PHYSICS

AAKASH INSTITUTE ENGLISH

RAY OPTICS AND OPTICAL INSTRUMENTS

Example

1. Where should an object be placed in front of a concave mirror of focal length 15 cm to have a magnification of 3 in case of

(a) real image

(b) virtual image ?

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2. The sun (diameter d) subtends an angle θ radian at the pole of a concave mirror of focal length f. What is the diameter of the image of the sun formed by the mirror ?

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3. If the refractive index of glass is 1.5. Find the velocity of light in glass. (Velocity of light in vacuum $= 3 \times 10^8 m/s$)

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4. The refractive index of glass with respect to water is $\frac{9}{8}$. If the velocity of wavelength of light in glass are $2 \times 10^8 m/s$

and 4000 Å respectively, find the velocity and wavelength of light in water.

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5. Find the thickness of a plate which will produce a change in optical path equal to half the wavelength λ of the light passing through it normally. The refractive index of the plate is μ.

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6. When light of wavelength 5000 Å in vacuum travels through same thickness in glass and water, the difference in the number of waves is 400. Find thickness. (Refractive indices of glass and water are $\frac{3}{2}$ and $\frac{4}{3}$ respectively)

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7. Find the critical angle of a denser medium of refractive index 1.65 for its interface with air $\left(\sin^{-1}(0.6061)37^{\circ}.18'\right)$.

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8. A liquid of refractive index 1.5 is poured into a cyclindrical jar of radius 20 cm upto a height of 20 cm. A small bulb at the centre of bottom glowing. Find area of the liquid surface through which the light of the bulb passes into air.

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9. A ray of light incident on the horizontal surface of a glass slab at 70° just grazes the adjacent vertical surface after

refraction. Complete the critical angle and refractive index of glass.

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10. A concave spherical surface of radius of curvature 100 cm separates two media of refractive indices 1.50 and $\frac{4}{3}$. An object is kept in the first medium at a distance of 30 cm from the surface. Calculate the position of the image.

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11. Refraction takes place at a convex spherical boundary separating air-glass medium. For the image to be real, the object distance $(\mu_g = 3/2)$

Note Object lying in the glass.

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12. A convex surface of radius of curvature 40 cm separate two media of refractive indices $\frac{4}{3}$ and 1.50. An object is kept in the first medium at a distance of 20 cm from the surface. Calculate the position of the image.

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13. An equilateral glass prism is made of a material of refractive index 1.500. Find its angle of minimum deviation.

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14. A prism of refracting angle 4° is made of a material of refractive index 1.652. Find its angle of minimum deviation.

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15. The angle of minimum deviation produced by a 60° prism is 40°. Calculate the refractive index of the material of the prism.

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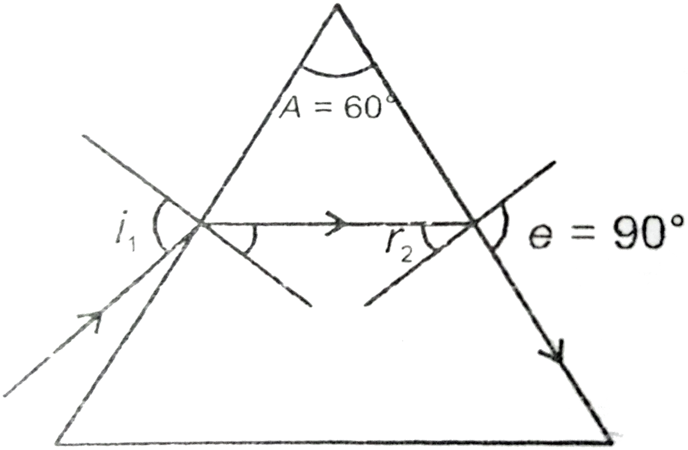
16. Calculate the angle of incidence on the face of a prism of refracting angle 60° and of refractive index 1.5, for which the emergent ray just grazes the other face.



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17. The refractive indices of flint glass prism for Red, Yellow and Violet colours are 1.790, 1.795 and 1.805 respectively, find dispersive power of the flint glass.

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18. Two small angled prisms A and B deviate the blue rays by 6° and 8° and the red rays by 4° and 6° respectively. Which prism has a greater dispersive power?

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19. The focal length of a converging lens is 8 cm. Fins the magnification power when it is used as a reading lens to form the image at near point.

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20. A microscope consisting of two convex lenses of focal lengths 2 cm and 5 cm placed 20 cm apart. Where must the object be placed so that the final image (virtual) is at a distance of 25 cm from eye ?

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21. The focal lengths of the objective and eyepiece of a telescope are 60 cm and 5 cm respectively. Find as magnifying power (P) for normal adjustment and when the image forms at near point.

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22. What will be the image speed if

(i) Object is moving towards the plane mirror with speed v ?

(ii) The plane mirror is moving towards the object with speed v ?

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23. If your height is h and you want to see your complete image in a plane mirror, what should be the minimum size of the mirror ?

Strategy : You can see your complete image if light rays from the top of your head and light rays from your feet reach your eyes after reflection.

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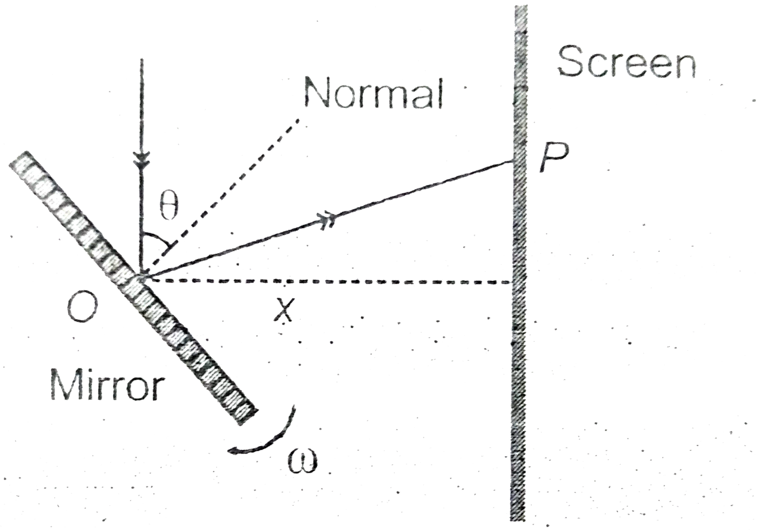
24. Figure shows a plane mirror hinged at O and free to rotate in a vertical plane. The point O is at a distance x from a long screen. A beam of light moving vertically downwards is reflected by the mirror at O so that a bright spot P is formed at the screen. At the instant shown, the angle of incidence is θ and the mirror is rotating clockwise with constant angular veloity ω. Find the speed of spot P at this instant.



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25. If velocity of bird (B) in downward direction with respect to surface (water and air) is 3m/s. Then what is the velocity of bird (B) with respect to fish (F) ? $\left(\cdot_a \mu_w = \frac{4}{3}\right)$

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26. If velocity of fish in upward direction is 4 m/s with respect to surface and velocity of bird in downward direction with respect to surface is 3 m/s. Then find the velocity of fish with respect to bird (Given that $._{a}\mu_{w} = \frac{4}{3}$)

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27. If the critical angle is $48^{\circ}42'$ when the media concerned are air and water and $36^{\circ}47'$ when they are air and glass, what is the critical angle when the media are water and glass.

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28. A disc is placed on the surface of pond filled with liquid of refractive index $\frac{5}{3}$. A source of light is placed 4m below the surface of liquid. Calculate the minimum area of the disc so that light does not come out of liquid.

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29. An object is placed at a distance f in front of a concave lens of focal length f. Locate its image.

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30. A converging beam of light is incident on a concave lens of focal length 20 cm. In the absence of the lens, the beam converges at a point 10 m behind the lens. Find where the beam will converge/diverge after refraction.

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31. Prove that when an object is placed in front of a concave lens, the image formed is (i) virtual (ii) erect (iii) diminished (iv) and located between pole and focus.

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32. Find the focal length of equivalent mirror if concave surface of a plano concave lens is silvered. Radius of curvature of concave surface is R and refractive index of material of prism is μ.

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33. What is the focal length if plane surface is silvered in previous illustration.

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34. A ray of light falling at an angle of 50° is refracted through a prism and suffers minimum deviation. The angle of the prism is 60°. Find the angle of minimum deviation and refraction index of the material of the prism.

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35. A prism of refractive index 1.53 is placed in water of refractive index 1.33. If the angle of prism is 60°, calculate the

angle of minimum deviation in water.

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36. A ray of light incident normally on one face of a right isosceles prism is totally reflected. What must be the minimum value of refractive index of glass ? Give relevant calculations.

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37. The dispersive power of crown and flint glasses are 0.02 and 0.04 respectively. If the difference between the refractive indices of blue and red colours is 0.012 for crown glass and 0.022 for flint glass, calculate the angle of the two prisms for a deviation of 8° (without dispersion).

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38. A prism of crown glass having angle of refractive as 3° and refractive index = 1.51 is combined with one flint glass prism of refractive index = 1.65 to produce dispersion without deviation. Find the angle of flint glass and net dispersion.

Given,

$\mu_v = 1.523, \mu_R = 1.513$ (for crown glass)

$\mu'_v = 1.665, \mu'_R = 1.645$ (for flint glass)

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39. The focal length of convex tens is f and the distance of an object from the principal focus is x. The ratio of the size of the real image to the size of the object is

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40. Find the position, magnification and nature of the image of an object placed at a distance of 8 cm from a convex mirror of radius of curvature 24 cm.

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41. A rod AB of length 5 cm lies along the principal axis of the concave mirror of focal length 15 cm in such a way that the end closer to the pole is 30 cm away from it. Find the length of the image.

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42. Where should an object be placed in front of a concave mirror of focal length 15 cm to have a magnification of 3 in case of

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(b) virtual image ?

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48. A fish in water sees an object which is $24cm$ above the surface of water. The height of the object above the surface of water that will appear to the flash is $(\mu = 4/3)$

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49. A microscope is focussed on a mark on a piece of paper and then a slab of glass of thickness 3 cm and refractive index 1.5 is placed over the mark. How should the microscope be moved to get the mark in foucs again ?

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50. An air bubble trapped inside a rectangular glass slab (cuboid) appear at 2 cm from one side and at 3 cm from the other opposite side. If the refractive index of glass is 1.5, what is the actual width of the glass slab?

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51. At what angle of incidence should a light beam strike a glass slab of refractive index $\sqrt{3}$, such that the reflected and the refracted rays are perpendicular to each other ?

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52. One face of a rectangular glass plate 6 cm thick is silvered. An object held 8 cm in front of the first face, forms an image 12 cm behind the silvered face. The refractive index of the glass is

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53. A disc is placed on the surface of pond filled with liquid of refractive index $\frac{5}{3}$. A source of light is placed 4m below the surface of liquid. Calculate the minimum area of the disc so that light does not come out of liquid.

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55. A concave spherical surface of radius of curvature 100 cm separates two media of refractive indices 1.50 and $\frac{4}{3}$. An object is kept in the first medium at a distance of 30 cm from the surface. Calculate the position of the image.

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56. Show that for refraction at a concave spherical surface (separating glass-air medium), the distance of the object should be greater than three times the radius of curvature of the refracting surface for the image to be real.

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57. A convex surface of radius of curvature 40 cm separate two media of refractive indices $\frac{4}{3}$ and 1.50. An object is kept in the first medium at a distance of 20 cm from the surface. Calculate the position of the image.

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58. An object is placed 21 cm in front of a concave mirror of radius of curvature 10cm. A glass slabe of thickness 3cm and refractive index 1.5 is then placed close to the irror in the space between the object and the mirror. The distance of the near surface of the slabe from the mirror is 1cm. The final image from the mirror will be formed at

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59. A concave mirror of radius 40 cm lies on a horizontal table and water is filled in it upto a height of 5cm. A small dust particle floats on the water surface at a point P vertically above the point of contact of the mirror with the table. Locate the image of the dust particle directly above it. μ_w=2/3.

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60. There is small air bubble inside a glass sphere $(\mu = 1.5)$ of radius 10 cm. The bubble is 4.0 cm below the surface and is viewed normally from the outside figure. Find the apparent depth of the bubble

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61. A thin lens made of glass of refractive index $\mu = 1.5$ has a focal length equal to 12 cm in air. It is now immersed in water ($\mu = \frac{4}{3}$). Its new focal length is

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62. The radius of curvature of the convex surface of a thin plano-convex lens is 12 cm, and the refractive index of its material is 1.6. What is the power of lens ?

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63. An equilateral glass prism is made of a material of refractive index 1.500. Find its angle of minimum deviation.

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65. The angle of minimum deviation produced by a 60° prism is 40°. Calculate the refractive index of the material of the prism.

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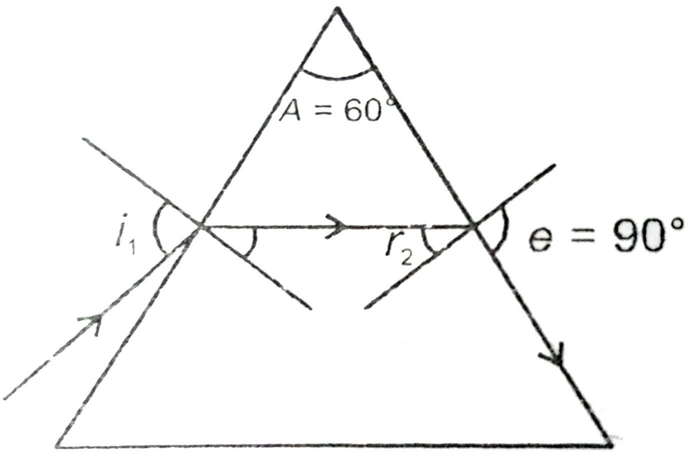
66. Calculate the angle of incidence on the face of a prism of refracting angle 60° and of refractive index 1.5, for which the emergent ray just grazes the other face.



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67. A ray of light is incident at an angle of 60° on the face of a prism having refracting angle 30°. The ray emerging out of the prism makes an angle 30° with the incident ray. Show that the emergent ray is perpendicular to the face through which it emerges and calculate the refractive index of the material of prism.

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68. For a ray of light refracted through a prism of angle 60°, the angle of incidence is equal to the angle of emergence, each equal to 45°. Find the refractive index of the material of the prism.

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69. A ray of light incident normally on one face of a right isosceles prism is totally reflected. What must be the minimum value of refractive index of glass ? Give relevant calculations.

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70. The refractive indices of flint glass prism for violet, Yellow and Red colours are 1.790, 1.795 and 1.805 respectively, find dispersive power of the flint glass.

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71. Two small angled prisms A and B deviate the blue rays by 6° and 8° and the red rays by 4° and 6° respectively. Which prism has a greater dispersive power ?

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72. The difference between angle of minimum deviation of violet and red rays in the spectrum of white light from a prism is 2°. If angle of minimum deviation of mean ray is 48°, the dispersive power of material of the prism is

A. 48

B. 24

C. 0.032

D. 0.0416

Answer: D

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73. The focal length of a converging lens is 8 cm. Fins the magnification power when it is used as a reading lens to form the image at near point.

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75. The focal lengths of the objective and eyepiece of a telescope are 60 cm and 5 cm respectively. Find as magnifying power (P) for normal adjustment and when the image forms at near point.

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Try yourself

1. Which type of mirror is usually used as a rear-view mirror in motor cars ?

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2. Why are mirrors used in search lights parabolic and not concave sphrical ?

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3. A person moves with a velocity v towards a plane mirror. With what velocity does his image move towards him ?

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4. What is the ratio of velocity of red colour light to velocity of violet colour of light in vacuum ?

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5. Can the absolute value of refractive index of a medium be less than unity ?

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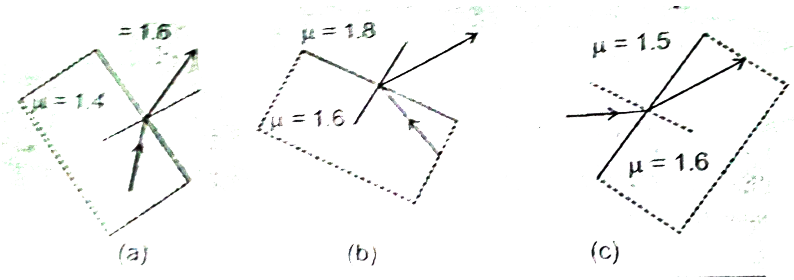
6. Which of the three drawings here show physically possible ?



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

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8. A small filament is at the centre of a hollow glass sphere of inner and outer radii 8 cm and 9 cm respectively. The refractive index of glass is 1.50. Calculate the position of the image of the filament when viewed from outside the sphere.

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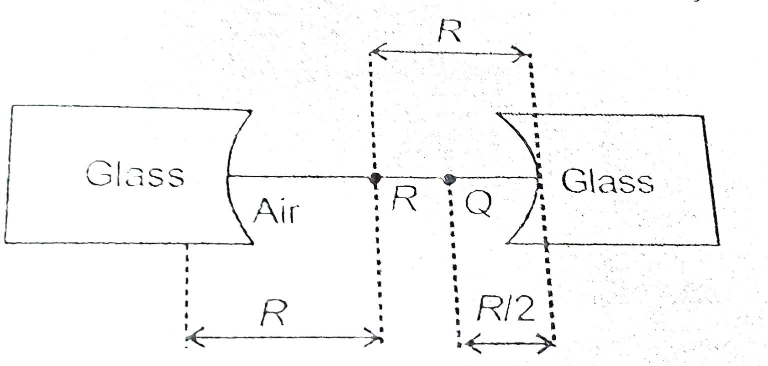
9. Two concave refracting surface of equal radii of curvature and refractive index 1.5 face each other in air as shown in figure. A point is placed midway in between the centre and one of the vertices. What is the separation between the image of O formed by each refracting surface ?



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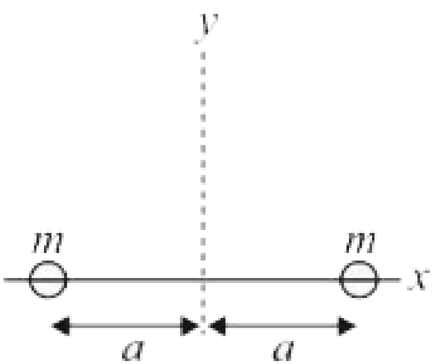
10. Two identical spherical balls, each of mass m, are placed as shown in figure. Plot the variation of g(gravitation intensity) along the x-axis due to both the masses.



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11. Light falls at normal incidence on one face of a glass prism of refractive index 1.5, what will be the angle of emergence when the angle of the prism is (a) 30° (b) 50° ?

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12. In the minimum deviation position, the.......... In the prism is......... to the base of the prism.

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13. Are the incident of emergent rays symmetrical with respect to the base of a prism in minimum deviation position ?

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14. Is the angle of minimum deviation different for different wavelengths ?

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15. Can a prism be used to produce inversion (refracted in opposite direction) Without deviation ?

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16. Is deviation always followed by dispersion ?

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17. The aperture and focal length of the objective of telescope are large, why?

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18. The aperture and focal length of the objective of telescope are large, why?

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19. The magnifying powers of astronomical telescope and terrestrial telescope same, why ?

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20. The speed of sound in a perfectly rigid rod is

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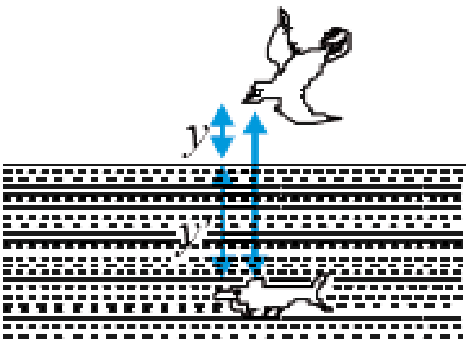
21. A fish rising vertically up towards the surface of water with speed $3ms^{-1}$ observes a bird diving vertically down towards it with speed $9ms^{-1}$. The actual velocity of bird is:



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

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23. A concave mirror of focal length $15cm$ forms an image having twice the linear dimension of the object. The position of the object when the image is virtual be :

A. 7.5 cm

B. 22.5 cm

C. 40 cm

D. 30 cm

Answer: A

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24. A source of light is at 10 cm from a convex mirror and is then moved to a distance of 2 cm from the mirror. How much does the image move if the radius of curvature of the mirror is 4.8 cm?

A. 0.95 cm

B. 0.85 cm

C. 0.75 cm

D. 0.65 cm

Answer: B

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25. A short linear object of length b lies along the axis of a concave mirror of focal length fat a distance u from the pole of the mirror, what is the size of image?

A. $\left(\frac{f}{u-f}\right)b$

B. $\left(\frac{f}{u-f}\right)^2 b$

C. $\left(\frac{f}{u-f}\right)b^2$

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

Answer: B

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26. What type of mirror is generally preferred for motor vehicles ?

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27. What is the ratio of velocity of red colour light to velocity of violet colour of light in vacuum ?

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28. Can absolute refractive index of a medium be less than unity ?

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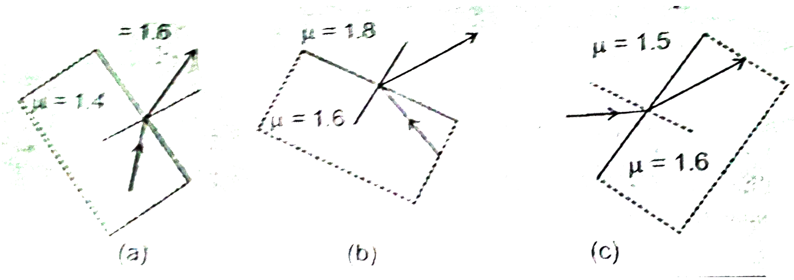

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30. A ray of light strikes a glass plate at an angle of 60°. If the reflected and refracted rays are perpendicular to each other, the index of refraction of glass is

A. $\sqrt{3}$

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

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

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

Answer: A

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31. A glass slab of thickness 12 cm is placed on a table. The level surface of the slab has a black spot. At what depth from the upper surface will the spot appear when viewed from above? (Refractive index of glass = 1.5)

A. 2 mm

B. 4 mm

C. 6 mm

D. 8 mm

Answer: D

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32. Light enters at an angle of incidence in a transparent rod of refractive index n of the material of the rod. Find the range of n so that the light once entered into it will not leave it through its lateral face, the value of angle of incidence.

