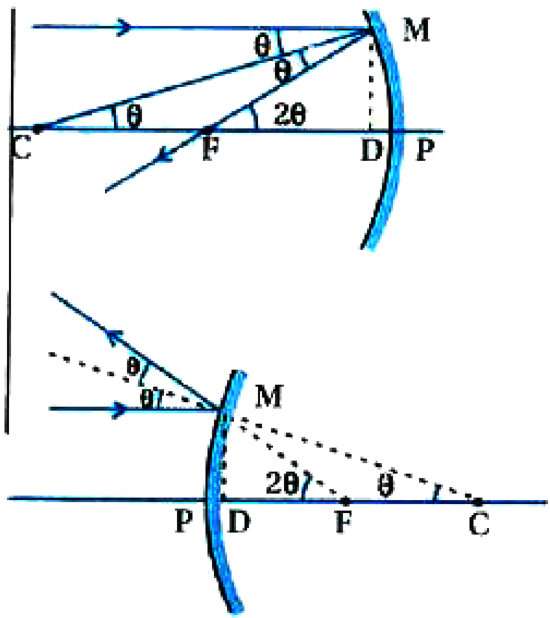
9. Give relation between focal length and radius of curvature for spherical mirror.



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10. What is image ? Explain its types.

Watch Video Solution

11. Write mirror equation for spherical mirror.

Watch Video Solution

12. Draw ray diagram when object is in between of F and P in concave mirror

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13. What is refraction of light ? Explain laws of refraction.

Watch Video Solution

14. Write Snell.s law for refraction

Watch Video Solution

15. If $n_{21} > 1$, then write relation between incidence and refraction angle.

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16. Explain rarer and denser medium.

Watch Video Solution

17. Give one example whose mass density is low but light density is high.

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18. Give meaning of n_{12}.

Watch Video Solution

19. $n_{32} \times n_{21} = \ldots\ldots.$

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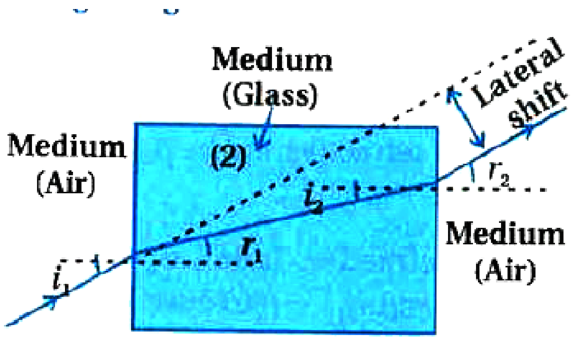
20. Explain lateral shift for the refraction from rectangular glass slab.



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21. Mention relation between the real and apparent depth with refractive indices of their media.

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22. Write condition for total internal reflection.

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23. What is total internal reflection ?

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24. Write definition of critical angle.

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25. Draw diagram of right angle prism for which object and image are of same size.

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26. In optical fibre is refractive index of core greater than cladding or smaller ?

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27. What is transducer ?

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28. Explain use of optical fibre in medical field.

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29. What is lens ?

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30. Write equation of image formed by curved surface of radius of curvature R in medium of refractive index n_1

Watch Video Solution

31. Write equation for image formed by thin lens.

Watch Video Solution

32. Derive lensmaker's formula for thin lens.

Watch Video Solution

33. Write Gaussian equation for lens.

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34. Explain first focal centre and second focal centre for biconvex lens by diagram.

Watch Video Solution

35. Explain first focal centre and second focal centre for biconcave lens by diagram.

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36. Write equation and definition of lateral magnification for lens.

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37. Define power of lens, obtain its equation and write its SI unit.

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38. Write SI unit of power.

Watch Video Solution

39. Is power negative or positive for concave lens ?

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40. In which optical instruments, combination of lenses is used ?

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41. What is incidence angle ?

Watch Video Solution

42. What is emergence angle?

Watch Video Solution

43. Define deviation angle.

Watch Video Solution

44. On which does deviation angle depend ?

Watch Video Solution

45. Write equation of refractive index of from refraction through prism.

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46. For small prism angle, obtain $D_m = (n_{21} - 1)$

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47. Define minimum deviation angle.

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48. Mention element colours of white light.

Watch Video Solution

49. What is despersion of light?

Watch Video Solution

50. Mention the colours which have the least and the most wavelength in visible light.

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51. Which colour has more speed in glass prism? Blue or yellow ?

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52. Explain dispersive and non-dispersive medium.

Watch Video Solution

53. By combination of which processes, rainbow is formed ?

Watch Video Solution

54. Can rainbow be seen in noon time?

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55. Mention colours of primary rainbow.

Watch Video Solution

56. Which is the upper most colour in secondary rainbow ?

Watch Video Solution

57. Why the intensity of light is low in secondary rainbow?

Watch Video Solution

58. What is scattering of light ? And on which doe the scattering depend ?

Watch Video Solution

59. On which does the scattering of light depend ?

Watch Video Solution

60. What is rayleigh scattering?

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61. Give name of natural optical instrument.

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62. What is simple microscope ? Obtain the equation of magnification for the image formed at normal vision distance.

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63. Write equation of magnification for simple microscope when image is formed at near point.

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64. Mention maximum magnification of simple microscope.

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65. What is objective and eye-piece lens ?

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66. What is tube lenght of compound microscope ?

Watch Video Solution

67. What is telescope ? Discuss the types of telescopes that are used in general.

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68. Obtain the equation of magnification for compound microscope.

Watch Video Solution

69. What is tube length of telescope ?

Watch Video Solution

70. In which type of telescope, extra pair of inverting lens is available ?

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71. On which does capacity of convergence of light depend ?

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72. What is diameter of objective used in astronomical telescope in present use ?

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73. Where is the largest telescope in India ? What is diameter of objective in it?

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74. Where is the largest reflecting telescope in world ? Mention the diameter of reflector.

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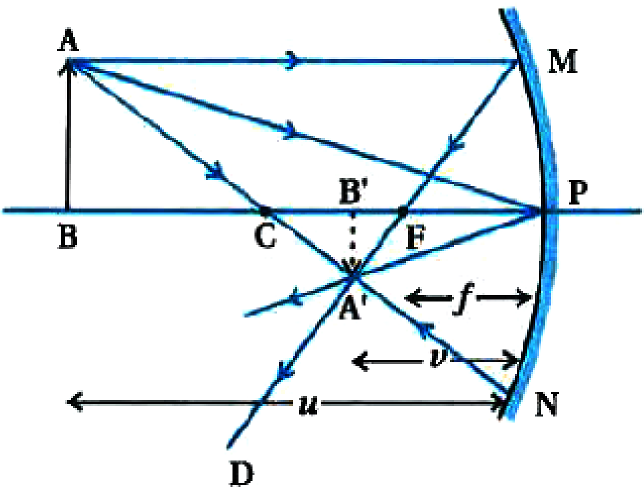
Section B Numericals Numerical From Textual Illustrations

1. Suppose that the lower half of the concave mirror.s reflecting surface as shown in figure is covered with an opaque (non-reflective) material. What effect will this have on the image of an object placed in front of the mirror ?



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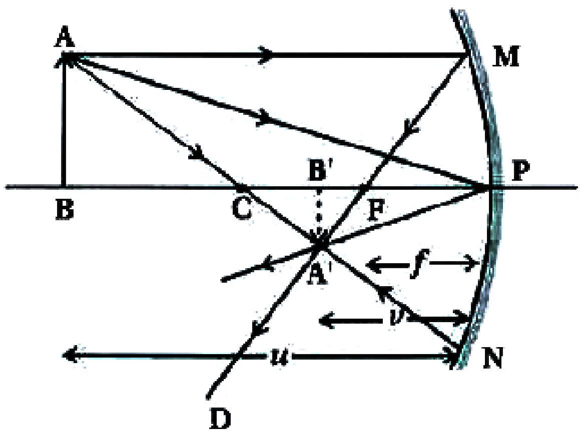
2. Suppose that the upper half of the concave mirror.s reflecting surface as shown in figure is covered with an opaque (non-reflective) material. What effect will this have on the image of an object placed in front of the mirror ?



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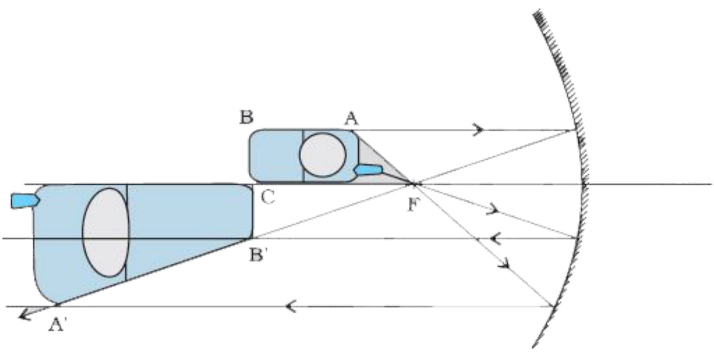
3. A mobile phone lies along the principal axis of a concave mirror, as shown in Fig. 9.7. Show by suitable diagram, the formation of its image. Explain why the magnification is not uniform. Will the distortion of image depend on the location of the phone with respect to the mirror?



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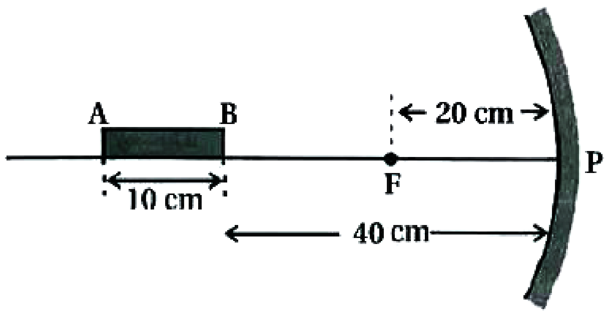
4. As shown in the figure, a thin rod AB of length 10 cm is placed on the principal axis of a concave mirror such that it.s end B is at a distance of 40 cm from the mirror. If the focal length of the mirror is 20 cm, find the length of the image of the rod



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5. An object is placed at (i) 10 cm, (ii) 5 cm in front of a concave mirror of radius of curvature 15 cm. Find the position, nature, and magnification of the image in each case.

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6. An object is placed at 30 cm in front of a concave mirror of radius of curvature 30 cm.

Find the position, nature, and magnification of the image in each case.

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7. Suppose while sitting in a parked car, you notice a jogger approaching towards you in the side view mirror of R = 2 m. If the jogger is running at a speed of 5 ms^{-1} , how fast the image of the jogger appear to move when the jogger is (a) 39 m, (b) 29 m, (c) 19 m, and (d) 9 m away.

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8. Suppose while sitting in a parked car, you notice a jogger approaching towards you in the side view mirror of R = 2 m. If the jogger is running at a speed of 5 ms^{-1}, how fast the image of the jogger appear to move when the jogger is (a) 49 m, (b) 59 m away.

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9. The earth takes 24 h to rotate once about its axis. How much time does the sun take to shift by 1° when viewed from the earth?

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10. The earth takes 24 h to rotate once about its axis. How much time does the sun take to shift by IS when viewed from the earth ?

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11. Light from a point source in air falls on a spherical glass surface (n = 1.5 and radius of curvature = 20 cm). The distance of the light source from the glass surface is 100 cm. At what position the image is formed?

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12. Light from a point source in air falls on a spherical glass surface (n = 1.5 and radius of curvature = 30 cm). The distance of the light source from the glass surface is 12 cm. At what position the image is formed

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13. A magician during a show makes a glass lens with n=1.47 disappear in the trough of liquid. What is the refractive index of the liquid.

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14. (i) If f = 0.5 m for a glass lens, what is the power of the lens? (ii) 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 glass? (iii) A convex lens has 20 cm focal length in air. What is focal length in water? (Refractive index of air-water = 1.33, refractive index for air-glass = 1.5.)

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15. (i) If f =- 0.2 m for a glass lens, what is the power ofthe lens?

(ii) The radii ofcurvature ofthe faces of a double convex lens are 15 cm and 12 cm. Its focal length is 15 cm. What is the refractive index of glass ?

(iii) Refractive index and radii of curvature oftwo equal plana-convex lens are 1.5 and 20 cm respectively. They are placed in a vessel such that their convex surfaces are in contact at centre and oil ofrefractive index 1.7 is filled in them, then what will be the focal length of combination ?

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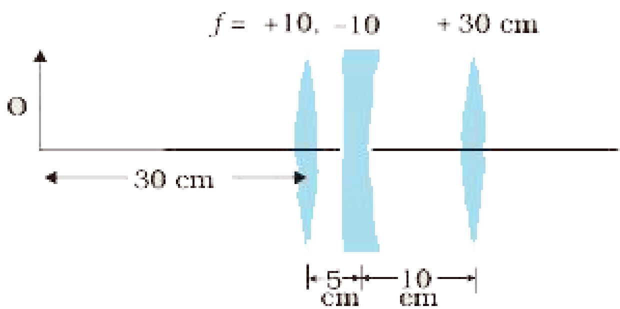
16. Find the position of the image formed by the lens combination given in the Fig.



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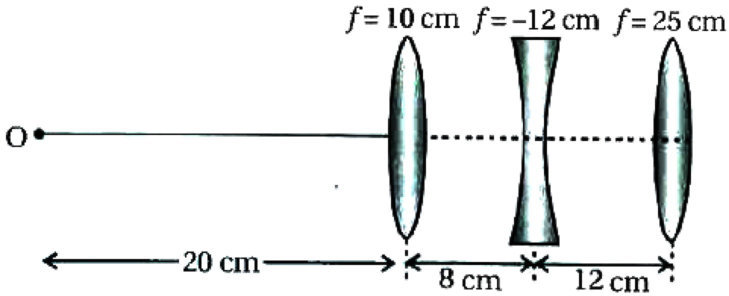
17. Decide the position of the image formed by the given combination of lenses.



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Section B Numericals Numerical From Textual Exercise

1. A small candle, 2.5 cm in size is placed at 27 cm in front of a concave mirror of radius of curvature 36 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image? Describe the nature and size of the image. If the candle is moved closer to the mirror, how would the screen have to be moved?

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2. 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.

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3. A tank is filled with water to a height of 12.5 cm. The apparent depth of a needle lying at the bottom of the tank is measured by a microscope to be 9.4 cm. What is the refractive index of water? If water is replaced by a liquid of refractive index 1.63 up to the same height, by what distance would the microscope have to be moved to focus on the needle again?

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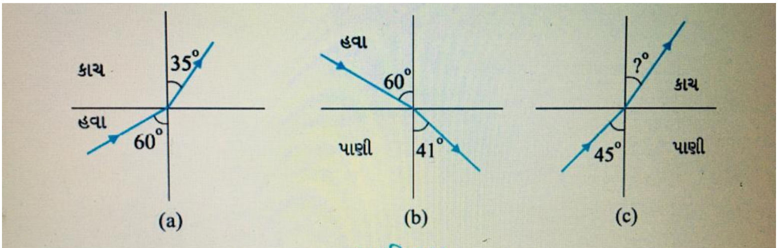
4. Figures 9.31(a) and (b) show refraction of a ray in air incident at 60° with the normal to a glass-air and water-air interface, respectively. Predict the angle of refraction in glass when the angle of incidence in water is 45° with the normal to a water-glass interface [Fig. 9.31(c)].



આકૃતિ 9.31

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5. A small bulb is placed at the bottom of a tank containing water to a depth of 80cm. What is the area of the surface of water through which light from the bulb can emerge out? Refractive index of water is 1.33. (Consider the bulb to be a point source.)

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6. A prism is made of glass of unknown refractive index. A parallel beam of light is incident on a face of the prism. The angle of minimum deviation is measured to be 40°. What is the refractive index of the material of the prism? The refracting angle of the prism is 60°. If the prism is placed in water (refractive index 1.33), predict the new angle of minimum deviation of a parallel beam of light

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7. Double-convex lenses are to be manufactured from a glass of refractive index 1.55, with both faces of the same radius of curvature. What is the radius of curvature required if the focal length is to be 20cm?

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8. A beam of light converges at a point P. Now a lens is placed in the path of the convergent beam 12cm from P. At what point does the beam converge if the lens is (a) a convex lens of focal length 20cm, and (b) a concave lens of focal length 16cm?

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9. An object of size 3.0cm is placed 14cm in front of a concave lens of focal length 21cm. Describe the image produced by the lens.

What happens if the object is moved further away from the lens?

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10. What is the focal length of a convex lens of focal length 30cm in contact with a concave lens of focal length 20cm? Is the system a converging or a diverging lens? Ignore thickness of the lenses.

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11. A compound microscope consists of an objective lens of focal length 2.0 cm and an eyepiece of focal length 6.25 cm separated by a distance of 15cm. How far from the objective should an object be placed in order to obtain the final image at (a) the least distance of distinct vision (25cm), and (b) at infinity? What is the magnifying power of the microscope in each case?

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12. A person with a normal near point (25 cm) using a compound microscope with objective of focal length 8.0 mm and an eyepiece of focal length 2.5cm can bring an object placed at 9.0mm from the objective in sharp focus. What is the separation between the two lenses? Calculate the magnifying power of the microscope,

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13. A small telescope has an objective lens of focal length 144cm and an eyepiece of focal length 6.0cm. What is the magnifying power of the telescope? What is the separation between the objective and the eyepiece?

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14. (a) A giant refracting telescope at an observatory has an objective lens of focal length 15m. If an eyepiece of focal length 1.0cm is used, what is the angular magnification of the telescope?

(b) 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 $3.48 \times 10^6 m$, and the radius of lunar orbit is $3.8 \times 10^8 m$.

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15. Use the mirror equation to deduce that:

(a) an object placed between f and 2f of a concave mirror produces a real image beyond 2f.

(b) a convex mirror always produces a virtual image independent of the location of the object.

(c) the virtual image produced by a convex mirror is always diminished in size and is located between the focus and the pole.

(d) an object placed between the pole and focus of a concave mirror produces a virtual and enlarged image.

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16. A small pin fixed on a table top is viewed from above from a distance of 50cm. By what distance would the pin appear to be raised if it is viewed from the same point through a 15cm thick glass slab held parallel to the table? Refractive index of glass = 1.5. Does the answer depend on the location of the slab?

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17. (a) Figure 9.32 shows a cross-section of a 'light pipe' made of a glass fibre of refractive index 1.68. The outer covering of the pipe is made of a material of refractive index 1.44. What is the range of the angles of the incident rays with the axis of the pipe for which total reflections inside the pipe take place, as shown in the figure.

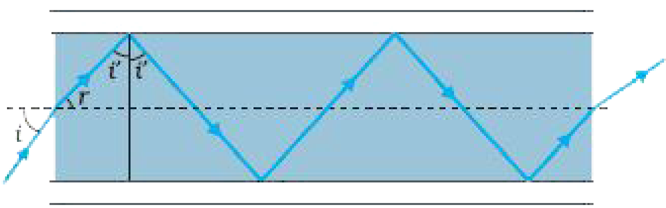

FIGURE 9.32

(b) What is the answer if there is no outer covering of the pipe?

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18. Answer the following questions:

(a) You have learnt that plane and convex mirrors produce virtual images of objects. Can they produce real images under some circumstances? Explain.

