PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

RAY OPTICS AND OPTICAL INSTRUMNTS

Physics

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

$\cos(A/2)$. The angle of minimum deviation is

A. $\pi - 2A$

B. $\pi - A$

C. $\dfrac{\pi}{2} - 2A$

D. $\dfrac{\pi}{2} - A$

Answer:

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2. If two lenses of $+5$ dioptres are mounted at some distance apart, the equivalent power will always be negative if the distance is

    A. greater than 40 cm

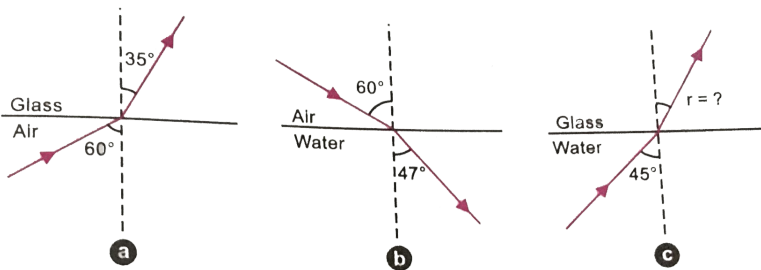   B. equal to 40 cm

    C. equal to 10 cm

    D. less than 10 cm

Answer:

3. Fig. (a) and (b) show refraction of an incident ray in air at $60°$ with the normal to a glass-air and water-air interface respectively. Predict the angle of refraction of an incident ray in water at $45°$ with the normal to a water glass interface. Take $.^a\mu_g = 1.32$.

A. $30°$

B. $35°$

C. $60°$

D. $41°$

Answer:

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

A. $36\sqrt{5}$

B. $4\sqrt{5}$

C. $36\sqrt{7}$

D. $36/\sqrt{7}$

Answer:

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5. Let f_v and f_r are the focal lengths of a convex lens for violet and red lights respectively. If F_v and F_r are the focal lengths

of a concave lens for violet and red light respectively, then

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:

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6. Spherical aberration in a lens

A. is minimum when most of the deviation

is at first surface

B. is minimum when most of the deviation

is at the second surface

C. is minimum when the total deviation is

equally distributed over the two surfaces

D. does not depend on the above

considerations

Answer:

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7. 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 the end closer to the pole is 20 cm away from it. Find the length of the image.

    A. 10 cm

    B. 15 cm

C. 2.5 cm

D. 5 cm

Answer:

8. A telescope consists of two lenses of focal lengths $0.3m$ and $3cm$ respectively. It is fucussed on moon which subtends an angle of $0.5°$ at the obejctive. Calculate the angle

subtended at the eye by the final image in normal adjustment of the telescope.

A. 5°

B. 0.25°

C. 0.5°

D. 0.35°

Answer:

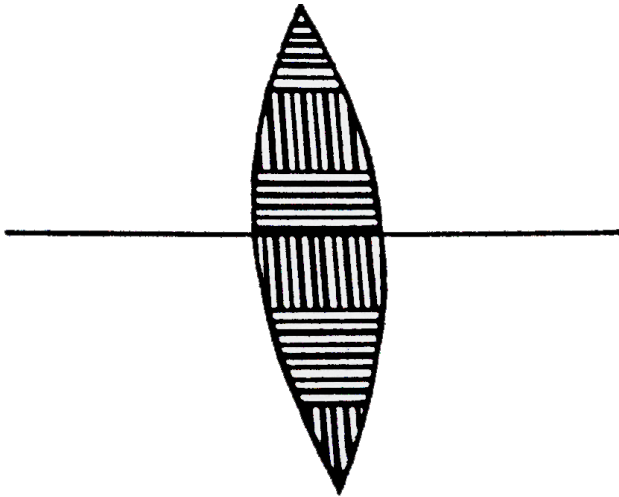▶ **Watch Video Solution**

9. The layered lens as shown is made of two types of transparent materials-one indicated by horizontal lines and the other by vertical lines. The number of images formed of an object will be

A. 1

B. 2

C. 3

D. 6

Answer:

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10. A person's near point is $50cm$ and his far point $3m$. Power of the lenses he requires for

(i) reading and

(ii) for seeing distant stars are

A. –2 D and + 3 D

B. +2 D and –3 D

C. +2 D and –0.33 D

D. –2 D and + 0.33 D

Answer:

11. A ray of light falls on a transparent glass slab of refractive index 1.62. If the reflected ray

and the refracted rays are mutually perpendicular, what is the angle of refraction ?

A. $\tan^{-1}(1.62)$

B. $\tan^{-1}\left(\dfrac{1}{1.62}\right)$

C. $\tan^{-1}(1.33)$

D. $\tan^{-1}\left(\dfrac{1}{1.33}\right)$

Answer:

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12. A telescope has an objective of focal length 100 cm and an eyepiece of focal length 5 cm. What is the magnifying power of the telescope when the final image is formed at the least distance of distinct vision ?