A. $n > \sqrt{2}$

B. n = 1

C. n = 1.1

D. n = 1.3

Answer: A

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33. A transparent cube contains a small air bubble. Its apparent distance is 2 cm when seen through other facel. If the refractive index of the material of the cube is 1.5, the real length of the edge of cube must be

A. 3 cm

B. 7.5 cm

C. 10.5cm

D. $\frac{14}{3}$ cm

Answer: C

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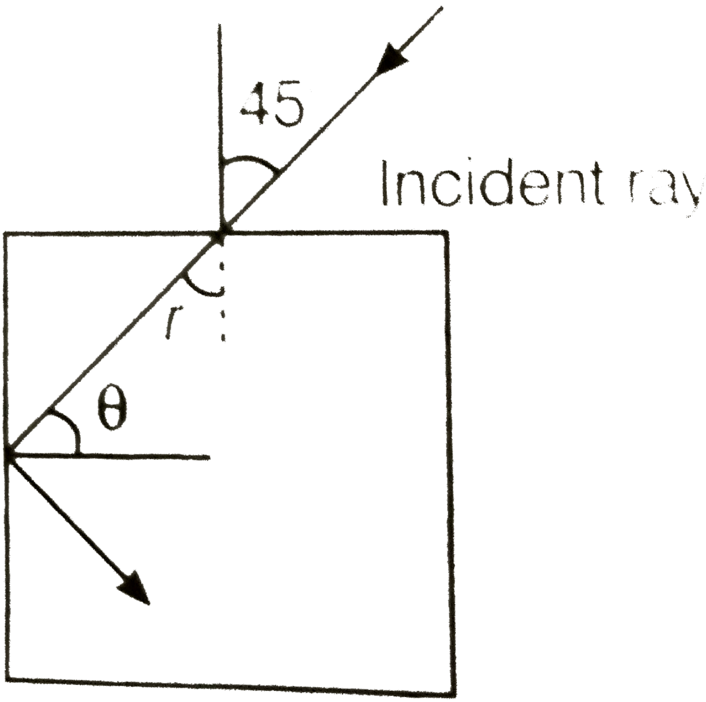
34. For the given incident ray as shown in figure, the condition of total internal reflection of the ray will be satisfied if the refractive indesx of block will be



A. $\frac{\sqrt{3}+1}{2}$

B. $\frac{\sqrt{2}+1}{2}$

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

D. $\sqrt{\frac{7}{6}}$

Answer: C

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35. A ray of light travels from an optically denser to rarer medium. The critical angle for the two media is C. The maximum possible deviation of the ray will be

A. 2C

B. $\frac{\pi}{2} - C$

C. $\pi - C$

D. $\pi - 2C$

Answer: B

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36. The apparent depth of water in cylindrical water tank of diameter 2R is reducing at the rate of x cm/min when water is being drained out at a constant rate. The amount of water drained in cc/min is (n_1=refractive index of air,n_2=refractive index of water)

A. $\dfrac{x\pi R^2 n_1}{n_2}$

B. $\dfrac{x\pi R^2 n_2}{n_1}$

C. $\dfrac{2\pi R n_1}{n_2}$

D. $\pi R^2 x$

Answer: B

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37. Refractive index of glass with respect to medium is $\frac{4}{3}$. If $v_m - v_g = 6.25 \times 10^7$ m/s., then velocity of light in medium is

A. 2.5×10^8 m/s

B. 0.125×10^8 m/s

C. 1.5×10^7 m/s

D. 3×10^7 m/s

Answer: A

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38. A ray of light falls on the surface of a spherical glass paper weight making an angle α with the normal and is refracted in the medium at an angle β. The angle of deviation of the emergent ray from the direction of the incident ray is :

A. $(\alpha - \beta)$

B. $2(\alpha - \beta)$

C. $(\alpha - \beta)/2$

D. $(\beta - \alpha)$

Answer: B

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41. A convex lens and a concave lens, each heaving same focal length of $25cm$, are put in contact to from a combination of lenses. The hpjower in diopters of the combination is

A. 25

B. 50

C. Infinite

D. Zero

Answer: D

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42. If the focal length of the lens is 20 cm, find the distance of the image from the lens in the following figure?

A. 5.5 cm

B. 7.5 cm

C. 12.0 cm

D. 20.0 cm

Answer: B

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43. For a given lens, the magnification was found twice as large when as when the object was 0.15 m distance from it as when the distance was 0.2 m. Find power of the lens.

A. 1.5 m

B. 0.20 m

C. 0.10 m

D. 0.05 m

Answer: C

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44. A lens of refractive index μ is put in a liquid of refractive index μ'. If focal length of lens in air is f, its focal length in liquid will be.

A. $\dfrac{f\mu'(\mu-1)}{(\mu-\mu')}$

B. $\dfrac{f(\mu'-\mu)}{\mu'(\mu-1)}$

C. $\dfrac{\mu'(\mu-1)}{f(\mu'-\mu)}$

D. $\dfrac{f\mu\mu'}{(\mu-\mu')}$

Answer: A

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45. An achromatic doublet is formed by combining two lenses.if the focal length of the lenses and their dispersive powers are f, f' and ω, ω' respectively then

A. $\omega = \omega_0, \omega' = 2\omega_0, f' = 2f$

B. $\omega = \omega_0, \omega' = 2\omega_0, f' = -2f$

C. $\omega = \omega_0, \omega' = 2\omega_0, f' = \frac{f}{2}$

D. $\omega = \omega_0, \omega' = 2\omega_0, f' = -\frac{f}{2}$

Answer: B

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46. A convex lens (refractive index μ = 1.5) has a power P. If it is immersed in a liquid (μ = 4/3), then its power will become/remain

A. P

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

C. $\frac{P}{4}$

D. 4P

Answer: C

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47. A cocave lens forms the image of an object such that the distance between the object and image is 10 cm and the magnification produced is 1/4. the focal length of the lens will be

A. 22 cm

B. 44 cm

C. 10 cm

D. 4.4 cm

Answer: A

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48. A body is locatyed on a wall. Its image of equal size is to be obtained on parallel wall with the help of a convex lens. The lens is placed at a distance d ahead of second wall, then the required focal length will be

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

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

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

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

Answer: B

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49. If $f(V)$ and f_R are the focal lengths of a convex lens for violet and red light respectively and $F_V$and F_R are the focal lengths of concave lens for violet and red light respectively, then we have

A. $f_V < f_R$ and $F_V > F_R$

B. $f_V < f_R$ and $F_V < F_R$

C. $f_V > f_R$ and $F_V > F_R$

D. $f_V > f_R$ and $F_V < F_R$

Answer: B

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50. A plano-convex lens has refractive index 1.6 and radius of curvature 60 cm. What is the focal length of the lens?

A. 50 cm

B. 100 cm

C. 200 cm

D. 150 cm

Answer: B

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51. 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 small, but non-zero

B. Remain unchanged

C. Become zero

D. Become infinite

Answer: D

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52. A vessel consists of two plane mirrors at right angles as shown in figure. The vessel is filled with water. The toal deviation in incident ray is

A. 0°

B. 90°

C. 180°

D. 45°

Answer: C

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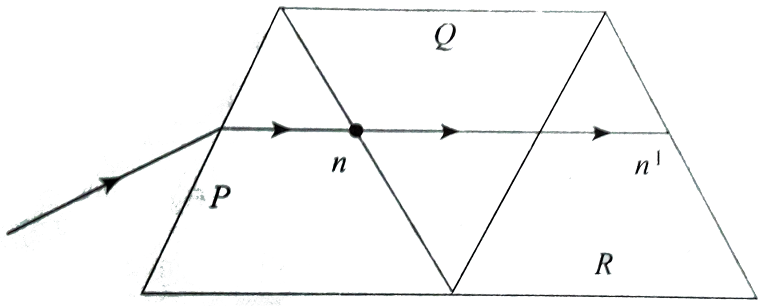
53. A given ray of light suffers minimum deviation in an equilateral prism P. Additional prism Q and R of identical shape and of the same material as P are now added as shown in figure. The ray will now suffer



A. Same deviation

B. Greater deviation

C. Total internal reflection

D. No deviation

Answer: A

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54. A thin prism of 6° is made of material of refractive index $\frac{5}{3}$.

The deviation caused by it is

A. 2°

B. 8°

C. 4°

D. 6°

Answer: C

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55. The minimum deviation produced by a glass prism of angle 40° is 36°. The refractive index of the glass will be

A. 1.4

B. 1.2

C. 1.5

D. 1.8

Answer: D

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56. 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 enterying 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. 45°

B. 60°

C. 0°

D. 30°

Answer: A

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57. An equilateral prism is made up of material of refractive index $\sqrt{3}$. The angle of minimum deviation of light passing through the prism is________.

A. 90°

B. 60°

C. 45°

D. 30°

Answer: B

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58. If the critical angle for the material of a prism is C, and the angle of the prism is A, then there will be no emergent ray when

A. 60°

B. 75°

C. 45°

D. 30°

Answer: C

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59. The aperture and focal length of the objective of telescope are large, why?

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60. The aperture and focal length of the objective of telescope are large, why?

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61. The magnifying powers of astronomical telescope and terrestrial telescope same, why ?

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62. Four lenses of focal length $+15cm, +20cm, +150cm$ and $+250cm$ are available for making an astronomical telescope. To produce the largest magnification, the focal length of the eye-piece should be

A. 250 cm

B. 150 cm

C. 20 cm

D. 15 cm, 5 cm

Answer: D

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63. The optical length of an astronomical telescope with magnifying power of 10, for normal vision is 44cm. What is focal length of the objective?

A. 4 cm

B. 40 cm

C. 44 cm

D. 440 cm

Answer: B

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64. The diameter of the moon is $3.5 \times 10^3 km$ and its distance from the earth is $3.8 \times 10^5 km$. It is seen by a telescope having the focal length of the objective and the eye-piece as $4m$ and $10cm$ respectively. The diameter of the image of the moon will be approximately

A. 2°

B. 20°

C. 40°

D. 50°

Answer: B

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Assignment (Section - A) Objective Type Questions (One option is correct)

1. A ray of light takes 10^{-9} second to cross a glass slab of refractive index 1.5. The thickness of the slab will be

A. 0.1 m

B. 0.2 m

C. 0.3 m

D. 0.4 m

Answer: B

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2. The time taken by a monochromatic light to travel a certain distance in air in 9×10^{-6} seconds. The time taken by the light ray to travel the same distance in water of refractive index $\frac{4}{3}$ is

A. 12s

B. $12\mu s$

C. $\frac{27}{4}\mu s$

D. $\frac{27}{2}\mu s$

Answer: B

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3. A monochromatic light passes through a glass slab $\left(\mu = \frac{3}{2}\right)$ of thickness 90 cm in time t_1. If it takes a time t_2 to travel the same distance through water $\left(\mu = \frac{4}{3}\right)$. The value of $(t_1 - t_2)$ is

A. $5 \times 10^{-8}s$

B. $5 \times 10^{-10} s$

C. $2.5 \times 10^{-10} s$

D. $2.5 \times 10^{-8} s$

Answer: B

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4. A glass slab of thickness $4cm$ contains the same number of waves as $5cm$ of water, when both are traversed by the same monochromatic light. If the refractive index of water is $4/3$, then refractive index of glass is

A. $\frac{5}{3}$

B. $\frac{5}{4}$

C. $\frac{16}{15}$

D. $\frac{3}{2}$

Answer: A

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5. A beam of light is partially reflected and partially refracted from a surface. The angle between reflected and refracted light ray is 90°. If the angle of refraction is 30°, the angle of incidence is

A. 60°

B. 48°

C. 45°

D. 90°

Answer: A

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6. A light ray is travelling from air to glass. True reflected and refracted rays are perpendicular to each other. If the angle of incidence in air is I the refractive index of glass is

A. sin i

B. cos i

C. tan i

D. cot i

Answer: C

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7. An object is placed in front of a slab $(\mu = 1.5)$ of thickness 6cm at a distance 28cm from it. Other face of the slab is silvered. Find the position of final image.

A. 1.15

B. 1.25

C. 1.67

D. 1.1

Answer: C

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8. A denser medium of refractive index 1.5 has a concave surface of radius of curvature 12 cm. An object is situated in the denser medium at a distance of 9 cm from the pole. Locate the image due to refraction in air.

A. A real image at 8 cm

B. A virtual image at 8 cm

C. A real image at 4.8 cm

D. A virtual image at 4.8 cm

Answer: D

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9. A point object is situated at a distance of 36 cm from the centre of the sphere of radius 12 cm and refractive index 1.5. Locate the position of the image due to refraction through sphere.

A. 24 cm from the surface

B. 36 cm from the centre

C. 24 cm from the centre

D. Both (1) & (2)

Answer: D

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10. In a medium of refractive index 1.6 and having a convex surface has a point object in it at a distance of 12 cm from the pole. The radius of curvature is 6 cm. Locate the image as seen from air

A. A real image at 30 cm

B. A virtual image at 30 cm

C. A real image at 4.28 cm

D. A virtual image at 4.28 cm

Answer: B

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11. Light travels in two media A and B with speeds $1.8 \times 10^{8} ms^{-1}$ and $2.4 \times 10^{8} ms^{-1}$ respectively. Then the critical angle between them is

A. $\sin^{-1}\left(\frac{1}{5}\right)$

B. $\sin^{-1}\left(\frac{4}{5}\right)$

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

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

Answer: B

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12. Light takes t_1 second to travel a distance x cm in vacuum and the same light takes t_2 second to travel 10x cm in medium. The critical angle for the corresponding medium is

A. $\sin^{-1}\left[\frac{10t_2}{t_1}\right]$

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

C. $\sin^{-1}\left[\frac{10t_1}{t_2}\right]$

D. $\sin^{-1}\left[\frac{t_1}{10t_2}\right]$

Answer: C

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13. In the figure shown, for an angle of incidence 45°, at top surface, what is the maximum refractive index needed for total internal reflection at vertical face AD?

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

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

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

D. None of these

Answer: A

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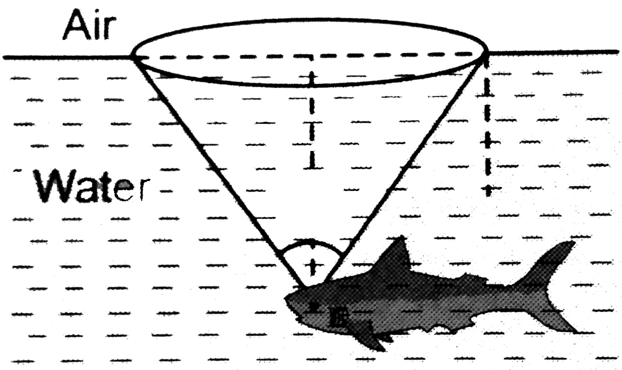
14. A fish is a little away below the surface of a lake. If the critical angle is 49° , then the fish could see things above the water surface withing an angular range of θ° where



A. $\theta = 49^\circ$

B. $\theta = 90^\circ$

C. $\theta = 98^\circ$

D. $\theta = 24.5^\circ$

Answer: C

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15. A parallel beam of monochromatic light falls on a combination of a convex lens and a concave lens of focal lengths 15 cm and 5 cm respectively. What is the distance between the two lenses to obtain a parallel beam of light from the concave lens ?

A. 20cm

B. 3 cm

C. 10 cm

D. 45 cm

Answer: C

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16. In question 118, if m_1 and m_2 are the magnifications for two positions of the lens, then

A. $\sqrt{m_1 m_2}$

B. $\dfrac{d}{\sqrt{m_1 - m_2}}$

C. $\dfrac{d m_1 m_2}{m_1 - m_2}$

D. $\dfrac{d}{m_1 - m_2}$

Answer: C

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17. Three lenses in contact have a combined focal length of 12 cm. When the third lens is removed, the combined focal length is $\dfrac{60}{7}$ cm. The third lens is

A. A converging lens of focal length 30 cm

B. A converging lens of foca length 60 cm

C. A diverging lens of focal length 30 cm

D. A diverging lens of focal length 60 cm

Answer: C

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18. A lens made of material of Refractive index μ_2 is surrounded by a medium of Refractive Index μ_1. The focal length f is related as

A. $f \propto (\mu_2 - \mu_1)$

B. $f \propto \frac{\mu_1}{(\mu_2 - \mu_1)}$

C. $f \propto (\mu_2 + \mu_1)$

D. $f \propto \dfrac{1}{(\mu_2 + \mu_1)}$

Answer: B

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19. The radii of curvatures of a convex lens are 0.04 m and 0.04m. Its refractive index is 1.5. Its focal length is

A. 0.04 m

B. 0.4 m

C. 4m

D. 40 m

Answer: A

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20. For a plano convex lens, the radius of curvature of convex surface is 10 cm and the focal length is 30 cm. The refractive index of the material of the lens is

A. 1.5

B. 1.66

C. 1.33

D. 2.5

Answer: C

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21. A convex glass lens $(\mu_g = 1.5)$ has a focal length of 8 cm when placed in air. What is the focal length of the lens when it is immersed in water ?

$\left(\mu_\omega = \frac{4}{3}\right)$

A. 32 cm

B. 6 cm

C. 16 cm

D. 30 cm

Answer: A

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22. A light ray is incident normally on one of the refracting faces of a prism and just emerges out grazing the second surface. Then, the relation between angle of the prism and its critical angle is

A. $A = C$

B. $A \neq C$

C. $A < C$

D. $A > C$

Answer: A

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23. If a light ray incidents normally on one of the faces of the prism of refractive index 2 and the emergent ray just grazes the second face of the prism, then the angle of deviation is

A. 0°

B. 30°

C. 45°

D. 60°

Answer: D

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24. A ray of light is incident on one of the faces of the angle prism with an angle 40° with the surface. The angle of the prism is 60°. The emergent ray is deviated through an angle 38°. The angle of emergence is

A. 38°

B. 48°

C. 52°

D. 58°

Answer: B

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25. A prism of refractive index sqrt2 has refractive angle 60°. In the order that a ray suffers minimum deviation it should be incident at an angle of

A. 30°

B. 45°

C. 60°

D. 75°

Answer: B

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26. The least angle of deviation for a glass prism is equal to its refracting angle. The refractive index of glass is 1.5. Then the angle of the prism is

A. $2\cos^{-1}\left(\frac{3}{4}\right)$

B. $\sin^{-1}\left(\frac{3}{4}\right)$

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

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

Answer: A

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27. A light ray of angles of incidence 40° emerged from the prism in minimum deviation position. Then what is the angle of incidence on the second surface ?

A. 90°

B. 0°

C. 40°

D. 20°

Answer: C

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28. The angle of minimum deviation for a 75° prism of dense glass is found to be 45° when in air and 15° when immersed in certain liquid. The refractive index of the liquid is

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

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

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

D. $\sqrt{3}$

Answer: C

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29. Suppose a small angled prism of 6° deviates a ray through 3°, then the refractive index is

A. 1.62

B. 1.33

C. 1.5

D. 1.72

Answer: C

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30. A crown glass prism of angle 5° is to be combined with a flint glass prism in such a way that the mean ray passes undeviated. Find (a) the angle of the flint glass prism needed and (b) the angular dispersion produced by the combination when white light goes through it. Refractive indices for red, yellow and viloet light are 1.514, 1.517 and 1.523 respectively for crown glass and 1.613 1.620 and 1.632 for flint glass.

A. 10°

B. 2.5°

C. 2°

D. 5.45°

Answer: B

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31. A thin prism of angle 6° made up of glass of refractive index 1.5 is combined with anorher prism made up of glass of refractive index 1.75 to produce dispersion without deviation. The angle of second prism is

A. 7°

B. 4°

C. 9°

D. 5°

Answer: B

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32. Compare the dispersive powers of two prisms if one of them deviates the blue and red rays through 10° and 6° respectively and the second prism through 8° and 4.5°

A. 0.69

B. 0.79

C. 0.89

D. 0.99

Answer: C

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33. A convex mirror forms an image one-fourth the size of the object. If object is at a distance of 0.5 m from the mirror the focal length of the mirror is

A. 0.16

B. $-1.5m$

C. 0.4 m

D. $-0.4m$

Answer: A

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34. A body weights 500N on the surface of the earth. How much would it weights half-way below the surface of the earth?

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

B. $\frac{3.4}{2.5}$

C. $\frac{4}{5}$

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

Answer: C

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35. While a moving picture is being screened, a boy introduced a glass slab of thickness 3 cm and refractive index 1.5 between the projector and the screen. In order to have a clear picture on the screen the screen should be moved through a distance of

A. 1 cm away

B. 1 cm nearer

C. 2 cm away

D. 3 cm away

Answer: A

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36. A travelling microscope is focussed on to a scratch on the bottom of a beaker. Water of refractive index $\frac{4}{3}$ is poured in it. Then the microscope is to be lifted through 2 cm focus it again. Find the depth of water in the beaker.

A. 4 cm

B. 8 cm

C. $\frac{8}{7}cm$

D. $\frac{8}{3}cm$

Answer: B

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37. In optical fibre, refractive index of inner part is 1.68 and refractive index of outer part is 1.44. The numerical aperture of the fibre is

A. 0.5653

B. 0.6553

C. 0.7653

D. 0.8753

Answer: D

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38. A fish looking up throughthe water sees the outside the 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 the circle in cm is:

A. $\frac{16}{\sqrt{7}}cm$

B. $\frac{26}{\sqrt{7}}cm$

C. $\frac{36}{\sqrt{7}}cm$

D. $\frac{46}{\sqrt{7}}cm$

Answer: C

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Assignment (Section - B) Objective Type Questions (One option is correct)

1. A lens forms a sharp image on a screen. On inserting a parallel sided glass slab between the lens and the screen, it is found necessary to move the screen a distance d away the lens in order for the image to be sharp again. If the refractive index of the material of the slab is μ, the thickness of the slab is

A. μd

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

C. $(\mu - 1)\frac{d}{\mu}$

D. $\frac{\mu d}{\mu - 1}$

Answer: D

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2. For an eye kept at a depth h inside water is refractive index μ, and viewed outside, the radius of circle through which the outer objects can be seen will be

A. $\frac{h}{\sqrt{\mu^2 - 1}}$

B. $\frac{h}{\mu}$

C. $\dfrac{h}{\sqrt{\mu^2+1}}$

D. $\left(\dfrac{\sqrt{\mu^2-1}}{\mu}\right)h$

Answer: A

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3. A convex lens A of focal length 20cm and a concave lens B of focal length 5cm are kept along the same axis with a distance d between them. I a parallel lbeam of leight falling on A leaved B as a parallel beam, then d is equal to ____________cm.