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19. Answer the following questions:

(b) A virtual image, we always say, cannot be caught on a screen. Yet when we 'see' a virtual image, we are obviously bringing it on to the 'screen' (i.e., the retina) of our eye. Is there a contradiction?

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20. Answer the following questions:

(c) A diver under water, looks obliquely at a fisherman standing on the bank of a lake.

Would the fisherman look taller or shorter to the diver than what he actually is?

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21. Answer the following questions:

(d) Does the apparent depth of a tank of water change if viewed obliquely? If so, does the apparent depth increase or decrease?

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22. Answer the following questions:

(e) The refractive index of diamond is much greater than that of ordinary glass. Is this fact of some use to a diamond cutter?

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23. The image of a small electric bulb fixed on the wall of a room is to be obtained on the opposite wall 3m away by means of a large convex lens. What is the maximum possible focal length of the lens required for the purpose?

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24. A screen is placed 90cm from an object. The image of the object on the screen is formed by a convex lens at two different locations separated by 20cm. Determine the focal length of the lens.

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25. Determine the .effective focal length. of the combination of the two lenses in Exercise 9.10, if they are placed 8.0 cm apart with their principal axes coincident. Does the answer depend on which side of the combination a beam of parallel light is incident ? Is the notion of effective focal length of this system useful at all .

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26. An object 1.5 cm in size is placed on the side of the convex lens in the arrangement (a) above. The distance between the object and the convex lens is 40 cm. Determine the magnification produced by the two-lens system, and the size of the image.

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27. At what angle should a ray of light be incident on the face of a prism of refracting angle 60° so that it just suffers total internal reflection at the other face? The refractive index of the material of the prism is 1.524.

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28. A card sheet divided into squares each of size $1mm^2$ is being viewed at a distance of 9 cm through a magnifying glass (a converging lens of focal length 10 cm) held close to the eye.

(a) What is the magnification produced by the lens? How much is the area of each square in the virtual image?

(b) What is the angular magnification (magnifying power) of the lens?

(c) Is the magnification in (a) equal to the magnifying power in (b)? Explain.

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29. (a) At what distance should the lens be held from the figure in Exercise 9.29 in order to view the squares distinctly with the maximum possible magnifying power?

(b) What is the magnification in this case?

(c) Is the magnification equal to the magnifying power in this case? Explain.

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30. What is the magnification in this case ?

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31. (a) At what distance should the lens be held from the figure in Exercise 9.29 in order to view the squares distinctly with the maximum possible magnifying power?

(b) What is the magnification in this case?

(c) Is the magnification equal to the magnifying power in this case? Explain.

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32. What should be the distance between the object in Exercise 9.24 and the magnifying glass if the virtual image of each square in the figure is to have an area of $6.25mm^2$. Would you be able to see the squares distinctly with your eyes very close to the magnifier?

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33. Answer the following questions:

(a) The angle subtended at the eye by an object is equal to the angle subtended at the eye by the virtual image produced by a magnifying glass. In what sense then does a magnifying glass provide angular magnification?

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34. Answer the following questions:

(b) In viewing through a magnifying glass, one usually positions one's eyes very close to the lens. Does angular magnification change if the eye is moved back?

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35. Answer the following questions:

(c) Magnifying power of a simple microscope is inversely proportional to the focal length of the lens. What then stops us from using a convex lens of smaller and smaller focal length and achieving greater and greater magnifying power?

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36. Answer the following questions:

(d) Why must both the objective and the eyepiece of a compound microscope have short focal lengths?

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37. Answer the following questions:

(e) When viewing through a compound microscope, our eyes should be positioned not on the eyepiece but a short distance away from it for best viewing. Why? How much should be that short distance between the eye and eyepiece?

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38. An angular magnification (magnifying power) of 30X is desired using an objective of focal length 1.25cm and an eyepiece of focal length 5cm. How will you set up the compound microscope?

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39. A small telescope has an objective lens of focal length 140cm and an eyepiece of focal length 5.0cm. What is the magnifying power of the telescope for viewing distant objects when

(a) the telescope is in normal adjustment (i.e., when the final image is at infinity)?

(b) the final image is formed at the least distance of distinct vision (25cm)?

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40. For the telescope described in Exercise 9.3 (a), what is the separation between the objective lens and the eyepiece ?

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41. If this telescope is used to view a 100 m tall tower 3 km away, what is the height of the image of the tower formed by the objective lens ?

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42. (a) For the telescope described in Exercise 9.28 (a), what is the separation between the objective lens and the eyepiece?

(b) If this telescope is used to view a 100 m tall tower 3 km away, what is the height of the image of the tower formed by the objective lens?

(c) What is the height of the final image of the tower if it is formed at 25cm?

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43. A Cassegrain telescope uses two mirrors as shown in Fig. 9.30. Such a telescope is built with the mirrors 20mm apart. If the radius of curvature of the large mirror is 220mm and the small mirror is 140mm, where will the final image of an object at infinity be?

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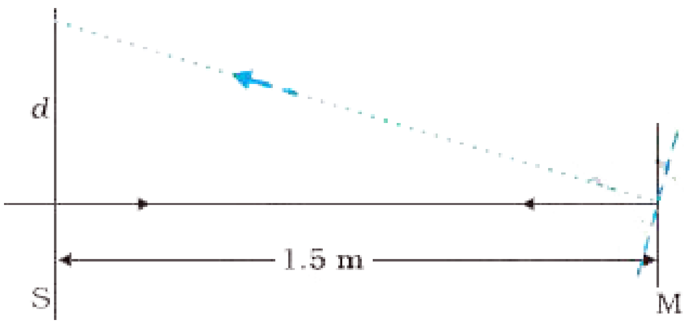
44. Light incident normally on a plane mirror attached to a galvanometer coil retraces backwards as shown in Fig. 9.33. A current in the coil produces a deflection of 3.5° of the mirror. What is the displacement of the reflected spot of light on a screen placed 1.5 m away?



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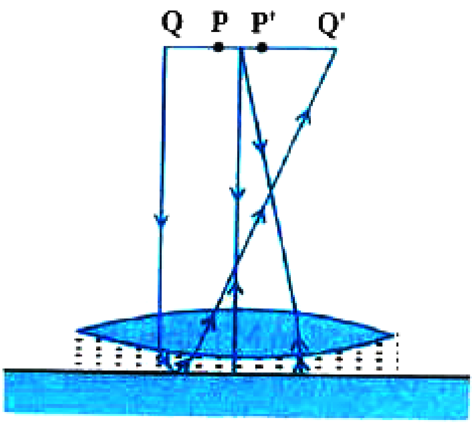
45. Figure shows an equiconvex lens (of refractive index 1.50) in contact with a liquid layer on top of a plane mirror. A small needle with its tip on the principal axis is moved along the axis until its inverted image is found at the position of the needle. The distance of the needle from the lens is measured to be 45.0 cm. The liquid is removed and the experiment is repeated. The new distance is measured to be 30.0 cm. What is the refractive index of the liquid ?



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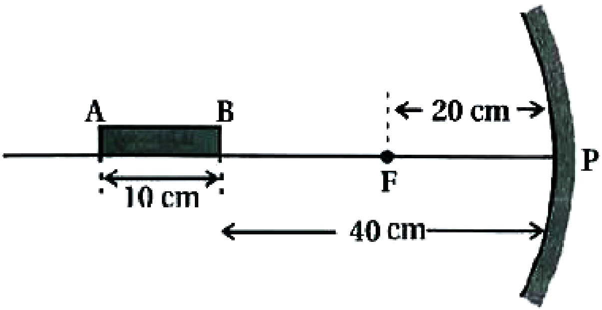
Section B Numericals Numerical From Darpan Based On Textbook

1. As shown in the figure, a thin rod AB of length 10 cm is placed on the principal axis of a concave mirror such that it.s end B is at a distance of 40 cm from the mirror. If the focal length of the mirror is 20 cm, find the length of the image of the rod



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2. Assuming that the angle of incidence at a refractive surface is sufficiently small, the relation between real depth, apparent depth , 1 and refractive index is

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3. A swimmer is diving in a swimming pool vertically down with a velocity of $2ms^{-I}$. What will be the velocity as seen by a stationary fish at the bottom of the pool right below the diver? Refractive index of water is 1.33

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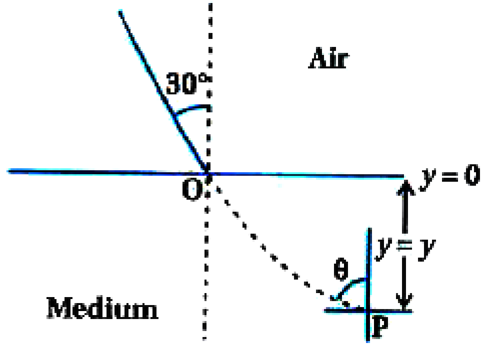
4. As shown in figure a ray of light in air is incident at 30° on a medium and proceeds ahead in the medium. The refractive index of this medium varied with distance y as given by $n(y) = 1.6 + \frac{0.2}{(y+1)^2}$ where y is in cm. What is the angle formed by the ray with the normal at a very large depth ?



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5. For a prism, angle of prism is 60° and it.s refractive index is 1.5, find (1) angle of incidence corresponding to the angle of minimum deviation and (2) angle of emergence for angle of maximum deviation.

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6. An equilateral prism is kept in air and for a particular ray angle of minimum deviation is 38°. If the prism is immersed in water the angle of minimum deviation =........ Refractive index of water is 1.33

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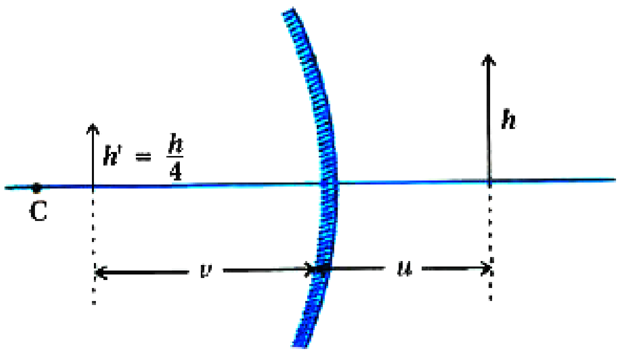
7. An image of a linear object due to a convex mirror is $\frac{1}{4}th$ of the length of the object . If focal length of the mirror is 10 cm , find the distance between the object and the image. The linear object is kept perpedicular to the axis of the mirror.



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8. The diameter of the sun subtends an angle of 0.5° at the pole of the concave mirror. The radius of curvature of the mirror is 1.5 m. Find the diameter of the image of the sun. Consider the distance of sun from the mirror infinite

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9. A real image obtained by a concave mirror is 4 times bigger than the object. If the object is displaced by 3 cm away from the mirror, the image size becomes 3 times the object size. Find the focal length of the mirror.

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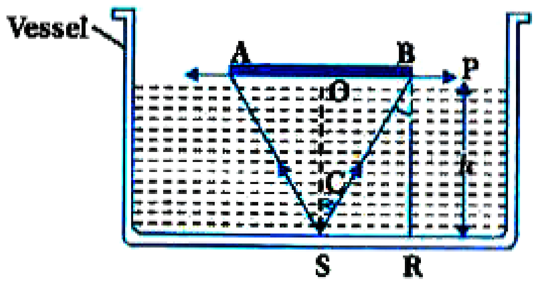
10. A vessel is fully filled with liquid having refreactive index $\frac{5}{3}$. At the bottom of the vessel a point-like source of light is kept. An observer looks at the source of light from the top. Now, an opaque circular disc is kept on the surface of the water in such a way that its centre just rests above the light source. Now liquid is taken out from the bottom gradually. Calculate the maximum height ofthe liquid to be kept so that light source cannot be seen from outside. (Radius of the disc is 1 cm.)



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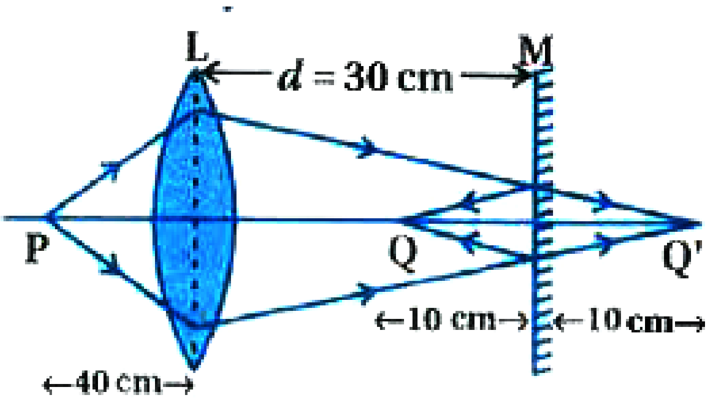
11. A point - like object is placed at 40 cm distance from a covex lens of 20 cm . Plan

mirror is placed behind convex lens at 30 cm .

Find the image distance by this combination.



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12. A convex mirror and convex lens of radius of curvature 20 cm are placed on same axis with 30 cm separation. A point-like object is

placed at 20 cm from convex lens and its image by this combination is obtained at object. What will be focal length of convex lens ?

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Section C Ncert Exemplar Solution Multiple Choice Questions Mcqs

1. A ray of light incident at an angle θ on a refracting face of a prism emerges from the other face normally. If the angle of the prism is 5° and the prism is made of a material of refractive index 1.5, the angle of incidence is

A. 7.5°

B. 5°

C. 15°

D. 2.5°

Answer: A

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2. A short pulse of white light is incident from air to a glass slab at normal incidence. After travelling through the slab, the first colour to emerge is

A. blue

B. green

C. violet

D. red

Answer: D

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3. An object approaches a convergent lens from the left of the lens with a uniform speed 5 m/s and stops at the focus. The image

A. moves away from the lens with an uniform speed 5 m / s.

B. moves away from the lens with an uniform acclcration.

C. moves away from the lens with a non uniform acceleration,

D. moves towards the lens with a non-uniform acceleration.

Answer: A::C

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4. A passenger in an aeroplane shall

A. never see a rainbow.

B. may see a primary and a secondary rainboi as concentric circles.

C. may see a primary and a secondary rainbox as concentric arcs.

D. shall never see a secondary rainbow.

Answer: A::B::C::D

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5. You are given four sources of light each on providing a light of a single colour - red, blue green and yellow. Suppose the angle o refraction for a beam of yellow ligh corresponding to a particular angle o incidence at the interface of two media is 90º Which of the following statements is correct i the source of yellow light is replaced with tha of other lights without changing the angle o incidence ?

A. The beam of red light would undergo tota. internal reflection.

B. The beam of red light would bend towards normal while it gets refracted through the second medium.

C. The beam of blue light would undergo total internal reflection.

D. The beam of green light would bend away from the normal as it gets refracted through the second medium.

Answer: A::B::C::D

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6. The radius of curvature of the curved surface of a plano-convex lens is 20 cm. If the refractive index of the material of the lens be 1.5, it will

A. act as a convex lens only for the objects that lie on its curved side.

B. act as a concave lens for the objects that lie on its curved side.

C. act as a convex lens irrespective of the side on which the object lies.

D. act as a concave lens irrespective of side on which the object lies.

Answer: A::B::C::D

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7. The phenomena involved in the reflection of radiowaves by ionosphere is similar to

A. reflection of light by a plane mirror.

B. total internal reflection of light in air during a mirage.

C. dispersion of light by water molecules during the formation of a rainbow.

D. scattering of light by the particles of air.

Answer: A::B::C::D

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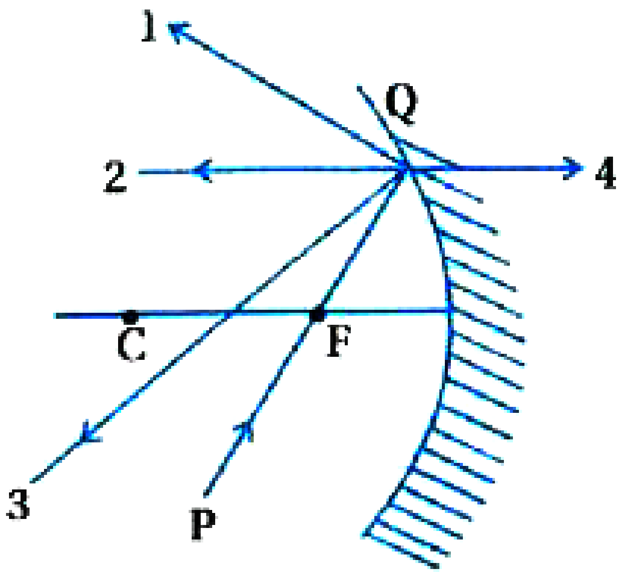
8. The direction of ray of light incident on a concave mirror is shown by PQ while directions in which the ray would travel after reflection is shown by four rays marked 1, 2, 3 and 4 (See figure). Which of the four rays correctly shows the direction of reflected ray ?



A. 1

B. 2

C. 3

D. 4

Answer: B

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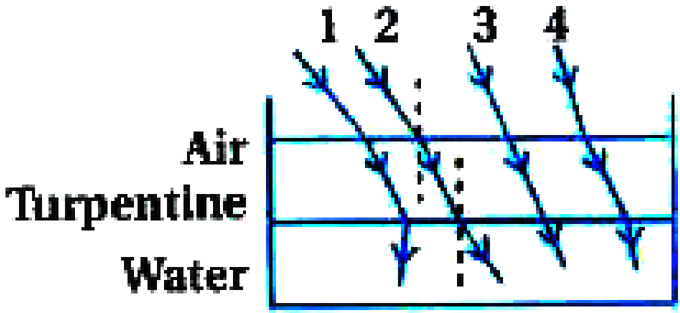
9. The optical density of turpentine is higher than that of water while its mass density is lower. Figure shows a layer of turpentine floating over water in a container. For which one of the four rays incident on turpentine in as figure, the path shown is correct?



A. 1

B. 2

C. 3

D. 4

Answer: B

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10. A car is moving with at a constant speed of 60 km h^{-1} on a straight road. Looking at the rear view mirror, the driver finds that the car following him is at a distance of 100 m and is approaching with a speed of 5 km h^{-1}. In order to keep track of the car in the rear, the driver begins to glance alternatively at the rear and side mirror of his car after every 2 s till the other car overtakes. If the two cars were maintaining their speeds, which of the following statement (s) is / are correct?

A. The speed of the car in the rear is 65 km h^{-1}.

B. In the side mirror, the car in the rear would appear to approach with a speed of 5 km h^{-1} to the driver of the leading car.

C. In the rear view mirror, the speed of the approaching car would appear to decrease as the distance between the cars decreases.

D. In the side mirror, the speed of the approaching car would appear to increase as the distance between the cars decreases.

Answer: A::B::C::D

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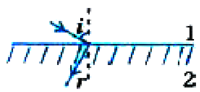
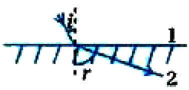
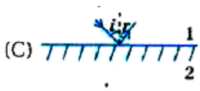
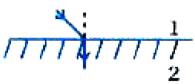
11. There are certain material developed in laboratories which have a negative refractive index (See figure). A ray incident from air (medium 1) into such a medium (medium 2) shall follow a path given by

A. 