    A. 20

    B. 24

    C. 28

    D. 32

Answer:

13. Which light rays undergoes two internal reflection inside a raindrop, which of the rainbow is formed?

A. Primary rainbow

B. Secondary rainbow

C. Both (a) and (b)

D. Can't say

Answer:

14. When a plane mirror is placed horizontally on level ground at a distance of 60 m from the foot of a tower, the top of the tower and its image in the mirror subtend and angle of $90°$ at the eye. The height of the tower is

    A. 30m
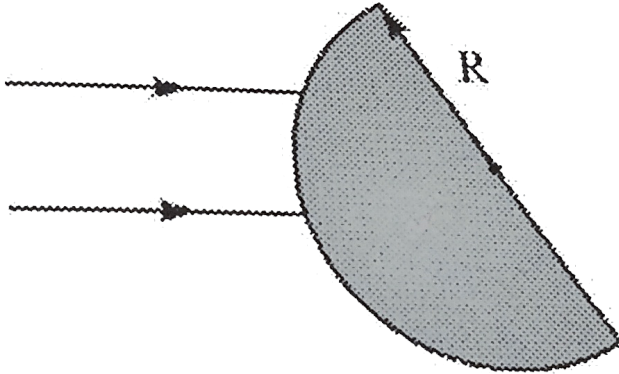
    B. 60m

    C. 90m

D. 120m

Answer:

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15. A parallel beam of light is incident on the surface of a transparent hemisphere of radius R and refractive index 2.0 as shown in figure. The position of the image formed by

refraction at the first surface is :

A. R/2

B. R

C. 2 R

D. 3R

Answer:

16. A lens made of glass whose index of refraction is 1.60 has a focal length of + 20 cm in air. Its focal length in water, whose refractive index is 1.33, will be

A. three times longer than in air

B. two times longer than in air

C. same as in air

D. None of these

Answer:

17. A compound microscope has an eye piece of focal length $10cm$ and an objective of focal length $4cm$. Calculate the magnifcation, if an object is kept at a distance of $5cm$ from the objective so that final image is formed at the least distance vision $(20cm)$

A. 12

B. 11

C. 10

D. 13

Answer:

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18. For a prism kept in air, it is found that for

an angle of incidence $60°$, the angle of

refraction A, angle of deviation δ and anble of

emergence e become equal. Then, the refractive index of the prism is

A. 1.73

B. 1.15

C. 1.5

D. 1.33

Answer:

19. 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. −1.0 D

    B. −1.33 D

    C. −1.67 D

    D. −2.0 D

Answer:

20. An object is placed at a distance of 40 cm in front of a concave mirror of focal length 20 cm. The image produced is

A. real, inverted and smaller in size

B. real, inverted and of same size

C. real and erect

D. virtual and inverted

Answer:

21. A vessel of depth d is half filled with a liquid of refractive index μ_1 and the other half is filled with a liquid of refractive index μ_2. The apparent depth of the vessel, when looked at normally, is

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

B. $\dfrac{x\mu_1 + \mu_2}{2(\mu_1 + \mu_2)}$

C. $\dfrac{x\mu_1 + \mu_2}{(\mu_1 + \mu_2)}$

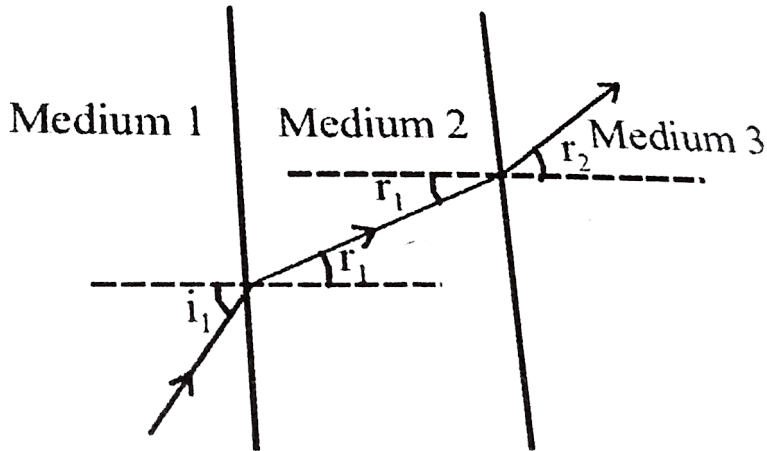D. $\dfrac{2x(\mu_1 + \mu_2)}{\mu_1\mu_2}$

Answer:

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22. The following figure shows refraction of

light at the interface of three media Correct

the order of optical density (d) of the media is

A. $d_1 > d_2 > d_3$

B. $d_2 > d_1 > d_3$

C. $d_3 > d_3 > d_2$

D. $d_2 > d_3 > d_1$

Answer:

23. 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. $\sin^{-1}\left(\dfrac{2}{3}\right)$

B. $\tan^{-1}\left(\dfrac{3}{4}\right)$

C. $\tan^{-1}\left(\dfrac{2}{3}\right)$

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

Answer:

24. The refractive index of a glass is 1.520 for red light and 1.525 for blue light. Let D_1 and D_2 be angles of minimum deviation for red and blue light respectively in a prism of this glass. Then,

    A. $D_1 < D_2$

    B. $D_1 = D_2$

C. D_1 can be less than or greater than D_2

depending upon the angle of prism

D. $D_1 < D_2$

Answer:

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

A. Working of optical fibre

B. Difference between apparent and real

depth of pond

C. Mirage on hot summer days

D. Brilliance of diamond

Answer:

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26. A body is located on a wall. Its image of

equal size is to be obtained on a parallel wall

with the help of a convex leng. The lens is

placed at a distance d ahead of second wall, then the required focal length will be:

A. $only \dfrac{D}{4}$

B. $only \dfrac{D}{2}$

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

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

Answer:

27. A concave mirror forms the image of an object on a screen. If the lower half of the mirror is covered with an opaque card, the effect would be

    A. image less bright.

    B. lower half of the image disappear.

    C. upper half of the image disappear

    D. image blurred.

Answer:

28. A ray of light passes through an equilateral prism (refractive index 1.5) such that angle of incidence is equal to angle of emergence and the latter is equal to $3/4th$ of the angle of prism. Calculate the angle of deviation.

A. $25°$

B. $30°$

C. $45°$

D. $35°$

Answer:

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29. The power of a biconvex lens is 10 dioptre and the radius of curvature of each surface is 10 cm. Then the refractive index of the material of the lens is

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

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

C. $\dfrac{9}{8}$

D. $\dfrac{5}{3}$

Answer:

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

A. 4.5 cm downward

B. 1 cm downward

C. 2 cm upward

D. 1 cm upward

Answer:

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31. What causes chromatic aberration?
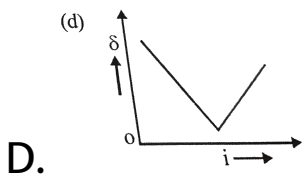
A. Marginal rays

B. Central rays
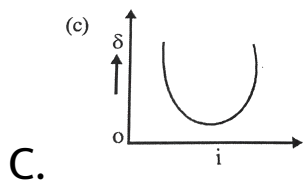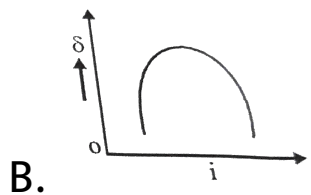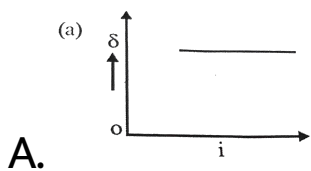
C. Difference in radii of curvature of its surfaces

D. Variation of focal length of lens with colour

Answer:

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32. The graph between angle of deviation (δ) and angle of incidence (i) for a triangular prism is represented by

A.

B.

C.

D.

Answer:

33. The ratio of thickness of plates of two transparent medium A and B is 6 : 4. If light takes equal time in passing through them, then refractive index of A with respect to B will be

   A. 1.33

   B. 1.75

C. 1.4

D. 1.5

Answer:

34. A rectangular block of glass is placed on a mark made on the surface of the table and it is viewed from the vertical position of eye. If refractive index of glass be μ and its thickness d, then the mark will appear to be raised up by

A. $\dfrac{(\mu + 1)d}{\mu}$

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

C. $\dfrac{(\mu + 1)}{\mu d}$

D. $\dfrac{(\mu - 1)\mu}{d}$

Answer:

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35. If a glass prism is dipped in water, its dispersive power

A. increases

B. decreases

C. does not change

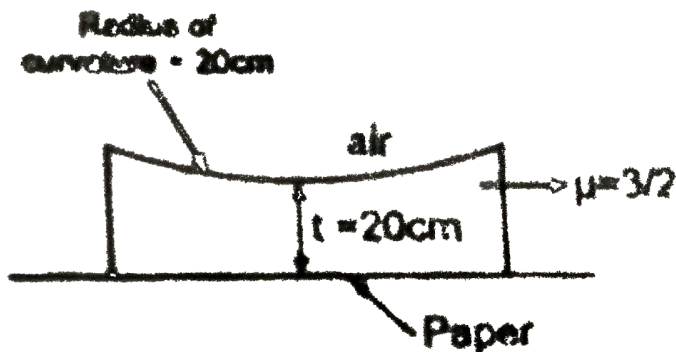D. may increase or decrease depending on whether the angle of the prism is less than or greater than 60°

Answer:

36. In the given figure a plano-concave lens is placed on a paper on which a flower is drawn. How far above its actual position does the flower appear to be ?