A. 25

B. 15

C. 20

D. 40

Answer: B

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4. An equilateral triangular prism is made of glass $(\mu = 1.5)$. A ray of light is incident normally on one of the faces. The angle between the incident and emergent ray is

A. 60°

B. 90°

C. 120°

D. 180°

Answer: A

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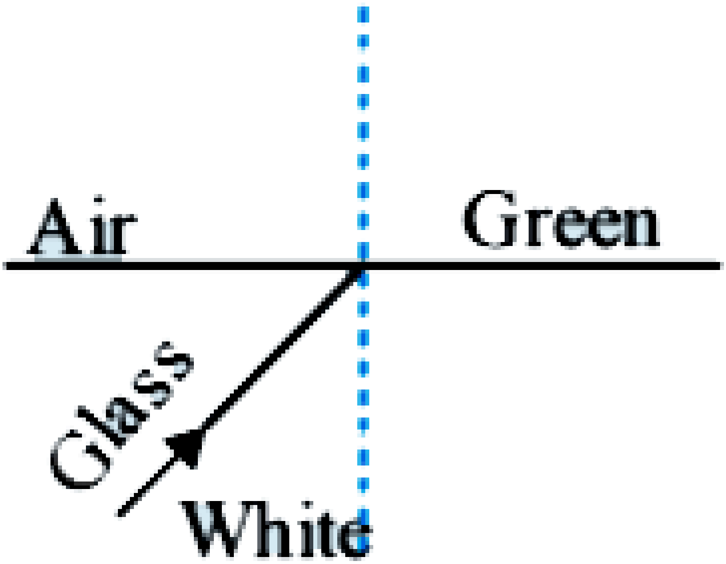
5. White light is incident on the interface of glass and air as shown in the figure. If green light is just totally internally reflected then the emerging ray in air contains:



A. Yellow, orange, red

B. Violet, indigo, blue

C. All colours

D. All colours except green

Answer: A

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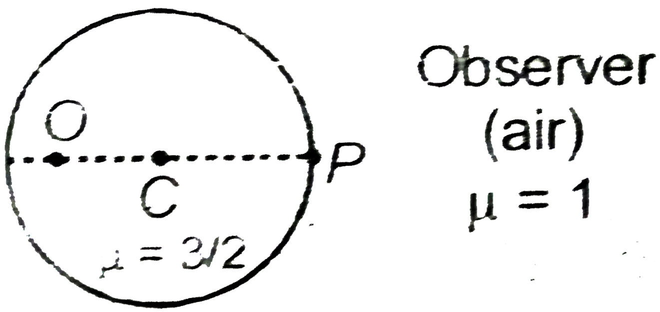
6. In a spherical paper weight (R = 10 cm) made of glass of refractive index $\mu = \frac{3}{2}$, an object is embedded at a distance 5 cm from its centre. What is the apparent position of the object when seen from the opposite side (see figure)?



A. 10 cm behind centre

B. 10 cm behind P

C. 15 cm behind centre

D. 5 cm behind P

Answer: A

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7. A concave mirror is placed on a horizontal table with its axis directed vertically upward. Let O be the pole of the mirror C its center of curvature and F is the focus. A point object is placed at C. It has a real image, also located at C. If the mirror is now filled with water, the image will be

A. Real, at C

B. Real, located beyond C

C. Virtual, beyond C

D. Real an located before C

Answer: D

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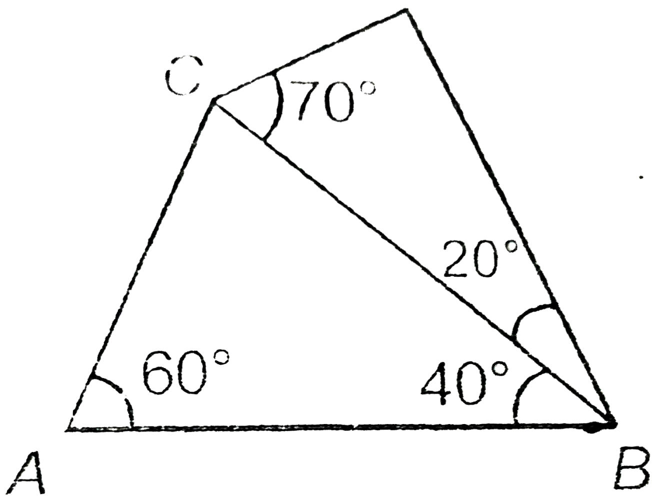
8. Two prisms of same glass $(\mu = \sqrt{2})$ are stuck together without gap as shown. Find the angle of incidence i on the face AC such that the deviation produced by the combination is minimum ?



A. 60°

B. 15°

C. 30°

D. 45°

Answer: D

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9. A short linear object of length b lies along the axis of a concave mirror of focal length fat a distance u from the pole of the mirror, what is the size of image?

A. $b\left(\frac{u-f}{f}\right)^{\frac{1}{2}}$

B. $b\left(\frac{f}{u-f}\right)^{\frac{1}{2}}$

C. $b\left(\frac{u-f}{2}\right)$

D. $b\left(\frac{f}{u-f}\right)^2$

Answer: D

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10. An object is placed 1m in front of the curved surface of a plano-convex lens whose plane surface is silvered. A real image is formed in front of the lens at a distance of 120cm. Then, the focal length of the lens is

A. 100 cm

B. 200 cm

C. 150 cm

D. 300 cm

Answer: B

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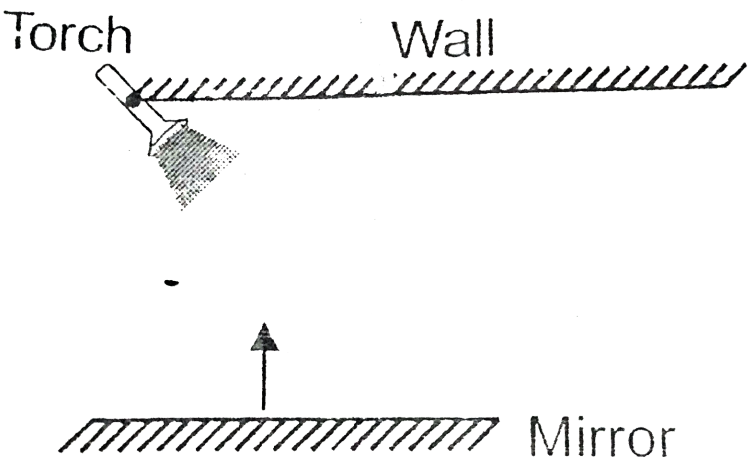
11. Figure shows a torch sending a parallel beam of light fixed on a wall and a plane mirror which forms a spot on the wall. As the mirror moves towards the wall, the spot on the wall moves



A. Towards the torch

B. Away from the torch

C. First closer to torch then away

D. Nowhere

Answer: A

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12. A ray of light passes from vaccum into a medium of refractive index n. If the angle of incidence is twice the angle of refraction, then the angle of incidence is

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

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

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

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

Answer: C

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13. A plane mirror is placed horizontally inside water (μ=4/3). A ray falls normally on it. Then mirror is rotated through an angle θ. The minimum value of θ for which ray does not come out of the water surface is

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

B. $\sin^{-1}\left(\frac{3}{4}\right)$

C. $\frac{1}{2}\sin^{-1}\left(\frac{3}{4}\right)$

D. $2\sin^{-1}\left(\frac{3}{4}\right)$

Answer: C

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14. A thin lens focal length f and its aperture has diameter d. It forms an image of intensity I. Now the central part of the aperture up to diameter $\frac{d}{2}$ is blocked by an opaque paper. The focal length and image intensity will change to

A. $(f), \frac{3I}{4}$

B. $\frac{f}{2}, \frac{I}{2}$

C. $\frac{3f}{4}, \frac{3I}{4}$

D. $f, \frac{I}{4}$

Answer: D

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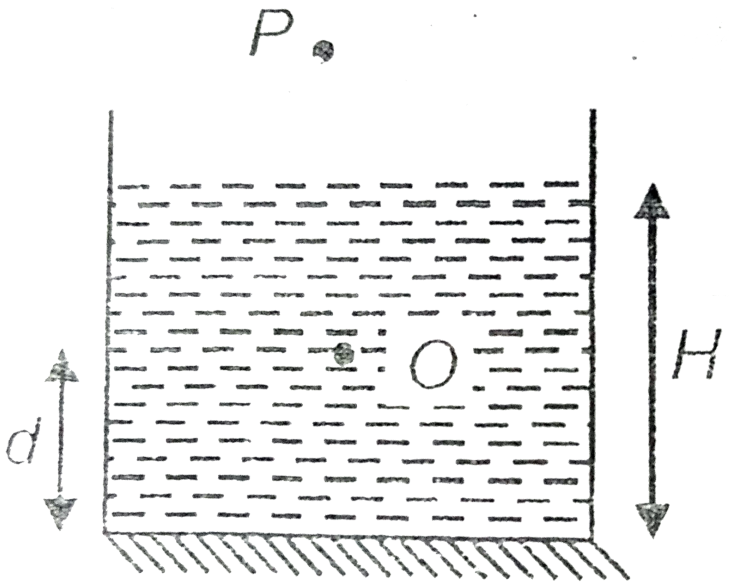
15. A tank contains a transparent liquid of refractive index μ. The bottom of the tank is a plane mirror as shown. A person at P looks at an object O and its image in the mirror. The distance between the object and its image in the mirror as preceived by the person is



A. $2\mu d$

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

C. $\frac{2(H-d)}{\mu}$

D. $\dfrac{(H+D)}{\mu}$

Answer: B

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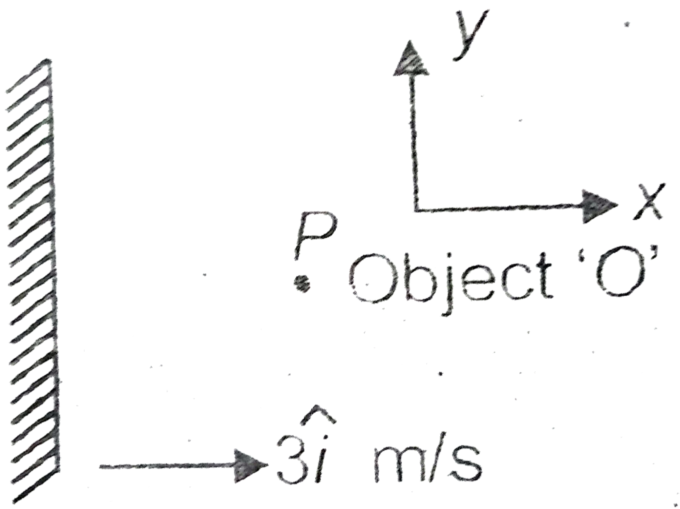
Assignment (Section - C) Objective Type Questions (More than one option are correct)

1. Figure shows an object O kept at P. A plane mirror parallel to yz plane is moving with velocity $3\hat{i} m/s$. Select the correct alternative



A. The velocity of image is $6\hat{i}m/s$

B. The velocity of image is $-6\hat{i}m/s$

C. The velocity of image w.r.t. mirror is $3\hat{i}m/s$

D. The velocity of image w.r.t. object is $-6\hat{i}m/s$

Answer: A::C

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2. A converging beam of light is incident on a concave lens. The beam converges behind the lens at 15 cm from its centre, in the absence of the lens. Select the correct alternative

A. After passing through the lens, beam becomes diverging, what ever may be the focal length

B. If focal length = 10 cm, the beam diverges away

C. If focal length = 20 cm, the beam diverges away

D. Focal length = 30 cm, beam converged at focal point of the lens

Answer: B::D

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3. A ray of light travelling in a transparent medium falls on a surface separating the medium from air at an angle of incidence 45°. The ray undergoes total internal reflection. If n is the refractive index of the medium with respect to air, select the possible value (s) of n from the following

A. 1.3

B. 1.4

C. 1.5

D. 1.6

Answer: C::D

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4. When an object is placed 40cm from a diverging lens, its virtual image is formed 20cm from the lens. The focal length and power of lens are

A. If $f > 0$, y must be greater than x

B. If $f < 0$, y must be less than x

C. If $f > 0$, I_2 may be farther from lens than I_1

D. If $f < 0$, I_1 must be farther from lens than I_2

Answer: B::C::D

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5. A point object is placed 30 cm in front of an equiconvex lens of radius of curvature 15 cm and made of glass of refractive index $\frac{3}{2}$. On placing a convex mirror of radius of curvature 15 cm behind the lens on image side, the final image is found to coincide with the object. The possible distance between convex lens and convex mirror is

A. 15 cm

B. 30 cm

C. 7.5 cm

D. 45 cm

Answer: A::B

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6. A point object is placed 30 cm in front of an equiconvex lens of radius of curvature 15 cm and made of glass of refractive index $\frac{3}{2}$. On placing a convex mirror of radius of curvature 15 cm behind the lens on image side, the final image is found to coincide with the object. The possible distance between convex lens and convex mirror is

A. Deviation produced by first prism is $\frac{\theta}{\omega_1}$

B. Deviation produced by 2^{nd} prism is $\frac{\theta}{\omega_2}$

C. Dispersion of the combination is $\theta\left(1-\frac{\omega_2}{\omega_2}\right)$

D. Dispersion of the combination is $\theta\left(1+\frac{\omega_2}{\omega_1}\right)$

Answer: A::C

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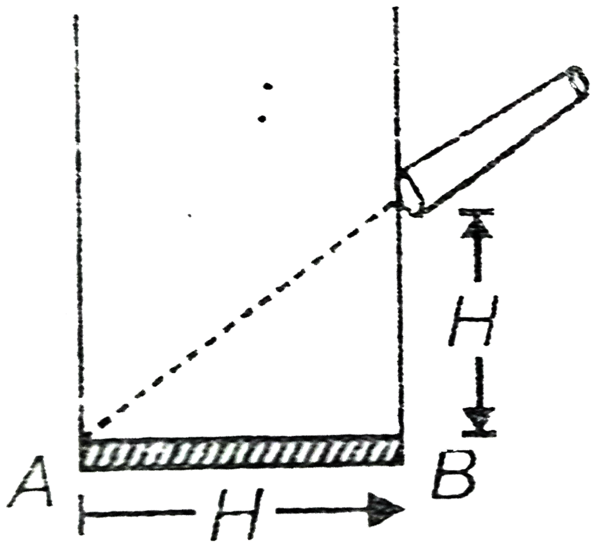
7. Figure shows a container of width H. A telescope is fitted at a height H above the base on its side wall such that it is focussed at the point A as shown. Now a liquid is poured slowly in the container. The refractive index of liquid is $\mu = \sqrt{2}$. Select the correct alternatives



A. When level of liquid column is h, the point of focus is at a distance $h\left(1 - \frac{1}{\sqrt{3}}\right)$ from A

B. When level of liquid is h, the point of focus is at $\frac{h}{\sqrt{3}}$ from A

C. When level of liquid exceeds H, point of focus is always at $\frac{H}{2}$ from A

D. When level of liquid exceeds H, point of focus is A

Answer: A::D

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8. A converging lens is used to form an image on a screen. When the upper half of the lens is covered by opaque screen, then

A. Half of the image will disappear

B. Complete image will be formed

C. Intensity of the image will increase

D. Intensity of the image will decreases

Answer: B::D

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9. A convex lens of focal length 20 cm is placed in front of a convex mirror of focal length 15 cm at a distance of 5 cm. An object of length 2 cm is placed perpendicular to the common axis at a distance of 20 cm from the lens

A. The final image is formed at 163 cm from the lens

B. The final image is formed at infinity

C. The size of final image is 10.7 cm

D. The size of final image is very large

Answer: B::D

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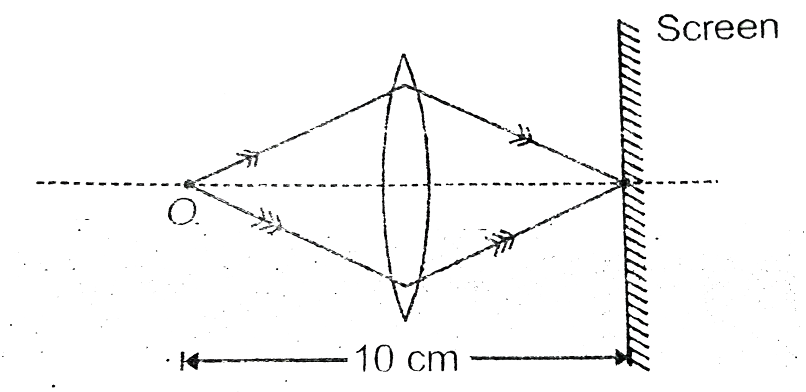
Assignment (Section - D) Linked Comprehension Type Questions

1. An object O is placed in front of a convex lens such that the lens forms a sharp image on the screen. The distance between the object and screen is 10 cm. The lens is made of glass at refractive index $\mu_g = \frac{3}{2}$. The surrounding medium is air with refractive index 1.



The focal length of the lens, used in the above experiment, satisfies the condition given by

A. $f > 5cm$

B. $5cm < f < 10cm$

C. $0 < f \leq 2.5cm$

D. $2.5 \leq f \leq 5cm$

Answer: C

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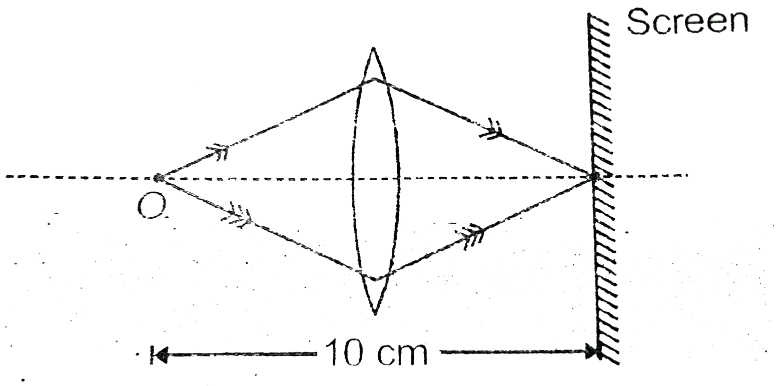
2. An object O is placed in front of a convex lens such that the lens forms a sharp image on the screen. The distance between the object and screen is 10 cm. The lens is made of glass at refractive index $\mu_g = \frac{3}{2}$. The surrounding medium is air with refractive index 1.



The focal length of the lens, used in the above experiment, satisfies the condition given by

A. $f \leq 2.5cm$

B. $f \leq 0.625cm$

C. $f \leq 1.25cm$

D. $f \leq 5cm$

Answer: B

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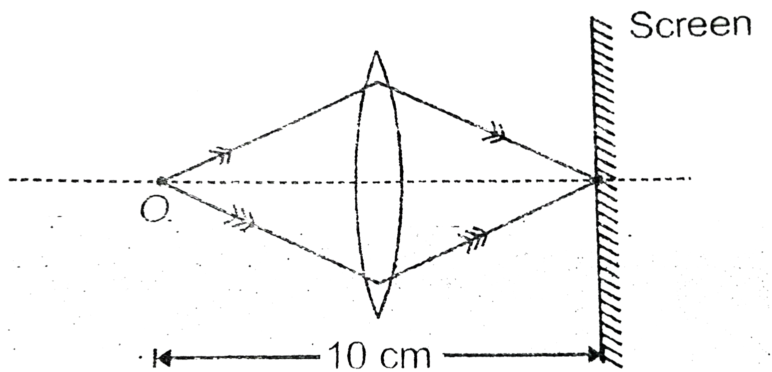
3. An object O is placed in front of a convex lens such that the lens forms a sharp image on the screen. The distance between the object and screen is 10 cm. The lens is made of glass at refractive index $\mu_g = \frac{3}{2}$. The surrounding medium is air with refractive index 1.



The focal length of the lens, used in the above experiment, satisfies the condition given by

A. Either - 2 or $-\frac{1}{2}$

B. Only -2

C. Only $-\frac{1}{2}$

D. Either 2 or $\frac{1}{2}$

Answer: A

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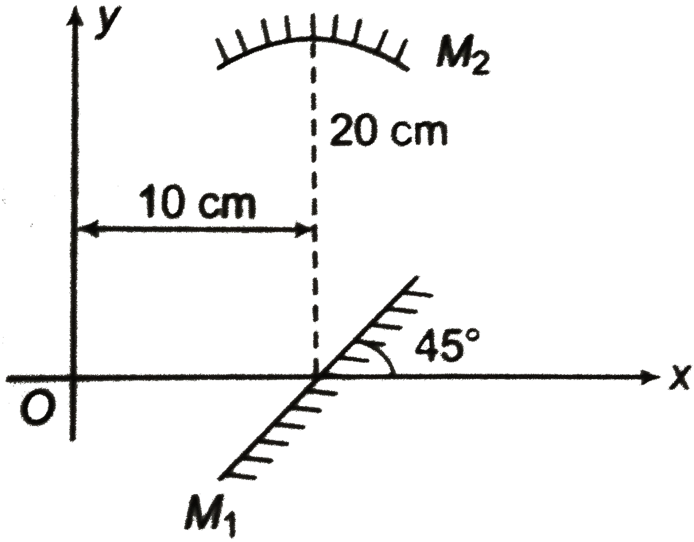
4. A plane mirror (M_1) and a concave mirror (M_2) of focal length 10 cm are arranged as shown in figure. An object is kept at origin. Answers the following questions. (consider image formed by single reflection in all cases).



The coordination of image formed by plane mirror are

A. $-20cm$, 0 cm

B. 10 cm, $-60cm$

C. 10cm, $-10cm$

D. 10 cm, 10 cm

Answer: C

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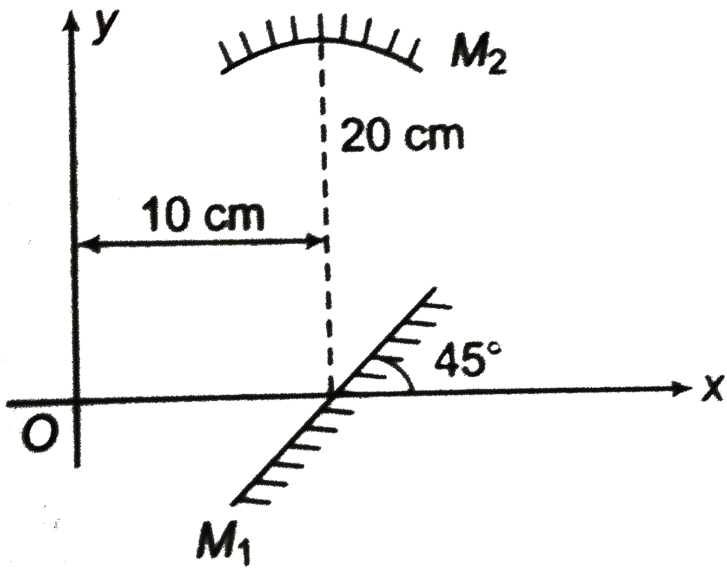
5. A plane mirror (M_1) and a concave mirror (M_2) of focal length 10 cm are arranged as shown in figure. An object is kept at origin. Answers the following questions. (consider image formed by single reflection in all cases).



If concave mirror is replaced by convex mirror of same focal length then coordinates of image formed by (M_2) will be

A. 10cm, -10 cm

B. 10 cm, -60 cm

C. 10 cm, 8 cm

D. None of these

Answer: D

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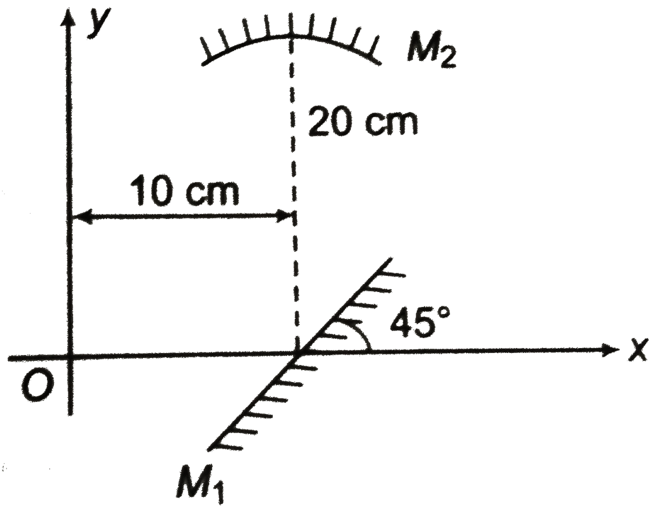
6. A plane mirror (M_1) and a concave mirror (M_2) of focal length 10 cm are arranged as shown in figure. An object is kept at origin. Answers the following questions. (consider image formed by single reflection in all cases).



The coordination of image formed by concave mirror are

A. 10 cm, 12 cm

B. 10 cm, 22 cm

C. 10 cm, 8 cm

D. None of these

Answer: D

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7. A plano-convex lens P and a concavo-convex lens Q are in contact as shown in figure. The refractive index o fthe material of the lens P and Q is 1.8 and 1.2 respectively. The radius of curvature of the concave surface of the lens Q is double the radius of curvature of the convex surface. The convex surface of Q is silvered.

An object is placed on the placed on the principal axis at a distance $10cm$ form the plane surface. The image is formed at a distance $40cm$ from the plane surfaces on the same side. The focal length of the system is

A. $-8cm$

B. 8 cm

C. $-\dfrac{40}{3}cm$

D. $\dfrac{40}{3}cm$

Answer: A

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8. A plano-convex lens P and a concavo-convex lens Q are in contact as shown in figure. The refractive index o fthe material of the lens P and Q is $1.8 \text{ and } 1.2$ respectively. The radius of curvature of the concave surface of the lens Q is double the radius of curvature of the convex surface. The convex surface of Q is silvered.

If the plane surface of P is silvered as shown in figure, the system acts as

A. 48 cm

B. 24 cm

C. 12 cm

D. 8 cm

Answer: A

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9. A plano-convex lens P and a concavo-convex lens Q are in contact as shown in figure. The refractive index o fthe material of the lens P and Q is $1.8 \text{ and } 1.2$ respectively. The radius of curvature of the concave surface of the lens Q is double the radius of curvature of the convex surface. The convex surface of Q is silvered.

If the plane surface of P is silvered as shown in figure, the system acts as

A. Convex mirror of focal length 24 cm

B. Concave mirror of focal length 8 cm

C. Concave mirror of focal length 24 cm

D. Convex mirror of focal length 8 cm

Answer: C

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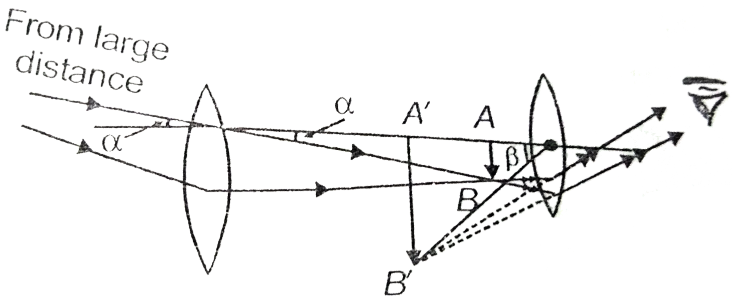
10. The figure shows a simple arrangement which works as an astronomical telescope. The arrangement consists of two convex lenses placed coaxially. The lens which faces a distant object is called the objective. It has a large aperture and a large focal length also. The second lens is closed to the observers eyes. It is called the eyepiece. It has a smaller aperture as compared to the objective. Its focal length is also small in comparison to objective.



The objective forms a real image of a distant object. This image acts as the object for the eyepiece. The eye-piece may form its image at a large distance (∞) or at least distance of distinct vision (D = 25 cm). The magnifying power of the telescope is the ratio $\frac{-\beta}{\alpha}$. Maximum angular magnification is produced when the final image is at the least distance of distinct vision.

A telescope has an objective of focal length 50 cm and an eye-piece of focal length 5 cm. The least distance of distinct vision is 25 cm. The telescope is adjusted for distinct vision and it is focussed on an object 200 cm away. The length of the telescope is

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

B. $-\left(1+\dfrac{f_0}{f_e}\right)$

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

D. $-\left(1+\dfrac{f_e}{f_0}\right)$

Answer: A

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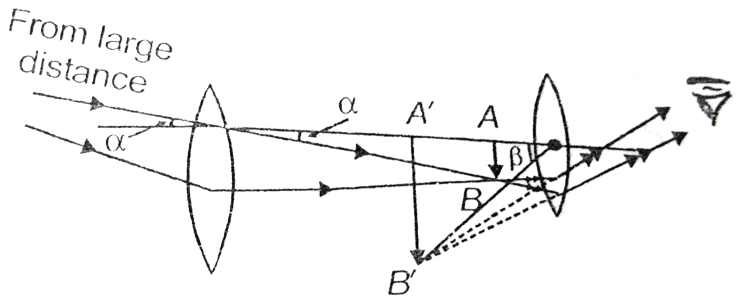
11. The figure shows a simple arrangement which works as an astronomical telescope. The arrangement consists of two convex lenses placed coaxially. The lens which faces a distant object is called the objective. It has a large aperture and a large focal length also. The second lens is closed to the observers eyes. It is called the eyepiece. It has a smaller aperture as compared to the objective. Its focal length is also small in comparison to objective.



The objective forms a real image of a distant object. This image acts as the object for the eyepiece. The eye-piece may form its image at a large distance (∞) or at least distance of distinct vision (D = 25 cm). The magnifying power of the telescope is the ratio $\frac{-\beta}{\alpha}$. Maximum angular magnification is produced when the final image is at the least distance of distinct vision.

A telescope has an objective of focal length 50 cm and an eye-piece of focal length 5 cm. The least distance of distinct vision is 25 cm. The telescope is adjusted for distinct vision and it is focussed on an object 200 cm away. The length of the telescope is

A. $L = f_0 + f_e$

B. $L < f_0 + f_e$

C. $L > f_0 + f_e$

D. $L = f_0 - f_e$

Answer: B

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12. When a single gene influences more than one traits it is called

A. $\frac{425}{6} cm$

B. 55 cm

C. 53 cm

D. 45 cm

Answer: A

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Assignment (Section - E) Assertion - Reason Type Questions

1. STATEMENT - 1 : The white light incident on a prism, after emerging from the prism will form a spectrum of rays.

and

STATEMENT - 2 : For different colours, a prism has different refractive indices.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-2

C. Statement-1 is True, Statement-2 is false

D. Statement-1 is False, Statement-2 is True

Answer: A

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2. Statement-1 : A single lens produces a coloured image of an object illuminated by white light.

Statement-2 : The refractive index of material of lens is different for different wavelengths of light.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-2

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-3

C. Statement-1 is True, Statement-2 is false

D. Statement-1 is False, Statement-2 is True

Answer: A

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3. STATEMENT -1 : A convex lens suffers from chromatic aberration.

and

STATEMENT - 2 : All parallel rays passing through a convex lens do not come to a focus at the same point.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-3

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-4

C. Statement-1 is True, Statement-2 is false

D. Statement-1 is False, Statement-2 is True

Answer: B

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4. STATEMENT -1 : If reflected or refracted ray diverge from a point, the image will be virtual.

and

STATEMENT - 2 : After reflection or refraction the refracted or reflected rays appear to meet at a point on principle axis. They do not actually meet at a point.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-4

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-5

C. Statement-1 is True, Statement-2 is false

D. Statement-1 is False, Statement-2 is True

Answer: A

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5. STATEMENT -1 : The critical angle is defined when light goes from denser medium to the rarer medium.

and

STATEMENT - 2 : In total internal reflection, intensity of light remains same.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-5

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-6

C. Statement-1 is True, Statement-2 is false

D. Statement-1 is False, Statement-2 is True

Answer: B

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6. STATEMENT -1 : When a light ray is incident normally on a plane refracting surface, it does not deviate from it's path.

and

STATEMENT - 2 : The angle of incidence and angle of refraction will be same and equal to zero.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-6

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-7

C. Statement-1 is True, Statement-2 is false

D. Statement-1 is False, Statement-2 is True

Answer: A

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7. STATEMENT -1 : The colour of light depends on its wavelength and

STATEMENT - 2 : On passing through, from one medium to other medium, its frequency does not change.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-7

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-8

C. Statement-1 is True, Statement-2 is false

D. Statement-1 is False, Statement-2 is True

Answer: D

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8. STATEMENT -1 : The images of an object placed between two plane mirror inclined at an angle θ are symmetrical placed.

and

STATEMENT - 2 : The images of an object by inclined plane mirrors lie on a circle.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-8

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-9

C. Statement-1 is True, Statement-2 is false

D. Statement-1 is False, Statement-2 is True

Answer: A

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9. STATEMENT -1 : An object is placed inside a liquid and screen through air perpendicularly look at shorter depth than its actual depth.

and

STATEMENT - 2 : When light passes from denser medium to rarer medium it deviates away from normal.

A. a.Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-1

B. b.Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1

C. c.Statement-1 is True, Statement-2 is false

D. d.Statement-1 is False, Statement-2 is True

Answer: A

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10. STATEMENT -1 : when an object moves towards a plane mirror with a certain velocity, its image will also move with same velocity.

and

STATEMENT - 2 : The distance from mirror to image is equal to distance of object from mirror.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-10

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-11

C. Statement-1 is True, Statement-2 is false

D. Statement-1 is False, Statement-2 is True

Answer: D

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11. STATEMENT - 1: A light ray passing though a prism it suffers minimum deviation, if after refraction the refracted ray becomes parallel to the base of the prism.

and

STATEMENT - 2 : In the case of minimum deviation angle of incidence is equal to angle of emergence.

A. Statement-1 is True, Statement-2 is True, Statement-2 is a correct explanation for Statement-11

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-12

C. Statement-1 is True, Statement-2 is false

D. Statement-1 is False, Statement-2 is True

Answer: D

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Assignment (Section - F) Matrix-Match Type Questions

1. For real object match the following two columns corresponding to linear magnification m given in Column-1

Column-I	Column-II
(A) $m = -2$	(p) Convex mirror
(B) $m = -0.5$	(q) Concave mirror
(C) $m = +2$	(r) Real image
(D) $m = +0.5$	(s) Virtual image

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2. A convex lens L_1 and a concave lens L_2 have refractive index $\frac{3}{2}$. Match the following two columns.

Column-I	Column-II
(A) L_1 is immersed in a liquid of refractive index $\frac{7}{5}$	(p) Lens will behave as convex lens
(B) L_1 is immersed in a liquid of refractive index $\frac{8}{5}$	(q) Lens will behave as concave lens
(C) L_2 is immersed in a liquid of refractive index $\frac{7}{5}$	(r) Magnitude of power of lens will increase
(D) L_2 is immersed in a liquid of refractive index $\frac{8}{5}$	(s) Magnitude of power of lens will decrease

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3. Match the following two column for a convex lens corresponding to object position shown in Column-I (Note : O -

Optical centre, F_1 - First focus, F_2 - second focus)

Column-I	Column-II
(A) Between O and F_1	(p) Real
(B) Between F_1 and $2F_1$	(q) Virtual
(C) Between O and F_2	(r) Erect
(D) Between F_2 and $2F_2$	(s) Inverted

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4. Match Column-I with Column-II

Column-I	Column-II
(A) $CaOCl_2$ (Oxidation state of Cl)	(p) +6, +6
(B) $S_2O_3^{2-}$ (Oxidation state of S)	(q) +1, −1
(C) NH_4NO_3 (Oxidation state of N)	(r) Peroxy linkage is present
(D) H_2SO_5 and $H_2S_2O_8$ (Oxidation state of S)	(s) −3, +5
(E) $K_2Cr_2O_7$, K_2CrO_4 (Oxidation number of Cr)	(t) −2, +6

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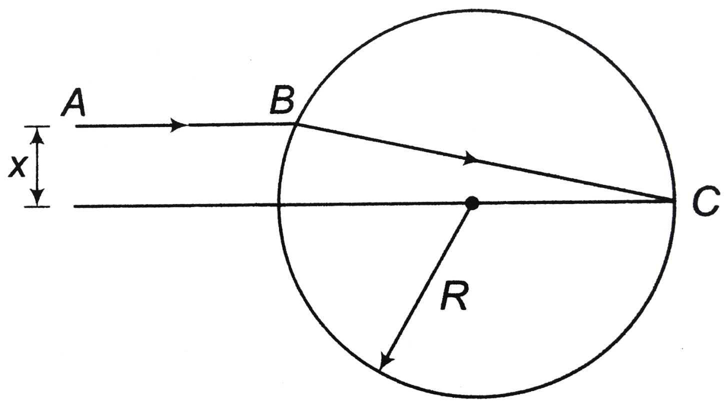
Assignment (Section - G) Integer Answer Type Questions

1. A spherical ball of transparent material has index of refractionμ. A narrow beam of light AB is aimed as shown. What must the index of refraction be in order that the light is focused at the point C on the opposite end of the diameter from where the light entered? Given that $x > \quad > R$.



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2. The escape velocity at the surface of Earth is approximately 8 km/s. What is the escape velocity for a planet whose radius is 4 times and whose mass is 100 times that of Earth?

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3. An object is placed $12 cm$ to the left of a diverging lens of focal length $-6.0 cm$. A converging lens with a focal length of $12.0 cm$ is placed at a distance d to the right of the diverging lens. Find the distance d that corresponds to a final image at infinity.

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Assignment (Section - H) Multiple True-FalseType Questions

1. STATEMENT - 1 : Image formed by a convex mirror is always virtual, erect and diminished.

STATEMENT - 2 : In case of a convex mirror the image is erect and virutal, when the object is placed between focus and pole.

STATEMENT - 3 : In case of a concave mirror the image is real, when the object is placed between focus and centre of curvature.

A. F T T

B. T T T

C. T F T

D. T T F

Answer: A

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2. STATEMENT - 1 Deviation produced by prism for yellow light is more that for red light.

STATEMENT - 2 : Angle of deviation δ varies with the angle of incidence.

STATEMENT - 3 : At angle of minimum the ray passes symmetrically through the prism, i.e., the angle of emergence of the ray from the second face is equal to the angle of incidence of the ray on the first face.

A. T T T

B. T T F

C. F T F

D. F F T

Answer: A

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3. STATEMENT - 1 : When a lens is placed in a medium for which μ is less than of the lens, its focal length is moer than focal length in air.

STATEMENT - 2 : When the lens is placed in a medium for which μ is greater than that of the lens. The nature of the lens remains unchanged.

STATEMENT - 3 : When a lens of focal length f is placed in a medium for which μ is same as that of the lens then the power of the lens becomes zero

A. F F F

B. T F T

C. F F T

D. F T F

Answer: B

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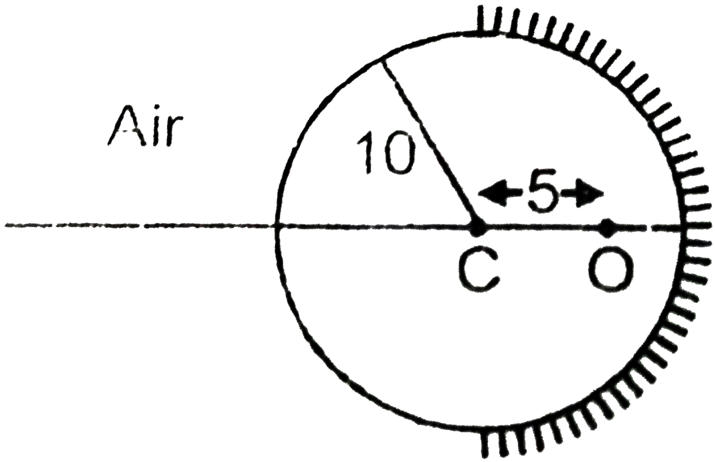
Assignment (Section - I) Subjective Type Questions

1. A small air bubble O (as shown in figure) is formed inside the solid glass sphere of radius 10 cm. The refractive index of glass $\mu = \frac{3}{2}$. The position of air at distance 5 cm from centre. If one half of sphere is polished. Then find the distance between images seen by observer on the left side of sphere. Assume

$\mu = 1.5.$



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2. A small fish 0.4 m below the surface of a lake is viewed through a simple converging lens of focal length 3 m. The lens is kept at 0.2 m above the water surface such that fish lies on the optical axis of the lens. The image of the fish seen by observer will be at $\left(\mu_{\text{water}} = \frac{4}{3}\right)$

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3. A convex lens focusses an object 10 cm from it on a screen placed 10 cm away from it. A glass plate $(\mu = 1.5)$ of thickenss 1.5 cm is inserted between the lens and the screen. Where should the object be placed so that its image is again focussed on the screen?

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4. A parallel incident beam falls on a solid glass sphere at near normal incidence.Show that the image in terms of the index of refractive μ and the sphere of radius R is given by

$$\frac{R(2-\mu)}{2(\mu-1)}$$

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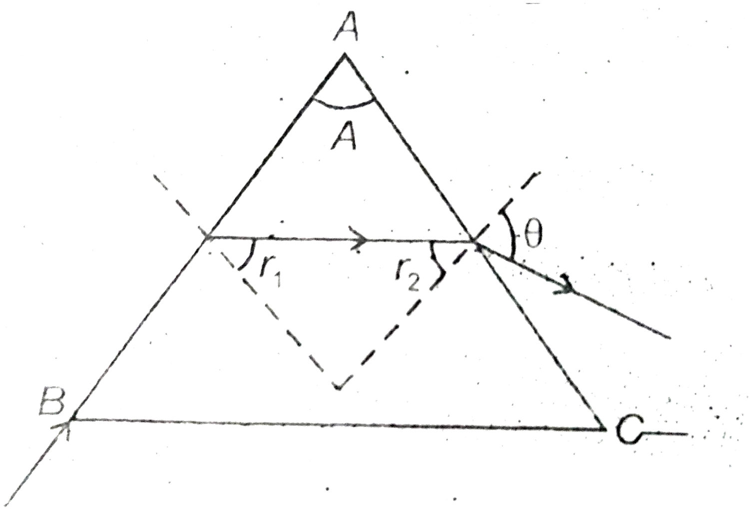
5. Light enters a prism of angle A at a grazing incidence to emerge at an angle θ with the normal. Show that, μ for the material of a prism is given by $\mu = \left[1 + \left(\frac{\sin\theta + \cos A}{\sin A}\right)^2\right]^{\frac{1}{2}}$



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6. The weight of an object on the surface of the Earth is 40 N. Its weight at a height equal to the radius of the Earth is

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Assignment (Section - J) Aakash Challengers Questions

1. A particle is projected from a horizontal floor with speed $10\frac{m}{s}$ at an angle 30° with the floor and striking the floor after sometime. State which is correct.

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2. A ball is kept at a height h above the surface of a heavy transparent sphere made of a material of refractive index The radius of the sphere is R. At t = 0, the ball is dropped to fall normally on the sphere. Find the speed of the image formed as a function of time for $t < \sqrt{\frac{2h}{g}}$. Consider only the image by a single refraction.

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3. A ray of light travelling in air in inciden tat grazing angle (inciden angle $= 90^{\circ}$) on a long rectangular slab of a tranparent medium of thickness$t = 1.0m$. The point of incidence is the origin $A(0, 0)$. The medium has a variable of refraction $n(y)$ given by

$$n(y) = \left[ky^{3/2} + 1\right]^{1/2}$$

where$k = 1.0(m)^{-3/2}$

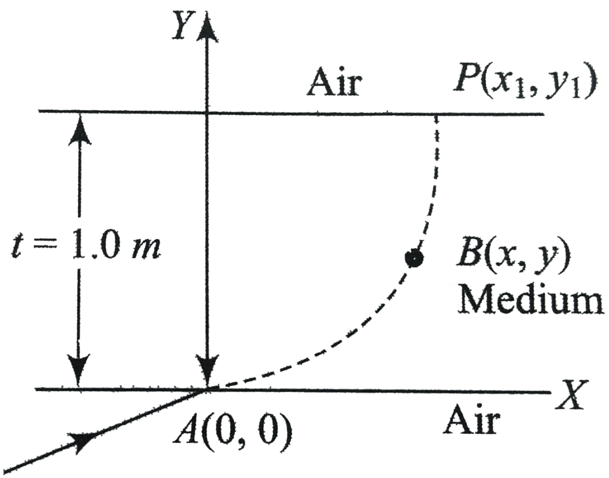
The refractive index of air is 1.0.

a. Obtain a relation between the slop of the trajectory of the ray at point $B(x, y)$ in the medium and the incident angle at the point.

b. Obtain an equation for the trajectory $y(x)$ of the ray in the medium.

c. Determing the coordinates (x_1, y_1) of point P, where the ray intersects the upper surface of the slab-air boundary.

d. Indicate the path of the ray subsequently.



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4. Does the escape speed of a body from the earth depend on.

(i)mass of the body

(ii)the location from where it is projected (iii)the direction of projection

(iv)the height of the location from where the body is launched?

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5. A particle executes a simple harmonic motion of amplitude 1.0 cm along the principal axis of a convex lens of focal length 12 cm. The mean position of oscillation is at 20 cm from the lens. Find the amplitude of oscillation of the image of the particle.

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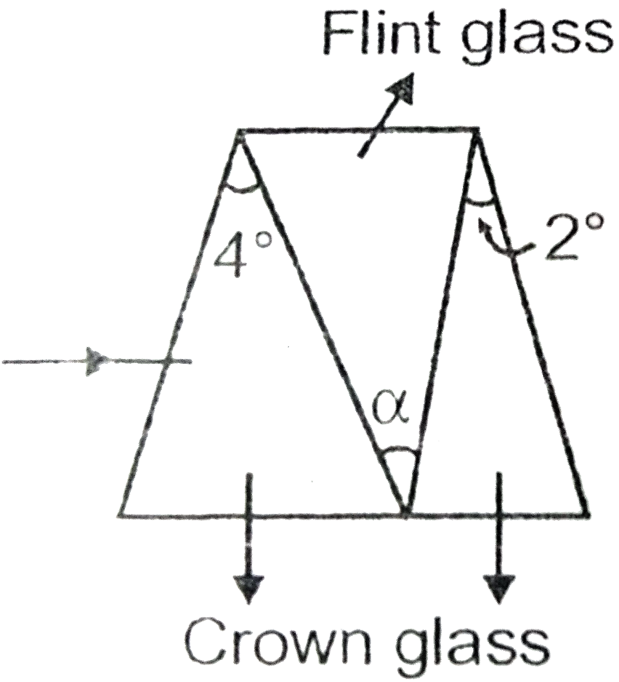
6. The refractive index of the crown glass for violet and red lights are 1.51 and 1.49 respectively and those of flint glass are 1.77 and 1.73 respectively. A narrow beam of white light is incident at a small angle of incident on shown combination of thin prism. Find values of α for which mean deviation of beam is zero. Also calculate net dispersing.



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7. A satellite is launched into a circular orbit of radius R around the earth while a second satellite is launched into an orbit of radius 1.02R. The percentage difference in the time period is:

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EXERCISE

1. Nature of image of a real object formed by convex mirror is always

A. Virtual, erect and magnified

B. Virtual, erect and diminished

C. Virtual, inverted and diminished

D. Real, inverted and diminished

Answer: B

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2. Magnification produced by a convex mirror is $\frac{1}{3}$, then distance of the object from mirror is

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

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

C. 1f

D. 2f

Answer: D

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3. A concave mirror is half dipped in water. Focal length of portion of mirror is the air is f_1 and length of mirror in water is

f_2, then (Take refractive index of water = $\frac{4}{3}$)

A. $f_1 > f_2$

B. $f_1 < f_2$

C. $f_1 = f_2$

D. $f_1 \geq \frac{4}{3} f_2$

Answer: C

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4. What will be the deviation produced when a ray of light is incident on a plane mirror at an angle of incidence 60°?

A. 30°

B. 90°

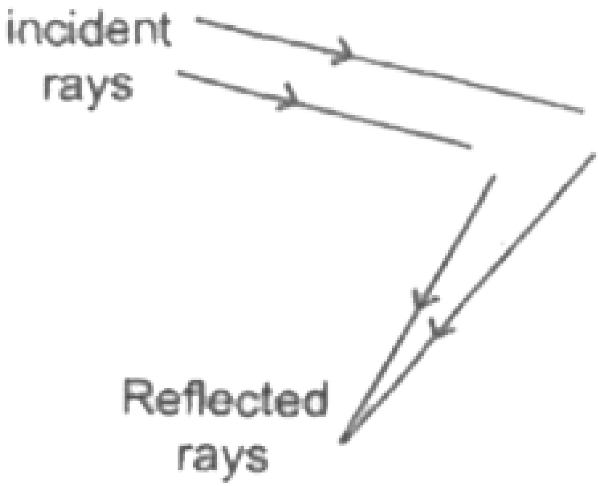
C. 60°

D. 120°

Answer: C

Watch Video Solution

5. Ray diagram for rays before and after reflection is show in given figure, then mirror is



A. Diverging lens

B. Concave mirror

C. Converging lens

D. Convex mirror

Answer: B

Watch Video Solution

6. For a concave mirror, paraxial rays are focused at distance $\frac{R}{2}$ from pole and marginal rays are focused at distance x from pole, then (R is radius of curvature)

A. $x = \frac{R}{2}$

B. $x = -f$

C. $x > \frac{R}{2}$

D. $x < \frac{R}{2}$

Answer: B

Watch Video Solution

7. If two mirrors are inclined at some angle θ. An object is placed between the mirrors and there are 5 images formed for an object, then θ is may be

A. 45°

B. 53°

C. 63°

D. 75°

Answer: C

Watch Video Solution

8. Find the nature of image when an object is placed at 2f from the pole of a convex mirror of focal length f

A. Real, inverted and of same size

B. Virtual, erect and of $\frac{1}{3}$ times

C. Virtual, erect and 3 times

D. Real, inverted and $\frac{1}{3}$ times

Answer: B

Watch Video Solution

9. An object is at 20 cm from a concave mirror of focal length 10 cm, the nature of image is

A. Real and inverted

B. Virtual and erect

C. Real and 3 times magnified

D. Real and 2 times magnified

Answer: A

Watch Video Solution

10. A ray of light 10^{-9} second to cross a glass slab of refractive index 1.5. The thickness of the slab will be

A. 0.1 m

B. 0.2 m

C. 0.3 m

D. 0.4 m

Answer: B

Watch Video Solution

11. The time taken by a monochromatic light to travel a certain distance in air in 9×10^{-6} seconds. The time taken by the light ray to travel the same distance in water of refractive index $\frac{4}{3}$ is

A. 12 s

B. 12μ s

C. $\frac{27}{4}\mu$ s

D. $\frac{27}{2}\mu$ s

Answer: B

Watch Video Solution

12. A monochromatic light passes through a glass slab $\left(\mu = \frac{3}{2}\right)$ of thickness 90 cm in time t_1. If it takes a time t_2 to travel the same distance through water $\left(\mu = \frac{4}{3}\right)$. The value of $(t_1 - t_2)$ is

A. 5×10^{-8} s

B. 5×10^{-10} s

C. 2.5×10^{-10} s

D. 2.5×10^{-8} s

Answer: B

Watch Video Solution

13. A beam of light is partially reflected and partially refracted from a surface. The angle between reflected and refracted light ray is 90°. If the angle of refraction is 30°, the angle of incidence is

A. 60°

B. 48°

C. 45°

D. 90°

Answer: A

Watch Video Solution

14. An object is placed in front of a slab $(\mu = 1.5)$ of thickness 6cm at a distance 28cm from it. Other face of the slab is silvered. Find the position of final image.

A. 1.15

B. 1.25

C. 1.67

D. 1.1

Answer: C

Watch Video Solution

15. A glass slab of thickness $4cm$ contains the same number of waves as $5cm$ of water, when both are traversed by the same monochromatic light. If the refractive index of water is $4/3$, then refractive index of glass is

A. $\frac{5}{3}$

B. $\frac{5}{4}$

C. $\frac{16}{15}$

D. $\frac{3}{2}$

Answer: A

Watch Video Solution

16. The velocities of light in two different media are 2*10^8m/s and 2.5 * 10^8m/s respectively.The critical angle for these media is

A. $\sin^{-1}\left(\frac{1}{5}\right)$

B. $\sin^{-1}\left(\frac{4}{5}\right)$

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

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

Answer: B

Watch Video Solution

17. Light takes t_1 second to travel a distance x cm in vacuum and the same light takes t_2 second to travel 10x cm in medium.

The critical angle for the corresponding medium is

A. $\sin^{-1}\left[\frac{10t_2}{t_1}\right]$

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

C. $\sin^{-1}\left[\frac{10t_1}{t_2}\right]$

D. $\sin^{-1}\left[\frac{t_1}{10t_2}\right]$

Answer: C

Watch Video Solution

18. A fish is a little away below the surface of a take. If the critical angle is 49°, then the fish could see things above the water surface within an angular range of

A. $\theta = 49^\circ$

B. $\theta = 90^\circ$

C. $\theta = 98^\circ$

D. $\theta = 24.5^\circ$

Answer: C

Watch Video Solution

19. A parallel beam of monochromatic light falls on a combination of a convex lens and a concave lens of focal lengths 15 cm and 5 cm respectively. What is the distance between the two lenses to obtain a parallel beam of light from the concave lens ?

A. 20 cm

B. 3 cm

C. 10 cm

D. 45 cm

Answer: C

Watch Video Solution

20. Three lenses in contact have a combined focal length of 12 cm. When the third lens is removed, the combined focal length is $\frac{60}{7}$ cm. The third lens is

A. A converging lens of focal length 30 cm

B. A converging lens of focal length 60 cm

C. A diverging lens of focal length 30 cm

D. A diverging lens of focal length 60 cm

Answer: C

Watch Video Solution

21. The radii of curvatures of a convex lens are 0.04 m and 0.04m. Its refractive index is 1.5. Its focal length is

A. 0.04 m

B. 0.4 m

C. 4 m

D. 40 m

Answer: A

Watch Video Solution

22. A convex glass lens $(\mu_g = 1.5)$ has a focal length of 8 cm when placed in air. What is the focal length of the lens when it is immersed in water ?

$\left(\mu_\omega = \frac{4}{3}\right)$

A. 32 cm

B. 6 cm

C. 16 cm

D. 30 cm

Answer: A

Watch Video Solution

23. A convex mirror forms an image one-fourth the size of the object. If object is at a distance of 0.5 m from the mirror the focal length of the mirror is

A. 0.16 m

B. $-1.5m$

C. 0.4 m

D. $-0.4m$

Answer: A

Watch Video Solution

24. A travelling microscope is focussed on to a scratch on the bottom of a beaker. Water of refractive index $\frac{4}{3}$ is poured in it. Then the microscope is to be lifted through 2 cm focus it again. Find the depth of water in the beaker.

A. 4 cm

B. 8 cm

C. $\frac{8}{7}$ cm

D. $\frac{8}{3}$ cm

Answer: B

Watch Video Solution

25. While a moving picture is being screened, a boy introduced a glass slab of thickness 3 cm and refractive index 1.5 between the projector and the screen. In order to have a clear picture on the screen the screen should be moved through a distance of

A. 1 cm away

B. 1 cm nearer

C. 2 cm away

D. 3 cm away

Answer: A

Watch Video Solution

26. For a plano convex lens, the radius of curvature of convex surface is 10 cm and the focal length is 30 cm. The refractive index of the material of the lens is

A. 1.5

B. 1.66

C. 1.33

D. 2.5

Answer: C

Watch Video Solution

27. A lens made of material of Refractive index μ_2 is surrounded by a medium of Refractive Index μ_1. The focal length f is related as

A. $f \propto (\mu_2 - \mu_1)$

B. $f \propto \frac{1}{(\mu_2 - \mu_1)}$

C. $f \propto (\mu_2 + \mu_1)$

D. $f \propto \frac{1}{(\mu_2 + \mu_1)}$

Answer: B

Watch Video Solution

28. A light ray is incident normally on one of the refracting faces of a prism and just emerges out grazing the second surface. Then, the relation between angle of the prism and its critical angle is

A. A = C

B. $A \neq C$

C. $A < C$

D. $A > C$

Answer: A

Watch Video Solution

29. If a light ray incidents normally on one of the faces of the prism of refractive index 2 and the emergent ray just grazes the second face of the prism, then the angle of deviation is

A. 0°

B. 30°

C. 45°

D. 60°

Answer: D

Watch Video Solution

30. A ray of light is incident on one of the faces of the angle prism with an angle 40° with the surface. The angle of the prism is 60°. The emergent ray is deviated through an angle 38°. The angle of emergence is

A. 38°

B. 48°

C. 52°

D. 58°

Answer: B

Watch Video Solution

31. A prism of refractive index sqrt2 has refractive angle 60°. In the order that a ray suffers minimum deviation it should be incident at an angle of

A. 30°

B. 45°

C. 60°

D. 75°

Answer: B

Watch Video Solution

32. The least angle of deviation for a glass prism is equal to its refracting angle. The refractive index of glass is 1.5. Then the angle of the prism is

A. $2\cos^{-1}\left(\frac{3}{4}\right)$

B. $\sin^{-1}\left(\frac{3}{4}\right)$

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

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

Answer: A

Watch Video Solution

33. A light ray of angles of incidence 40° emerged from the prism in minimum deviation position. Then what is the angle of incidence on the second surface ?

A. 90°

B. 0°

C. 40°

D. 20°

Answer: C

Watch Video Solution

34. The angle of minimum deviation for a 75° prism of dense glass is found to be 45° when in air and 15° when immersed in certain liquid. The refractive index of the liquid is

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

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

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

D. $\sqrt{3}$

Answer: C

Watch Video Solution

35. Suppose a small angled prism of 6° deviates a ray through 3°, then the refractive index is

A. 1.62

B. 1.33

C. 1.5

D. 1.72

Answer: C

Watch Video Solution

36. For a given prism θ and δ are angular dispersion and deviation. Correct relation is

A. $\theta \propto \delta$

B. $\theta \propto \frac{1}{\delta}$

C. $\theta \propto \delta^2$

D. $\theta\alpha \propto \frac{1}{\delta^2}$

Answer: A

Watch Video Solution

37. If a is the size of scatterer and λ is the wavelength of light then Rayleigh law of scattering is valid for

A. $a = \lambda$

B. $a > > \lambda$

C. $a = \lambda / 2$

D. $a < < \lambda$

Answer: D

Watch Video Solution

38. Which of the following colour is scattered most is atmosphere?

A. Red

B. Blue

C. Green

D. Violet

Answer: D

Watch Video Solution

39. Astigmatism can be corrected by using

A. Prismatic lens

B. Concave lens

C. Cylindrical lens

D. Convex lens

Answer: C

Watch Video Solution

40. Lateral magnification of objective of compound microscope is 100 and angular magnification of its eyepiece is 20. The magnifying power of compound microscope is

A. 120

B. 5

C. 2000

D. 1000

Answer: C

Watch Video Solution

41. Focal length of objective eye piece and inverting lens of a terrestrial telescope are 20 cm, 10 cm and 5 cm respectively. Length of the tube containing these lenses at normal adjustment is

A. 30 cm

B. 35 cm

C. 50 cm

D. 40 cm

Answer: C

Watch Video Solution

42. Advantages of cassegrain telescope is/are

A. Free of chromatic aberration

B. High resolving power

C. Free of spherical aberration

D. All of these

Answer: D

Watch Video Solution

43. A simple telescope consisting of an objective of focal length 60 cm and a single eye lens of focal length 5 cm is focused on a distant object in such a way that parallel rays emerge from eye lens. If the object subtends an angle of 2° at the objective, the angular width of the image is (Let $\tan\theta \square \theta$ assuming small).

A. 62°

B. 48°

C. 24°

D. 12°

Answer: C

Watch Video Solution

44. A telescope has an objective lens of focal length $200cm$ and an eye piece with focal length $2cm$. If this telescope is used to see a 50 meter tall building at a distance of $2km$, what is the height of the image of the building formed by the objective lens?

A. 5 cm

B. 10 cm

C. 1 cm

D. 2 cm

Answer: A

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45. Which of the following is not involved in Rainbow formation?

A. Refraction

B. Internal reflection

C. Angular deviation

D. Dispersion

Answer: C

Watch Video Solution

ASSIGNMENT (SECTION - A)

1. Digital movie projectors work on the principle of

A. Reflection from micromirrors

B. Refraction from thin lenses

C. Dispersion from thin prisms

D. Total internal reflection from optical fibres

Answer: A

Watch Video Solution

2. When a beam of light is incident on a plane mirror, it is found that a real image is formed. The incident beam must be

A. Converging

B. Diverging

C. Parallel

D. Formation of real image by a plane mirror is impossible

Answer: A

Watch Video Solution

3. If an object is placed symmetrically between two plane mirrors, inclined at an angle of 72°, then the total number of images formed is:

A. 5

B. 4

C. 2

D. Infinite

Answer: B

Watch Video Solution

4. A person 1.6 m tall is standing at the center between two walls three meter high. What is the minimum size of a plane mirror fixed on the wall in front of him, if he is to see the full height of the wall behind him?

A. 0.8 m

B. 1 m

C. 1.5 m

D. 2.3 m

Answer: B

Watch Video Solution

5. While capturing solar energy for commercial purposes we use

A. Parabolic mirrors

B. Plane mirrors

C. Convex mirrors

D. Concave mirrors

Answer: A

Watch Video Solution

6. A convex mirror is used to form an image of a real object. The image

(i) always lies between the pole and the focus

(ii) is dimished in size

(iii) is erect

(iv) is real

A. The image lies between the pole and focus

B. The image is diminished in size

C. The image is erect

D. The image is real

Answer: D

Watch Video Solution

7. A concave mirror of focal length f produces a real image n times the size of the object. What is the distance of the object from the mirror?

A. (n - 1)f

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

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

D. (n + 1)f

Answer: C

Watch Video Solution

8. A convex mirror has a focal length f. A real object is placed at a distance f in front of it from the pole produces an image at

A. Infinity

B. f

C. f/2

D. 2f

Answer: C

Watch Video Solution

9. An object placed in front of a concave mirror of focal length 0.15 m produces a virtual image, which is twice the size of the object. The position of the object with respect to the mirror is

A. $-5.5cm$

B. $-6.5cm$

C. $-7.5cm$

D. $-8.5cm$

Answer: C

Watch Video Solution

10. When a light ray from a rarer medium is refracted into a denser medium, its

A. Speed increases, wavelength increases

B. Speed decreases, wavelength increases

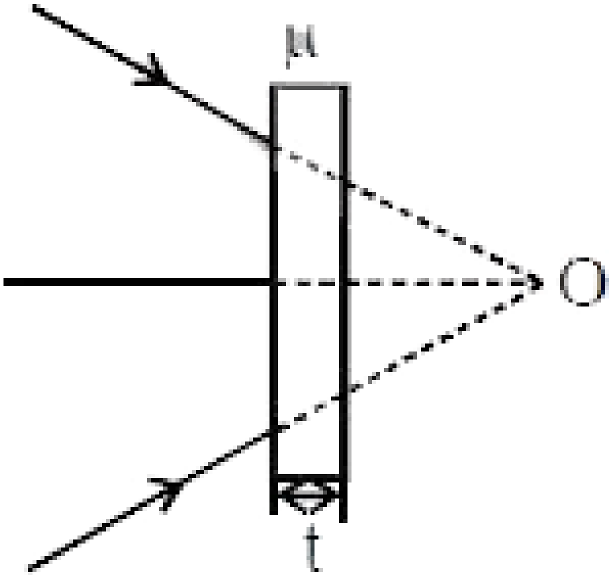
C. Speed increases, wavelength decreases

D. Speed decreases, wavelength decreases

Answer: D

Watch Video Solution

11. A beam of light is converging towards a point. A plane parallel plate of glass of thickness t, refractive index μ is introduced in the path of the beam. The convergent point is shifted by (assume near normal incidence) :



A. $t(1 - 1/\mu)$ away

B. $t(1 + 1/\mu)$ away

C. $t(1 - 1/\mu)$ nearer

D. $t(1 + 1/\mu)$ nearer

Answer: A

Watch Video Solution

12. The length of a vertical pole at the surface of a lake of water $\left(\mu = \frac{4}{3}\right)$ is 24 cm. Then to an under-water fish just below the water surface the tip of the pole appeard to be

A. 18 cm above the surface

B. 24 cm above the surface

C. 32 cm above the surface

D. 36 cm above the surface

Answer: C

Watch Video Solution

13. A ray of light strikes a glass plate at an angle of 60°. If the reflected and refracted rays are perpendicular to each other, the index of refraction of glass is

A. $\sqrt{3}$

B. $3/2$

C. $\sqrt{(3/2)}$

D. $1/2$

Answer: A

Watch Video Solution

14. A microscope is focussed on a coin lying at the bottom of a beaker. The microscope is now raised up by $1cm$. To what depth should the water be poured into the beaker so that coin is again in focus ? (Refration index of water is $4/3$)

A. 1 cm

B. $4/3$ cm

C. 3 cm

D. 4 cm

Answer: D

Watch Video Solution

15. Two transparent media A and B are separated by a plane boundary. The speed of light in medium A is $2.0 \times 10^8 ms^{-1}$ and in medium B is $2.5 \times 10^8 ms^{-1}$. The critical angle for which a ray of light going from A to B suffers total internal reflection is

A. $\sin^{-1} 1/2$

B. $\sin^{-1} 2/5$

C. $\sin^{-1} 4/5$

D. $\sin^{-1} 3/4$

Answer: C

Watch Video Solution

16. Which of the following phenomenon light forms a rainbow?

A. Reflection of light

B. Refraction

C. Total internal reflection

D. Reflection as well as refraction

Answer: D

Watch Video Solution

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

A. Endoscopy

B. High speed internet traffic

C. Radio, TV & Telephone signals

D. All of these

Answer: D

Watch Video Solution

18. An object is placed at a distance of $f/2$ from a convex lens. The image will be

A. At one of the foci, virtual and double its size

B. At 3f/2, real and inverted

C. At 2f, virtual and erect

D. At f, real and inverted

Answer: A

Watch Video Solution

19. The place faces of two identical plano-convex lenses, each with focal length f are pressed against each other using an optical glue to from a usual convex lens .The distance from the optical centre at which an object must be placed to obtain the image same as the size of the object is

A. 80 cm

B. 40 cm

C. 20 cm

D. 160 cm

Answer: B

Watch Video Solution

20. Two thin lenses of focal lengths 20 cm and -20 cm are placed in contact with other. The combination has a focal length equal to

A. Infinite

B. 50 cm

C. 60 cm

D. 10 cm

Answer: A

Watch Video Solution

21. If in a planoconvex lens, the radius of curvature of the convex surface is $10cm$ and the focal length is $30cm$, the refractive index of the material of the lens will be

A. 1.5

B. 1.66

C. 1.33

D. 3

Answer: C

Watch Video Solution

22. A glass concave lens is placed in a liquid in which it behaves like a convergent lens. If the refractive indices of glass and liquid with respect to air are ${}_a\mu_g$ and ${}_a\mu_l$ respectively, then

A. ${}_a\mu_g = 5{}_a\mu_l$

B. ${}_a\mu_g > {}_a\mu_l$

C. ${}_a\mu_g < {}_a\mu_l$

D. ${}_a\mu_g = 2{}_a\mu_l$

Answer: C

Watch Video Solution

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

A. 10 cm

B. 15 cm

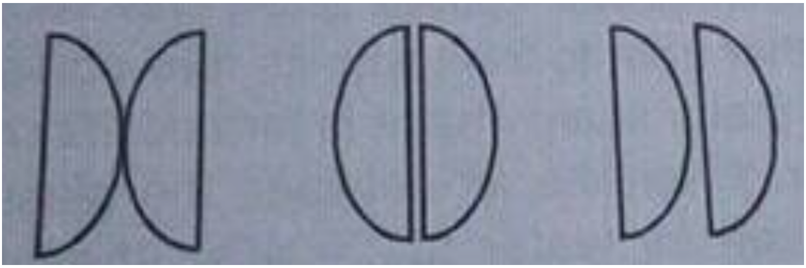
C. 30 cm

D. 60 cm

Answer: C

Watch Video Solution

24. Two plano-convex lenses of equal focal lengths are arranged as shown



The ratio of the combined focal lengths is

A. $1 : 2 : 1$

B. $1 : 2 : 3$

C. $1 : 1 : 1$

D. $2 : 1 : 2$

Answer: C

Watch Video Solution

25. When the object is at distance u_1 and u_2 from the optical centre of a convex lens, a real and a virtual image of the same magnification are obtained. The focal length of the lens is

A. $u_1 - u_2$

B. $\frac{u_1 - u_2}{2}$

C. $\frac{u_1 + u_2}{2}$

D. $u_1 + u_2$

Answer: C

Watch Video Solution

26. A convex mirror of focal length f produced an image $(1/n)^{th}$ of the size of the object. The distance of the object from the mirror is

A. (x - 1)f

B. (x + 1)f

C. {(x - 1)/x}f

D. {(x + 1)/x}f

Answer: A

Watch Video Solution

27. A thin convergent glass lens $(\mu_g = 1.5)$ has a power of $+5.0D$. When this lens is immersed in a liquid of refractive index μ_1, it acts as a divergent lens of focal length $100cm$. The value of μ_1 is

A. $4/3$

B. $3/4$

C. $5/3$

D. $8/3$

Answer: C

Watch Video Solution

28. In case of displacement method of lenses, the product of magnification in both cases is

A. 1

B. 2

C. Zero

D. Infinite

Answer: A

Watch Video Solution

29. The focal length of a planoconvex glass lens is 20 cm $(\mu_g = 1.5)$. The plane face of it is silvered. An illuminating object is placed at a distance of 60 cm from the lens on its axis along the convex side. Then the distance (in cm) of the image is

A. 20

B. 30

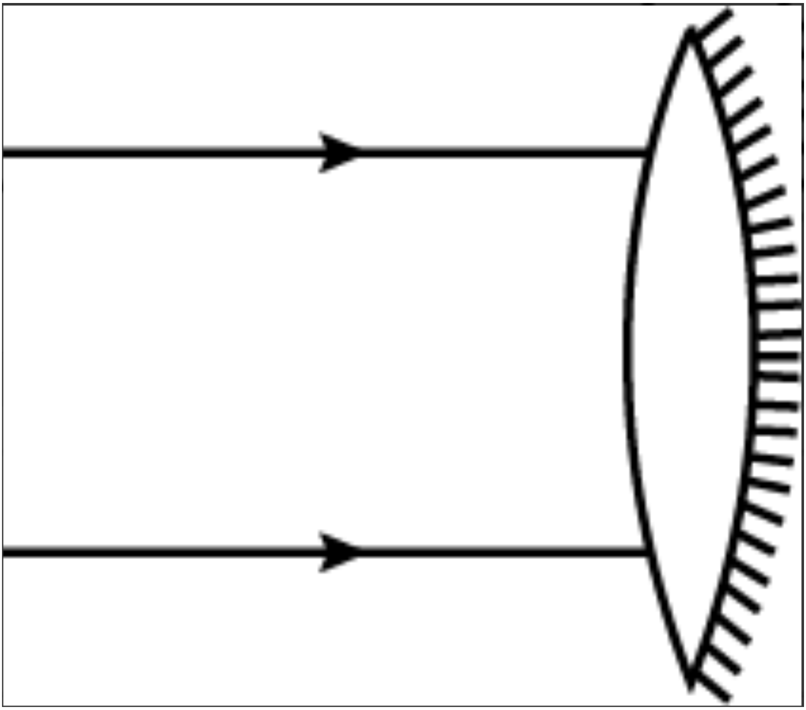
C. 40

D. 12

Answer: D

Watch Video Solution

30. Two thin similar convex glass pieces are joined together front to front with its rear portion silvered such that a sharp image is formed 20 cm from the mirror. When the air between the glass pieces is replaced by water $(\mu_w = 4/3)$, then the image formed from the mirror is at a distance of



A. 8 cm

B. 10 cm

C. 6 cm

D. 12 cm

Answer: D

Watch Video Solution

31. What is the cause of dispersion of white light through a glass prism Draw a ray diagram to show the path of light when two identical glass prisms are arranged together in inverted position with respect to each other and narrow beam of white light is allowed to fall obliquely on one of the faces of the prisms.

A. $i_1 = i_2$

B. $i_1 > i_2$

C. $i_1 < i_2$

D. $i_1 + i_2 = 90$

Answer: A

Watch Video Solution

32. The angle at which a ray of light be incident on one face of an equilateral prism,so that the emergent ray may graze the second surface of the prism is $\frac{\pi}{x}$ rad.then find "x" .($\mu = 2$)]

A. 30°

B. 90°

C. 45°

D. 60°

Answer: B

Watch Video Solution

33. A prism of refractive index sqrt2 has refractive angle 60°.

In the order that a ray suffers minimum deviation it should be incident at an angle of

A. 30°

B. 45°

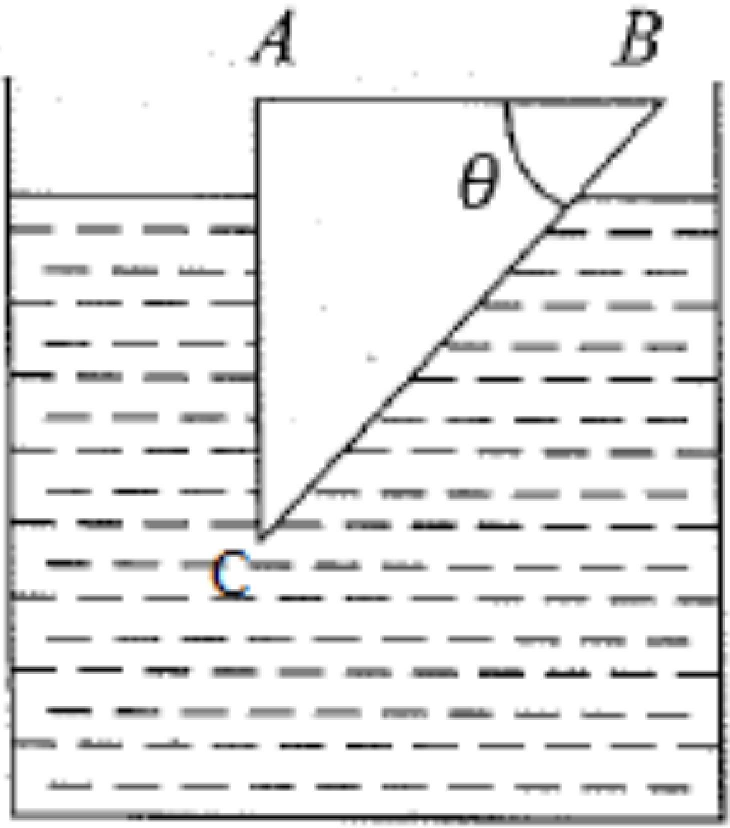
C. 60°

D. 75°

Answer: B

Watch Video Solution

34. A glass prism of refractive index 1.5 is immersed in water of refractive index 4/3. A light ray incident normally on face AB is totally reflected at face AC if



A. $\sin\theta > 8/9$

B. $\sin\theta < 2/3$

C. $\sin\theta = \sqrt{3}/2$

D. $2/3 < \sin\theta \leq 8/9$

Answer: A

Watch Video Solution

35. A person can see clearly only upto a distance of $25cm$. He wants to read a book placed at a distance of $50cm$. What kind of lens does he require for his spectacles and what must be its power ?

A. Concave, -1.0 D

B. Convex, + 1.5 D

C. Concave, -2.0 D

D. Convex, + 2.0 D

Answer: C

Watch Video Solution

36. An astronomical telescope has an objective of focal length 100 cm and an eye piece of focal length 5 cm. The final image of a star is seen 25 cm from the eyepiece. The magnifying power of the telescope is

A. 20

B. 22

C. 24

D. 26

Answer: C

Watch Video Solution

37. When a telescope is adjusted for parallel light, the distance of the objective from the eye piece is found to be $80cm$. The magnifying power of the telescope is 19 . The focal length of the lenses are

A. 61 cm, 19 cm

B. 40 cm, 40 cm

C. 76 cm, 4 cm

D. 50 cm, 30 cm

Answer: C

Watch Video Solution

38. The focal lengths of the objective and eye lenses of a telescope are respectively 200 cm and 5 cm. The maximum magnifying power of the telescope will be:

A. -40

B. -48

C. -60

D. -100

Answer: B

Watch Video Solution

39. A convex lens of focal length 100 cm and a concave lens of focal length 10 cm are placed coaxialiy at a separation of 90 cm.

If a parallel beam of light is incident on convex lens, then after passing through the two lenses the beam

A. Converges

B. Diverges

C. Remains parallel

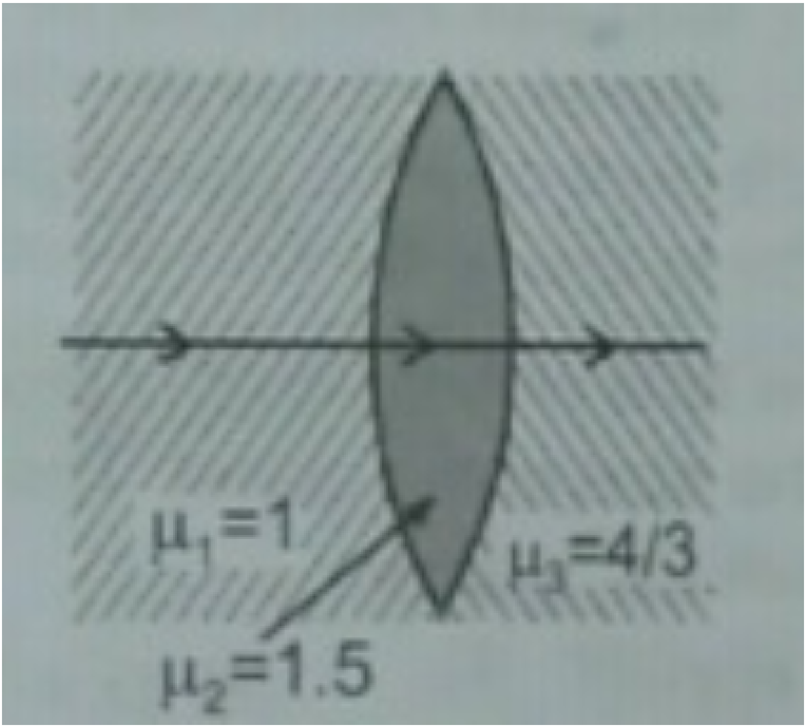
D. Disappears

Answer: C

Watch Video Solution

ASSIGNMENT (SECTION - B)

1. If radii of curvature of both convex surfaces is 20 cm, then focal length of the lens for an object placed in air in the given arrangement is



A. 10 cm

B. 20 cm

C. 40 cm

D. 80 cm

Answer: C

Watch Video Solution

2. A rear mirror of a vehicle is cylindrical having radius of curvature 10 cm. The length of arc of curved surface is also 10 cm. If the eye of driver is assumed to be at large distance, from the mirror, then the field of view in radian is

A. 2.0

B. 4.0

C. 3.0

D. 5.0

Answer: A

Watch Video Solution

3. Which of the following statements is correct?

A. During hot summer days, the trees and other tall objects seem to be quivering because the density of air changes in an irregular way

B. When the moon is near the horizon it appears bigger. The is due to optical illusion

C. If the critical angle for the medium of a prism is θ_c and the angle of prism is A, there will be no emergent ray when $A > 2\theta_c$

D. All of these

Answer: D

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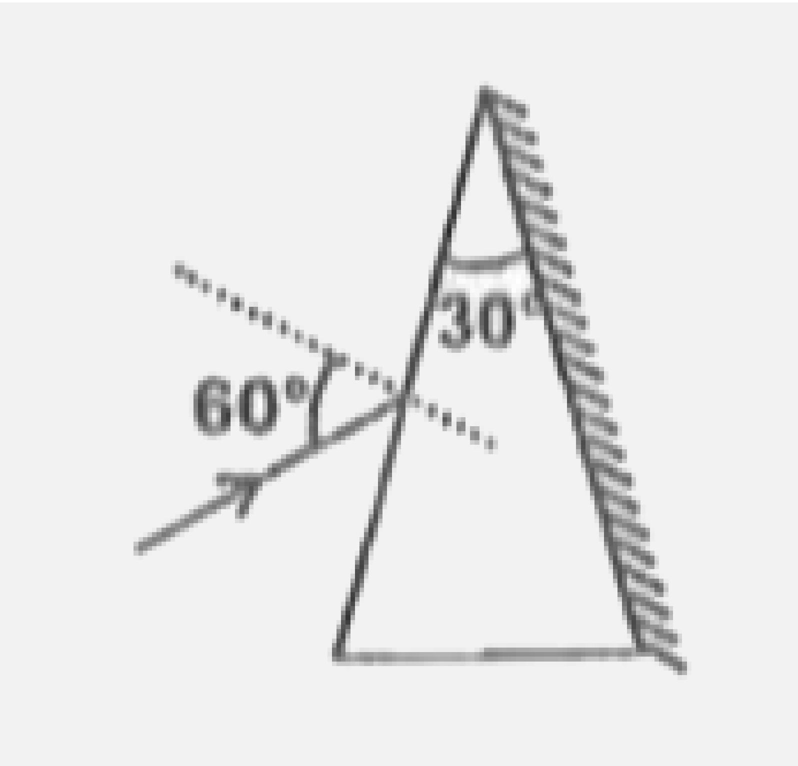
4. An isosceles prism of angle $A = 30^\circ$ has one of its surfaces silvered. Light rays falling at an angle of incidence 60° on the other surface retrace their path after reflection from the silvered surface. The refractive index of prism material is



A. 1.414

B. 1.5

C. 1.732

D. 1.866

Answer: C

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5. A short linear object of length b lies along the axis of a concave mirror of focal length fat a distance u from the pole of the mirror, what is the size of image?

A. $l \times \frac{v}{u}$

B. $l \times \frac{u}{v}$

C. $l \times \left(\frac{v}{u}\right)^2$

D. $l \times \left(\frac{u}{v}\right)^2$

Answer: C

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6. A fish looking up throughthe water sees the outside the 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 the circle in cm is:

A. $\frac{16}{\sqrt{7}}cm$

B. $\frac{26}{\sqrt{7}}cm$

C. $\frac{36}{\sqrt{7}}cm$

D. $\frac{46}{\sqrt{7}}cm$

Answer: C

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7. In optical fibre, refractive index of inner part is 1.68 and refractive index of outer part is 1.44. The numerical aperture of the fibre is

A. 0.5653

B. 0.6653

C. 0.7653

D. 08653

Answer: D

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8. Compare the dispersive powers of two prisms if one of them deviates the blue and red rays through 10° and 6° respectively and the second prism through 8° and 4.5°

A. 0.69

B. 0.79

C. 0.89

D. 0.99

Answer: C

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9. A thin prism of angle 6° made up of glass of refractive index 1.5 is combined with anorher prism made up of glass of refractive index 1.75 to produce dispersion without deviation. The angle of second prism is

A. 7°

B. 4°

C. 9°

D. 5°

Answer: B

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10. In a medium of refractive index 1.6 and having a convex surface has a point object in it at a distance of 12 cm from the pole. The radius of curvature is 6 cm. Locate the image as seen from air

A. A real image at 30 cm

B. A virtual image at 30 cm

C. A real image at 4.28 cm

D. A virtual image at 4.28 cm

Answer: B

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11. A point object is situated at a distance of 36 cm from the centre of the sphere of radius 12 cm and refractive index 1.5. Locate the position of the image due to refraction through sphere.

A. 24 cm from the surface

B. 36 cm from the centre

C. 24 cm from the centre

D. Both (1) & (2)

Answer: D

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12. A denser medium of refractive index 1.5 has a concave surface of radius of curvature 12 cm. An object is situated in the denser medium at a distance of 9 cm from the pole. Locate the image due to refraction in air.

A. A real image at 8 cm

B. A virtual image at 8 cm

C. A real image at 4.8 cm

D. A virtual image at 4.8 cm

Answer: D

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13. A light ray is travelling from air to glass. True reflected and refracted rays are perpendicular to each other. If the angle of incidence in air is I the refractive index of glass is

A. sini

B. cosi

C. tani

D. coti

Answer: C

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14. A light waves travels from glass to water. The refractive index for glass and water are $\frac{3}{2}$ and $\frac{4}{3}$ respectively. The value of the critical angle will be

A. $\sin^{-1}\left(\frac{3}{4}\right)$

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

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

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

Answer: C

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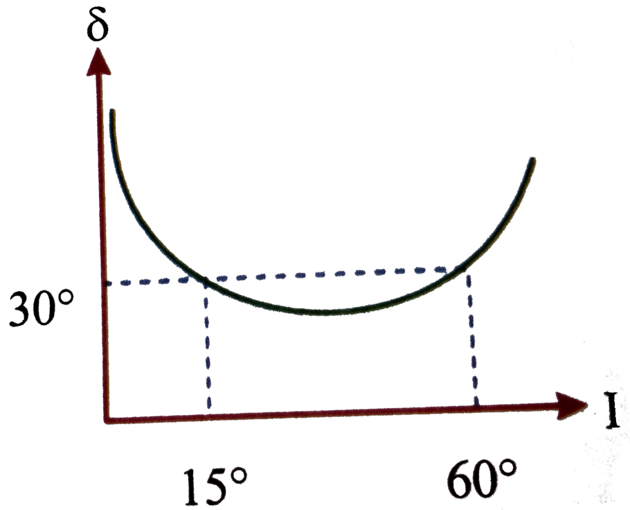
15. A plot between the angle of deviation and angle of incidence is shown in figure. From the graph one can say that the prism angle is



A. 47°

B. 46°

C. 45°

D. 60°

Answer: B

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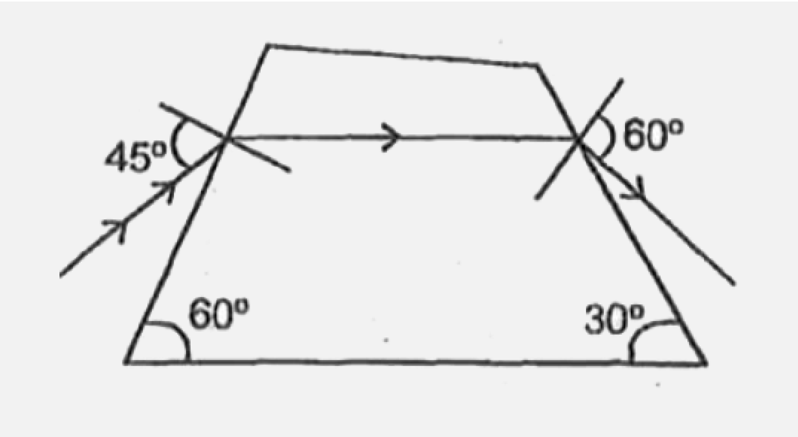
16. In the diagram, a ray is passing through a broken prism, find angular deviation for the ray



A. 105°

B. 30°

C. 60°

D. 15°

Answer: D

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17. A glass slab $(\mu = 1.5)$ of thickness 6 cm is placed over a paper. What is the shift in the letters?

A. 2 cm

B. $\frac{4}{3}$ cm

C. $\frac{1}{3}$ cm

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

Answer: A

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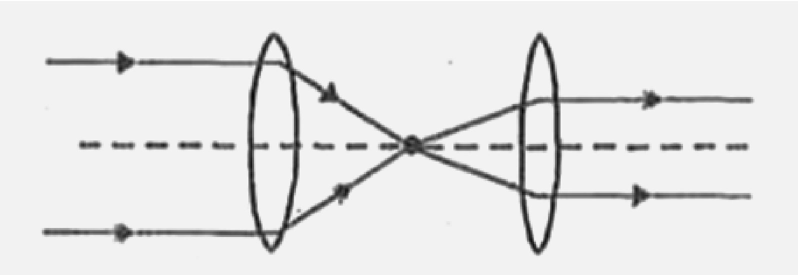
18. Ray diagram for two lenses kept at some distance given in the diagram, which of the following option is correct $(f_1, f_2$ =

focal length, d = distance between lenses)



A. $f_1 + f_2 > d$

B. $f_1 + f_2 < d$

C. $f_1 + f_2 = d$

D. Combination behaves like converging lens

Answer: C

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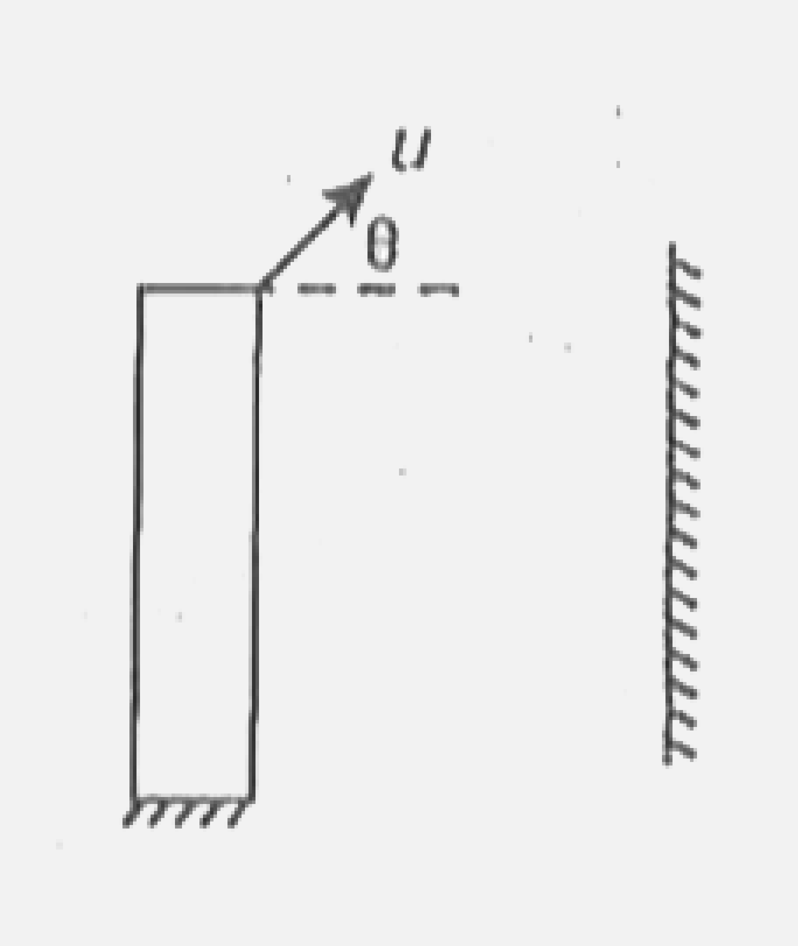
19. A ball is projected from top of the table with initial speed u at an angle of inclination θ, motion of image of ball w.r.t ball



A. Must be projectile

B. Must be straight line and vertical

C. Must be straight line and horizontal

D. May be straight line, depends upon value of θ

Answer: C

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20. In displacement method, convex lens forms a real image of an object for its two different positions. If heights of the images in two cases be 24 cm and 6 cm, then the height of the object is

A. 3 cm

B. 36 cm

C. 6 cm

D. 12 cm

Answer: D

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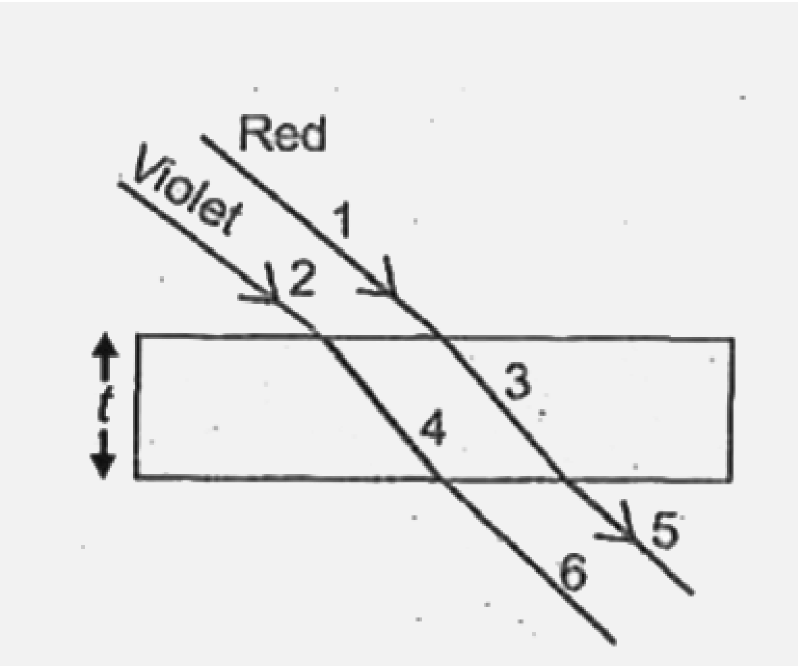
21. Two parallel rays of red and violet colour passed through a glass slab, which of the following is correct?



A. 3 and 4 are parallel

B. 4 and 5 are parallel

C. 6 and 3 are parallel

D. 2 and 5 are parallel

Answer: D

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22. A plane glass is kept over a coloured word 'VIBGYOR', where colour of letters as same as the colours in white light start by fetter, the letter which appears least raised is

A. R

B. Y

C. O

D. V

Answer: A

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23. The near point of a person is 75 cm. In order that he may be able to read book at a distance 30 cm. The power of spectacles lenses should be

A. $-2D$

B. $+3.75D$

C. $+2D$

D. $+3D$

Answer: C

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24. If a lens is moved towards the object from a distance of 40 cm to 30 cm, the magnification of the image remains the same (numarically). The focal length of the lens is

A. 20 cm

B. 15 cm

C. 35 cm

D. 18 cm

Answer: C

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25. A convex lens of power $+2.5D$ is in contact with a concave lens of focal length 25 cm. The power of combination is

A. $-1.5D$

B. 0 D

C. $+1.5D$

D. $+6.5D$

Answer: A

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26. When a telescope is in normal adjusment, the distance of the objective from the eyepiece is found to $100cm$. If the magnifying power of the telescope, at normal adjusment, is 24 focal lengths of the lenses are

A. 24 cm, 3 cm

B. 27 cm, 8 cm

C. 12 cm, 6 cm

D. 27 cm, 9 cm

Answer: A

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27. A converging lens of focal length 30 cm is placed in contact with another converging lens of unknown focal length, then possible value for focal length of combination is

A. 15 cm

B. 60 cm

C. 36 cm

D. $-12cm$

Answer: A

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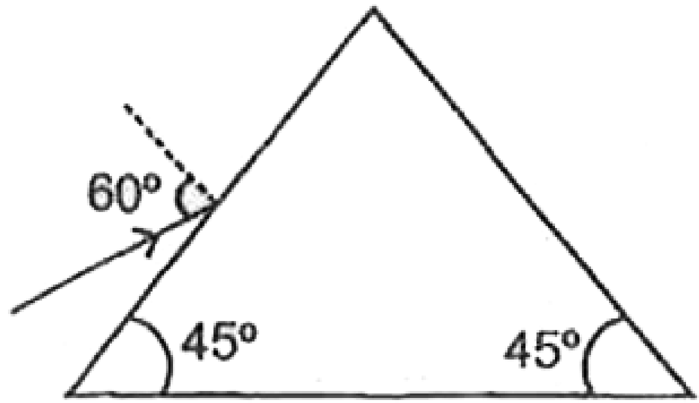
28. In the diagram the ray passing through prism is parallel to the base. Refractive index of material of prism is



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

B. $\sqrt{3}$

C. $\sqrt{2}$

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

Answer: D

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29. In a displacement method the distance between the object and the screen is 70 cm and the focal length of the lens is 16 cm, find the separations of the magnified and diminished image position of the lens.

A. $-15cm$

B. 30 cm

C. 12 cm

D. 20 cm

Answer: C

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30. A red colour in air has wavelength 760 nm when light passes through water of refractive index $\left(n = \frac{4}{3}\right)$, wavelength becomes 570 nm. (wavelength of yellow colour in air is 570 nm). Then colour of red light in water is

A. Red

B. Green

C. Yellow

D. Blue

Answer: A

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31. $\widehat{n}_1$ is the unit vector along incident ray, $\widehat{n}_2$ along normal and $\widehat{n}_3$ is the unit vector along reflected ray, then which of the following must be true?

A. $\widehat{n}_1 \cdot \widehat{n}_2 = 0$

B. $\widehat{n}_1 \cdot \widehat{n}_3 = 0$

C. $(\widehat{n}_1 \times \widehat{n}_2) \cdot \widehat{n}_3 = 0$

D. $(\widehat{n}_1 \times \widehat{n}_2) \times \widehat{n}_3 = 0$

Answer: C

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32. A double convex lens has two surfaces of equal radii R and refractive index m=1.5, we have

A. $-15cm$

B. $-30cm$

C. $+15cm$

D. $+30cm$

Answer: C

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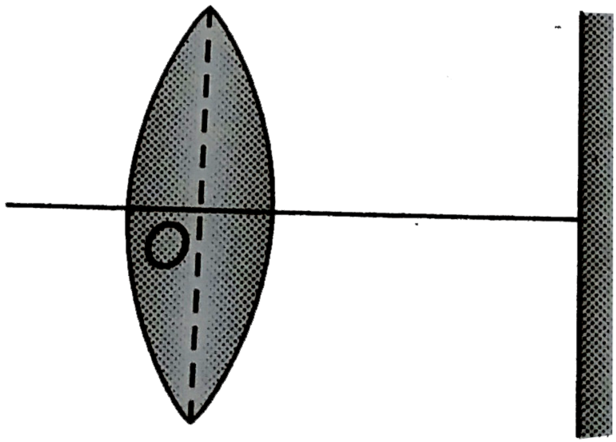

33.

The distance between a convex lens and a plane mirror is 10 cm. The parallel rays incident on the convex lens after reflection from the mirror forms image at the optical centre of the lens. Focal length of lens will be

A. $1.5f$

B. $2f$

C. $2.5f$

D. $4f$

Answer: A

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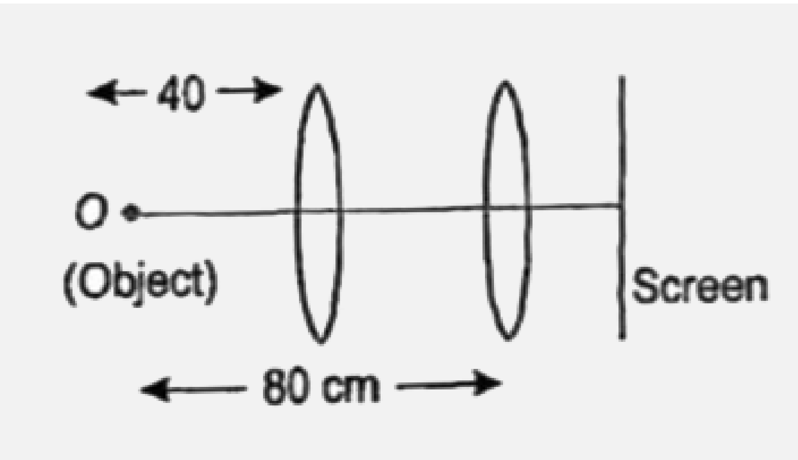
34. In displacement method, there are two position of a lens for which we get clear image. First position of the lens is at 40 cm from object and second is at 80 cm, the focal length of lens is



A. 40 cm

B. $\frac{40}{3}$ cm

C. 80 cm

D. $\frac{80}{3}$ cm

Answer: D

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35. Maximum magnification produced by simple microscope of focal length f=5cm is

A. 5

B. 7

C. 6

D. 8

Answer: C

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ASSIGNMENT (SECTION - C)

1. A beam of light from a source L is incident normally on a plane mirror fixed at a cetain distance x from the source.The beam is relfected back as a spot on a scale placed just above the source L.when the mirror is ratated through a small angle θ the spot of the light is found to move thourgh a distance y on the scale.The angle θ is given by

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

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

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

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

Answer: A

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2. A thin prism having refracting angle 10° is made of glass of refractive index 1.42.This prism is combined with another thin prism of lass of reefractive index 1.7.This combination produces disperion without deviation. The refracting angle of second prism should be

A. 4°

B. 6°

C. 8°

D. 10°

Answer: B

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3. Two identical glass $(\mu_g = 3/2)$ equi-convex lenses of focal length f each kept in contanct. The space betweem the two lenses is filled with water $(\mu_w = 4/3)$. The focal length of the combination is

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

B. f

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

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

Answer: D

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

A. 8

B. 10

C. 12

D. 16

Answer: C

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5. A person can see clearly objects only when they lie between 50 cm and 400 cm from his eyes. In order to increase the miximum distance of distinct vision to infinity , the person has to use, will be

A. Convex, +2.25 diopter

B. Concave, -0.25 diopter

C. Concave, -0.2 diopter

D. Convex, +0.15 diopter

Answer: B

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6. Match the corresponding entries of column 1 with column 2. 'Where m is the magnification produced by the mirror'

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

A.

$$A \rightarrow c \text{ and } d, B \rightarrow b \text{ and } d, C \rightarrow b \text{ and } c, D \rightarrow a \text{ and } d$$

B.

$$A \rightarrow b \text{ and } c, B \rightarrow b \text{ and } c, C \rightarrow b \text{ and } d, D \rightarrow a \text{ and } d$$

C.

$$A \rightarrow a \text{ and } c, B \rightarrow a \text{ and } d, C \rightarrow a \text{ and } b, D \rightarrow c \text{ and } d$$

D.

$$A \rightarrow a \text{ and } d, B \rightarrow b \text{ and } c, C \rightarrow b \text{ and } d, D \rightarrow b \text{ and } c$$

Answer: B

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7. A astronomical telescope has objective and eye-piece of focal length 40cm, 4cm, respectivley. To view an object must be separated by a distance

A. 54.0 cm

B. 37.3 cm

C. 46.0 cm

D. 50.0 cm

Answer: A

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8. The angle of incidernce 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, then the angle os minimum deviation and refractive index of the material of the prism respectively, are

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

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

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

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

Answer: C

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9. In an astronomical telescope in normal adjustment,a straight black line of length L is drawn on the objective lens. The eypeice forms a real image of this line. The length of this image ie l. The magnification of the telescope is

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

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

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

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

Answer: A

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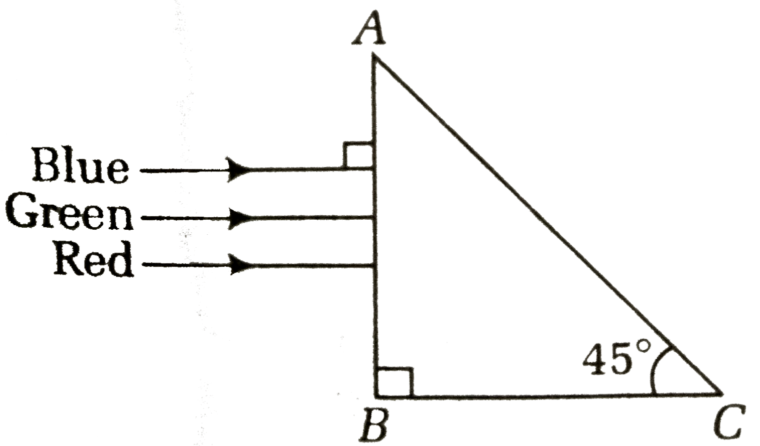
10. A beam of light consisting of red, green and blue colours is incident on a right angled prism. The refractive index of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47, respectively.



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 one another

D. Not separate the three colours at all

Answer: A

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11. The refractive angle of a prism is A, and the refractive of the material of the prism is $\cot(A/2)$. The angle of minimum deviation is

A. $180^\circ + 2A$

B. $180^\circ - 3A$

C. $180^\circ - 2A$

D. $90^\circ - A$

Answer: C

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12. Two identical thin plano convex glass leses (refractive index 1.5) each having redius of curvature of 20cm are placed with their convex surface in contanct at the centre. The intervening space is filled with oil refractive index 1.7. The focal length of the combination is

A. 50 cm

B. $-20cm$

C. $-25cm$

D. $-50cm$

Answer: D

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13. If the focal length of objective lens is increased then magnifying power of

A. Microscope will increase but that of telescope decrease

B. Microscope and telescope both will increase

C. Microscope and telescope both will decrease

D. Microscope will decreases but that of telescope will increase

Answer: D

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14. 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 returns back through the same path after sufferin reflection at the silvered surface. The refractive index μ, of the prism

A. $2\sin A$

B. $2\cos A$

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

D. $\tan A$

Answer: B

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15. 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 curface of the lenses, then the focal length of the combination is

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

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

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

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

Answer: B

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16. For a normal eye, the cornea of eye provides a converging power of 40D and the least converging power of the eye lens behing the cornea is 20D. Using this information, the distance between the retina and the cornea-eye lends can be estimated to be

A. 2.5 cm

B. 1.67 cm

C. 1.5 cm

D. 5 cm

Answer: B

Watch Video Solution

17. The magnifying power of a teloscope is 9. When it is adjusted for parallel rays the distance between the objective and eyepiece is 20 cm. The focal length of lenses are

A. 18 cm, 2 cm

B. 11 cm, 9 cm

C. 10 cm, 10 cm

D. 15 cm, 5 cm

Answer: A

Watch Video Solution

18. A ray of light is incident at small angle I on the surface of prism of small angle A and emerges normally from the oppsite surface. If the refractive index of the material of the prism is mu, the angle of incidence is nearly equal to

A. $\frac{A}{\mu}$

B. $\frac{A}{2\mu}$

C. μA

D. $\frac{\mu A}{2}$

Answer: C

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19. A concave mirror of focal length f_1 is placed at a distance of d from a convex lens of focal length f_2. A beam of light coming from infinity and falling on this convex lens- concave mirror combination retuens to infinity. The distance d must equal

A. $2f_1 + f_2$

B. $-2f_1 + f_2$

C. $f_1 + f_2$

D. $-f_1 + f_2$

Answer: A

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20. When a biconvex lens of glass having refractive index 1.47 is depped in a liquid it acts az a plane sheet of glass. This implies that the liquid must have refractive index

A. Greater than that of glass

B. Less than that of glass

C. Equal to that of glass

D. Less than one

Answer: C

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21. For the angle of minimum deviation of a prism to be equal to its refracting angle, the prism must be made of a material whose refractive index -

A. Lies between $\sqrt{2}$ and 1

B. Lies between 2 and $\sqrt{2}$

C. Is less than 1

D. Is greater than 2

Answer: B

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22. A rod of length 10 cm lies along the principal axis of a concave mirror of focal length 10 cm in such a way that its end closer to the pole is $20cm$ away from the mirror. The length of the image is

A. 10 cm

B. 15 cm

C. 2.5 cm

D. 5 cm

Answer: D

Watch Video Solution

23. Which of the following is not due to total internal reflection ?

A. Brilliance of diamond

B. Working if optical fibre

C. Difference between apparent and real depth of a pond

D. Mirage on hot summer days

Answer: C

Watch Video Solution

24. A biconvex lens has a radius of curvalure of magnitude $20cm$ Which one of the followinf options describe best the image formed of an object of heigh $2cm$ placed $30cm$ from the lens?

A. Real, inverted, height = 1 cm

B. Virtual, upright, height = 1 cm

C. Virtual, upright, height = 0.5 cm

D. Real, inverted, height = 4 cm

Answer: D

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25. A converging beam of rays is incident on a diverging lens. Having passed through the lens the rays intersect at a point $15cm$ from the lens. If the lens is removed, the point where the rays meet, move $5cm$ closer to the mounting that holds the lens. Find the focal length of the lens.

A. $-30cm$

B. 5 cm

C. $10cm$

D. 20 cm

Answer: A

Watch Video Solution

26. A thin prism of angle 15° made of glass of refractive index $\mu_1 = 1.5$ is combined with another prism of glass of refractive index $\mu_2 = 1.75$. The combination of the prisms produced dispersion without deviation. The angle of the second prism should be

A. 12°

B. 5°

C. 7°

D. 10°

Answer: D

Watch Video Solution

27. A ray of light travelling in a transparent medium of refractive index μ falls, on a surface separating the medium from air at an angle of incidence of 45°. for which of the following value of μ the ray can undergo total internal reflection ?

A. $\mu = 1.25$

B. $\mu = 1.33$

C. $\mu = 1.40$

D. $\mu = 1.50$

Answer: D

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28. A lens having focal length f and aperture of diameter d forms an image of intenjsity I. Aperture of diameter $\frac{d}{2}$ in central region of lens in covered by a black paper. Focal length of lens and intensity of image now will be respectively

A. f and $\frac{l}{4}$

B. $\frac{3f}{4}$ and $\frac{l}{2}$

C. f and $\frac{3l}{4}$

D. $\frac{f}{2}$ and $\frac{l}{2}$

Answer: C

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29. The speed of light in media M_1 and M_2 is 1.5×10^8 m/s and 2.0×10^8 m/s respectively. A ray of light enters from medium M_1 to M_2 at an incidence angle i. If the ray suffers total internalreflection the value of i is -

A. Equal to $\sin^{-1}\left(\frac{2}{3}\right)$

B. Equal to or less than $\sin^{-1}\left(\frac{3}{5}\right)$

C. Equal to or greater than $\sin^{-1}\left(\frac{3}{4}\right)$

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

Answer: C

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30. A ray of light is incident on a 60° prism at the minimum deviation position. The angle of refraction at the first face (i.e. incident face) of the prism is-

A. Zero

B. 30°

C. 45°

D. 60°

Answer: B

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31. Two thin lenses of focal length f_1 and f_2 are in contact and coaxial. The power of the combination is

A. $\dfrac{f_1 + f_2}{f_1 f_2}$

B. $\sqrt{\dfrac{f_1}{f_2}}$

C. $\sqrt{\dfrac{f_2}{f_1}}$

D. $\dfrac{f_1 + f_2}{2}$

Answer: A

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32. A boy is trying to start a fire by focusing sunlight on a piece of paper using an equiconvex lens of focal length $10cm$. The diameter of the sun is $1.39 \times 10^{9}m$ and its mean distance from the earth is $1.5 \times 10^{11}m$. What is the diameter of the sun's image on the paper ?

A. $12.4 \times 10^{-4}m$

B. $9.2 \times 10^{-4}m$

C. $6.5 \times 10^{-4}m$

D. $6.5 \times 10^{-5}m$

Answer: B

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33. The frequence of a light wave in a material in 2×10^{14} Hz and wavelength is $5000.\ \text{Å}$. The refractive index of material will be

A. 1.33

B. 1.40

C. 1.50

D. 3.00

Answer: D

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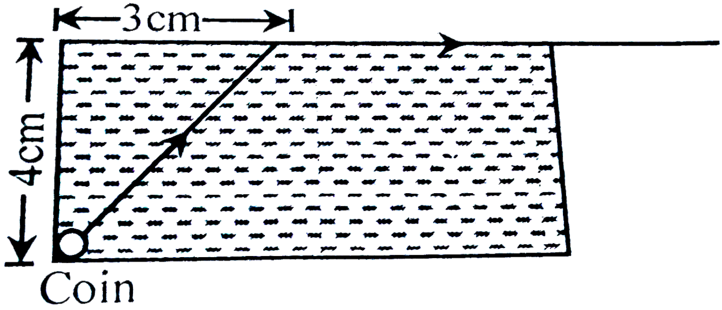
34. A small coin is resting on the bottom of a beaker filled with a liquid. A ray of light from the coin travels upto the surface of the liquid and moves along its surface (see figure)



How fast is the light traveling in the liquid ?

A. $1.2 \times 10^8 m/s$

B. $1.8 \times 10^8 m/s$

C. $1.3 \times 10^8 m/s$

D. $3.0 \times 10^8 m/s$

Answer: B

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35. A microscope is focussed on a mark on a piece of paper and then a slab of glass of thickness 3 cm and refractive index 1.5 is placed over the mark. How should the microscope be moved to get the mark in foucs again ?

A. 1 cm upward

B. 4.5 cm downward

C. 1 cm downward

D. 2 cm upward

Answer: A

Watch Video Solution

36. A convex lens and a concave lens, each heaving same focal length of $25cm$, are put in contact to from a combination of lenses. The hpjower in diopters of the combination is

A. 25

B. 50

C. Infinite

D. Zero

Answer: D

Watch Video Solution

37. A man of height 6 ft wants to see his full image in a plane mirror. The minimum length of the plane mirror required

A. 12 feet

B. 3 feet

C. 6 feet

D. Any length

Answer: B

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38. Images formed by an object placed between two plane mirrors whose reflecting surfaces make an angle of 90° with one another lie on a:

A. Straight line

B. Parabola

C. Circle

D. Ellipse

Answer: C

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39. An object is placed between two plane mirrors inclined at an angle to each other. If the number of images formed is 7 then the angle of inclination is -

A. 15°

B. 30°

C. 45°

D. 60°

Answer: C

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40. In opticle fibres,the refractive index of the core is

A. Greater than that of the cladding

B. Equal to that of the cladding

C. Smaller than that of the cladding

D. Independent of that of the cladding

Answer: A

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41. Light travels through a glass plate of thickness t and refractive index μ. If c is the speed of light in vacuum, the time taken by light to travel this thickness of glass is

A. $\dfrac{t}{\mu c}$

B. $\dfrac{\mu t}{c}$

C. $t\mu c$

D. $\dfrac{tc}{\mu}$

Answer: B

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42. A ray of light from a denser medium strikes a rare medium as shown in figure. The reflected and refracted rays make an angle of 90° with each other. The angles of reflection and refraction are r and r'. The critical angle would be

A. $\sin^{-1}(\tan r)$

B. $\tan^{-1}(\sin r)$

C. $\sin^{-1}(\cot r)$

D. $\tan^{-1}(\sin r')$

Answer: A

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43. The refractive index of water is 1.33. What will be the speed of light in water

A. $4 \times 10^{8} m / s$

B. $1.33 \times 10^{8} m / s$

C. $3 \times 10^{8} m / s$

D. $2.25 \times 10^{8} m / s$

Answer: D

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44. Electromagnetic radiation of frequency n, wavelength λ, travelling with velocity v in air, enters a glass slab of refractive index μ. The frequency, wavelength and velocity of light in the glass slab will be respectively

A. $n, 2\lambda$ and $\frac{v}{\mu}$

B. $\frac{2n}{\mu}, \frac{\lambda}{\mu}$ and v

C. $\frac{n}{\mu}, \frac{\lambda}{\mu}$ and $\frac{v}{\mu}$

D. $n, \frac{\lambda}{\mu}$ and $\frac{v}{\mu}$

Answer: D

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45. A disc is placed on the surface of pond filled with liquid of refractive index $\frac{5}{3}$. A source of light is placed 4m below the surface of liquid. Calculate the minimum area of the disc so that light does not come out of liquid.

A. ∞

B. 3 m

C. 6 m

D. 4 m

Answer: B

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46. A ray of light travelling in air haves wavelength λ, frequency n, velocity v and intensity I. If this ray enters into water then these parameter are λ', n' , v' and I' respectively. Which relation is correct

A. $\lambda = \lambda'$

B. n = n'

C. v = v'

D. I = I'

Answer: B

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47. Optical fibre are based on

A. Total internal reflection

B. Less scattering

C. Refraction

D. Less absorption coefficient

Answer: A

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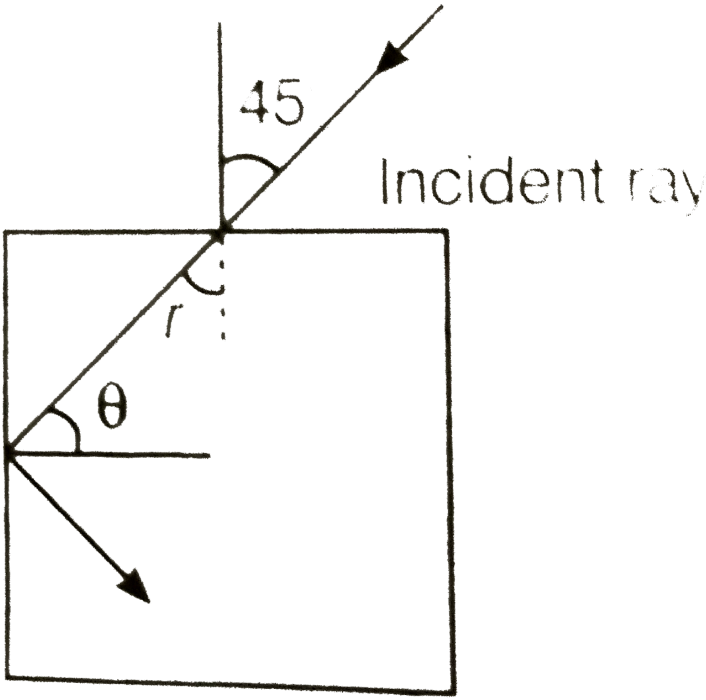
48. For the given incident ray as shown in figure, the condition of total internal reflection of the ray will be satisfied if the refractive indesx of block will be



A. $\frac{\sqrt{3}+1}{2}$

B. $\frac{\sqrt{2}+1}{2}$

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

D. $\sqrt{\frac{7}{6}}$

Answer: C

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49. A layer of benzene $(\mu = 1.5)$ 12 cm thick floats on water layer $(\mu = 4/3)$ 8 cm thick in a vessel. When viewed from the top, the apparent depth of bottom of vessel below the surface of benzene will be

A. 20 cm

B. 14 cm

C. 7 cm

D. 21 cm

Answer: B

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50. The critical angle for light going from medium X into medium Y is θ . The speed of light in medium X is v. The speed of light in medium Y is

A. $\frac{v}{\cos\theta}$

B. $v\sin\theta$

C. $\frac{v}{\sin\theta}$

D. $v\cos\theta$

Answer: C

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51. A bulb is placed at a depth of $2\sqrt{7}cm$ in water and a floating opaque disc is placed over the bulb so that the bulb is not visible from the surface. What is the minimum diameter of the disc?

A. 42 m

B. 6 m

C. $2\sqrt{7}$ m

D. 12 m

Answer: D

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52. Two optical media of refractive indices n_1 and n_2 contain x and y waves of the same colour in the same thickness. Then their relative refractive index n_1 / n_2

A. xy

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

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

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

Answer: B

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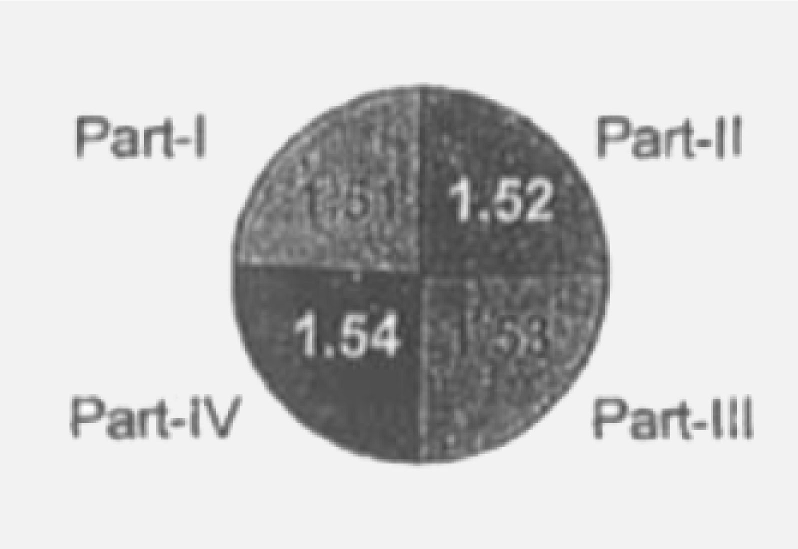
53. A light ray is travelling through a ring of an optical fibre which is made of four different glasses (shown below) but each part has the same geometrical thickness. Their respective refractive indices are shown. The light ray will take the maximum time in crossing the part



A. I

B. II

C. IV

D. Same in all

Answer: C

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54. Light enters at an angle of incidence in a transparent rod of refractive index n of the material of the rod. Find the range of n so that the light once entered into it will not leave it through its lateral face, the value of angle of incidence.

A. n = 1.1

B. n = 1

C. $n > \sqrt{2}$

D. n = 1.3

Answer: C

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55. If the refractive index of a material of equilateral prism is `sqrt3, then angle of minimum deviation of the prism is

A. 60°

B. 45°

C. 30°

D. 75°

Answer: A

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56. A beam of light composed of red and green rays is sincident obliquely at a point on the face of a retangular glass slab

When coming out on the opposite parallel face, the red an green rays emerge from

A. Two points propagating in two different non parallel directions

B. Two points propagating in two parallel directions

C. One point propagating in two different directions

D. One point propagating in the same directions

Answer: B

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57. 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 enterying 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. 45°

B. 60°

C. Zero

D. 30°

Answer: A

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58. Four lenses having the focal length of +45cm, +20 cm, +450 cm and +250 cm respectively are provided to make an astronomical telescope. The focal length of the eye piece to produce the largest magnification should be

A. $+15cm$

B. $+50cm$

C. $-150cm$

D. $-15cm$

Answer: A

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59. Alens is placed between a source of light and a wall. It forms images of are A_1 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. $\frac{1}{A_1}+\frac{1}{A_2}$

C. $\sqrt{A_1 A_2}$

D. $\frac{A_1+A_2}{2}$

Answer: C

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60. If $f(V)$ and f_R are the focal lengths of a convex lens for violet and red light respectively and $F_V$and F_R are the focal lengths of concave lens for violet and red light respectively, then we have

A. $f_V > f_R$ and $F_V > F_R$

B. $f_V < f_R$ and $F_V > F_R$

C. $f_V > f_R$ and $F_V < F_R$

D. $f_V < f_R$ and $F_V < F_R$

Answer: D

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61. A convex lens of focal length 80 cm and a concave lens of focal length 50 cm are combined toghether. What will be their resulting power ?

A. $+7.5D$

B. $-0.75D$

C. $+6.5D$

D. $-6.5D$

Answer: B

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62. The focal lengths of a converging lens measured for violet, green and red colours of $fv' f_G' f_R$ respectively. We will find

(A). $f_R > f_G > f_V$ (B). $f_v < f_R < f_G$

(C). $f_V > f_R > f_G$ (D). $f_V = f_R = f_G$

A. $f_v < f_f$

B. $f_g > f_f$

C. $f_v = f_g$

D. $f_g = f_f$

Answer: A

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63. A luminous object is placed at a distance of 30 cm. from the convex lens of focal length 20 cm. On the other side of the lens, at what distance from the lens, a convex mirror of radius of curvature 10 cm. be placed in order to have an upright image of the object coincident with it ?

A. 50 cm

B. 30 cm

C. 12 cm

D. 60 cm

Answer: A

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64. A plano convex lens is made of material of refactive index 1.6 The radius of curvature of the curved surface is 60 cm. The focal length of the lens is

A. 200 cm

B. 100 cm

C. 50 cm

D. 400 cm

Answer: B

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65. For a plane convex lens $(\mu = 1.5)$ has radius of curvature 10 cm. It is slivered on its plane surface. Find focal length after silvering:

A. 10 cm

B. 20 cm

C. 15 cm

D. 25 cm

Answer: A

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66. A bubble in glass slab $(\mu = 1.5)$ when viewed from one side appears at 5 cm and 2 cm from other side, then thickness of slab is :

A. 3.75 cm

B. 3 cm

C. 10.5 cm

D. 2.5 cm

Answer: C

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67. A body is locatyed on a wall. Its image of equal size is to be obtained on parallel wall with the help of a convex lens. The lens is placed at a distance d ahead of second wall, then the required focal length will be

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

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

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

D. Less than or equal to $\frac{d}{4}$

Answer: D

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68. 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. Become infinite

C. Become small, but non-zero

D. Remain unchanged

Answer: B

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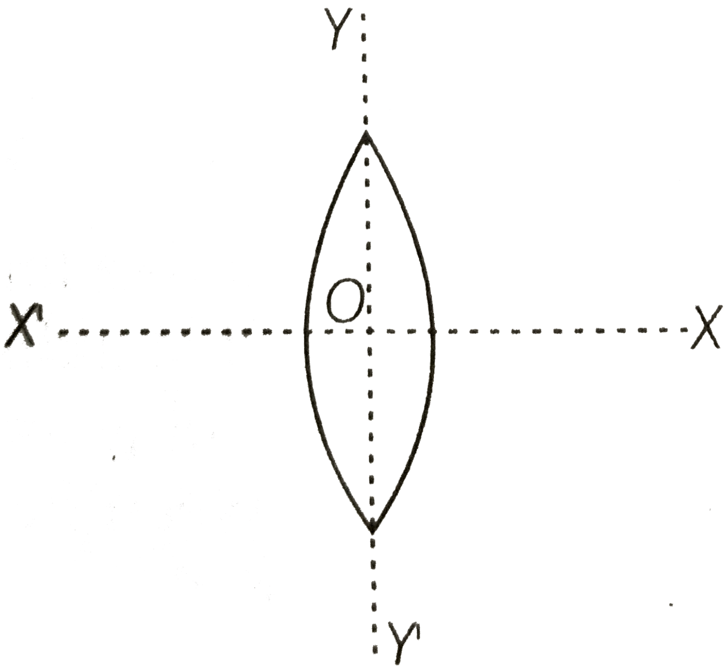
69. An equiconvex lens in cut into two halves along (i) XOX' f,f',f'' be the focal lengths of the complete lens, of each half in case (i) and of each half in case (ii) respectively.



Choose the correct statement from the following

A. f' = f, f" = 2f

B. f' = 2f, f" = f

C. f' = f, f" = f

D. f' = 2f, f" = 2f

Answer: A

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70. Which of the following is incorrect?

A. A thin convex lens of focal length f_1 is placed in contact with a thin concave lens of focal length f_2. The combination will act as convex lens if $f_1 < f_2$

B. Light on reflection at water-glass boundary will undergo a phase change of π

C. Spherical aberration is minimized by achromatic lens

D. If the image of distant object is formed in front of the retina then defect of vision may be myopia

Answer: C

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71. A double concave thin lens made out of glass $(\mu = 1.5)$ have radii of curvature 500cm. This lens is used to rectify the defect in vision of a person. The far point of the person will be at

A. 5 m

B. 2.5 m

C. 1.25 m

D. 1 m

Answer: A

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72. A convex lens forms a real image 16 mm long on a screen. If the lens is shifted to a new position without disturbing the object or the screen then again a real image of length 81 mm is formed. The length of the object must be

A. 48.5 mm

B. 36 mm

C. 6 mm

D. 72 mm

Answer: B

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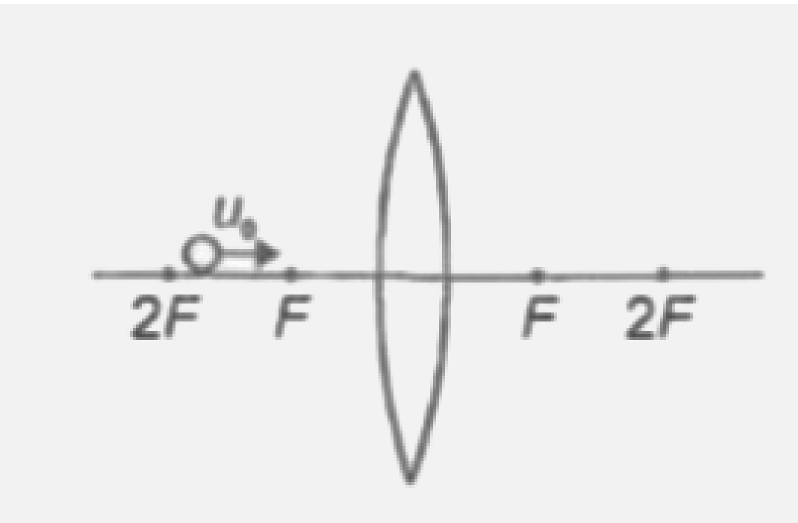
73. A point object is moving with speed u_0 at a position somewhere between 2F and F in front of a convex lens. The speed of its image is



A. $> u_0$

B. $< u_0$

C. $= u_0$

D. May be (1) or (2)

Answer: A

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74. The minimum magnifying power of an astronomial telescope is M. If the focal length of its eye-lens is halved, how much times the minimum magnifying power will increase.

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

B. 2M

C. 3M

D. 4M

Answer: B

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75. An object is placed in front of two convex lenses one by one at a distance u from the lens. The focal lengths of the lenses are 30 cm and 15 cm respectively. If the size of image formed in the two cases is same, then u is

A. 15 cm

B. 20 cm

C. 25 cm

D. 30 cm

Answer: B

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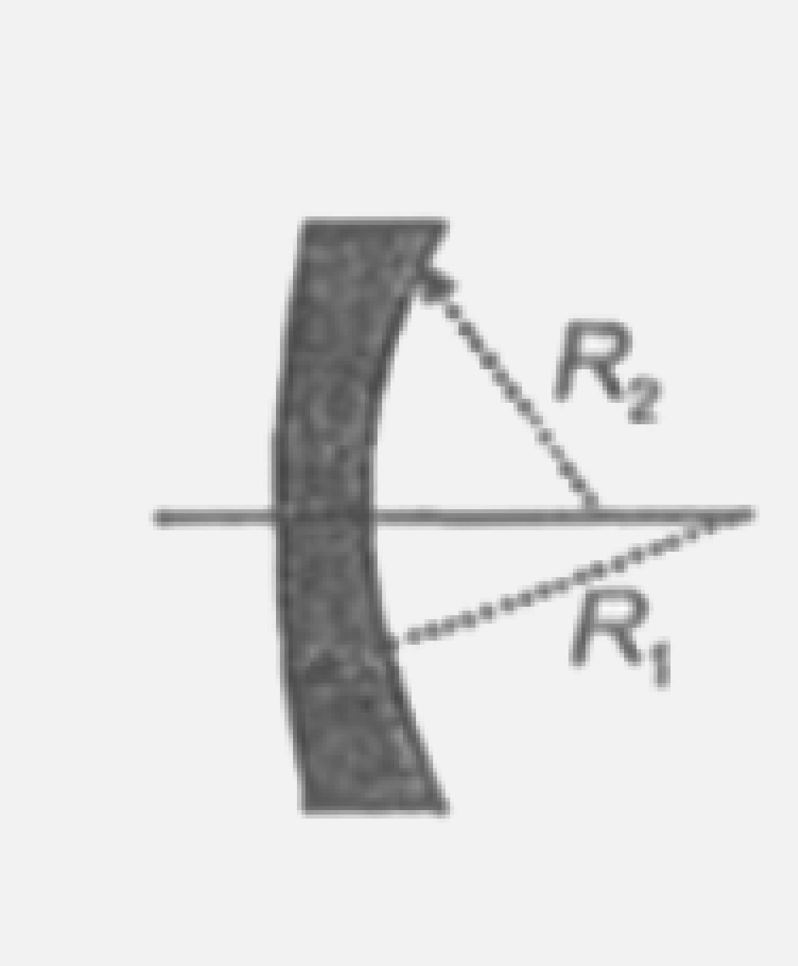
76. If R_1 and R_2 are the radii of curvature of the spherical surfaces of a thin lens and $R_1 > R_2$, then this lens can



A. Correct myopia

B. Correct hypermetropia

C. Correct presbiopia

D. Correct astigmatism

Answer: A

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77. The focal length of a thin lens in vacuum is f. If the material of the lens has $\mu = 3/2$, its focal length when immersed in water of refractive index $4/3$ will be.

A. f

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

C. 2f

D. 4f

Answer: D

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78. An astronomical telescope of ten-fold angular magnification has a length of $44 cm$. The focal length of the objective is

A. 44 cm

B. 440 cm

C. 4 cm

D. 40 cm

Answer: D

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79. Ray optics is valid, when characteristic dimensions are

A. Mush smaller than the wavelength of light

B. Of the same order as the wavelength of light

C. Of the order of one millimeter

D. Much larger than the wavelength of light

Answer: D

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80. The blue colour of the sky is due to

A. Scattering

B. Dispersion

C. Reflection

D. Refraction

Answer: A

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ASSIGNMENT (SECTION - D)

1. A : Plane and convex mirrors can produce real images of objects.

R : A plane of convex mirror can produce a real image if the object is virtual.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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2. A : A virtual image cannot be caught on a screen but it can be photographed.

R : The virtual image here serves as an object for the lens of the camera to produce a real image.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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3. A : When a diver under water looks obliquely at a fisherman standing on the bank of a lake then fisherman looks taller.

R : When a ray of light travelling in air enters water, it bends towards the normal.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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4. A : The apparent depth of a tank of water decreases if viewed obliquely.

R : Real depth decreases if viewed obliquely.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: C

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5. A : Proper cutting of diamond makes it sparkle.

R : Diamond has very large refractive index.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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6. 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 so the magnification produced is one.

R : During image formation through magnifying glass, the object as well as its image are at the same position.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: D

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7. The total plane angle subtended by a circle at its centre is

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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8. A : Magnifying power of a simple microscope cannot be increased beyond a limit.

R : Magnifying power is inversely proportional to focal length and there are some practical difficulty of grinding, aberrations etc. because of which focal length cannot be decreased below a limt.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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9. A : The objective and the eye-piece of a compound microscope should have short focal lengths.

R : Magnifying power of a compound microscope is inversely proportional to the focal lengths of both the lenses.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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10. A : When viewing through a compound microscope, our eyes should be positioned not on the eye piece but a short distance away from it for best viewing.

R : The image of the objective in the eye-piece is known as 'eye-ring' and if we position our eyes on the 'eye-ring' and the area of the pupil of out eye is greater or equal to the area of the eye ring, our eyes will collect all the light refracted by the objective.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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11. A uniform capillary tube of inner radius r is dipped vertically into a beaker filled with water. The water rises to a height h in the capillary tube above the water surface in the beaker. The surface tension of water is σ. The angle of contact between water and the wall of the capillary tube is θ. Ignore the mass of water in the meniscus. Which of the following statements is (are) true?

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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12. A : A virtual image cannot be produced on screen.

R : The light energy does not meet at the point(s) where virtual image is formed.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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13. A : Lenses of large aperture suffer from spherical aberration.

R : The curvature of the lens at central and peripheral regions is different.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: C

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14. A : The image formed by a concave lens is always virtual.

R : The rays emerging from a concave lens never meet on the principal axis.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: D

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15. A : When two lenses in contact form an achromatic doublet, then the materials of the two lenses are always different.

R : The dispersive powers of the materials of the two lenses are of opposite sign.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: C

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16. A : A reflecting type of telescope is preferred over refracting type in astronomy.

R : A reflecting type of telescope is free from chromatic aberration and spherical aberration.

A. If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).

B. If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).

C. If Assertion is true statement but Reason is false, then mark (3).

D. If both Assertion and Reason are false statements, then mark (4).

Answer: A

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