B. 

C. 

D. 

Answer: A

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12. Consider an extended object immersed in water contained in a plane trough. When seen from close to the edge of the trough the object looks distorted because

A. the apparent depth of the points close to the edge are nearer the surface of the water compared to the points away from the edge.

B. the angle subtended by the image of the object at the eye is smaller than the actual angle subtended by the object in air.

C. some of the points of the object far awa from the edge may not be visible because total internal reflection.

D. water in a trough acts as a lens an

magnifies the object.

Answer: A::B::C

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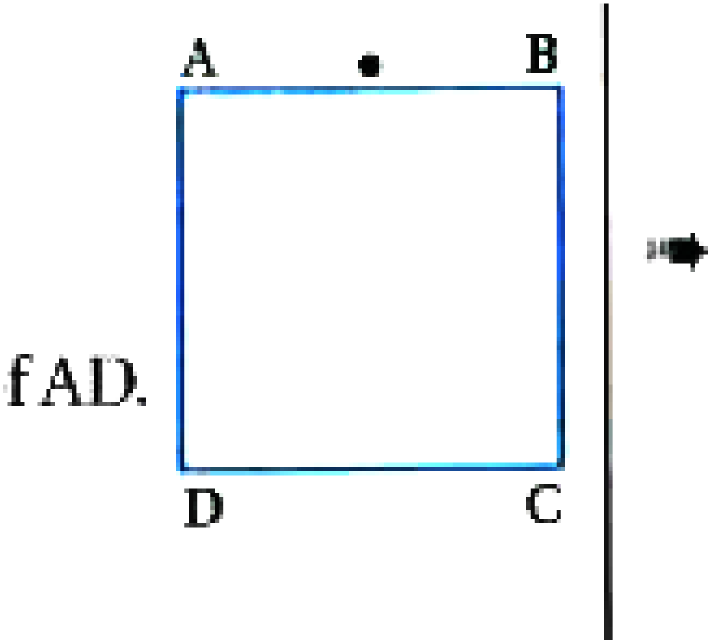
13. A rectangular block of glass ABCD has a refractive index 1.6. A pin is placed midway on the face AB (See figure). When observed from the face AD, the pin shall



A. appear to be near A.

B. appear to be near D.

C. appear to be at the centre of AD.

D. not be seen at all.

Answer: A

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14. Between the primary and secondary rainbows, there is a dark band known as Alexandar.s dark band. This is because

A. light scattered into this region interfere destructively.

B. there is no light scattered into this region.

C. light is absorbed in this region.

D. angle made at the eye by the scattered rays with respect to the incident light of the sun lies between approximately 42° and 50°.

Answer: B::D

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15. A magnifying glass is used, as the object to be viewed can be brought closer to the eye than the normal near point. This results in

A. a larger angle to be subtended by the object at the eye and hence viewed in greater detail.

B. the formation of a virtual erect image.

C. increase in the field of view.

D. infinite magnification at the near point.

Answer: A::B

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16. An astronomical refractive telescope has an objective of focal length 20 m and an eyepiece of focal length 2 cm.

A. The length of the telescope tube is 20.02m.

B. The magnification is 1000.

C. The image formed is inverted.

D. An objective of a larger aperture will increase the brightness and reduce chromatic aberration of the image.

Answer: A::B::C

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Section C Ncert Exemplar Solution Very Short Answer Type Quesitons

1. Will the focal length of a lens for red light be more, sam or less than that for blue light

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2. The near vision of an average person is 25 cm To view an object with an angular magnification of 10, what should be the power of the microspcope ?

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3. An unsymmetrical double convex thin lens forms the image of a point object on its axis will the position of the image change if the lens is reversed ?

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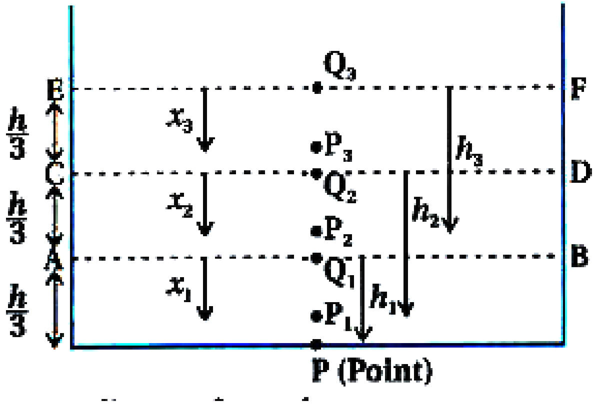
4. Three immiscible liquids of densities $d_1 > d_2 > d_3$ and refractive indies $\mu_1 > \mu_2 > \mu_3$ are put in a beaker. The light of each liquid column is $\frac{h}{3}$. A dot is made at the bottom of the beaker. For near normal vision, find the apparent depth of the dot.



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5. For a glass prism $(\mu = \sqrt{3})$, the angle of minimum deviation is equal to the angle of the prism . Find the angle of the prism .

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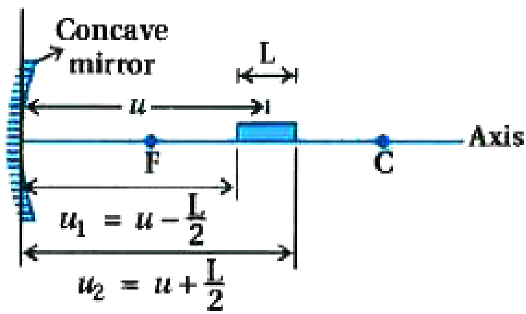
Section C Ncert Exemplar Solution Short Answer Type Quesitons

1. A short object of length L is placed along the principal axis of a concave mirror away from focus. The object distance is u. If the mirror has a focal length f, what will be the length of the image ? You may take $L < < |v - f|$.



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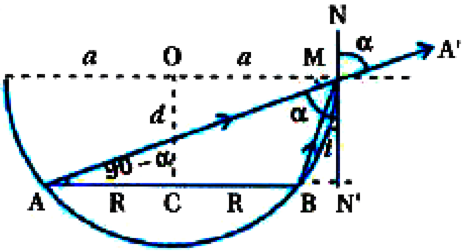
2. A cicular disc of radius R is placed co-axially and horizontally inside an opaque hemi spherical bowl of radius .a. (see figure). The faredge of the disc in just visible when viewed from the edge of the bowl . The bowl is filled with transparent liquid of refractive index μ and the near edge of the disc becomes just visible. How far below the top of the bowl is the disc placed ?



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3. A thin convex lens of focal length 25 cm is cut into tow pieces 0.5 cm above the principal axis. The top part is placed at (0,0) and an object placed at (-50 cm , 0) Find the coordinates of the image.

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4. In many experimental set-ups, the source and screen are fixed at a distance say D and the lens is movable. Show that there are two positions for the lens for which an image is formed on the screen. Find the distance between these pionts and the ratio of the image sizes for these two points.

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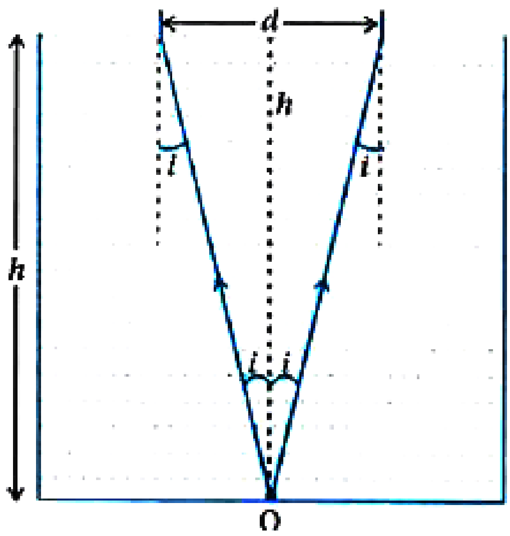
5. A jar of height h is filled with a transparent liquid of refractive index μ (See figure). At the centre of the jar on the bottom surface is a dot. Find the minimum diameter of a disc, such that when placed on the top surface symmertically aobut the centre , the dot is invisible



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6. A myopic adult has a far point at 0.1 m. His power of accomodation is 4 Diopters.(i) What power lenses are required to see distant objects ?

(ii) What is his near point without glasses ? (iii) What is his near point with glasses ? (iii) What is his near point with glasses ? (Take the image distance from the lens of the eye to the retina to be 2 cm.)

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Section C Ncert Exemplar Solution Long Answer Type Quesitons

1. Show that for a material with refractive index $\mu \geq \sqrt{2}\sim$, light incident at any angle shall be guided along a length perpendicular to the incident face.

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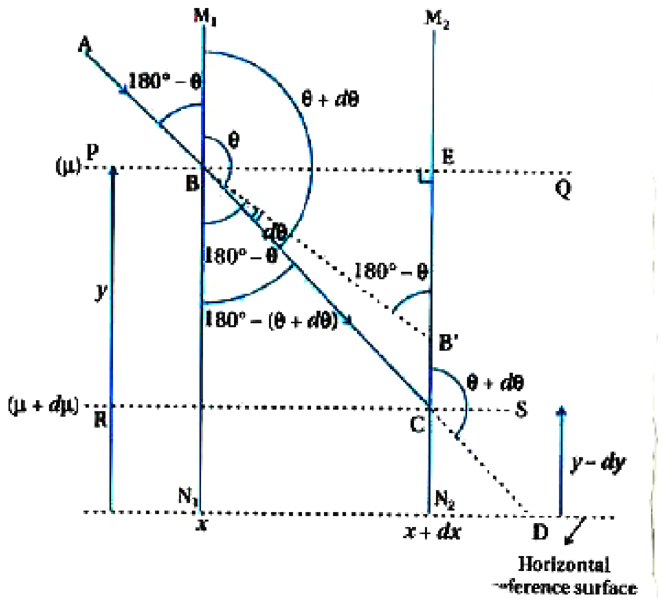
2. The mixture a pure liquid and a solution in long vertical column (i.e, horizontal dimensions $<<$ vertical dimensions) Produce diffusion of solute particles and hence refractive index gradient along the vertical dimesion . A ray of light entering the column I at right angles to the vertical is deviated from its original path. Find the deviated from its original path. Find the deviation in travelling a horizontal distance

$d < < \text{h}$, the height of the coloumn.



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3. If light passes near a massive object, the gravitational interation causes a bending of the ray. This can be thought of as heappening due to a change in the effective refrative index of the medium given by

$n(r) = 1 + 2GM/rc^2$

where r is the distance of the point of consideration from the centre of the mass of the massive body, G is the universal gravitational constant, M the mass of the body and c the speed of light in vacuum.

Considering a spherical object find the deviation of the ray form the original path as it graxes the object.

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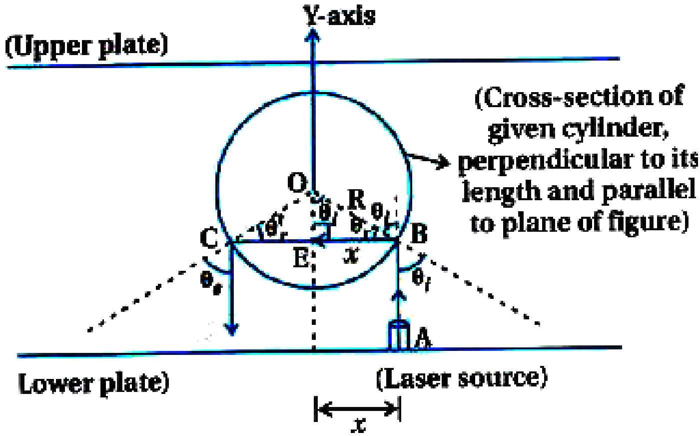
4. An infinitely long cylinder of radius R is made of an unusual exotic material with refractive index-1 (see figure). The cyliner is palced between two planes whose normals are along the y- direction . The center of the cylinder O lies along the y - axis . A narrow laser beam is directed along the y direction from the lower plate. The laser source is at a horizontal distance x from the diameter in the y - direction.

Find the range of x such that light emitted from the lower plane does not reach the upper plane.



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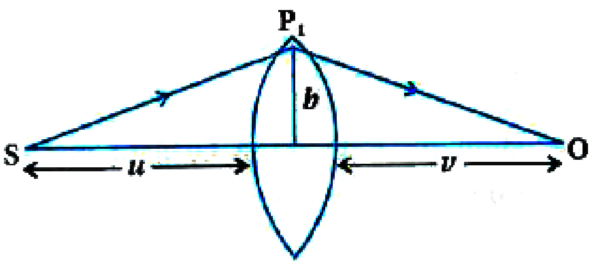
5.



Consider a thin lens placed between a source

(S) and an observer (O) (see figure) . Let the thicknes of the lens very as $w(b) = w_0 - \frac{b^2}{\alpha}$, where b is the verticle distance from the pole. w_0 is constant. Using Fermat.s principle i.e. the time of transit for a ray between the source and observer is an extremum, find the condition that all paraxial rays starting from the source will converage at a point O on the axis. Find the focal length.

(ii) A gravitational lens may be assumed to have a varying width of the from

$$w(b) = k_1 \ln\left(\frac{k_2}{b}\right) b_{\min} < b < b_{\max}$$

$$= k_1 \ln\left(\frac{k_2}{b_{\min}}\right) b < b_{\min}$$

Show that an observe will see an image of a point object as a right about the center of the lens with and angular radius

$$\beta = \sqrt{\frac{(n-1)k_1 \frac{u}{v}}{u+v}}$$

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Section D Multiple Choice Questions Mcqs Mcqs From Darpan Based On Textbook

1. Diameter of spherical mirror is 10 cm, what will be aperture of mirror ?

A. 20 cm

B. 10 cm

C. 40 cm

D. 5 cm

Answer: A::B::C

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2. Aperture of a spherical mirror is 20 cm, then circumference of this spherical mirror will be

A. 3.14 cm

B. 6.28 cm

C. 20 cm

D. 62.8 cm

Answer: B::C::D

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3. Radius of curvature of a concave mirror is 20 cm, then its focal length is ...... cm.

A. - 20 cm

B. + 20 cm

C. – 10 cm

D. + 10 cm

Answer: A::C

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4. No. of images obtained by combination of two plane mirrors kept perpendicular to each other is ......

A. 2

B. 3

C. 4

D. infinite

Answer: B::C

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5. The number of images formed between two parallel plane mirrors are ....

A. 0

B. 90

C. 100

D. ∞

Answer: D

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6. To get three images of a single object, one should have two plane mirrors at an angle of .....

A. 90°

B. 120°

C. 180°

D. 360°

Answer: A::B

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7. A ray is incident at an angle 38° with a mirror. The angle between normal and reflected ray is ....

A. 52°

B. 38°

C. 90°

D. 70°

Answer: A::B

Watch Video Solution

8. If a ray of light is incident on a plane mirror at an angle of 30°, then deviation produced by a plane mirror is ....

A. 30°

B. 60°

C. 90°

D. 120°

Answer: A::B::D

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9. An object is placed at a distance of 25 cm on the axis of a concave mirror, having focal length 20 cm. Find the lateral magnification of an image.

A. -4

B. 4

C. 2

D. -2

Answer: A::D

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10. For a thin convex lens when the heights of the object is double than its image, its object distance is equal to .... Focal length of a lens is f.

A. f

B. 2f

C. 3f

D. 4f

Answer: C

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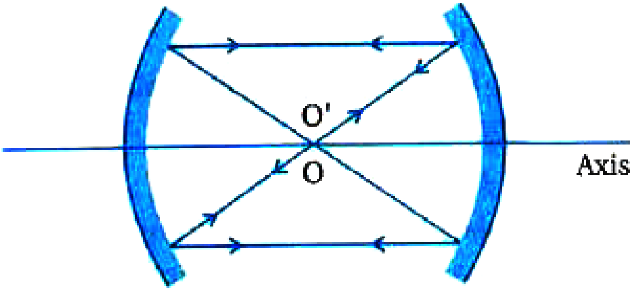
11. A point object O is placed midway between on the common axis of two concave mirrors of equal focal length. If the final image is formed at the position of the object, the separation between two mirrors is .... Focal length of mirrors is f.



HINT:- A situation is depicted n the figure [Note : A another possible situation for which object and its image coincide is when distance between mirrors is 4f] .

A. f

B. 2f

C. $\frac{3}{2}f$

D. $\frac{1}{2}f$

Answer: B

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12. For ..... mirror, height of image is always ...... than height of object.

A. convex, less

B. convex, more

C. concave, less

D. concave, more

Answer: A::C

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13. An object is placed at a distance 40 cm in front of concave mirror. Focal length of mirror is 20 cm, so what will be type of image ?

A. Virtual and inverted

B. Real and erect

C. Real, inverted and of the same size of object

D. Real, inverted and smaller.

Answer: A::B::C::D

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14. A convex mirror having focal length 20 cm is used as side glass in car. Driver will find image of car coming behind 6 m away at .....

A. 15.4 cm

B. 17.4 cm

C. 19.4 cm

D. 21.4 cm

Answer: A::C::D

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15. In which of the following mirrors can a person not see a reflection larger than his height ?

A. Concave mirror

B. Convex mirror

C. Plane mirror

D. None of these

Answer: B::C

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16. Object is placed 60 cm away from convex mirror. If magnification is 0.5, image distance = ...

A. -30

B. 15

C. 30

D. -15

Answer: C

Watch Video Solution

17. Lateral magnification of an object by spherical mirror is 0.3. If focal length of mirror is 30 cm, find type of mirror.

A. concave

B. convex

C. concave or convex

D. none of these

Answer: B::C

Watch Video Solution

18. Plane mirror is moving towards you at 5 cm /s. You can see your image in it. So at how much speed image moves towards you ?

A. 5 cm / s

B. 2.5 cm / s

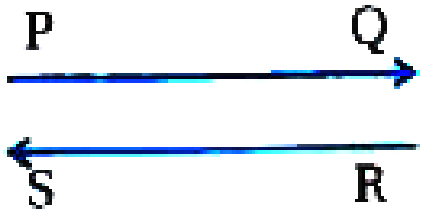
C. 10 cm / s

D. 7.5 cm / s

Answer: A::C

Watch Video Solution

19. PQ type incident radiation and RS is the reflected ray. They are both parallel. So which mirror on the right makes this possible? There may be one or more reflections through the mirror.



A. Plane mirror

B. Convex mirror

C. Plane and concave mirror

D. An concave mirror

Answer: A::C::D

Watch Video Solution

20. Focal length of concave mirror is f and ratio of heights of object to image for an object at x distance from mirror is .....

A. $\sqrt{\frac{f}{x}}$

B. $\frac{f}{x}$

C. $\frac{f^2}{x^2}$

D. $\frac{f+x}{f}$

Answer: B

Watch Video Solution

21. If f is focal length and v is image distance for spherical mirror, then beteral magnification m = ...

A. $\frac{f}{f+v}$

B. $\frac{f}{f-v}$

C. $\frac{f+v}{f}$

D. $\frac{f-v}{f}$

Answer: D

Watch Video Solution

22. If f is focal length and u is object distance for spherical mirror, then lateral magnification m = ...

A. $\frac{f}{u-f}$

B. $\frac{f}{u+f}$

C. $\frac{f}{f-u}$

D. $\frac{f-u}{f}$

Answer: C

Watch Video Solution

23. If image obtained from concave mirror of focal length f is $\left(\frac{1}{n}\right)^{th}$ times of object, then find object distance.

A. $\frac{f}{n}$

B. fn

C. (n+1)f

D. (n-1)f

Answer: A::C

Watch Video Solution

24. An image of an object obtained by a convex mirror is n times smaller than the object. If the focal length of lens is f, the object distance would be ....

A. $\frac{f}{n}$

B. $\frac{f}{(n-1)}$

C. $(n-1)f$

D. nf

Answer: A::C

Watch Video Solution

25. If real image obtained from concave mirror of focal length f is n times of object, then find object distance.

A. $(n - 1)f$

B. $(n + 1)f$

C. $\left(\frac{n+1}{n}\right)f$

D. $\left(\frac{n-1}{n}\right)f$

Answer: A::C

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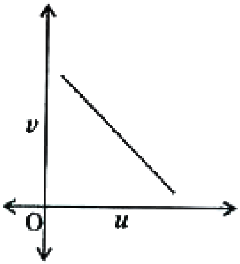
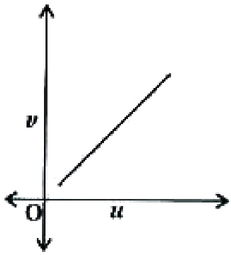
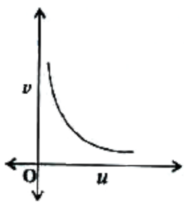
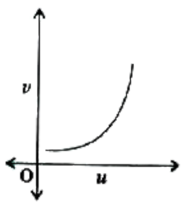
26. In an experiment to find focal length of a concave mirror a graph is drawn. The graph looks like ....

A. 

B. 

C. 

D. 

Answer: C

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Section D Multiple Choice Questions Mcqs Mcqs From Darpan Based On Textbook Refraction

1. Refraction index of medium-2 with respect to medium-1 is ....

A. $n_{12} = \frac{n_1}{n_2}$

B. $n_{21} = \frac{n_2}{n_1}$

C. $n_{12} = \frac{n_2}{n_1}$

D. $n_{21} = \frac{n_1}{n_2}$

Answer: A::B

Watch Video Solution

2. Which of the following doesn.t represent the refractive index of medium-2 with respect to medium-1 ?

A. $n_{21} = \frac{\sin\theta_1}{\sin\theta_2}$

B. $n_{21} = \frac{v_1}{v_2}$

C. $n_{21} = \frac{v_2}{v_1}$

D. $n_{21} = \frac{n_2}{n_1}$

Answer: A::B::C

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3. $n_{21} \times n_{12}$ = ...

A. 1

B. -1

C. ∞

D. 0

Answer: A

Watch Video Solution

4. Which of the following relation is correct for relative refractive index ?

A. ${}^{1}n_2 = {}^{1}n_2 \times {}^{3}n_2$

B. ${}^{1}n_3 \times {}^{3}n_2 = {}^{2}n_1$

C. ${}^{1}n_3 \times {}^{3}n_1 = 0$

D. $\dfrac{{}^{1}n_3}{{}^{2}n_3} = {}^{1}n_2$

Answer: A::B::C::D

Watch Video Solution

5. If the speed of light in a medium is $200 \times 10^{6}\ \mathrm{m/s}$, then refractive index of medium is ...... $[C = 3 \times 10^{8}\ \mathrm{m/s}]$

A. 1

B. 1.2

C. 1.33

D. 1.5

Answer: A::D

Watch Video Solution

6. Time taken by the sunlight to pass through a slab of thickness 4 mm and refractive index 3 is .... sec.

A. 4×10^{-11} s

B. 2×10^{-11} s

C. 2.5×10^{10} s

D. 36×10^{5} s

Answer: A::D

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7. When a ray of light travel from one medium to other then the physical quantity which does not change is

A. velocity

B. wavelength

C. frequency

D. intensity

Answer: C

Watch Video Solution

8. When light ray travels from denser to rarer medium and if θ_1 is incidence and θ_2 is refraction angle, then .....

A. $\theta_1 > \theta_2$

B. $\theta_1 < \theta_2$

C. $\theta_1 = \theta_2$

D. $\theta_2 > \theta_1 \text{ or } \theta_1 > \theta_2$

Answer: A::B

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9. In hot summer as we move up refractive index of air in atmosphere ....

A. decreases

B. increases

C. does not change

D. becomes less than one

Answer: A::B::C

Watch Video Solution

10. The velocity of light in vacuum can be changed by changing ......

A. amplitude

B. frequency

C. wavelength

D. medium

Answer: D

Watch Video Solution

11. Refractive index of glass with respect to air is 1.8. So refractive index of air with respect to glass = ...

A. 1

B. 1.8

C. 0.556

D. 5.56

Answer: C

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12. When a ray of light enters into the medium of refractive index of μ, angle of refraction is half of angle of incidence so angle of incidence = ...

A. $2\sin^{-1}\left(\frac{\mu}{2}\right)$

B. $2\cos^{-1}(\mu)$

C. $\cos^{-1}\left(\frac{\mu}{2}\right)$

D. $2\cos^{-1}\left(\frac{\mu}{2}\right)$

Answer: A::B::C::D

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13. Green light of wavelength 5460 Å is incident on an air and glass interface. If refractive index of glass is 1.5, then wavelength of light in glass would be .....

A. 5460 Å

B. 4860 Å

C. 3640 Å

D. 2100 Å

Answer: C::D

Watch Video Solution

14. Velocity of light in diamond, glass and water decreases in the following order.

A. Water $>$ glass $>$ diamond

B. Diamond $>$ glass $>$ water

C. Diamond $>$ water $>$ glass

D. Water $>$ diamond $>$ glass

Answer: A::D

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15. The refractive indices of water and glass are 1.2 and 1.5 respectively. What will be the refractive index of glass with respect to water ?

A. 1.6

B. 1.4

C. 1.0

D. 1.25

Answer: A::B::D

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16. A sound wave travels from air to water. The angle of incidence is α_1, and the angle of reflection is α_2. If the Snell.s law is valid, then ......

A. $\alpha_1 = \alpha_2$

B. $\alpha_1 > \alpha_2$

C. $\alpha_1 < \alpha_2$

D. None of these

Answer: A::B::C

Watch Video Solution

17. A complete transparent object is invisible ir free space, then what is its refractive index ?

A. One

B. More than one

C. Less than one

D. 1.33

Answer: A

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18. Refractive index of diamond is 2. Speed of ligh in it is ...... Cm / s.

A. 6×10^{10}

B. 3.0×10^{10}

C. 2×10^{10}

D. 1.5×10^{10}

Answer: A::D

Watch Video Solution

19. A ray of light having intensity $0.5 \frac{W}{m^2}$ is incident perpendicular to the glass slab having refractive index 1.5. What will be intensity of partially refracted ray ?

A. $0.04\frac{W}{m^2}$

B. $0.02\frac{W}{m^2}$

C. $2\frac{W}{m^2}$

D. $4\frac{W}{m^2}$

Answer: B

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20. A ray of light is incident on liquid surface such that reflected and refracted ray are perpendicular to each other. If refractive index is 1.4, find angle of incident.

A. 54.5°

B. 55.4°

C. 5.45°

D. 5.54°

Answer: A::D

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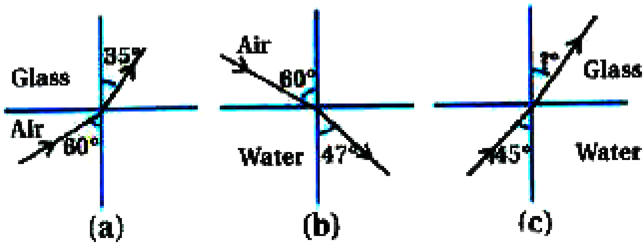
21. Light ray travels from air to glass and air to water, as shown in figure (i) and (ii) respectively. What is refraction angle for figure (iii) ?



A. 30°

B. 35°

C. 60°

D. 41°

Answer: B::C

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22. An observer stand on the bank of lake finds fish at the depth 12 cm in water. At what height is the image of fish found raised ?

A. 9 cm

B. 12 cm

C. 3 cm

D. 3.8 cm

Answer: C

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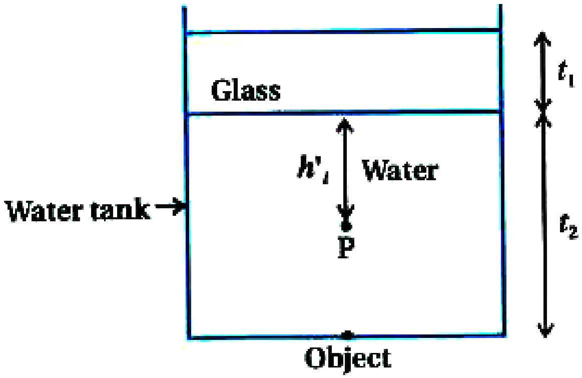
23. A water tank is partially fill upto 2 m height. As shown in figure, 0.1 m thick glass slab is placed on water surface. If refractive indices of water and glass are 1.3 and 1.5 respectively, what will be virtual depth of object placed at bottom when it is viewed from top ?



A. 3.2 m

B. 1.6 m

C. 0.8 m

D. 2.4 m

Answer: A::B

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24. A glass slab having refractive index n and thickness d is placed on the paper on table. A dot (drop) of dink is made on paper below glass slab. At how much height will the dot be found if it is observed from the upper side of slab?

A. $(n-1)\frac{d}{n}$

B. $(n+1)\frac{d}{n}$

C. $\left(\frac{n}{n-1}\right)d$

D. $\left(\frac{n}{n+1}\right)d$

Answer: A::D

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25. A mark at the bottom of a liquid beaker appears to rise by 0.1 m. If the depth of the liquid is 1.0 m, then refractive index of the liquid is ......

A. 1.1

B. 1.3

C. 1.5

D. 1.7

Answer: A

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26. A swimmer is diving in a swimming pool vertically down with a velocity of $2ms^{-I}$. What will be the velocity as seen by a stationary fish at the bottom of the pool right below the diver? Refractive index of water is 1.33

A. $2.66 cm s^{-1}$

B. $26.6 cm s^{-1}$

C. $266 cm s^{-1}$

D. $26.6 m s^{-1}$

Answer: A::B::C

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27. A ray of light enters in air from glass. What wi be deviation angle if angle of incidence is 50° Take refractive index of glass 1.5.

A. 0°

B. 80°

C. $50^\circ - \sin^{-1}\left(\frac{\sin 50^\circ}{1.5}\right)$

D. $\sin^{-1}(1.5\sin 50^\circ) - 50^\circ$

Answer: A::D

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28. When an object in rarer medium is viewed from denser medium, then that object seems to be .....

A. shifted up

B. shifted down

C. at the same position

D. none of these

Answer: B::D

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29. A vessel of depth d is half filled with liquid of refractive index μ_1, and half filled with liquid of refractive index μ_2. Bottom will be at depth ..... when viewed from top and perpendicularly to surface.

A. $2d\dfrac{\mu_2}{\mu_1}$

B. $2d\mu_1\mu_2$

C. $\dfrac{d}{2}\left[\dfrac{1}{\mu_1}+\dfrac{1}{\mu_2}\right]$

D. $2d\left[\dfrac{1}{\mu_1}+\dfrac{1}{\mu_2}\right]$

Answer: A::B::C::D

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30. A narrow beam of light is incident on a glass plate of refractive index 1.6. It makes an angle 53° with normal to the interface. Find the lateral shift of the beam at the point of emergence, if thickness of the plate is 30 mm. (Take sin53° = 0.8.)

A. 9.023 mm

B. 15.52 mm

C. 13.53 cm

D. 13.53 mm

Answer: A::C::D

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31. A bird views a fish at 3 m depth in water.

Real depth of fish is .....

(Refraction index of water is $\frac{4}{3}$)

A. 4 m

B. $\frac{9}{4}$ m

C. $\frac{4}{9}$ m

D. $\frac{3}{4}$ m

Answer: A::D

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32. An object viewed by a person in water is at 3 m height in air, then real height of object is ......

A. 4 m

B. $\frac{9}{4}$ m

C. $\frac{4}{9}$ m

D. $\frac{3}{4}$ m

Answer: B::D

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Section D Multiple Choice Questions Mcqs Mcqs From Darpan Based On Textbook Total Internal Reflection

1. When light ray travels from ...... then total internal reflection is possible.

A. from air to water

B. from air to glass

C. from water to glass

D. from glass to water

Answer: A::D

Watch Video Solution

2. A ray of light covers distance .d. in time t, in air and distance 10 d in time t_2, in medium, then critical angle for medium is .....

A. $\sin^{-1}\left(\frac{t_1}{t_2}\right)$

B. $\sin^{-1}\left(\frac{10t_1}{t_2}\right)$

C. $\tan^{-1}\left(\frac{t_1}{t_2}\right)$

D. $\tan^{-1}\left(\frac{10t_1}{t_2}\right)$

Answer: A::B

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3. A ray of light passes from glass (μ = 1.5) to water (μ = 1.33). The value of the critical angle of glass is ....

A. $\sin^{-1}\left(\frac{8}{9}\right)$

B. $\sin^{-1}\left(\sqrt{\frac{8}{9}}\right)$

C. $\sin^{-1}\left(\frac{1}{2}\right)$

D. $\sin^{-1}\left(\frac{2}{1}\right)$

Answer: A

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4. If critical angle for total internal reflection in diamond is 24.5°, then refractive index of diamond is ...... [Take sin 24.5° = 0.4147]

A. 1.41

B. 1.51

C. 2.1

D. 2.41

Answer: A::B::D

Watch Video Solution

5. Which of the following is responsible for glittering of a diamond ?

A. Interference

B. Diffraction

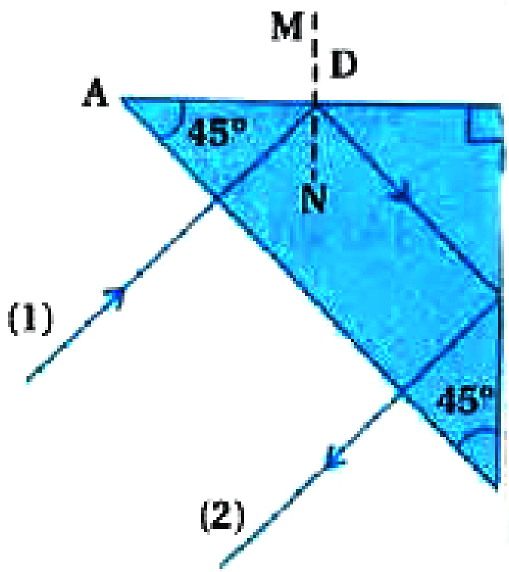
C. Total internal reflection

D. Refraction

Answer: C

Watch Video Solution

6. For right-angled prism, ray-1 is the incident ri and ray-2 is the emergent ray as shown in the figure. Refractive index of the prism is ....



A. $\frac{1}{\sqrt{2}}$

B. $\frac{\sqrt{3}}{2}$

C. $\frac{2}{\sqrt{3}}$

D. $\sqrt{2}$

Answer: B::D

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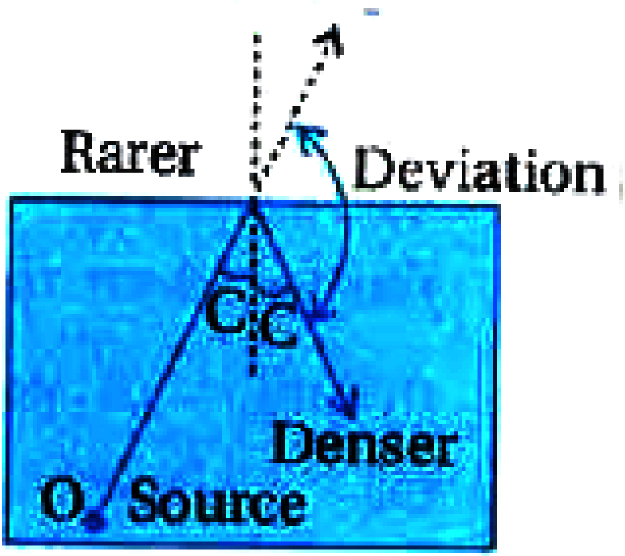
7. A ray of light is travelling from a denser medium to rarer medium. For these media the critical angle is C. The maximum possible deviation of the ray is ....



[Hint : The situation at total reflection is shown in the figure.]

A. $\pi - 2$

B. $\pi - 2C$

C. 2C

D. $\frac{\pi}{2} + C$

Answer: B::C

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8. .... obtained at angle of incidence equal to critical angle is called critical ray.

A. Refracted ray

B. Reflected ray

C. Incident ray

D. Partial refracted ray

Answer: B

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9. Refractive index of cladding of optical fibre is ...... that of core of optical fibre.

A. greater than

B. less than

C. same as

D. greater or less than

Answer: B

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10. Critical angle of glass-air is 42°, then speed of light in glass is .....

A. 3×10^{8} ms^{-1}

B. 2×10^{8} ms^{-1}

C. 1.5×10^{8} ms^{-1}

D. 2.5×10^{8} ms^{-1}

Answer: A::B

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11. Find critical angle of diamond whose refractive index is 2.42.

A. 2.441

B. 14.24

C. 24.41

D. 44.41

Answer: A::B::C::D

Watch Video Solution

12. If wavelengths of light in liquid A and B are 3500 Å and 7000 Å respectively, then critical angle of liquid A with respect to liquid B is .....

A. 15°

B. 30°

C. 45°

D. 60°

Answer: B::C

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13. A ray of light enters in denser medium from rarer medium. Speed of light in rarer medium is double than that in denser medium, what is the critical angle for total internal reflection ?

A. 30°

B. 45°

C. 60°

D. None of these

Answer: A::C

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14. If the critical angle for total internal reflection from a medium to vacuum is 30°, then velocity of light in the medium is .... ms^{-1}. (c = 3.8 $\times 10^8$ ms^{-1})

A. 3.0×10^8

B. 2.0×10^8

C. 1.5×10^8

D. 10^{-8}

Answer: A::C

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Section D Multiple Choice Questions Mcqs Mcqs From Darpan Based On Textbook Refraction Magnification Power And Combination Of Lens

1. Light rays emerge from denser medium (n_2), refract from curved surface and then travel through rarer medium (n_1), formula for this is ....

A. $-\frac{n_2}{u}+\frac{n_1}{v}=\frac{n_1-n_2}{R}$

B. $-\frac{n_2}{u}+\frac{n_1}{v}=\frac{n_2-n_1}{R}$

C. $-\frac{n_1}{u}+\frac{n_2}{v}=\frac{n_2-n_1}{R}$

D. $-\frac{n_1}{u}+\frac{n_2}{v}=\frac{n_1-n_2}{R}$

Answer: A

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2. Focal length of thin lens ......

A. decreases with increase in refractive index.

B. increases with increase in refractive index.

C. doesn.t change with refractive index.

D. none of these

Answer: A::C::D

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3. The radii of curvature of both the sides of a convex lens are 15 cm and if the refractive index of the material of the lens is 1.5, then focal length of lens in air is .... cm.

A. 10

B. 15

C. 20

D. 30

Answer: A::B

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4. The focal length of an equiconvex lens in air i equal to either of its radii of curvature. The refractive index of the material of the lens is ....

A. $\frac{4}{3}$

B. 1.5

C. 2.5

D. 0.8

Answer: A::B

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5. A concave or convex lens is given such that radii of curvature are same. If refractive index of glass is 1.5, then its focal length = ... where R = radius of curvature.

A. R

B. $\frac{R}{2}$

C. 2R

D. $\frac{1}{4}R$

Answer: A

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6. Focal lens of plane convex lens $\left(\mu = \frac{3}{2}\right)$ is f and radius of curvature of curved surface is R. So write the relation between f and R.

A. f=R

B. f=$\frac{R}{2}$

C. f=2R

D. f=$\frac{3R}{2}$

Answer: B::C

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7. Radius of curvature of plano-convex lens is 10 cm. If its focal length is 30 cm, then its refractive index will be ....

A. 1.1

B. 1.22

C. 1.33

D. 1.66

Answer: A::C

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8. Radius of curvature of a convex curved surface is 50 cm. If refractive index of medium is 1.5, then find 1st and 2nd focal length.

A. -100 cm, 150 cm

B. -150 cm, 100 cm

C. 100 cm, -150 cm

D. 150 cm, -100 cm

Answer: A::C

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9. Refractive index of a thin convex lens is 1.5 and radii of curvature is 20 cm. The parallel rays incident on it intersect at distance .d., then d = ... cm.

A. $\frac{20}{3}$

B. 10

C. 20

D. 40

Answer: B::C

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10. For thin convex lens if magnification is one then object distance and image distances are .....

A. f,f

B. f,2f

C. 2f,f

D. 2f,2f

Answer: B::D

Watch Video Solution

11. What is the focal length of lens if the image distance remain same by keeping object at 24 cm and 16 cm from lens ?

A. 22 cm

B. 20 cm

C. 18 cm

D. none of these

Answer: B::C

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12. Focal length of convex lens for red, green and blue colour are f_r, f_g, and f_b respectively, so which of the following statements is true ?

A. $f_r < f_g$

B. $f_g < f_r$

C. $f_b > f_r$

D. $f_r = f_g = f_b$

Answer: B

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13. Convex lens having focal length f, and concave lens having focal length f2 are placed in contact. Out of conditions given below, which condition supports this combination to behave like concave lens ?

A. $f_1 = f_2$

B. $f_2 < f_1$

C. $f_2 > f_1$

D. $f_1 f_2 = 1$

Answer: A::B

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14. A convex lens is made up of three different materials as shown in figure. A point obiect, placed on its axis, the number of images

formed are ....

A. 1

B. 2

C. 3

D. 4

Answer: C

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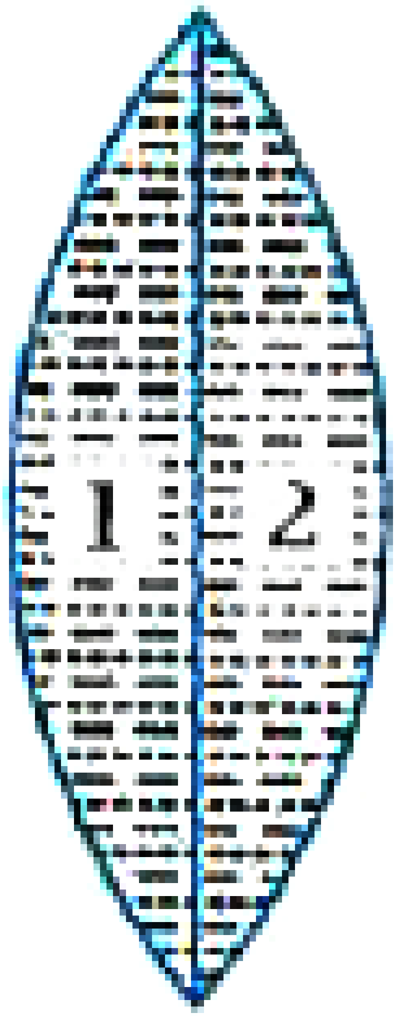
15. A convex lens has a focal length f. It is cut inti two parts along the dotted lines as shown ii figure. The focal length of each part will be

....



A. $\frac{f}{2}$

B. f

C. 3f

D. 2f

Answer: B::D

Watch Video Solution

16. Combination of two convex lenses works always as ....

A. concave lens

B. convex lens

C. rectangular glass slab

D. plane mirror

Answer: B::C

Watch Video Solution

17. One concave and one convex lens have same focal length. If they are kept in contact, combination behaves as ....

A. Concave lens

B. Convex lens

C. Transparent plane plate

D. Curved surface

Answer: A::C

Watch Video Solution

18. The medium in which the speed of light is half of the speed in air, if light travels from such medium to air, then for what angle of incidence light will do total internal refelction

?

A. 15°

B. 30°

C. 45°

D. 60°

Answer: B::C

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19. A concave mirror and convex lens (both of refractive index 1.5) have focal length 3 cm in air. When they are placed in water ofrefractive index $\frac{4}{3}$, then their new focal lengths will be ......

A. f_{lens}=12 cm ,f_{mirror}=3 cm

B. f_{lens}=3 cm ,f_{mirror}=12 cm

C. f_{lens}=3 cm ,f_{mirror}=3 cm

D. f_{lens}=12 cm ,f_{mirror}=12 cm

Answer: A::B::C

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20. A convex lens is dipped in a liquid whose refractive index is equal to the refractive index of the lens. Then its focal length will ....

A. become zero

B. remain unchanged

C. become infinite

D. none of these

Answer: B::C

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21. Convex lens of focal length A and concave lens of focal length B are kept in contact, then the effective focal length of system is ....

A. A+B

B. A-B

C. $\frac{AB}{A+B}$

D. $\frac{AB}{B-A}$

Answer: A::B::D

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22. Two convex lenses 1 and 2 having focal lengths 25 cm and 30 cm are kept in contact such that they have the same principle axis, focal length of this combination motion is ......

A. 1.36

B. 13.6

C. 31.6

D. 61.3

Answer: A::B::C

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23. Convex lens having focal length 25 cm and concave lens having focal length 30 cm are kept in contact, such that they have the same principal axis. Focal length of this combination is ....

A. 1.5 cm

B. 27 cm

C. 150 cm

D. 15 cm

Answer: A::C

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24. Distance between divergent lens and object is m times than focal length. Linear magnification of lens is ......

A. m

B. $\frac{1}{m}$

C. m+1

D. $\frac{1}{m+1}$

Answer: A::D

Watch Video Solution

25. Power of lens depends on .....

A. only type of medium of lens.

B. type of medium of lens and medium in which lens is kept.

C. only volume of medium in which lens is kept.

D. none of these.

Answer: A::B::C::D

Watch Video Solution

26. The power of combination of two lenses o

powers + 1.5 D and - 2.5 D is ....

A. $-1.0D$

B. $\frac{5}{3}$ D

C. $\frac{3}{5}$ D

D. 4.0 D

Answer: A::D

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27. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. The power of the combination is ....

A. -6.5 D

B. $+6.5$ D

C. $+1.5$ D

D. -1.5 D

Answer: A::D

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28. If two lenses of power 2D and 3D are kept in contact with each other, then focal length of the combination will be .... cm.

A. 5

B. 10

C. 20

D. 25

Answer: B::C

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29. A convex lens is in contact with concave lens. If the ratio of their powers is $\frac{2}{3}$ and focal length of the combination is 30 cm, then individual focal lengths are

A. 75 cm and -50 cm

B. -75 cm and 10 cm

C. 15 cm and -10 cm

D. 15 cm and 10 cm

Answer: A::C::D

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Section D Multiple Choice Questions Mcqs Mcqs From Darpan Based On Textbook Refraction And Disposion By Prism

1. If minimum deviation is δ_m, for prism then refractive index of material of prism is ......

A. $\mu=\frac{\sin(A+\delta m)}{\frac{2}{\sin A/2}}$

B. $\mu=\frac{\sin\left(\frac{A+\delta m}{2}\right)}{\sin A/2}$

C. $\mu=\frac{2\sin(A+\delta m)}{\sin A}$

D. $\mu = \dfrac{\sin(A + \delta m)}{\sin A}$

Answer: B

Watch Video Solution

2. When white light passes through prism, which colour of light will experience minimum deviation ?

A. red

B. violet

C. blue

D. green

Answer: A::D

Watch Video Solution

3. Minimum angle of deviation for prism having angle prism 30° is 30°, so find angle of incident.

A. 15°

B. 60°

C. 30°

D. 45°

Answer: C

Watch Video Solution

4. A prism when placed in water instead of air, its ....

A. angle of prism changes.

B. minimum angle of deviation changes.

C. minimum angle of deviation does not change.

D. angle of prism does not change.

Answer: A::B::C::D

Watch Video Solution

5. If angle of deviations near the first and the second refractory surfaces are δ_1, and δ_2, then ......

A. $\delta_1 = \delta_2$

B. $\delta = \delta_1 - \delta_2$

C. $\delta = \delta_1 + \delta_2$

D. $\delta_1 = 2\delta_2$

Answer: C

Watch Video Solution

6. If the refractive index of a material of an equilateral prism is $\sqrt{3}$, then angle of minimum deviation will be ..... .

A. 30°

B. 40°

C. 50°

D. 60°

Answer: D

Watch Video Solution

7. Refractive index of prism is $\sqrt{2}$. One of surface of the prism is polished. If incidence

angle is ...., then the ray will be reflected back.

(Refraction angle is 30°)

A. 0°

B. 30°

C. 45°

D. 60°

Answer: C::D

Watch Video Solution

8. Critical angle of prism is 40°. Its prism angle should be ...... to get raywith minimum deviation.

A. 40°

B. 60°

C. 80°

D. 90°

Answer: C

Watch Video Solution

9. Refracted ray from an equilateral prism will be parallel to surface is incidence angle is .... (μ=1.5)

A. 28°

B. 38°

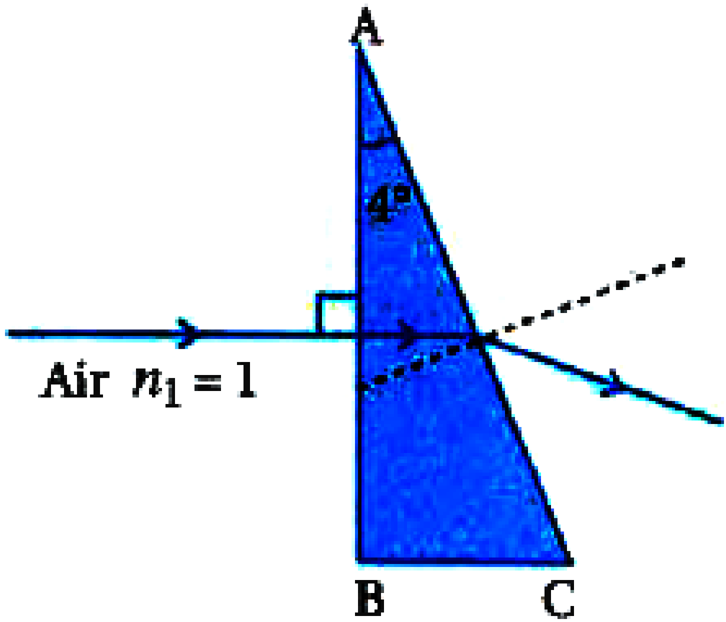
C. 48°

D. 82°

Answer: A::B

Watch Video Solution

10. A horizontal ray is incident on a right-angled prism with prism angle of 4o. If the refractive index of material of the prism is 1.5, angle of emergence is .... Use the given figure.



A. 4°

B. 6°

C. 10°

D. 0°

Answer: B

Watch Video Solution

11. Refractive index of prism of prism angle 6° is 1.5, then minimum deviation is ....

A. 3°

B. 6°

C. 2°

D. 1°

Answer: A::C

Watch Video Solution

12. A small angled prism of refrative index 1.7 gives a deviation of 4.9°. The angle of prism is ....

A. 5°

B. 7°

C. 9°

D. 11°

Answer: B

Watch Video Solution

13. The refracting angle of a prism is A and refractive index of the material of the prism is

$\cot\left(\frac{A}{2}\right)$.The angle of minimum deviation is :

A. $180^\circ - 3A$

B. $180^\circ - 2A$

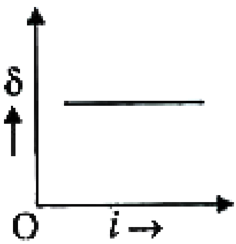
C. $90^\circ - A$

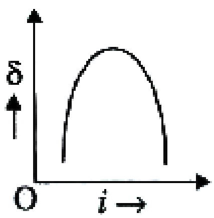
D. $180^\circ + 2A$

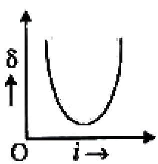
Answer: A::B

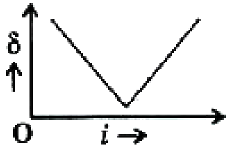
Watch Video Solution

14. The anode voltage of a photocell is kept fixed. The wavelength λ of the light falling on the cathode is gradually changed. The plate current I of the photocell varies as follows :

A. 

B. 

C. (C) 

D. 

Answer: C

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Section D Multiple Choice Questions Mcqs Mcqs From Darpan Based On Textbook Natural Phenomena Due To Sun Light

1. In which phenomenon, white light gets divided into its element colours ?

A. Reflection

B. Refraction

C. Dispersion

D. Scattering

Answer: C

Watch Video Solution

2. Which of the following doesn.t play any role in rainbow formation ?

A. Reflection

B. Refraction

C. Dispersion

D. Absorption

Answer: D

Watch Video Solution

3. For which colour of light, refractive index of glass is maximum ?

A. Red

B. Green

C. Blue

D. Violet

Answer: D

Watch Video Solution

4. When the wavelength of scattered light is increased, then its scattering effect

A. decreases

B. increases

C. does not change

D. none of these

Answer: A::C::D

Watch Video Solution

5. If the earth had no atmosphere ....

A. sky could be bright.

B. sky would have been blackisha

C. we could no see stars at night

D. sunlight would not have reached the earth

Answer: B

Watch Video Solution

6. We see Sunrise ......

A. before its actual time.

B. after its actual time.

C. at its actual time.

D. none of these.

Answer: A

Watch Video Solution

7. If size of particle which scatters the light is .... it is called Rayleigh scattering.

A. smaller than the wavelength of incident light.

B. greater than the wavelength of incident light.

C. equal to the wavelength of the incident light.

D. 100 times the wavelength of incident light.

Answer: A

Watch Video Solution

8. For Rayleigh scattering of light, value of a is ......

A. $\alpha < \quad < \lambda$

B. $\alpha > \quad > \lambda$

C. $\alpha = \lambda$

D. $\alpha > \lambda$

Answer: A

Watch Video Solution

9. Due to which phenomenon, the colour of sky seems to be blue ?

A. reflection

B. refraction

C. scattering

D. dispersion

Answer: C

Watch Video Solution

10. The clouds generally appear white due to .....

A. reflection of light

B. scattering of light

C. diffraction of light

D. dispersion of light

Answer: A::B::C

Watch Video Solution

11. The danger signal of light is red, because red colour is least ....

A. reflected

B. refracted

C. dispersed

D. scattered

Answer: A::C::D

Watch Video Solution

Section D Multiple Choice Questions Mcqs Mcqs From Darpan Based On Textbook Optical Instruments

1. One cannot see through the fog, because ....

A. fog absorbs light

B. refractive index of fog is infinity

C. light is scattered by the droplets in the fog

D. light suffers total internal reflection

Answer: A::B::C::D

Watch Video Solution

2. In reflecting type telescope ....

A. $f_0 = f_e, D_0 = D_e$

B. $f_0 > f_e, D_0 = D_e$

C. $f_0 < f_e, D_0 < D_e$

D. $f_0 > f_e, D_0 < D_e$

Answer: B

Watch Video Solution

3. When tube length of compound microscope is increased, then its magnifying power ......

A. increases

B. decreases

C. doesn.t change

D. none of these

Answer: A::C

Watch Video Solution

4. If f_0 and f_e, are respective focal lengths of objective and eye-piece of compound microscope, then ......

A. $f_0 = f_e$

B. $f_0 < f_e$

C. $f_0 > f_e$

D. none of these

Answer: B

Watch Video Solution

5. Magnifying power of objective of compound microscope is 5. If magnifying power of compound microscope is 30, then magnifying power of eye-piece will be ......

A. 1

B. 3

C. 6

D. 9

Answer: C

Watch Video Solution

6. ...... is optical length of telescope.

A. $\dfrac{f_0 - f_e}{f_0}$

B. $\dfrac{f_0}{f_e}$

C. $f_0 - f_e$

D. $f_0 + f_e$

Answer: D

Watch Video Solution

7. The magnifying power of a simple microscope can be increased if we use eye piece of ....

A. higher focal length

B. lower focal length

C. larger diameter

D. smaller diameter

Answer: A::B::C::D

Watch Video Solution

8. To increase magnification of telescope ....

A. f_0, should be greater and f_e smaller

B. Both f_0 and f_e should be greater

C. Both f_0 and f_e should be smaller

D. f_0, should be smaller and f_e greater

Answer: A::B::C::D

Watch Video Solution

9. If the tube length of astronomical telescope is 105 cm and magnifying power is 20 for normal setting, then the focal length of the objective is .... cm.

A. 10

B. 20

C. 25

D. 100

Answer: A::D

Watch Video Solution

10. Near point for a person having normal vision, D= ....

A. 25 mm

B. 25 cm

C. 25 m

D. infinite

Answer: B

Watch Video Solution

11. Formula of magnification of astronomical telescope is ......

A. $m = \frac{f_0}{f_e}$

B. $m = \frac{f_e}{f_0}$

C. $m = f_0 f_e$

D. $m = m = f_0 + f_e$

Answer: A

Watch Video Solution

12. If me and m,are magnifications of objective and microscope, then magnification of microscope is ....

A. $m_0 + m_e$

B. $m_0 m_e$

C. $m_0 - m_e$

D. $\frac{m_0}{m_e}$

Answer: B

Watch Video Solution

13. Formula of magnification of compound microscope is ....

A. $m = \frac{LDf_e}{f_0}$

B. $m = \frac{L + D}{f_0 f_e}$

C. $m = \frac{L / D}{F_0 / f_e}$

D. $m = \frac{LD}{f_0 f_e}$

Answer: D

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Section D Multiple Choice Questions Mcqs Mcqs From Darpan Based On Textbook Mcqs Based On Textual Illustration And Exercise

1. The earth takes 24 h to rotate once about its axis. How much time does the sun take to shift by 1° when viewed from the earth?

A. 2 min

B. 4 min

C. 6 min

D. 1 min

Answer: B

Watch Video Solution

2. Light from a point source in air falls on a spherical glass surface (n = 1.5 and radius of curvature = 20 cm). The distance of the light source from the glass surface is 100 cm. At what position the image is formed?

A. 42.9 cm

B. 10 cm

C. 100 cm

D. 50 cm

Answer: C

Watch Video Solution

3. A magician during a show makes a glass lens with $n=1.47$ disappear in the trough of liquid. What is the refractive index of the liquid.

A. zero

B. 0.94

C. 2.94

D. infinite

Answer: D

Watch Video Solution

4. (i) If $f = 0.5$ m for a glass lens, what is the power of the lens? (ii) 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 glass? (iii) A convex lens has 20 cm focal length in air. What is focal length in water? (Refractive index of air-water = 1.33, refractive index for air-glass = 1.5.)

A. $+5$ D

B. $+2$ D

C. -5 D

D. -2 D

Answer: B

Watch Video Solution

5. (i) If f = 0.5 m for a glass lens, what is the power of the lens? (ii) 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 glass? (iii) A convex lens has 20 cm focal length in air. What is focal length in water? (Refractive index of air-water = 1.33, refractive index for air-glass = 1.5.)

A. 2.5

B. 1.5

C. 1.0

D. 1.67

Answer: B

Watch Video Solution

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

A. 39.1 cm

B. 156.4 cm

C. 78.2 cm

D. 20.0 cm

Answer: C

Watch Video Solution

7. A small candle, 2.5 cm in size is placed at 27 cm in front of a concave mirror of radius of curvature 36 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image? Describe the nature and size of the image. If the candle is moved closer to the mirror, how would the screen have to be moved?

A. -54 cm

B. $+54$ cm

C. -11 cm

D. $+11$ cm

Answer: A

Watch Video Solution

8. 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.

A. -6.67 cm, 2.5 cm

B. +6.67 cm, 2.5 cm

C. - 60 cm, 2.5 cm

D. +60 cm, 2.5 cm

Answer: B

Watch Video Solution

9. A tank is filled with water to a height of 12.5 cm. The apparent depth of a needle lying at the bottom of the tank is measured by a microscope to be 9.4 cm. What is the refractive index of water? If water is replaced by a liquid of refractive index 1.63 up to the same height, by what distance would the microscope have to be moved to focus on the needle again?

A. $\mu = 1.33, d = 1.7cm$

B. $\mu = 1.33, d = 7.7cm$

C. $\mu = 1.33, d = 9.4cm$

D. $\mu = 1.33, d = 17.1cm$

Answer: A

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10. A small bulb is placed at the bottom of a tank containing water to a depth of 80cm. What is the area of the surface of water through which light from the bulb can emerge out? Refractive index of water is 1.33. (Consider the bulb to be a point source.)

A. $2.8m^{\circ}$

B. $2.7m^{\circ}$

C. $2.6m^{\circ}$

D. $2.5m^{\circ}$

Answer: C

Watch Video Solution

11. Double-convex lenses are to be manufactured from a glass of refractive index 1.55, with both faces of the same radius of curvature. What is the radius of curvature required if the focal length is to be 20cm?

A. 102 cm

B. 55 cm

C. 22 cm

D. 51 cm

Answer: C

Watch Video Solution

12. What is the focal length of a convex lens of focal length 30cm in contact with a concave lens of focal length 20cm? Is the system a converging or a diverging lens? Ignore thickness of the lenses.

A. 60 cm, concave lens

B. - 60 cm, convex lens

C. 60 cm, convex lens

D. - 60 cm, concave lens

Answer: D

Watch Video Solution

13. A small telescope has an objective lens of focal length 144cm and an eyepiece of focal length 6.0cm. What is the magnifying power of the telescope? What is the separation between the objective and the eyepiece?

A. 24, 138 cm

B. 24, 150 cm

C. 0.042, 138 cm

D. 0.042, 150 cm

Answer: B

Watch Video Solution

14. (a) A giant refracting telescope at an observatory has an objective lens of focal length 15m. If an eyepiece of focal length 1.0cm is used, what is the angular magnification of the telescope?

(b) 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 $3.48 \times 10^6 m$, and the radius of lunar orbit is $3.8 \times 10^8 m$.

A. 0.15

B. 1.5

C. 150

D. 1500

Answer: D

15. (a) A giant refracting telescope at an observatory has an objective lens of focal length 15m. If an eyepiece of focal length 1.0cm is used, what is the angular magnification of the telescope?

(b) 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 $3.48 \times 10^6 m$, and the radius of lunar orbit is $3.8 \times 10^8 m$.

A. 0.1374 cm

B. 13.74 cm

C. 1.374 cm

D. 137.4 cm

Answer: B

Watch Video Solution

16. A small pin fixed on a table top is viewed from above from a distance of 50cm. By what distance would the pin appear to be raised if it is viewed from the same point through a 15cm thick glass slab held parallel to the table? Refractive index of glass = 1.5. Does the answer depend on the location of the slab?

A. 0.5 cm

B. 5 cm

C. 4.5 cm

D. 0.45 cm

Answer: B

Watch Video Solution

17. The image of a small electric bulb fixed on the wall of a room is to be obtained on the opposite wall 3m away by means of a large convex lens. What is the maximum possible focal length of the lens required for the purpose?

A. 0.75 m

B. 1.33 cm

C. 0.75 cm

D. 1.33 m

Answer: C

Watch Video Solution

18. A screen is placed 90cm from an object. The image of the object on the screen is formed by a convex lens at two different locations separated by 20cm. Determine the focal length of the lens.

A. 21.4 cm

B. 26.25 cm

C. -21.4 cm

D. -26.25 cm

Answer: A

Watch Video Solution

19. At what angle should a ray of light be incident on the face of a prism of refracting angle 60° so that it just suffers total internal reflection at the other face? The refractive index of the material of the prism is 1.524.

A. 41°

B. 19°

C. 30°

D. 60°

Answer: C

Watch Video Solution

20. A small telescope has an objective lens of focal length 140cm and an eyepiece of focal length 5.0cm. What is the magnifying power of the telescope for viewing distant objects when

(a) the telescope is in normal adjustment (i.e., when the final image is at infinity)?

(b) the final image is formed at the least distance of distinct vision (25cm)?

A. 0.036

B. 28

C. 135

D. 145

Answer: B

Watch Video Solution

21. A small telescope has an objective lens of focal length 140cm and an eyepiece of focal length 5.0cm. What is the magnifying power of the telescope for viewing distant objects when

(a) the telescope is in normal adjustment (i.e., when the final image is at infinity)?

(b) the final image is formed at the least distance of distinct vision (25cm)?

A. 5.6

B. 22.4

C. 23.3

D. 33.6

Answer: D

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22. For the telescope described in Exercise 9.3 (a), what is the separation between the objective lens and the eyepiece ?

A. 135 cm

B. 140 cm

C. 145 cm

D. 28 cm

Answer: C

Watch Video Solution

23. If this telescope is used to view a 100 m tall tower 3 km away, what is the height of the image of the tower formed by the objective lens ?

A. 4.67 cm

B. 3.33 cm

C. 21.43 cm

D. 46.7 cm

Answer: A

Watch Video Solution

24. (a) For the telescope described in Exercise 9.28 (a), what is the separation between the objective lens and the eyepiece?

(b) If this telescope is used to view a 100 m tall tower 3 km away, what is the height of the image of the tower formed by the objective lens?

(c) What is the height of the final image of the tower if it is formed at 25cm?

A. 280 cm

B. 0.28 cm

C. 2.8 cm

D. 28 cm

Answer: D

Watch Video Solution

Section D Multiple Choice Questions Mcqs Mcqs Asked In Competitive Exams

1. Which of the following is used in optical fibres ?

A. Total internal reflection

B. Scattering

C. Diffraction

D. Refraction

Answer: A

Watch Video Solution

2. An astronomical telescope has a large aperture to ..... .

A. reduce spherical aberration

B. have high resolution

C. increase span of observation

D. have low dispersion

Answer: A::B

Watch Video Solution

3. If two mirrors are kept at 60° to each other, then the number of images formed by them is ......

A. 5

B. 6

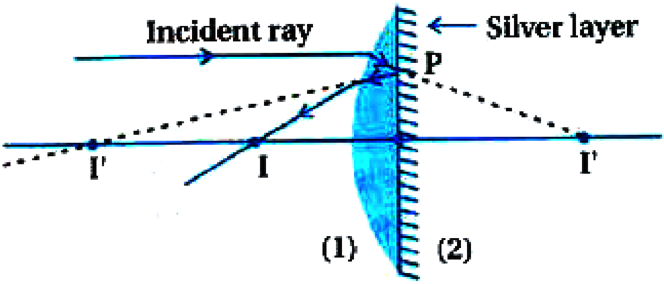
C. 7

D. 8

Answer: A

Watch Video Solution

4. As shown in figure, a plano-convex lens of focal length 20 cm is silvered at its plane surface and it is made reflecting, then find new focal length of system.



A. 20 cm

B. 30 cm

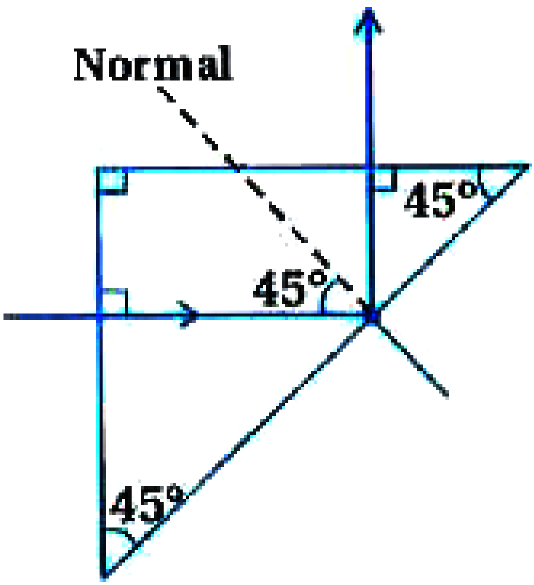
C. 40 cm

D. 10 cm

Answer: A::C::D

Watch Video Solution

5. A light ray is incident perpendicular to one face of a 90° prism and is totally internally reflected at the glass-air interface. If the angle of reflection is 45°, we conculde that for the refractive index n as



A. $n < \frac{1}{\sqrt{2}}$

B. $n > \sqrt{2}$

C. $n > \frac{1}{\sqrt{2}}$

D. $n < \sqrt{2}$

Answer: B

Watch Video Solution

6. A plano- convex lens of refractive index 1.5 and radius of curvature 30 cm is silvered at the curved surface. Now , this lens has been used to form the image of an object . At what distance from this lens, an object be placed in order to have a real image of the size of the object?

A. 20 cm

B. 30 cm

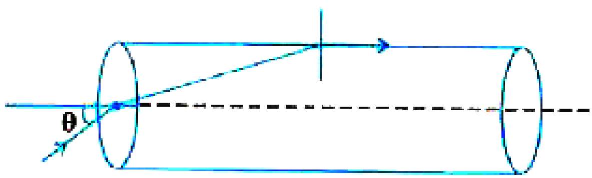
C. 60 cm

D. 80 cm

Answer: A::B::C

Watch Video Solution

7. The refractive index of transparent cylindrical rod is $\frac{2}{\sqrt{3}}$. As shown in the figure the ray i incident at the mid point of its one end. For which angle of incidence, the ray become parallel to the length of rod ?



A. $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B. $\sin^{-1}\left(\frac{1}{2}\right)$

C. $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$

D. $\sin^{-1}\left(\frac{2}{\sqrt{3}}\right)$

Answer: A::C

Watch Video Solution

8. A fish looking up through the water sees the outside world, contained in a circular horizon. If the refractive index of water is $\frac{4}{3}$ and the fish is 12 cm below the water surface, the radius of this circle (in cm) is .....

A. $36\sqrt{2}$

B. $4\sqrt{5}$

C. $36\sqrt{7}$

D. $\frac{36}{\sqrt{7}}$

Answer: C::D

Watch Video Solution

9. Two point white dots are 1 mm apart on a black paper. They are viewed by eye of pupil diameter 3 mm. Approximately, what is the maximum distance at which these dots can be resolved by the eye ? [Take wavelength of light = 500 nm]

A. 6 m

B. 3 m

C. 5 m

D. 1 m

Answer: C

Watch Video Solution

10. A thin glass (refractive index 1.5) lens has optical power of - 5D in air. Its optical power in a liquid medium with refractive index 1.6 will be .....

A. $-1D$

B. $1D$

C. $-5D$

D. $0.625D$

Answer: B::D

Watch Video Solution

11. The refractive index of glass is 1.520 for red light and 1.525 for blue light. Let D 1, and D 2, be angles of minimum deviations for red and blue light respectively in a prism of this glass. Then,

A. $D_1 > D_2$

B. $D_1 < D_2$

C. $D_1 = D_2$

D. can be less than or greater than D_2, depending upon the angle of prism.

Answer: A::B::D

Watch Video Solution

12. Two lenses of power - 15D and + 5D are in contact with each other. The focal length of the combination is .....

A. $+10cm$

B. $-20cm$

C. $-10cm$

D. $+20cm$

Answer: A::C

Watch Video Solution

13. When monochromatic red light is used instead of blue light in a convex lens, its focal length will ......

A. not depend on colour in light.

B. increase

C. decrease

D. remain same

Answer: A::B::C

Watch Video Solution

14. A beaker contains water up to a height h_1 and kerosene of height h_2 above water so that the total height of (water + kerosene) is

$(h_1 + h_2)$. Refractive index of water is μ_1 and that of kerosene is μ_2 . The apparent shift in the position of the bottom of the beaker when viewed from above is :-

A. $\left(1 - \frac{1}{\mu_1}\right)h_2 + \left(1 - \frac{1}{\mu_2}\right)h_1$

B. $\left(1 + \frac{1}{\mu_2}\right)h_1 + \left(1 + \frac{1}{\mu_1}\right)h_2$

C. $\left(1 - \frac{1}{\mu_1}\right)h_1 + \left(1 - \frac{1}{\mu_2}\right)h_2$

D. $\left(1 + \frac{1}{\mu_1}\right)h_2 - \left(1 + \frac{1}{\mu_2}\right)h_1$

Answer: A::B::C

Watch Video Solution

15. Diameter of a plano-convex lens is 6 cm and thickness at the centre is 3 mm. If speed of light in material of lens is 2×10^8 m/s., the focal length of the lens is ......

A. 15 cm

B. 20 cm

C. 30 cm

D. 10 cm

Answer: C

Watch Video Solution

16. A green light is incident from the water to the air-water interface at the critical angle (θ). Select the correct statement.

A. The entire spectrum of visible light will come out of the water at an angle of 90° to the normal.

B. The spectrum of visible light whose frequency is less than that of green light will come out of the air medium.

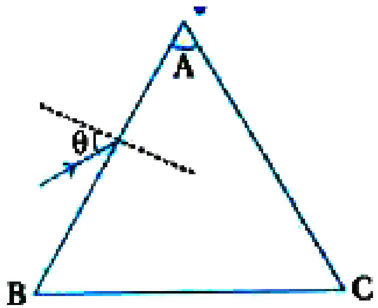
C. The spectrum of visible light whose frequency is more than that of green light will come out to the air medium.

D. The entire spectrum of visible light will come out of the water at various angles to the normal.

Answer: A::B::C::D

Watch Video Solution

17. Monochromatic light is incident on a glass prism of angle A. If the refractive index of the material of the prism is μ, a ray, incident at an angle θ, on the face AB would get transmitted through the face AC pf the prism provided.



A. $\theta > \sin^{-1}\left[\mu \sin\left(A - \sin - 1\left(\frac{1}{\mu}\right)\right)\right]$

B. $\theta < \sin^{-1}\left[\mu \sin\left(A - \sin - 1\left(\frac{1}{\mu}\right)\right)\right]$

C. $\theta > \cos^{-1}\left[\mu \sin\left(A + \sin - 1\left(\frac{1}{\mu}\right)\right)\right]$

D. $\theta < \cos^{-1}\left[\mu \sin\left(A + \sin - 1\left(\frac{1}{\mu}\right)\right)\right]$

Answer: A

Watch Video Solution

18. On a hot summer night, the refractive index of air is smallest near the ground and increases with height from the ground. When a light beam is directed horizontally, the Huygens. principle leads us to conclude that as it travels, the light beam 1......

A. becomes narrower

B. goes horizontally without any deflection

C. bends downwards

D. bends upwards

Answer: A::B::D

Watch Video Solution

19. An observer looks at a distant tree of height 10 m with a telescope of magnifying power of 20. To the observer the tree appears.:

A. 20 times nearer

B. 10 times taller.

C. 10 times nearer.

D. 20 times taller

Answer: A::B

Watch Video Solution

20. A diverging lens with magnitude of focal length 25 cm is placed at a distance of 15 cm from a converging lens of magnitude of focal length 20 cm. A beam of parallel light falls on the diverging lens. The final image formed is ......

A. real and at a distance of 40 cm from the divergent lens.

B. real and at a distance of 6 cm from the convergent lens.

C. real and at a distance of 40 cm from convergent lens.

D. virtual and at a distance of 40 cm from convergent lens.

Answer: A::C::D

Watch Video Solution

21. The eye can be regarded as a single refracting surface. The radius of curvature of this surfac is equal to that of cornea (7.8 mm). This surface separates two media of refractive indices 1 an 1.34. Calculate the distance from the refracting surface at which a parallel beam of light wil come to focus.

A. 4.0 cm

B. 1 cm

C. 3.1 cm

D. 2 cm

Answer: A::C

Watch Video Solution

22. A thin lens made of glass (refractive index = 1.5) of focal length f= 16 cm is immersed in a liquid of refractive index 1.42. If its focal length in liquid is f_1, then the ratio $f_1$lf is closest to the integer

A. 9

B. 17

C. 1

D. 5

Answer: A

Watch Video Solution

23. If we need a magnification of 375 from a compound microscope of tube length 150 mm and an objective lens of focal length 5 cm, the focal length of the eye-piece should be close to:

A. 2 mm

B. 22 mm

C. 12 mm

D. 33 mm

Answer: A::B

Watch Video Solution

24. A telescope has a magnification equal to 5 and the length of its tube is 60 cm. The focal length of its eye piece is

A. 10 cm

B. 20 cm

C. 30 cm

D. 40 cm

Answer: A::C

Watch Video Solution

25. A plano-convex lens of radius of curvature 30 cm and refractive index 1.5 is kept in air. Find its focal length (in cm).

A. 30

B. 60

C. 15

D. 120

Answer: B

Watch Video Solution

26. If nij is reftactive index of medium i with respect to medium j $n_{21}Xn_{32}Xn_{43}$ = ...

A. $3^{\mu}{}_1$

B. $3^{\mu}{}_{2}$

C. $\dfrac{1}{1^{\mu}{}_{4}}$

D. $4^{\mu}{}_{2}$

Answer: A::C::D

Watch Video Solution

27. Magnification of microscope of objective of focal length 5 mm is 400. If its tube length is 20 cm, then focal length of eye-piece is ......

A. 200 cm

B. 160 cm

C. 2.5 cm

D. 0.1 cm

Answer: B::C

Watch Video Solution

28. Refractive index of a prism is $\sqrt{2}$. One side of prism is polished, if ray incidences at ......, then it will return back to its original path, refraction angle is 30°

A. 0°

B. 30°

C. 45°

D. 60°

Answer: C::D

Watch Video Solution

29. Focal length of convex lens having refractive index 1.5 is 2 cm. If this lens is dipped in a liquid having refractive index 1.25 its focal length will be ...... cm.

A. 10

B. 2.5

C. 5

D. 7.5

Answer: C

Watch Video Solution

30. Minimum deviation of prism having refractive index μ and small angle of prism A is shown by .....

A. $\delta_m = (\mu - 1)A$

B. $\delta_m = A(\mu + 1)$

C. $\delta = \dfrac{\sin\left(\frac{A+\delta_m}{2}\right)}{\frac{\sin\theta}{2}}$

D. $\delta_m = A\left[\dfrac{\mu - 1}{\mu + 1}\right]$

Answer: A::D

Watch Video Solution

31. For ...... light, focal length of convex lens is maximum.

A. blue

B. yellow

C. green

D. red

Answer: D

Watch Video Solution

32. Point source of light is placed 4 m below water surface in the medium (water) having refractive index $\frac{5}{3}$. A disc is placed on the water surface such that it blocks the light coming out of water completely so minimum diameter of disc = ...

A. 9

B. 6

C. 4

D. 3

Answer: B

Watch Video Solution

33. A lens is placed between a source of light and a wall . It forms images of area $A_1 \text{and} A_2$ on the wall, for its two different positions . The area of the source of light is :

A. $\dfrac{A_1 + A_2}{2}$

B. $\left[\dfrac{1}{A_1} + \dfrac{1}{A_2}\right]^{-1}$

C. $\sqrt{A_1 A_2}$

D. $\left[\dfrac{\sqrt{A_1} + \sqrt{A_2}}{2}\right]^2$

Answer: A::B::C

Watch Video Solution

34. Light passes through a glass slab of refractive index .n. and thickness .t.. If .C. is the speed of light in free space, then time taken to emerge | light out of glass slab will be ......

A. $\frac{t}{nc}$

B. ntc

C. $\frac{nt}{c}$

D. $\frac{tc}{n}$

Answer: C

Watch Video Solution

35. An object is there on a wall. Now by help of convex lens, an image of object is obtained of same size as of object on the opposite parallel wall. If the lens is at distance d from second wall, then what should be the focal length of lens ?

A. $\frac{d}{4}$

B. $\frac{d}{2}$

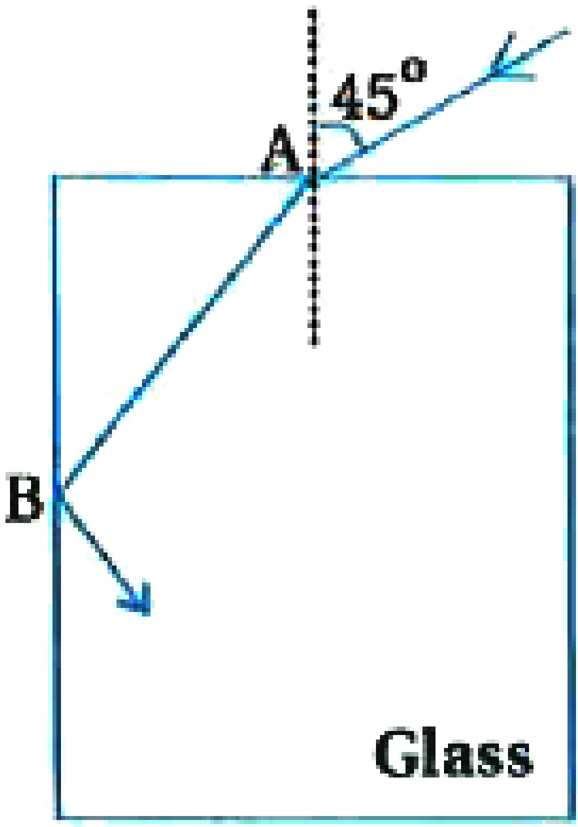
C. more than $\frac{d}{4}$ but less than $\frac{d}{2}$

D. less than $\frac{d}{4}$

Answer: B::D

Watch Video Solution

36. As shown in figure, a ray of light is incident on glass cube. If it experiences total internal reflection in vertical plane, then what is the refractive index of glass?



A. $\sqrt{\frac{3}{2}}$

B. $\frac{\left(\sqrt{3}+1\right)}{2}$

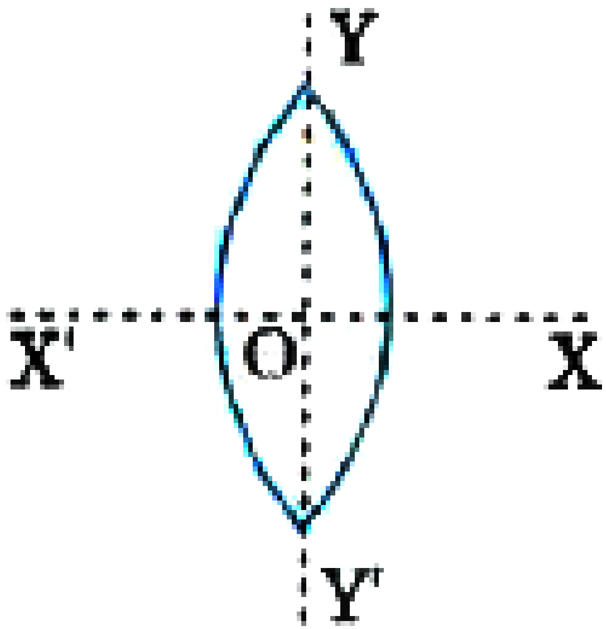
C. $\frac{\left(\sqrt{2}+1\right)}{2}$

D. $\frac{\sqrt{5}}{2}$

Answer: A::B::C

Watch Video Solution

37. A biconvex lens is cut in such a way that its equal two halves are (i) XOX. and (ii) YOY.axis respectively. If the focal length of original lens is fi f. is focal length in case (i) and fi in case (ii), then which of the following is true ?



A. f.=2f,f..=2f

B. f.=f,f..=2f

C. f.=2f,f..=f

D. f.=f,f..=f

Answer: B

Watch Video Solution

38. A mixed ray of red and green colour incidents obilquely on surface of rectangular glass slab. After passing through slab, the rays of red and violet colour emerging out surface parallel to incident surface are.....

A. emerging out from same point and moving in same direction.

B. observed to be coming out from different points and moving in different directions.

C. observed to be coming out from different points and moving parallelly.

D. emergingout from same point and moving in different directions.

Answer: A::B::C::D

Watch Video Solution

39. Diameter of objective of a telescope is 10 cm Its distance from two different objects is 1 km If wavelength of light is 5000 Å, then at wha minimum distance, these objects are clearl seen by telescope ?

A. 5 cm

B. 0.5 m

C. 5 m

D. 5 mm

Answer: D

Watch Video Solution

40. Angular resolution of telescope is of order of ...... for 10 cm objective diameter and 5000 Å wavelength of light.

A. 10^{6} rad

B. 10^{-2} rad

C. 10^{-4} rad

D. 10^{-6} rad

Answer: A::D

Watch Video Solution

41. A combination is formed by keeping a convex lens in contact with a concave lens. If both have same focal length of value 25 cm, then power of combination is ...... D.

A. 50

B. infinite

C. zero

D. 25

Answer: C

Watch Video Solution

42. A microscope is arranged to observe a mark on a piece of paper clearly. Now if a cube of refractive index 1.5 and thickness 3 cm is placed on this mark, then now what should be the displacement given to microscope to observe the mark clearly again ?

A. 4.5 cm downward

B. 1 cm downward

C. 2 cm upward

D. 1 cm upward

Answer: A::C::D

Watch Video Solution

43. Frequency and wavelength of light in transparent material are 2×10^{14} Hz and 5000 Å respectively, then its refractive index is

A. 1.50

B. 3.00

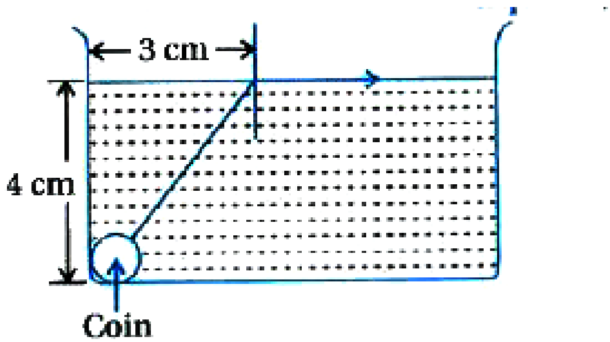
C. 1.33

D. 1.40

Answer: B::C

Watch Video Solution

44. A coin is at rest at bottom of a tank filled with liquid. A ray of light coming towards surface will move on the surface after incident on it, then what is the speed of light in liquid ?



A. $2.4 \times 10^8 ms^{-1}$

B. $3.0 \times 10^8 ms^{-1}$

C. $1.2 \times 10^8 ms^{-1}$

D. $1.8 \times 10^8 ms^{-1}$

Answer: A::D

Watch Video Solution

45. A boy focuses Sunlight on a paper by using biconvex lens of focal length 10 cm. Such that paper can be burnt. Diameter of Sun is 1.39×10^9 m and distance of Earth from Sun is 1.5×10^{11} m approximately, then the diameter of image of Sun on paper will be

A. 9.2×10^{-4} m

B. 6.5×10^{-4} m

C. 6.5×10^{-5} m

D. 12.4×10^{-4} m

Answer: A::B::D

Watch Video Solution

46. A ray of light travels in medium of refractive index μ. It incidents at a surface in contact with air at 45°. For what value of μ, this ray will undergo total internal reflection ?

A. μ=1.33

B. $\mu = 1.40$

C. $\mu = 1.50$

D. $\mu = 1.25$

Answer: A::C

Watch Video Solution

47. Which of the following phenomenon doesn.t depend on total internal reflection ?

A. Work of optical fibre.

B. Real and apparent depth of vessel filled with water.

C. Mirage formation in summer.

D. Sparkling of diamond.

Answer: A::B::D

Watch Video Solution

48. Radius of curvature of a biconvex lens is 20 cm. An object of 2 cm height is placed at 30 cm from lens, then which option represents the image ?

A. Virtual, erect, of height 1 cm

B. Virtual, erect, of height 0.5 cm.

C. Real, inverted, of height 4 cm.

D. Real, inverted, of height 1 cm.

Answer: A::C::D

Watch Video Solution

49. A prism of refractive index μ = 1.5 and prisim angle 15° is arranged with another prism (refractive index μ_2 = 1.75. If this combination gives the dispersion without deviation, the what should be the prism angle of second prism ?

A. 7°

B. 10°

C. 12°

D. 5°

Answer: A::B

Watch Video Solution

50. A converging light beam incidents on diverging lens. After passing through lens, rays intersect at 15 cm behind the lens. If lens is kept away, then these rays intersect at 5 cm. Focal length of lens is ..

A. $-10cm$

B. 20 cm

C. -30 cm

D. 5 cm

Answer: C

Watch Video Solution

51. A plano convex lens fits exactly into a plano concave lens. Their plane surfaces are parallel to each other. If lenses are made of different materials of refractive indices μ_1, and μ_2, and

R is the radius of curvature of the curved surface of the lenses, then the focal length of the combination is ......

A. $\dfrac{R}{2(\mu_1 + \mu_2)}$

B. $\dfrac{R}{2(\mu_1 - \mu_2)}$

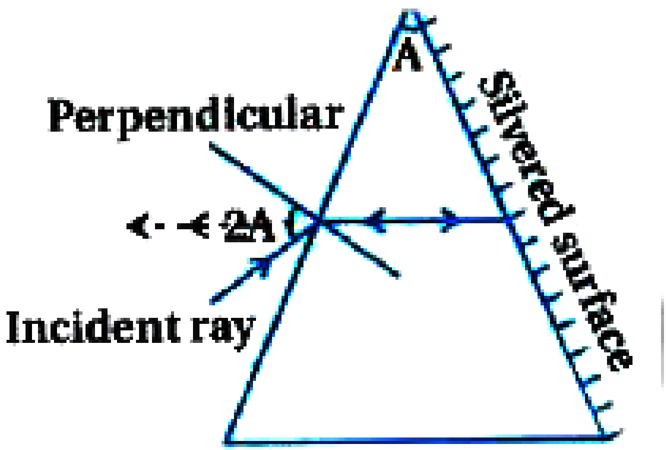
C. $\dfrac{R}{(\mu_1 - \mu_2)}$

D. $\dfrac{2R}{(\mu_1 - \mu_2)}$

Answer: A::B::C

Watch Video Solution

52. The angle of a prism is A. One of its refracting surfaces is silvered. Light rays falling at an angle of incidence 2A on the first surface re turns back through the same path after suffer ing reflection at the silvered surface. The re fractive index m of the prism is



A. 2 sin A

B. 2 cos A

C. $\frac{1}{2}$ cos A

D. tan A

Answer: A::B::C

Watch Video Solution

53. Two identical thin plano-convex glass lenses (refractive index 1.5) each having radius of curvature of 20 cm are placed with their convex surface in contact at the centre. The intervening space is filled with oil of refractive index 1.7. The focal length of the combination is :

A. -20 cm

B. -25 cm

C. -50 cm

D. 50 cm

Answer: C

Watch Video Solution

54. The refracting angle of a prism is A and refrac tive index of the material of the prism is $\cot\left(\frac{A}{2}\right)$ The angle of minimum deviation is :

A. $180^\circ - 3A$

B. $180^\circ - 2A$

C. $90^\circ - A$

D. $180^\circ + 2A$

Answer: A::B

Watch Video Solution

55. In an astronomical telescope in normal adjustment a straight black line of length L is drawn on inside part of objective lens. The eye-piece forms a real image of this line. The length of this image is I. The magnification of the telescope is :

A. $\frac{L}{I}$

B. $\frac{L}{I} + 1$

C. $\frac{L}{I} - 1$

D. $\frac{L+1}{L-1}$

Answer: A

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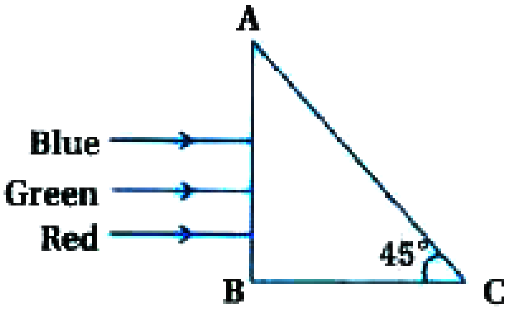
56. A beam of light consisting of red, green and blue colours is incident on a right angled prism. The refractive index of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively.



The prism will :

A. separate the red colour part from the green and blue colours

B. separate the blue colour part from the red and green colours

C. separate all the three colours from on another

D. not separate the three colours at all

Answer: A::B::C::D

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57. Match the corresponding entries of column-1 with column-2. (Where m is the magnification produced by the mirror.)

	Column-1		Column-2
(1)	$m = -2$	(a)	Convex mirror
(2)	$m = -\frac{1}{2}$	(b)	Concave mirror
(3)	$m = +2$	(c)	Real image
(4)	$m = +\frac{1}{2}$	(d)	Virtual image

A. (1 - a and c), (2 – a and d), (3 – a and b) (4 – c and d)

B. (1 - a and d), (2 - b and c), (3 - b and d) (4- b and c)

C. (1 – c and d), (2 – b and d), (3 - b and c) (4 - a and d)

D. (1 - b and c), (2 - b and c), (3 - b and d) (4 - a and d)

Answer: D

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58. The angle of incidence for a ray of light at a refracting surface of a prism is 45°. The angle of prism is 60°. If the ray suffers minimum deviation through the prism, the angle of minimum deviation and refractive index of the material of the prism respectively, are

A. $30^{\circ}, \sqrt{2}$

B. $45^{\circ}, \sqrt{2}$

C. $30^{\circ}, \frac{1}{\sqrt{2}}$

D. $45^\circ, \frac{1}{\sqrt{2}}$

Answer: A::B::C

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59. Two identical glass $\left(\mu_g = \frac{3}{2}\right)$ equiconvex lenses of focal length f each are kept in contact. The space between the two lenses is filled with water $\mu_w = \frac{4}{3}$. The focal length of the combination is

A. $\frac{4f}{3}$

B. $\dfrac{3f}{4}$

C. $\dfrac{f}{3}$

D. f

Answer: A::C::D

Watch Video Solution

60. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face. The thickness (in cm) of the slab is

A. 12

B. 16

C. 8

D. 10

Answer: A::B

Watch Video Solution

61. If the angle of a prism is 60° and angle of minimum deviation is 40°, then the angle of refraction will be ....

A. 4°

B. 30°

C. 20°

D. 3°

Answer: B::C

Watch Video Solution

62. A light beam is incident on a denser medium whose refractive index is 1.414 at an angle of incidence 45°. Find the ratio of width of refracted beam in a medium to the width of the incident beam in air.

A. $\sqrt{3} : \sqrt{2}$

B. $1 : \sqrt{2}$

C. $\sqrt{2} : 1$

D. $\sqrt{2} : \sqrt{3}$

Answer: A::B::C

View Text Solution

63. If power of objective lens increases, then magnifying power.........

A. of microscope increases and of telescope decreases.

B. of microscope and telescope both increases.

C. of microscope and telescope both decreases.

D. of microscope decreases and of telescope increases.

Answer: A::C::D

Watch Video Solution

64. A astronomical telescope has objective and eyepiece of focal length 40 cm and 4 cm respectively. To view an object 200 cm away from the objective, the lenses must be separated by a distance

A. 50.0 cm

B. 54.0 cm

C. 37.3 cm

D. 46.0 cm

Answer: B::C::D

Watch Video Solution

65. A beam of light from a source L is incident normally on a plane mirror fixed at a certain distance x from the source. The beam is reflected back as a spot on a scale placed just above the source L. When the mirror is rotated through a small angle θ, the spot of the light is found to move through a distance y on the scale. The angle θ is given by

A. $\frac{y}{x}$

B. $\frac{x}{2y}$

C. $\frac{x}{y}$

D. $\frac{y}{2x}$

Answer: B::D

Watch Video Solution

66. A prism of refractive index μ_1 = 1.42 and prism angle 10° is arranged with another prism of refractive index μ_2 = 1.7. If this combination gives the dispersion without deviation, then what should be the prism angle of second prism?

A. 6°

B. 8°

C. 10°

D. 4°

Answer: A

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67. An object is placed at a distance of 40 cm from a concave mirror of focal length 15 cm. If the object is displaced through a distance of 20 cm towards the mirror, the displacement of the image will be

A. 36 cm towards the mirror

B. 30 cm away from the mirror

C. 30 cm towards the mirror

D. 36 cm away from the mirror

Answer: A::C::D

Watch Video Solution

68. The refractive index of the material of a prism is $\sqrt{2}$ and the angle of the prism is 30°. One of the two refracting surfaces of the prism is made a mirror inwards, by silver coating. A beam of monochromatic light entering the prism from the other face will retrace its path (after reflection from the silvered surface) if its angle of incidence on the prism is

A. zero

B. 60°

C. 30°

D. 45°

Answer: D

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69. Pick the wrong answer in the context with rainbow.

A. Rainbow is a combined effect of dispersion, refraction and reflection of sunlight.

B. When the light rays undergo two internal reflections in a water drop, a secondary rainbow is formed.

C. The order of colours is reversed in the secondary rainbow

D. An observer can see a rainbow when his front is towards the sun.

Answer: A::B::C::D

Watch Video Solution

70. Two similar thin equi-convex lenses, of focal length f each, are kept coaxially in contact with each other such that the focal length of the combination is F_1, when the space between the two lenses is filled with glycerin (which has the same refractive index (μ = 1.5) as that of glass) then the equivalent focal length is F_2. The ratio $F_1 : F_2$ will be :

A. $3 : 4$

B. $2 : 1$

C. $1 : 2$

D. $2 : 3$

Answer: B::C

Watch Video Solution

71. In total internal reflection when the angle of incidence is equal to the critical angle for the pair of media in contant, what will be angle of refraction ?

A. 90°

B. 120°

C. 0°

D. equal to angle of incidence

Answer: A

Watch Video Solution

72. Which of the following is responsible fo

glittering of a diamond ?

A. Interference

B. Diffraction

C. Total internal reflection

D. Refraction

Answer: C

Watch Video Solution

73. When a beam of light is used determine the position of an object, the maximum accuracy is achieved if the light is .....

A. is converging

B. has more wavelength

C. has small wavelength

D. has more intensity

Answer: C

Watch Video Solution

74. Astronunt in space shuttle at 400 km height from Earth surface is observing Earth. If diameter of retina of his eye is 5 mm and wavelength of light is 500 nm, then it will experience the resolution of range of ......

A. 0.5 m

B. 5 m

C. 50 m

D. 500 m

Answer: C

Watch Video Solution

75. A substance is dipped in liquid, then due to which reason, substances will be invisible ?

A. When substance reacts as perfect reflector.

B. When it absorbs the light completely.

C. When its refractive index is 1.

D. When refractive indices of substance and liquid are same.

Answer: A::B::C::D

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76. Doctor uses .optical fibre. to observe inner parts of body, which works on ...... principle.

A. refraction

B. reflection

C. total internal reflection

D. scattering

Answer: C

Watch Video Solution

77. n_1 and n_2 are refractive indices of core and cladding of optical fibre respectively, then maximum acceptance angle θ = ...

A. $\sin^{-1}\left(\frac{n_2}{n_1}\right)$

B. $\sin^{-1}\sqrt{n_1^2 - n_2^2}$

C. $\left[\frac{\tan^{-1}(n_2)}{n_1}\right]$

D. $\left[\frac{\tan^{-1}(n_1)}{n_2}\right]$

Answer: B

View Text Solution

78. Focal lenghts of objective and eye-piece of telescope 200 cm and 2 cm respectively. If a building of 50 m height at 2 km away is observed from this, then height of image of objective will be ......

A. 5 cm

B. 10 cm

C. 1 cm

D. 2 cm

Answer: A::C

Watch Video Solution

79. Light ray bends when it travels from one medium to another medium because ......

A. frequency changes

B. refractive index changes

C. speed changes

D. amplitude changes

Answer: A::C::D

Watch Video Solution

80. Lens is kept nearer to eye to observe a small thin net of wire at 8 cm distance by magnifying glass of 10 cm focal length, then magnification = ...

A. 5

B. 8

C. 10

D. 20

Answer: A

Watch Video Solution

81. Flint glass lens is made of refractive index 1.5. When it is placed in a liquid of refractive index 1.25, then its focal length will be ....

A. 1.25 f

B. 2.5 f

C. 1.2 f

D. 1.3 f

Answer: B

Watch Video Solution

82. The leaf which has only green pigament is given light of 0.6328 um wavelength, then it will be seen of ...... colours.

A. brown

B. black

C. red

D. green

Answer: A::B::C

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83. Aperture of lens of a camera is f and its exposure time is $\frac{1}{60}$ s. If aperture becomes 1.4 f, then what will be the exposure time ?

A. $\frac{1}{42}$ s

B. $\frac{1}{56}$ s

C. $\frac{1}{72}$ s

D. $\frac{1}{31}$ s

Answer: A::C::D

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84. Intensity of point-like source at 1000 m is I. it is changed to 16I, then required distand will be

A. 250 m

B. 500 m

C. 750 m

D. 800 m

Answer: A::B

Watch Video Solution

85. Focal lengths of objective and eye-piece of microscope is 1.6 cm and 2.5 cm respectively. Distance between two lenses is 21.7 cm. If final image is formed at infinity, then magnification m = ...

A. 11

B. 110

C. 1.1

D. 44

Answer: A::B

Watch Video Solution

86. Power of a convex lens of refractive index $\frac{3}{2}$ is 2.5 D in air. If it is inerted in liquid of refractive index 2, then new power will be ......

A. -1.25

B. -1.5

C. 1.25

D. 1.5

Answer: A::B

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87. The surface which doesn.t reflect is given incidence light with $18W/cm^2$ energy flux, than what will be the pressure?

A. $2N/m^2$

B. $2 \times 10^{-4} N / m^2$

C. $6N / m^2$

D. $6 \times 10^{-4} N / m^2$

Answer: A::B::D

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88. For concave mirror, image obtained at d_2 from focus for object at d_1 from focus . The focal length of mirror will be ......

A. $f = \sqrt{d_1 d_2}$

B. $d_1 d_2$

C. $\frac{(d_1 + d_2)}{2}$

D. $\sqrt{\frac{d_1}{d_2}}$

Answer: A::B::D

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89. Object of small length 1 is placed on the axis of concave mirror of focal length f, then size of image will be ...... if object is at distance d from pole.

A. $\frac{If}{d-f}$

B. $\frac{d-f}{If}$

C. $l\frac{f^2}{(d-f)^2}$

D. $\frac{(d-f)^2}{f^2}.\,l$

Answer: B::C::D

View Text Solution

90. Two lenses of focal lengths -20 cm and + 10 cm are conneceted to form a combination, their combinational power will be ...... D.

A. -1

B. -2

C. $+5$

D. $+2$

Answer: C

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91. A: Stars twinkle in sky at night, planets don.t.

R: Volume of stars is much greater than planets.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: B

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92. A: Owl can move easily at night time.

R : There are so many rods in the retina in The eye of owl.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: A

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93. A: Red substance seems to be black in presence of yellow light.

R: Scattering of red colour is least.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: B

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94. A: Transperency of glass decreases if its surface becomes rough.

R : Glass of rough surface absorbs more light.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: C

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95. A: Diamond glitters.

R: Diamond doesn.t absorb sun light.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: B

Watch Video Solution

96. A: Resolution of telescope is high if diameter of objective is large.

R: More light rays are converged by objective of large diameter.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: A

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97. A: Power of lens of goggles is zero.

R: Radii of curvature of both surfaces of lens of goggles is same.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: A

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98. A: If objective and eye-piece of compoun microcscope are interchanged, then i becomes a telescope.

R: Focal length of objective of telescope i small.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: D

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99. A: When white light passes through lens then refraction of violet light is more than that of red light.

R: For given lens, focal length of red light is more than that of violet light.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: A

Watch Video Solution

100. A: Magnified image is obtained by microscope.

R: Angular dispersion of image is more as compared to object of microscope.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: A

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101. A: Magnification for convex mirror is always positive where it may be positive or negative for concave mirror.

R: It depends on our choice of sign convention

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion

C. Assertion is true but the reason is false.

D. Both assertion and reason are false.

Answer: B

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102. A spherical mirror gives real image 3 times greater than object. If distance between object and image is 100 cm, then its focal length is

A. 15 cm

B. 25 cm

C. 37.5 cm

D. $-37.5cm$

Answer: C::D

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103. Focal length of plane mirror is ......

A. zero

B. infinite

C. 1

D. same as of radius of curvature

Answer: B

Watch Video Solution

104. A light of ray incidents normally on one side of equilateral prism. If refractive index of prism is 1.5, then deviation angle is ......

A. 30°

B. 60°

C. 45°

D. 75°

Answer: C

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105. Two thin lenses of focal lengths f1 and f2, are in contact and coaxial. The power of combination is

A. $\dfrac{f_1 f_2}{f_1 - f_2}$

B. $\sqrt{f_1 f_2}$

C. $\dfrac{f_1 f_2}{f_1 + f_2}$

D. $\dfrac{f_1 + f_2}{f_1 f_2}$

Answer: A::B::C

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106. The colour of rays is the property of ......

A. amplitude

B. wavelength

C. frequency

D. velocity

Answer: C

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107. A critical angle for a medium is 60°. Then the refractive index of the medium will be

A. $\sqrt{3}$

B. $\frac{\sqrt{3}}{2}$

C. $\frac{2}{\sqrt{3}}$

D. $\frac{1}{\sqrt{3}}$

Answer: B::C

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108. A wavelength of a monochromatic light in vacuum is λ . It travels from vacuum to a medium of absolute refractive index μ. The ratio of wavelength of the incident and refracted wave is

A. $1 : \mu$

B. $\mu : 1$

C. $1 : 1$

D. $\mu^2 : 1$

Answer: A::B

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109. An object is placed at a distance 40 cm in front of concave mirror. Focal length of mirror is 20 cm, so what will be type of image ?

A. real and erect

B. virtual and inverted

C. real, inverted and smaller in size

D. real, inverted and of same size

Answer: A::B::C::D

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110. A real object is placed at a distance f from the pole of a convex mirror, in front of the convex mirror. If focal length of the mirror is f, then distance of the image from the pole of the mirror is ....

A. $\frac{f}{2}$

B. $\frac{f}{4}$

C. $2f$

D. $4f$

Answer: A::B

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111. For a prism of refractive index 1.732, the angle of minimum deviation is equal to the angle of prism. Then the angle of the prism is

A. 60°

B. 70°

C. 50°

D. none of these

Answer: A

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112. A convex lens is immersed in a liquid, whose refractive index is equal to the refractive index of the material of the lens. Then its focal length will

A. become zero

B. remain unchanged

C. become infinite

D. none of these

Answer: B::C

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113. The magnifying power of a telescope is m. If the focal length of the eye-piece is halved, then its magnifying power is ....

A. $\frac{1}{2m}$

B. 4m

C. 2m

D. $\frac{m}{2}$

Answer: B::C

Watch Video Solution

114. A plane mirror produces a magnification of ....

A. zero

B. infinite

C. -1

D. $+1$

Answer: A::D

Watch Video Solution

115. A transparent plastic bag filled with air form a concave lens. Now, if this bag is completel immersed in water, then it behaves as ......

A. divergent lens

B. convergent lens

C. equilateral prism

D. rectangular slab

Answer: B

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116. A microscope is focussed on an ink mark on th top of a table. If we place a glass slab of 3 cm thick on it, how should the microscope be moved to focus the ink spot again ? The refractive index of glass is 1.5.

A. 2 cm upwards

B. 2 cm downwards

C. 1 cm upwards

D. 1 cm downwards

Answer: A::C::D

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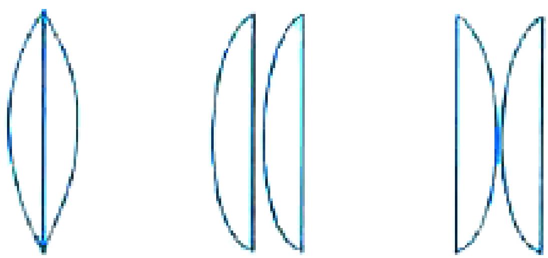
117. Given figures show the arrangements of two lenses. The radii of curvature of all the curved surfaces are same. The ratio of the equivalent focal length of combinations P, Q and R is ......



A. $2:2:1$

B. $1:1:1$

C. $1:2:2$

D. $2:1:1$

Answer: A::B

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118. The refracting angle of a prism is A and refrac tive index of the material of the prism is $\cot\left(\frac{A}{2}\right)$ The angle of minimum deviation is :

A. $\pi - A$

B. $\pi - 2A$

C. $\pi - \frac{A}{2}$

D. $\pi - 4A$

Answer: A::B

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119. A beaker having water of refractive index of $\frac{4}{3}$ water is filled upto 16 cm in it. As shown in figure, a concave mirror is kept 3 cm above the surface of water. If the object is place at the bottom of beaker and its image is ob tained from this mirror at 7 cm below the surface of water, then what will be the focal length of this concave mirror ?

A. 4 cm

B. 6 cm

C. 8 cm

D. 10 cm

Answer: B::C

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120. Refractive index of water is $\frac{4}{3}$ and that of glass is $\frac{3}{2}$. What is the refractive index of glass with respect to water ?

A. $\frac{9}{8}$

B. $\frac{8}{9}$

C. 2

D. $\frac{1}{2}$

Answer: A

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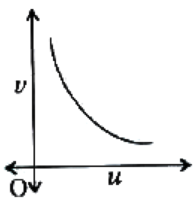
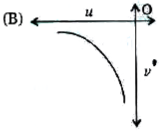
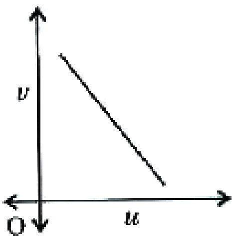
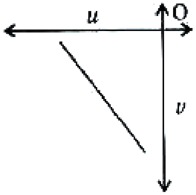
121. In an experiment to find focal length of a concave mirror a graph is drawn. The graph looks like ....

A. 

B. 

C. 

D. 

Answer: A

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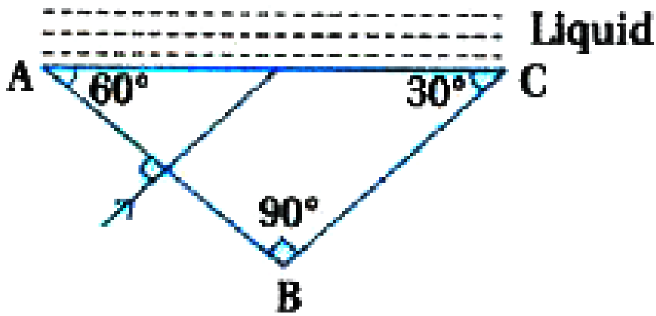
122. Light is incident normally on the face AB of a prism as shown in figure. A liquid of refractive index n is placed on face AC of the prism. The prism is made of glass of refractive index $\sqrt{3}$. The limiton n for which total internal reflection takes place on face AC is

....



A. $n > \sqrt{3}$

B. $n < \frac{3}{2}$

C. $n = \sqrt{3}$

D. $n > \frac{3}{2}$

Answer: B::C

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123. A defect of vision in which lines in one plan of an object appear in focus while those i another plane are out of focus is called ......

A. astigmatism

B. distortion

C. myopia

D. hypermetropia

Answer: A

View Text Solution

124. Antistokes lines is Raman Scattering are the lines of ..... frequency and ......wavelength.

A. low, high

B. low, low

C. high, high

D. high, low

Answer: D

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125. The time taken by the sunlight to reach the bottom of a tank of depth 4.5m filled completely with water is .... ns. The refractive index of water is $\frac{4}{3}$

A. 2

B. 1.5

C. 20

D. 200

Answer: B::C

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126. As shown in figure, a plano-concave lens is placed in such a way that it becomes completely fit with plano-convex lens. Their plane surfaces are parallel. If their refractive indices are 1.6 and 1.5 respectively and radius of curvature is R, then focal length of combination is .....

A. $\dfrac{R}{6.2}$

B. $\dfrac{R}{3.1}$

C. $\dfrac{R}{0.2}$

D. $\dfrac{R}{0.1}$

Answer: A::D

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127. A ray of light passes from a medium A having refractive index 1.6 to the medium B having refractive index 1.5. The value of critical angle of medium A is ....

A. $\sin^{-1}\left(\frac{16}{15}\right)$

B. $\sin^{-1}\left(\frac{1}{2}\right)$

C. $\sin^{-1}\sqrt{\frac{16}{15}}$

D. $\sin^{-1}\left(\frac{15}{16}\right)$

Answer: A::D

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128. Angle of minimum deviation for a prism of refractive index 1.5 is equal to the angle of prism of given prism. Then the angle of prism is ...... $(\sin 48^\circ 36. \ = 0.75)$

A. $41^\circ 24.$

B. 60°

C. 80°

D. $82^\circ 48.$

Answer: B::D

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129. Power of plane mirror is ......

A. ∞

B. 2D

C. 0

D. 4D

Answer: C

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130. Light waves travel from optically rarer medium to optically denser medium. Its velocity decreases because of change in ....

A. frequency

B. wavelength

C. amplitude

D. phase

Answer: B

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131. If the size of the particle scattering the light is smaller than the wavelength of incident light then the scattering is called ...... scattering.

A. Diffused

B. Raman

C. Mie

D. Rayleigh

Answer: D

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132. If the focal length of a lens for red and violet light rays respectively are f_R and f_V then which of the following is true relationship ?

A. $f_R \geq f_V$

B. $f_R > f_V$

C. $f_R = f_V$

D. $f_R \leq f_V$

Answer: B

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133. Time taken by the sunlight to pass through a slab of 4 cm and refractive index 1.5 is ...... s.

A. 2×10^{-8}

B. 2×10^{-10}

C. 2×10^{8}

D. 2×10^{10}

Answer: A::B

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134. A convex lens of focal length 12.5 cm is used as a simple microscope. When the image is formed at infinite, Magnification is .... (Near point for the normal vision is 25 cm).

A. 2.5

B. 1.0

C. 2

D. 25

Answer: B::C

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135. If wavelength of incident light for Rayleigh scattering is decreased from 8000 Å to 4000 Å, then intensity of scattered light will become ...... times then that of initial intensity.

A. 2

B. 4

C. 16

D. 8

Answer: A::C

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136. Two thin lenses of focal lengths f1 and f2, are in contact and coaxial. The power of combination is

A. $\sqrt{\dfrac{f_1}{f_2}}$

B. $\sqrt{\dfrac{f_2}{f_1}}$

C. $\dfrac{f_1 + f_2}{2}$

D. $\dfrac{f_1 + f_2}{f_1 f_2}$

Answer: A::B::D

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137. If deviation by a prism with small prism angle with refractive index 1.6 is 3.6°, then prism angle is ....

A. 7°

B. 6°

C. 5°

D. 8°

Answer: B

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138. If radius of curvature of curved surface of plano-convex lens of refractive index 1.5 is 60 cm, then its focal length is ...... cm.

A. -60

B. 120

C. 60

D. -120

Answer: A::B

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139. Focal length of thin lens of refractive index 1.5 is 15 cm. When placed on liquid of refractive index $\frac{4}{3}$, then its focal length will be ...... cm.

A. 80.31

B. 50

C. 78.23

D. 60

Answer: D

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140. If tube length of astronomical telescope is 96 cm and magnification is 15, then focal length of objective is ...... cm.

A. 100

B. 90

C. 105

D. 92

Answer: B

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141. In optical fiber the refractive index of the material of the core is.......... That of the cladding.

A. higher than

B. less than

C. equal to

D. half

Answer: A

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142. If a size of particle is a and wavelength of light isλ , for $a < \ < \lambda$ scattering is directly proportional to ....

A. $\frac{1}{\lambda^4}$

B. λ^4

C. λ^2

D. $\frac{1}{\lambda^2}$

Answer: A::B::D

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