A. 10 cm

B. 15 cm

C. 50 cm

D. None of these

Answer:

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

A. $60°$

B. $90°$

C. $120°$

D. $30°$

Answer:

38. Light propagates with speed of $2.2 \times 10^8 m/s$ and m/s `2.4 xx10 ^(8)´ in the media P and Q respectively. The critical angle of incidence for light undergoing reflection from P and Q is

A. $\sin^{-1}\left(\dfrac{1}{11}\right)$

B. $\sin^{-1}\left(\dfrac{11}{12}\right)$

C. $\sin^{-1}\left(\dfrac{5}{12}\right)$

D. $\sin^{-1}\left(\dfrac{5}{11}\right)$

Answer:

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39. A thin convergent glass lens $\left(\mu_g = 1.5\right)$ 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. 5/3

C. 5/4

D. 43621

Answer:

40. A ray of light travelling inside a rectangular glass block of refractive index$\sqrt{2}$is incident on the glass-air surface at an angle of incidence of $45°$. The refractive index of air is one. Under these conditions the ray will

   A. emerge into the air without any

      deviation

   B. be reflected back into the glass

   C. be absorbed

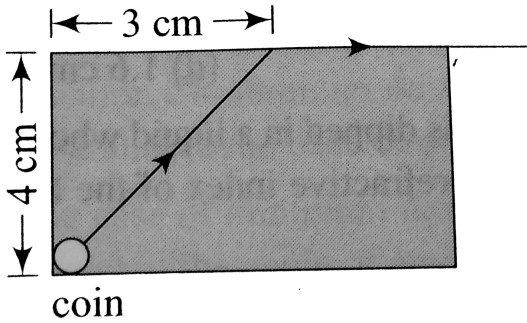D. emerge into the air with an angle of

refraction equal to $90°$

Answer:

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41. A small coin is resting on the bottom of a

beaker filled with a liquid. A ray of light from

the coin travels up to the surface of the liquid

and moves along its surface (see figure).

How fast is the light travelling in the liquid ?

A. $2.4 \times 10^8 m/s$

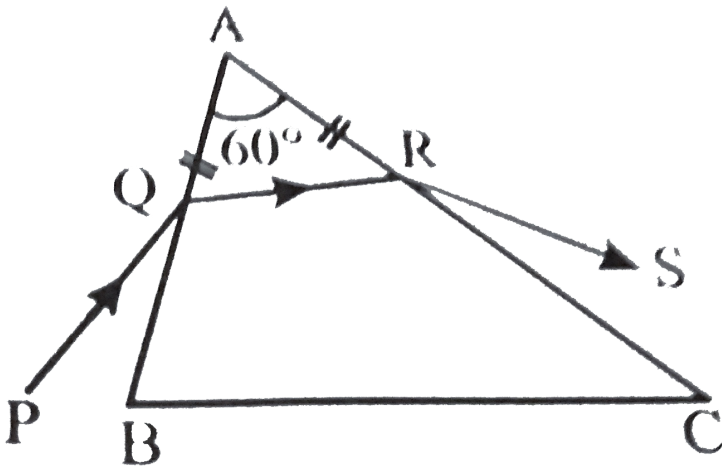B. $3.0 \times 10^8 m/s$

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

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

Answer:

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42. A ray PQ incident on the refracting face BA is refracted in the prism BAC as shown in the figure and emerges from the other refracting face AC as RS such that AQ = AR. If the angle of prism $A = 60°$ and the refractive index of the meterial of prism is $\sqrt{2}$, then the angle of deviation of the ray is

A. 60°

B. 45°

C. 30°

D. none of these

Answer:

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43. When a biconvex lens of glass having refractive index 1.47 is dipped in a liquid, it

acts as a plane sheet of glass. This implies that the liquid must have refractive index.

A. equal to that of glass

B. less then one

C. greater than that of glass

D. less then that of glass

Answer:

44. Show that the angle of deviation produced by a thin prism is reduced to one fourth (w.r.t. air) when it is immersed in water. Given $.^a \mu_g = 3/2$ and $.^a \mu_g = 4/3$.

A. $\dfrac{1}{5}$

B. $\dfrac{1}{4}$

C. $\dfrac{1}{2}$

D. $\dfrac{1}{3}$

Answer: