doubtnut
India's Number 1 Education App

PHYSICS

BOOKS - MTG GUIDE

OPTICS

Illustration

1. Show that the minimum size of a plane mirror required to see the full image of an observer is half the size of that observer.

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2. Two mirrors are placed at right angle to each other. A man is standing between them combining his hair. How many images he will see?

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3. Assume that a certain spherical mirror has a focal length of -10.0 cm. Locate and describe the

image for object distances of (a) 25.0 cm (b) 10.0 cm (c) 5.0 cm.

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4. (a) Find the refractive index of glass with respect to water. Given : $\mu_{gw} = \frac{3}{2} \text{and} \mu_{w} = \frac{4}{3}$.

(b) A source of yellow light placed in air is observed by a person swimming under water. If the wavelength of yellow light in air is

$6000Å$, then find its speed, wavelength and colour as observed by the person.

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5. When a ray passes through a glass slab of thickness t at an angle i with an angle of refraction r, what is the lateral shift of the emergent ray ?

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6. A stone S is on the bottom of a swimming pool. The depth of the lying pool is d and index of refraction of water is μ. What is the depth of the swimming pool visible to a normal eye ? Cheak the results with $d = 6ft$ and $\mu = 1.5$.

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7. In the figure shown for an angle of incidence i at the top of the surface, what is the minimum refractive index for total internal reflection at the vertical surface.

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8. Calculate the focal length of a biconvex lens in air if the radii of its surfaces are 60 cm and 15 cm. Refractive index of glass = 1.5

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9. A magnifying lens has a focal length of 10 cm. (a) Where should the object be placed if the image is to be 30 cm from the lens ? (b) What will be the magnification ?

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10. The deviation produced by a thin glass prism placed in air, when immersed in water is

[Given ${}_a\mu_g = 3/2$ and ${}_a\mu_w = 4/3$]

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11. A ray of light is incident on one face of a prism $(\mu = 1.5)$ at an angle of 60°. The refracting angle of the prism is also 60°. Find the angle of emergence and the angle of deviation. Is there any other angle of incidence, which will produce the same deviation?

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12. What is the required condition, if the light incident on one face, does not emerge from the other face ?

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13. Calculate the dispersive power of crown glass where $\mu_V = 1.522$ and $\mu_R = 1.514$.

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14. A compound microscope has an objective of focal length 1 cm and an eyepiece of focal length 2.5 cm. An object has to be placed at a distance of 1.2 cm away from the objective for normal adjustment. a.Find the angular magnification. b.Find the length of the microscope tube.

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15. An astronomical telescope has an angular magnification of magnitude 5 for distant object. The separation between the objective and eyepiece is $36cm$ and the final image is formed at infinity. Determine the focal length of objective and eyepiece.

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16. The interference pattern of two identical slits separated by a distance $d = 0.25$ mm is observed on a screen at a distance of 1 m from the plane of the slits. The slits are illuminated by monochromatic light of wavelength 589.3 nm (sodium D) travelling perpendicular to the plane of the slits. Bright bands are observed on each side of the central maxima. Calculate the separation between adjacent bright bands ?

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17. In a Young's doule slit experiment, the slits are 2 mm apart and are illuminated with a mixture of two wavelengths $\lambda = 750nm$ and $\lambda' = 900nm$. At what distance from the common central bright fringe on a screen 1.5 m from the slits will a bright fringe from one interference pattern coincide with a bright fringe from the other?

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18. The intensity of the light coming from one of the slits in a Young's double slit experiment is double the intensity from the other slit. Find the ratio of the maximum intensity to the minimum intensity in the interference fringe pattern observed.

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19. Light of wavelength 580 nm is incident on a slit having a width of 0.300 nm The viewing screen is 2.00 m from the slit. Find the positions of the first dark fringe and the width of the central bright fringe.

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20. In a single slit diffraction expriment, first minimum for red light $(660nm)$ coincide with first maximum of some other wavelength λ'. Calculate λ'.

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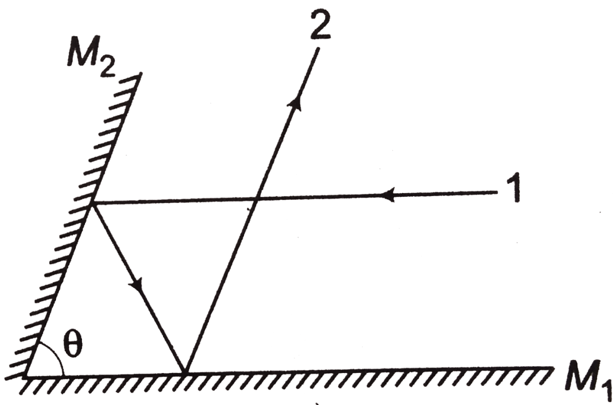
Topicwise Practice Questions

1. Two plane mirror M_1 and M_2 area inclined at angle θ as shown. A ray of light 1, which is parallel to M_1strikes M_2 and after two reflection , the ray 2 become parrallel to M_2 .Find the angle θ



A. 0°

B. 30°

C. 45°

D. 60°

Answer: D

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2. A ray of light is incident on a plane mirror at an angle of incidence of 30°. The deviation produced by the mirror is

A. 30°

B. 60°

C. 90°

D. 120°

Answer: D

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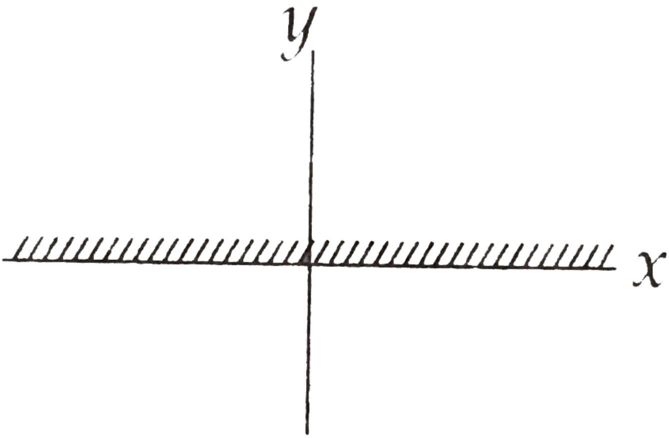
3. A plane mirror is placed along the x-axis facing negative y-axis. The mirror is fixed, A point object is moving with $3\hat{i} + 4\hat{j}$ in front of the plane mirror. The relative velocity of image with respect to its object is



A. $-8\hat{j}$

B. 8 hatj`

C. $3\hat{i} - 4\hat{j}$

D. $-6\hat{i}$

Answer: A

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4. A student of height 1.9 m can see his full image in a plane mirror fixed on a wall. His eyes are 1.85 m from the floor level. What is the minimum length of the plane mirror required to get the full image of the student ?

A. 0.1 m

B. 0.7 m

C. 0.9 m

D. 0.5 m

Answer: C

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5. A man runs towards a mirrorr at a speed $15m/s$. The speed of the image relative to the man is

A. $15ms^{-1}$

B. $30ms^{-1}$

C. $35ms^{-1}$

D. $20ms^{-1}$

Answer: B

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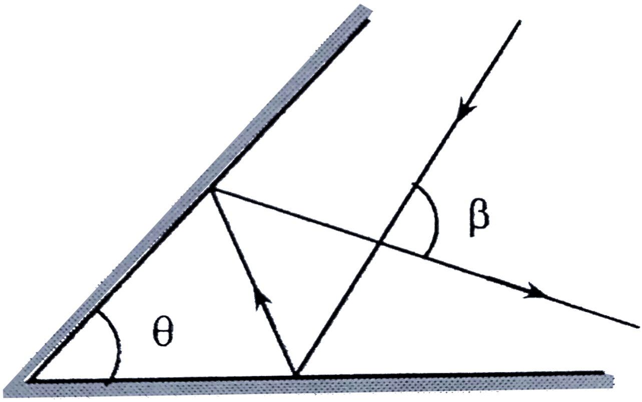
6. The reflecting surface of two intersecting flat mirrors are at an angle $\theta(0^{\circ} < \theta < 90^{\circ})$. As shown in Figure. For a light ray that strikes the horizontal mirror, the emerging ray intersects the incident ray at an angle β . If one of the mirrors is rotated at $\frac{d\theta}{dt} = 1^\circ / s$, then the angle β changes aat the rate of



A. $\phi = \theta$

B. $\phi = 180^\circ - \theta$

C. $\phi = 90^\circ - \theta$

D. $\phi = 180^\circ - 20$

Answer: D

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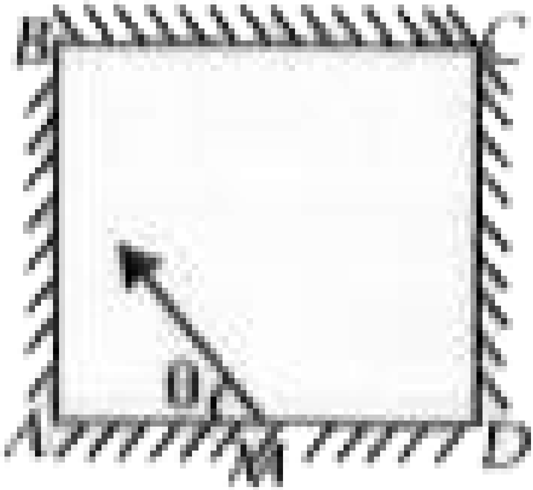
7. Four indentical mirrors are made to stand vertically to form a square arrangement as shown in a top view. A ray starts from the midpoint M of mirror AD and after two reflections reaches corner D. Then, angle θ

must be



A. $\tan^{-1}(0.75)$

B. $\cot^{-1}(0.75)$

C. $\sin^{-1}(0.75)$

D. $\cos^{-1}(0.75)$

Answer: B

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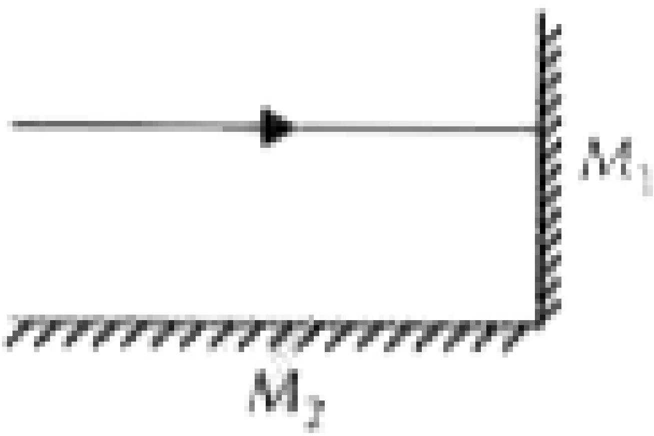
8. A ray of light strikes a silvered surface inclined to another one at an angle of 90°. Then the reflected ray will turn through



A. 0°

B. 45°

C. 90°

D. 180°

Answer: D

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9. A concave mirror gives an image three times as large as the object placed at a distance of

20 cm from it . For the image to be real , the focal length should be-

A. 10 cm

B. 15 cm

C. 20 cm

D. 30 cm

Answer: B

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10. The speed at which the image of the luminous point object is moving, if the luminous point object is moving at speed v_0 towards a spherical mirror, along its axis is (Given, $R =$ radius of curvature $u =$ object distance)

A. $v_i = -v_0$

B. $v_i = -v_0\left(\frac{R}{2u - R}\right)$

C. $v_i = -v_0\left(\frac{2u - R}{R}\right)$

D. $v_i = -v_0\left(\frac{R}{2u - R}\right)^2$

Answer: D

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11. An object is placed in front of a convex mirror of a radius of curvature 20 cm. Its image is formed 8 cm behind the mirror. The object distance is

A. 20 cm

B. 40 cm

C. 60 cm

D. 80 cm

Answer: B

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12. Two objects A and B when placed in turn in front of a concave mirror of radius of curvature $15cm$, give images of equal size. If A is three times the size of B and is placed $30cm$ from the mirror, the distance of B from the mirror is

A. 18 cm

B. 15 cm

C. 20 cm

D. 25 cm

Answer: B

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13. An object is placed in front of a spherical mirror of focal length f. If x and x' recpectively represent the distance of the object and the image from the focus, then

A. $f = x + x'$

B. $f^2 = xx$

C. $f = |x - x'|$

D. $f = xx$

Answer: B

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14. When an object is kept at a distance of 30cm from a concave mirror, the image is formed at a distance of 10 cm. If the object is moved with a speed of $9cms^{-1}$ the speed with which the image moves is

A. $10ms^{-1}$

B. $1ms^{-1}$

C. $9ms^{-1}$

D. $0.9ms^{-1}$

Answer: B

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15. The image formed by a spherical mirror is virtual. The mirror will be.

A. concave only

B. convex only

C. plane

D. concave or convex

Answer: A

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16. If the lower half of a concave mirror's reflecting surface is made opaque, which of the following statements describe the image of an object placed in front of the mirror ?

S1 : Intensity of the image will increase.

S2 : The image will show only half of the object.

S3 : No change in the image.

S4 : Intensity if the image will be reduced to half.

A. S1 only

B. S2 only

C. S2 and S3

D. S4 only

Answer: D

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17. An object is placed at 15 cm in front of a concave mirror whose focal length is 10 cm. The image formed will be

A. magnified and inverted

B. magnified and erect

C. reduced in size and inverted

D. reduced in size and erect.

Answer: A

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18. An object placed in front of a concave mirror at a distance of x cm from the pole gives a 3 times magnified real image. If it is moved to a distance of $(x+5)$ cm, the magnification of the image becomes 2. The focal length of the mirror is

A. 15 cm

B. 20 cm

C. 25 cm

D. 30 cm

Answer: D

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19. A vessel of depth 2d cm is half filled with a liquid of refractive index μ_1 and the upper half with a liquid of refractive index μ_2. The apparent depth of the vessel seen perpendicularly is

A. $\frac{d}{2}\left[\frac{1}{\mu_1}+\frac{1}{\mu_2}\right]$

B. $2d\left[\frac{1}{\mu_1}+\frac{1}{\mu_2}\right]$

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

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

Answer: C

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20. The reflective index of water with respect to air is $4/3$ and the reflective index of glass with respect to air is $3/2$. Then the refractive index of water with respect to glass is

A. $9/8$

B. $8/9$

C. $1/2$

D. 2

Answer: B

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21. A plane glass slab is placed over various coloured letters. The letter which appears to be raised the least is

A. blue

B. violet

C. green

D. red

Answer: D

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22. A ray of light is incident on a medium at an angle i. It is found that the reflected ray is at right angles to the refracted ray . The refractive index of the medium is given by

A. $\mu = \frac{1}{\tan \theta}$

B. $\mu = \tan^2 \theta$

C. $\mu = \sin \theta$

D. $\mu = \tan \theta$

Answer: D

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23. A ray incident at a point at an angle of incidence of 60° enters a glass sphere with refractive index $\sqrt{3}$ and it is reflected and refracted at the farther surface of the sphere. The angle between the reflected and refracted rays at this surface is:

A. 50°

B. 60°

C. 90°

D. 40°

Answer: C

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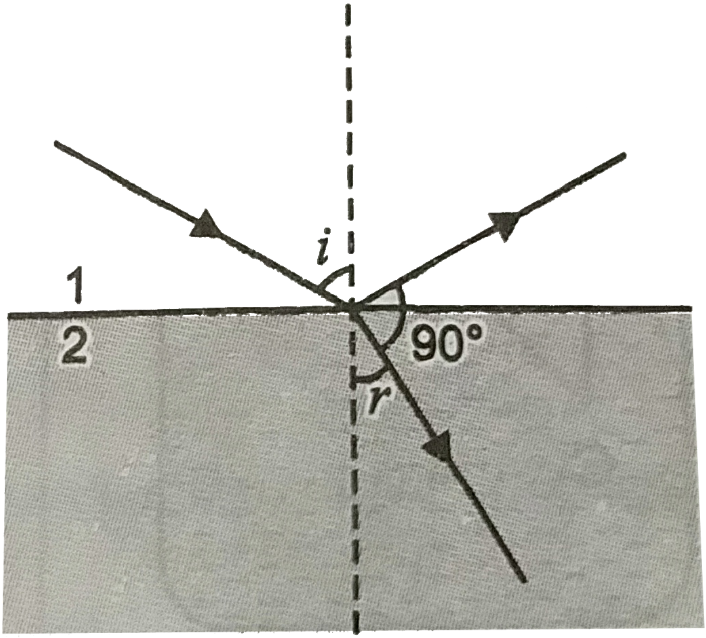
24. Light incident on a surface separating two media is partly reflected and party refracted as shown in Fig. Then :



A. $\sin i = \dfrac{\mu_2}{\left(\mu_1^2 + \mu_2^2\right)^{\frac{1}{2}}}$

B. $\tan i = \dfrac{\mu_1}{\mu_2}$

C. $\sin i = \tan r$

D. $\sin i = \sec r$

Answer: A

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25. A ray of light strikes a glass plate at an angle of 40°. If the reflected and refracted rays are perpendicular to each other the index of refractive of glass is

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

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

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

D. $\sqrt{3}$

Answer: D

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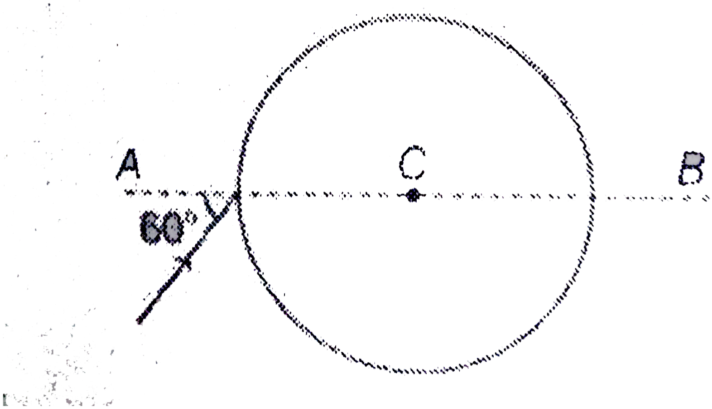
26. A ray of light falls on a transparent sphere with centre at C as shown in figure. The ray emerges from the sphere parallel to line AB.

The refractive index of the sphere is



A. $\mu = \sqrt{2}$

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

C. $\mu = \sqrt{3}$

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

Answer: A

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27. Refractive indices of water an glass are $4/3$ and $3/2$ respectively. A ray of light travelling in water is incident on the water glass interface at 30°. Calculate the angle of refraction.

A. $\sin^{-1}\left(\frac{8}{18}\right)$

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

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

D. $\sin^{-1}\left(\frac{18}{8}\right)$

Answer: A

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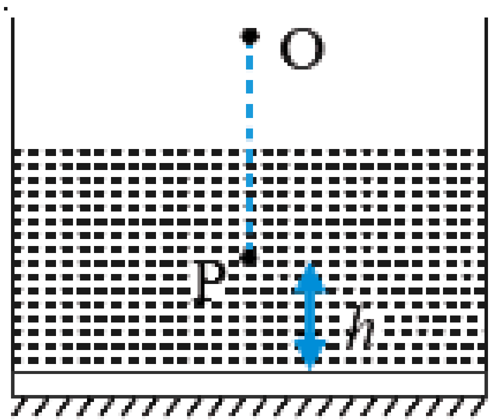
28. A plane mirror is placed at the bottom of the tank containing a liquid of refractive index μ. P is a small object at a height h above the mirror. An observer O-vertically above P outside the liquid see P and its image in the mirror. The apparent distance between these two will be:



A. $2\mu h$

B. $\dfrac{2h}{\mu}$

C. $\dfrac{2h}{\mu - 1}$

D. $h\left(1 + \dfrac{1}{\mu}\right)$

Answer: B

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29. The apparent depth of water in cylindrical water tank of diameter $2R cm$ 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 $c.c.$ per minute is $(n_1 =$ refractive index of air, $n_2 =$ refractive index of water)

A. $\dfrac{x\pi R^2\mu_1}{\mu_2}$

B. $\dfrac{x\pi R^2\mu_2}{\mu_1}$

C. $\frac{2\pi R\mu_1}{\mu_2}$

D. $\pi R^2 x$

Answer: B

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30. A ray of light is incident on a glass slab of thickness t, at an angle i,r is the angle of refraction in the glass slab. Distance travelled in the glass slab is

A. $t \cos r$

B. anr

C. $\dfrac{t}{\cos r}$

D. $\dfrac{t}{\sin r}$

Answer: C

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31. A ray of light is incident on the surface of a glass plate of thickness t. If the angle of incidence θ is small, the emerging ray would be displaced side ways by an amount

(Take n = refractive index of glass)

A. $t\left(1-\frac{i}{r}\right)$

B. $t\left(1-\frac{i}{r}\right)$

C. $it\left(1-\frac{r}{i}\right)$

D. $t\left(1-\frac{r}{i}\right)$

Answer: C

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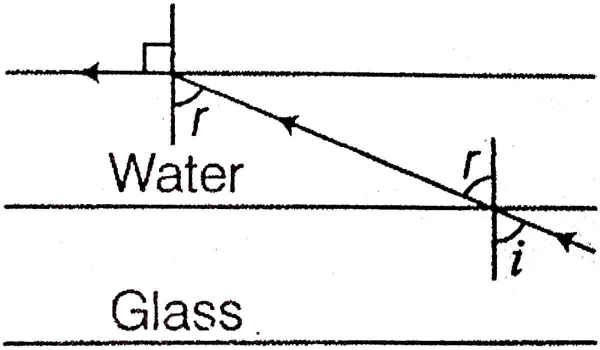
32.



A ray of light is incident at the glass-water interface at an angle i it emerges finnaly parallel to the surface of water, then the value of μ_g would be

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

B. $\frac{1}{\sin i}$

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

D. none of these

Answer: B

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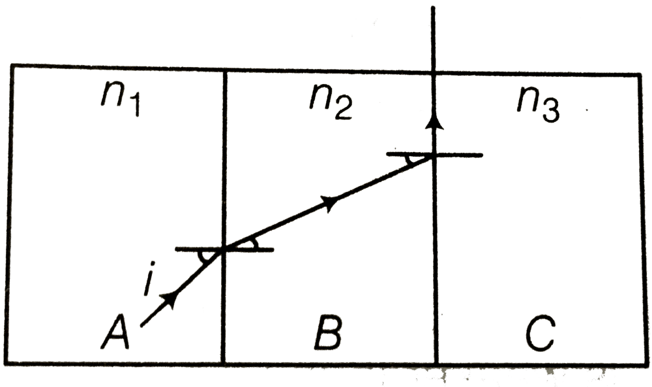
33. A,B, and C are the parallel sided transparent media of refractive indices n_1, n_2 and n_3 respectively. They are arranged as shown in the figure. A ray is incident at an angle i on the surface of separation of A and B which is as shown in the figure. After the refraction into the medium B the ray grazes the surfaces of separation of the media B and C. then $\sin i$ equal to



A. $\frac{\mu_3}{\mu_1}$

B. $\frac{\mu_1}{\mu_3}$

C. $\frac{\mu_2}{\mu_3}$

D. $\frac{\mu_1}{\mu_2}$

Answer: A

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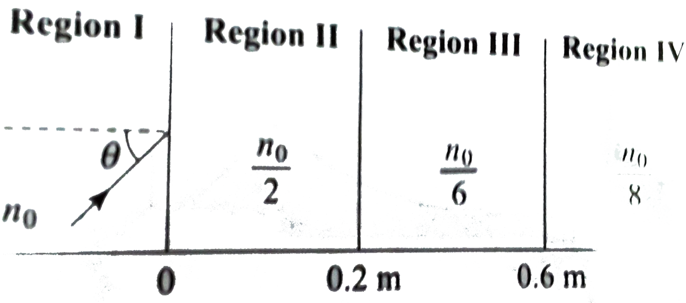
34. A light beam is traveling from Region I to region IV (refer figure). The refractive indices in Region I, II, III, and IV are $n_0, n_0/2, n_0/6$ and $n_0/8$, respectively. The angle of incidence θ for which the beam just misses entering Region IV is



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

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

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

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

Answer: B

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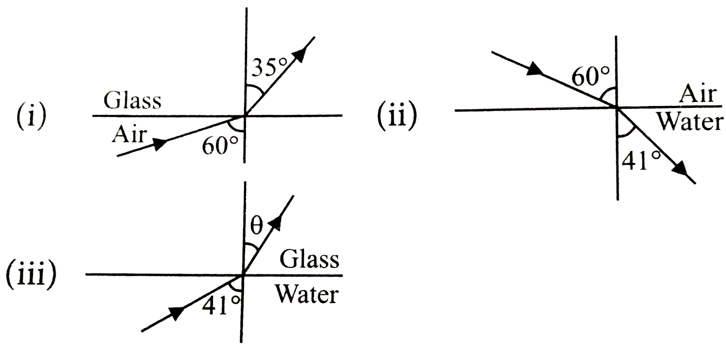
35. Refraction of light from air to glas and from air to water are shown in figure (i) and figure (ii) below. The value of the angle θ in the case of refraction as shown in figure (iii) will be



A. 30°

B. 35°

C. 60°

D. 41°

Answer: B

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36. The refractive index of water, glass and diamond are 1.33, 1.50, 2.40 respectively. The refractive index of diamond relative to water and of glass relative of diamond, respectively are nearly

A. $1.80, 0.625$

B. $0.554, 0.625$

C. $1.80, 1.6$

D. $0.554, 1.6$

Answer: A

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37. A vesse of depth x is half filled with oil of refractive index μ_1 and the other half is filled with water of refrative index μ_2. The apparent depth of the vessel when viewed above is

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

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

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

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

Answer: A

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38. Sun is visible a little before the actual sunrise and until a little after a actual sunset. This is due to

A. total internal reflection

B. reflection

C. refraction

D. polarization

Answer: C

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39. When a light ray centers a refracing medium, it is found that the magnitude of the angle of refraction is equal to half the angle of reflection. If μ is the refractive index of the medium, then the angle of incidence is

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

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

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

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

Answer: B

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40. A metal coin at the bottom of a beaker filled with a liquid of refractive index $4/3$ to height of $6cm$. To an observer looking from above the surface of the liquid, coin will appear at a depth of (consider paraxial rays).

A. 4.5 cm

B. 6.75 cm

C. 1.5 cm

D. 7.5 cm

Answer: C

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

A. Total internal reflection

B. Scattering

C. Diffraction

D. Refraction

Answer: A

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42. If the critical angle for total internal reflection from a medium to vacuum is 30°, the velocity of light in the medium is

A. 3×10^8 m/s

B. 1.5×10^8 m/s

C. 6×10^8 m/s

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

Answer: B

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43. Critical angle of glass is θ_1 and that of water is θ_2. The critical angle for water and glass surface would be $(\mu_g = 3/2, \mu_w = 4/3)$

A. between θ_1 and θ_2

B. greater than θ_2

C. less than θ_1

D. less than θ_2

Answer: B

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44. A light ray is incident normally on the face AB of a right-angled prism $ABC(\mu = \ = 1.50)$ as shown in figure. What is the largest angle ϕ for which the light ray is totally reflected at the surface AC ?

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

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

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

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

Answer: D

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45. A fish looking from within water sees the outside world through a circular horizon. If the fish $\sqrt{7}$ cm below the surface of water, what will be the radius of the circular horizon

A. 3 m

B. $\frac{3}{\sqrt{7}}$ m

C. $\sqrt{7}$ m

D. $3\sqrt{7}$ m

Answer: A

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46. A ray of light is incident at an angle α on the boundary separating two transparant media. It transmited in other medium. If the angle incidence is increased very slightly, the ray gets reflected in the same medium. The different between angles of deviation in the two cases will close to

A. α

B. $90^{\circ} - \alpha$

C. $180^{\circ} - \alpha$

D. $180^\circ - 2\alpha$

Answer: B

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47. Critical angle for light going from medium (i) to (ii) is θ . The speed of light in medium (i) is v then speed in medium (ii) is

A. $v(1 - \cos\theta)$

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

C. $\dfrac{v}{\cos\theta}$

D. $\dfrac{v}{1-\sin\theta}$

Answer: B

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48. A ray of light travelling in water is incident on its surface open to air. The angle of incidence is θ, which is less than the critical angle. Then there will be

A. only a reflected ray and no reflected ray

B. only a refracted ray and no reflected ray

C. a reflected ray and a refracted ray and the angle between them would be less than $180^\circ - 2\theta$

D. a reflected ray and a refracted ray and the single between them would be greater than $180^\circ - 2\theta$

Answer: C

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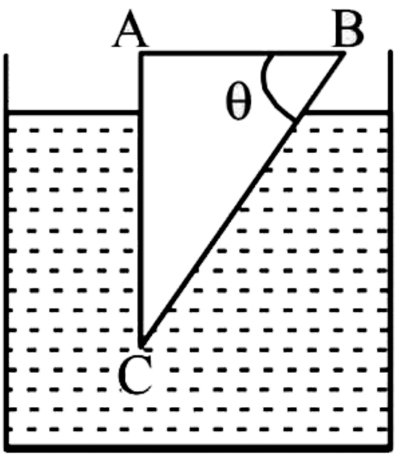
49. A glass prism of refractive index 1.5 is immersed in water (refractive index 4/3). A light beam incident normally on the face AB is totally reflected to reach on the face BC if.



A. $\sin\theta \leq \frac{2}{3}$

B. $\cos\theta \geq \frac{8}{9}$

C. $\sin\theta > \frac{8}{9}$

D. $\cos\theta \leq \frac{8}{9}$

Answer: C

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

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

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

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

Answer: D

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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. 8 cm

B. 12 cm

C. 15 cm

D. 20 cm

Answer: B

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52. A point object is placed at the center of a glass sphere of radius 6cm and refractive index 1.5. The distance of virtual image from the surface is

A. 2 cm

B. 4 cm

C. 6 cm

D. 12 cm

Answer: C

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53. A transparent sphere of radius R and refractie index μ is kept in air. At what distance from the surface of the sphere shold a point object be placed so as to form a rea image at the same distance from the sphere?

A. μR

B. $\frac{R}{\mu - 1}$

C. $\frac{R}{\mu + 1}$

D. $\frac{R}{\mu}$

Answer: B

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54. A double convex thin lens made of glass (refractive index $\mu = 1.5$) has both radii of curvature of magnitude 20 cm . Incident light rays parallel to the axis of the lens will converge at a distance L such that

A. $d = 10$

B. $d = 20/3$

C. $d = 40$

D. $d = 20$

Answer: D

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55. If a substance is behaving as convex lens in air and concave lens in water then which one of the following is its refractive index?

A. greater than air but less than water

B. greater than both air and water

C. smaller than air

D. almost equal to water

Answer: A

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56. A convex lens of focal length 20 cm made of glass of refractive index 1.5 is immersed in water having refractive index 1.33. The change in the focal length of lens is

A. 62.2 cm

B. 5.82 cm

C. 58.2 cm

D. 6.22 cm

Answer: C

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57. The focal length of a biconvex lens is 20 cm and its refractive index is 1.5. If the radii of curvatures of two surfaces of lens are in the ratio 1:2, then the larger radius of curvature is (in cm)

A. $0.045 \text{ m}, 0.09 \text{ m}$

B. $0.09 \text{ m}, 0.18 \text{ m}$

C. $0.04 \text{ m}, 0.08 \text{ m}$

D. $0.06 \text{ m}, 0.12 \text{ m}$

Answer: A

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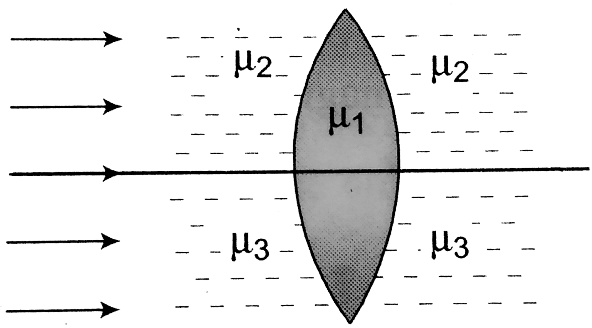
58. A double convex lens, lens made of a material of refractive index μ_1, is placed inside two liquids or refractive indices μ_2 and μ_3, as shown. $\mu_2 > \mu_1 > \mu_3$. A wide, parallel beam of light is incident on the lens from the left. The lens will give rise to



A. a single convergent

B. two different convergent beams

C. two different divergent beams

D. a convergent and divergent beam

Answer: D

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59. The radii of curvatures of a double convex lens are 15 cm and 30 cm, and its refractive index is 1.5. Then its focal length is -

A. 22 cm

B. 25 cm

C. 30 cm

D. 32 cm

Answer: A

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60. A convex Lens of focal Length "0.15m" is made of refractive "(3)/(2)" .When it is placed in liquid,its focal Length increases by "0.225m" .

Find the refractive index of the liquid.

A. $\frac{7}{4}$

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

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

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

Answer: B

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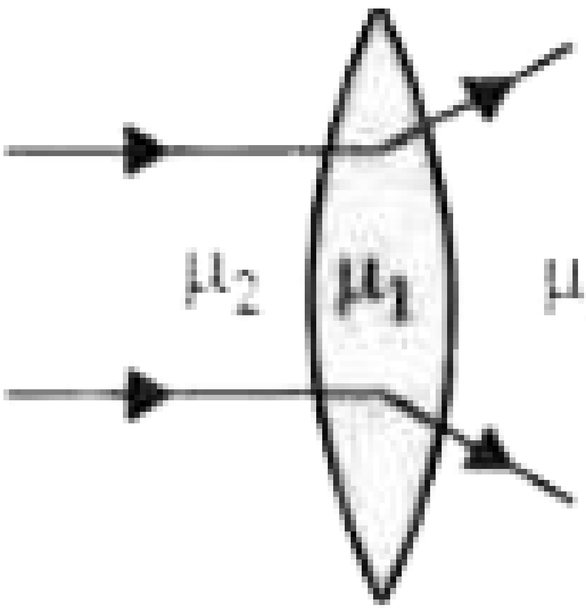
61. A convex lens made up of material of refractive index μ_1, is immersed in a medium of refractive index μ_2 as shown in the figure. The relation between μ_1 and μ_2 is



A. $\mu_1 < \mu_2$

B. $\mu_1 > \mu_2$

C. $\mu_1 = \mu_2$

D. $\mu_1 = \sqrt{\mu_2}$

Answer: A

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62. An equiconvex crown glass lens has a focal length 20 cm for violet rays. Its focal length for red rays is

$(\mu_v = 1.5 \text{and} \mu_r = 1.47)$

A. 20.82 cm

B. 21.28 cm

C. 22.85 cm

D. 24.85 cm

Answer: B

View Text Solution

63. The focal length of a convex lens of glass $(\mu = 1.5)$ in air is 30 cm. Find its focal length when the lens is placed in water $(\mu = 4/3)$.

A. 20 cm

B. 30 cm

C. 40 cm

D. 25 cm

Answer: C

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64. What is the refractive index of material of a plano-convex lens , if the radius of curvature of the convex surface is 10 cm and focal length of the lens is 30 cm ?

A. $\frac{6}{5}$

B. $\frac{7}{4}$

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

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

Answer: D

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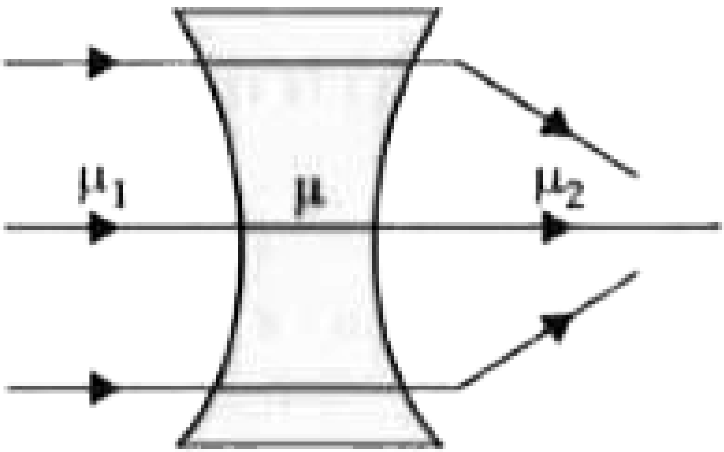
65. If the behaviour of light rays is as shown in the figure. The relation between refractive indices μ, μ_1 "and" μ_2 is



A. $\mu > \mu_2 > \mu_1$

B. $\mu < \mu_2 < \mu_1$

C. $\mu < \mu_2, \mu = \mu_1$

D. $\mu_2 < \mu_1, \mu = \mu_2$

Answer: C

View Text Solution

66. An equiconvex lens of glass of focal length 0.1 metre is cut along a plane perpendicular to principle axis into two equal parts. The ratio of focal length of new lenses formes is

A. $1:1$

B. $1:2$

C. $2:1$

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

Answer: A

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

A. -6.2 cm

B. -4.4 cm

C. -8.6 cm

D. -10 cm

Answer: B

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68. A screen is placed 90 cm from an object. The image an object on the screen is formed by a convex lens two different locations separated by 20 cm. the focus length of the lense is

A. $\frac{770}{36}$ cm

B. $\frac{77}{36}$ cm

C. $\frac{36}{770}$ cm

D. $\frac{360}{77}$ cm

Answer: A

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69. The divergent lens in m linear magnification produced by the lens is

A. m

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

C. $m+1$

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

Answer: D

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

A. 3.25 m

B. 1.55 m

C. 0.75 m

D. 0.28 m

Answer: C

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71. A thin glass (refractive index 1.5) lens has optical power of $-8D$ in air, its optical power in a liquid medium with refractive index 1.6 will be

A. 1 D

B. -1 D

C. 25 D

D. -25 D

Answer: A

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

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

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

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

Answer: A

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73. Two identical glass $\left(\mu_g = 3/2\right)$ equiconvex lenses of focal length f are kept ini contact. The space between the two lenses is filled with water $(\mu_w = 4/3)$. The focal length of the combination is

A. f

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

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

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

Answer: D

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74. Two thin equiconvex lenses each of focal length 0.2 m are placed coaxially with their optic centres 0.5m apart. Then find the focal length of the combination.

A. -0.4 m

B. 0.4 m

C. -0.1 m

D. 0.1 m

Answer: A

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75. The size of the image of an object,which is at infinity, as formed by a convex lens of focal length 20 cm is placed between the convex lens and the image at the distance of 26 cm from the convex lens, the new size of the image is

A. 1.25 cm

B. 2.5 cm

C. 1.05 cm

D. 2 cm

Answer: B

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76. The power of a convex lens is 2 dioptres. Its power is to be reduced to 1.5 dioptres, by putting another lens in combination with it. Which of the following lens will serve the purpose ?

A. A concave lens of focal length 2 m.

B. A concave lens of focal length 4 m.

C. A convex lens of focal length 2 m.

D. A concave lens of focal length 1 m.

Answer: A

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77. A lens of power 6 D is put in contact with a lens of power -4 D. The combination will behave like a

A. divergent lens of focal length 25 cm

B. convergent lens of focal length 50 cm

C. divergent lens of focal length 20 cm

D. convergent lens of focal length 100 cm

Answer: B

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78. A convex lens A of focal length 20cm and a concave lens G of focal length 5cm are kept along the same axis with the distance d between them. If a parallel beam of light falling on A leaves B as a parallel beam, then distance d in cm will be

A. 25

B. 15

C. 30

D. 50

Answer: B

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79. Two thin lenses have a combined power of +9D.When they are separated by a distance of 20 cm, then their equivalent power becomes $+\frac{27}{5}$ D. Their individual powers (in dioptre) are

A. $1, 8$

B. $2, 7$

C. $3, 6$

D. $4, 5$

Answer: C

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80. The plane face of a plano convex lens is silvered.If μbe the refrative index and R, the radius of curvature of curved suraface, then system will behave like a concave mirror of curvature

A. μR

B. $R / 2(\mu - 1)$

C. R^2 / μ

D. $[(\mu + 1) / (\mu - 1)]R$

Answer: B

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81. A point object is placed at a distance of $12cm$ from a convex lens of focal length $10cm$. On the other side of the lens, a convex mirror is placed at a distance of $10cm$ from the lens such that the image formed by the combination coincides with the object itself. The focal length of the convex mirror is

A. 25 cm

B. 50 cm

C. 10 cm

D. 20 cm

Answer: A

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82. If one face of a prism angle 30° and $\mu = \sqrt{2}$ is silvered, the incident ray retraces its initial path. What is the angle of incidence ?

A. 60°

B. 30°

C. 45°

D. 90°

Answer: C

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83. A thin prism P_1 with angle $4 degree$ and made from glass of refractive index 1.54 is combined with another thin prism P_2 made from glass of refractive index 1.72 to produce dispersion without deviation. The angle of the prism P_2 is

A. 3°

B. 6°

C. 9°

D. 12°

Answer: A

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84. When a white light passes through a hollow prism then

A. all colours have same speed

B. different colours have different speeds

C. violet has more speed than red

D. red has more speed than violet.

Answer: A

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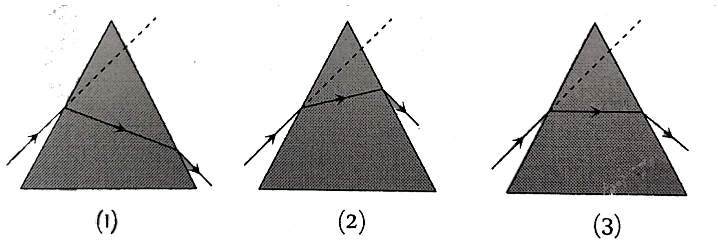
85. The figures represent three cases of a ray passing through a prism of angle A. The case corresponding to minimum deviation is



A. 1

B. 2

C. 3

D. none of these

Answer: B

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86. A ray of light passes through an equilateral glass prism in such a manner that the angle of incidence is equal to the angle of emergence and each of these angles is equal to 3/4 of the angle of the prism. The angle of deviation is

A. 45°

B. 39°

C. 20°

D. 30°

Answer: D

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87. A ray of light passes through an equilateral prism $(\mu = 1.5)$. The angle of minimum deviation is (Given $\sin 48^{\circ} 36' = 0.75$)

A. 45°

B. $37^{\circ}12'$

C. 20°

D. 30°

Answer: B

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88. Which colour shows maximum deviation when passed through a prism ?

A. Yellow

B. Red

C. Violet

D. Green

Answer: C

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89. A ray of light is incident normally on one of the faces of a prism of apex angle 30° and refractive index $\sqrt{2}$. The angle of deviation through prism is

A. 0°

B. 12.5°

C. 15°

D. 22.5°

Answer: C

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90. 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.

A. 4°

B. 8°

C. 12°

D. 16°

Answer: B

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91. A prism of a certain angle deviates the red and blue rays by 8° and 12° respectively. Another prism of the same angle deviates the red and blue rays by 10° and 14° respectively. The prisms are small angled and made of different materials. The dispersive powers of the materials of the prisms are in the ratio

A. $5:6$

B. $9:11$

C. $6:5$

D. $11:9$

Answer: C

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92. Dispersive power depends upon

A. material of the prism

B. shape of the prism

C. size of the prism

D. size, shape and material of the prism.

Answer: A

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93. A ray is ihncident at an angle of incidence ii on one surface of a prism of small angle A and emerge normally from opposite surface. If the refractive index of the material of prism is μ. the angel of incidance I 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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94. A prism is made up of material of refractive index $\sqrt{3}$. The angle of prism is A. If the angle of minimum deviation is equal to the angle of the prism, then the value of A is

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

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

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

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

Answer: C

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95. A ray of light is incident at 60° on one face of a prism of angle 30° and the emergent ray makes 30° with the incident ray. The refractive index of the prism is

A. 1.732

B. 1.414

C. 1.5

D. 1.33

Answer: A

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96. For an angle of incidence θ on an equilateral prism of refractive index $\sqrt{3}$, the ray refracted is parallel to the base inside the prism. The value of $\theta$is

A. 30°

B. 45°

C. 60°

D. 75°

Answer: C

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97. The angle of minimum deviation is an equilateral prism of refractive index 1.414 is

A. 60°

B. 30°

C. 90°

D. 45°

Answer: B

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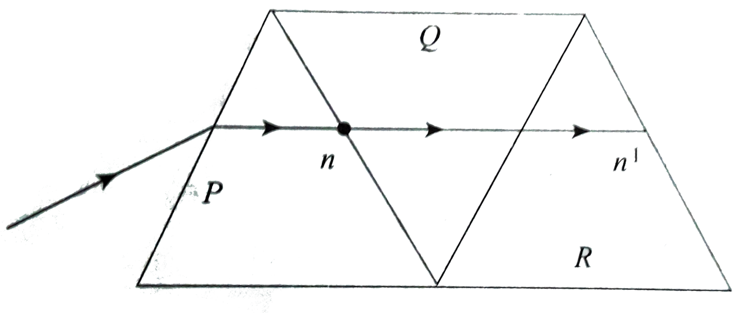
98. A given ray of light suffers minimum deviation in an equilateral prism P. Additional prism Q and R of identical shape and of the same material as P are now added as shown in figure. The ray will now suffer



A. greater deviation

B. no deviation

C. same deviation as before

D. total internal reflection .

Answer: C

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99. Two beams of red and violet colours are made to pass separately through a prism (angle of the prism is $60 degree$). In the position of minimum deviation, the angle of refraction will be

A. greater for red colour

B. equal but not 30° for both the colours

C. greater for violet colour

D. 30° for both the colours.

Answer: D

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100. A ray of light passes through an equilateral glass prism in such a manner that the angle of incidence is equal to the angle of emergence and each of these angles is equal to 3/4 of the angle of the prism. The angle of deviation is

A. 45°

B. 20°

C. 39°

D. 30°

Answer: D

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101. A light ray is incident normally on the face AB of a right-angled prism $ABC(\mu = \quad = 1.50)$ as shown in figure. What is the largest angle ϕ for which the light ray is totally reflected at the surface AC ?

A. yellow, orange and red colours

B. violet, indigo and blue colours

C. all colours

D. all colours except green

Answer: A

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102. A ray of light normally on one of the faces of a right-angled isosceles glass prism is found to be totally reflected. What is the minimum value of the refractive index of the material of the prism ?

A. $\sqrt{2}$

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

C. $4/3$

D. $3/4$

Answer: A

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103. Check the correct statements on scattering of light

$S1$: Rayleigh scattering is responsible for the bluish appearance of sky

$S2$: Rayleigh scattering is proportional to

$1/\lambda^4$ when the size of the scatterer is much less than λ

$S3$: Clouds having droplets of water (large scattering objects) scatter all wavelengths are almost equal and so are generally white

$S4$: The sun looks reddish at sunset and sunrise due to Rayleigh scattering

A. S1 only

B. S1 and S2

C. S2 and S3

D. S1, S2 and S3

Answer: D

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104. When sunlight is scattered by atmospheric atoms and molecules, the amount of scattering of light of wavelength 440 nm is A. The amount of scattering for the light of wavelength 660 nm is approximately

A. $(4)(9)A$

B. $2.25A$

C. $(A)(5)$

D. $0.66A$

Answer: C

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105. When sun light is scatterred by minute particles of atmosphere, then the intensity of light scattered away is proportional to

A. $(\text{wavelength of light})^4$

B. $(\text{frequency of light})^4$

C. $(\text{wavelength of light})^2$

D. $(\text{frequency of light})^2$

Answer: B

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106. An under-water swimmer cannot see very clearly even in absolutely clear water because of

A. absorption of light in water

B. scattering of light in water

C. reduction of speed of light in water

D. change in the focal length of eye lens.

Answer: D

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107. If a person can sees clearly at a distance of 100 cm, then find the power of leris used to see object at 40 cm.

A. -2.5 D and concave lens

B. -2.5 D convex lens

C. -3.5 D and concave lens

D. -3.5 D and convex lens

Answer: A

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108. When objects at different distances are seen by the eye, which of the following remai constant?

A. the focal length of the eye lens

B. the object distance from the eye lens

C. the radii of curvature of the eye lens

D. the image distance from the eye lens

Answer: D

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109. A student's near point is 0.5 m and far point is 3m . What are the powers of the spectacle lenses required for (a) reading the books and (b) seeing the distant objects ?

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: C

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110. The least distance of distinct vision of a person is 75 cm. The focal length of the reading spectacles for such a person should be

A. 37.5 cm

B. 40 cm

C. 25 cm

D. 50 cm

Answer: A

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111. The image formed by an objective of a compound microscope is

A. virtual and diminished

B. real and diminished

C. real and enlarged

D. virtual and enlarged

Answer: C

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112. The magnifying power of a telescope can be increased

A. increasing the length of telescope

B. increasing focal length of objective

C. increasing the diameter of objective

D. increasing the focal length of eye piece.

Answer: B

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113. v34

A. 5 cm

B. 10 cm

C. 55 cm

D. 0.2 cm

Answer: A

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114. The objective of a compound microscope is essentially

A. a concave lens of small focal length and small aperture

B. convex lens of small focal length and large aperture

C. convex lens of large focal length and large aperture

D. convex lens of small focal length and small aperture.

Answer: D

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115. The length of a telescope is 36 cm . The focal lengths of its lenses can be

A. 30 cm, 6 cm

B. -30 cm, -6 cm

C. 30 cm, -6 cm

D. -30 cm, 6 cm

Answer: A

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116. The magnifying power of an astronomical telescope is 8 and the distance between the two lenses is $54cm$. The focal length of eye lens and objective lens will be respectively

A. 6 cm and 48 cm

B. 48 cm and 6 cm

C. 8 cm and 64 cm

D. 64 cm and 8 cm

Answer: A

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117. In a laboratory four convex lenses L_1, L_2, L_3 and L_4 of focal lengths $2, 4, 6$ and $8cm$ respectively are available. Two of these lenses form a telescope of length $10cm$ and magnifying power 4 . The objective and eye lenses are

A. L_2, L_3

B. L_1, L_4

C. L_1, L_2

D. L_4, L_1

Answer: D

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118. 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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119. Least distance of distinct vision is 25 cm . Magnifying power of simple microscope of focal length 5 cm is

A. 2

B. 4

C. 5

D. 6

Answer: D

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120. Focal length of objective and eye piece of telescope are 200 cm and 4 cm respectively. What is the length of telescope for normal adjustment?

A. 196 cm

B. 204 cm

C. 250 cm

D. 225 cm

Answer: B

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121. 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: A

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122. The focal lengths of the objective and of the eye-piece of a compound microsope are f_0 and f_e respectively. If L is the tube length and

D,the least distance of distinct vision, then its angular magnification, when the image is formed at infinity, is

A. $\left(1 - \frac{L}{f_o}\right)\left(\frac{D}{f_e}\right)$

B. $\left(1 + \frac{L}{f_o}\right)\left(\frac{D}{f_e}\right)$

C. $\frac{L}{f_o}\left(1 + \frac{D}{f_e}\right)$

D. $\frac{L}{f_o}\left(\frac{D}{f_e}\right)$

Answer: D

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123. A square card of side length 1 mm is being seen through a magnifying lens of focal length 10 cm. The card is placed at a distance of 9 cm from the lens. The appaent area of the card thorugh the lens is

A. $1 cm^2$

B. $0.81 cm^2$

C. $0.27 cm^2$

D. $0.60 cm^2$

Answer: A

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124. 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. 96 cm, 4 cm

B. 48 cm, 2 cm

C. 50 cm, 50 cm

D. 80 cm, 20 cm

Answer: A

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125. Spherical wavefronts, emanating from a point source, strike a plane reflecting surface. What will happen to these wave fronts, immediately after reflection?

A. They will remain spherical with the same curvature, both in magnitude and sign.

B. They will become plane wave fronts

C. They will remain spherical with the same curvature, both sign of curvature reversed.

D. They will remain spherical, but with different curvature, both in magnitude and sign.

Answer: C

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126. A point source that emits wave uniformly in all directions, produces wavefronts that are

A. spherical

B. elliptical

C. cylindrical

D. planar

Answer: A

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127. The refractive index of glass is 1.9. If light travels through a glass slab of thickness d in time t and takes the same time to travel through a transparent beaker filled with water upto a level of 1.5 d, then the refractive index of water is

A. 1.27

B. 1.33

C. 1.20

D. 1.50

Answer: A

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128. Light propagates 2 cm distance in glass of refractive index 1.5 in time t_0. In the same time t_0, light propagates a distance of 2.25 cm in medium. The refractive index of the medium is

A. $4/3$

B. $3/2$

C. $8/3$

D. $1/2$

Answer: A

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129. Light of wavelength 5000Å falls on a plane reflecting surface. What are the wavelength and frequency of reflected light ? For what angle of incidence is the reflected ray normal to the incident ray ?

A. 0°

B. 30°

C. 90°

D. 45°

Answer: D

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130. The time required for the light to pass through a glass slab (refractive index=1.5) of thickness 4 mm is

(c=3×10^{8} m s^{-1}, speed of light in free space)

A. 10^{-11} s

B. 2×10^{-11} s

C. 2×10^{11} s

D. 2×10^{-5} s

Answer: B

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131. Light of certain colour has 2000 waves per millimetre in air . What will be the wavelength of this light in a medium of refractive index 1.25 ?

A. $1000\AA$

B. $2000\AA$

C. $3000\AA$

D. $4000\AA$

Answer: D

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132. In Young's double-slit experiment, the wavelength of light was changed from 7000Å to 3500 Å`. While doubling the separation between the slits, which of the following is not true for this experiment?

A. The width of fringes changes.

B. The colour of bright fringes changes.

C. The separation between successive bright fringes changes.

D. The separation between successive dark fringes remains unchanged.

Answer: D

Watch Video Solution

133. In the Young's double slit experiment , a mica slip of thickness t and refractive index μ is introduced in the ray from first source S_1 . By how much distance fringes pattern will be displaced ? (d = distance between the slits and D is the distance between slits and screen)

A. $\frac{d}{D}(\mu - 1)t$

B. $\frac{D}{d}(\mu - 1)t$

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

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

Answer: B

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134. The two coherent sources with intensity ratio β produce interference. The fringe visibility will be

A. $\dfrac{2\sqrt{\beta}}{1+\beta}$

B. 2β

C. $\dfrac{2}{(1+\beta)}$

D. $\dfrac{\sqrt{\beta}}{1+\beta}$

Answer: A

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135. Two slits, 4 mm apart, are illuminated by light of wavelength 6000Å. What will be the fringe width on a screen placed 2 m from the slits

A. 0.12 mm

B. 0.3mm

C. 3.0 mm

D. 4.0 mm

Answer: B

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136. Soap bubble appears coloured due to the phenomenon of

A. dispersion

B. reflection

C. interference

D. none of these

Answer: C

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137. In young's double slit experiment, the two slits are 0.2 mm apart. The fringes for light of wavelength 6000Å are found on the screen 80 cm away. The distance of fifth dark fringe, from the central fringe, will be

A. 6.8 mm

B. 7.8 mm

C. 9.8 mm

D. 10.8 mm

Answer: D

Watch Video Solution

138. An interference pattern has maximum and minimum intensities in the ratio of 36:1, what is the ratio of theire amplitudes?

A. $5:7$

B. $7:4$

C. $4:7$

D. $7:5$

Answer: D

Watch Video Solution

139. In Young's experiment the wavelenght of red light is $7.8 \times 10^{-5} cm$ and that of blue light is 5.2×10^{-5} cm. The value of n for which $(n+1)^{th}$ blue bright band coincides with n^{th} red band is

A. 4

B. 3

C. 2

D. 1

Answer: C

Watch Video Solution

140. In Young's double slit experiment 62 fringes are visible in the field of view with sodium light $(\lambda = 5893 \text{Å})$. If green light $(\lambda = 5461 \text{Å})$ is used then the number of visible fringes will be –

A. 62

B. 67

C. 85

D. 55

Answer: B

Watch Video Solution

141. In a Young's double slit experiment the intensity at a point where tha path difference is $\frac{\lambda}{6}$ (λ being the wavelength of light used) is

I. If I_0 denotes the maximum intensity, $\frac{I}{I_0}$ is equal to

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

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

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

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

Answer: A

Watch Video Solution

142. Which of the following is false for interference of light ?

A. Coherence of the source is an essential condition for interference.

B. The minima of the interference pattern need not to be of zero intensity.

C. interference simply redistributes light energy, without destroying any of it.

D. The minima of the interference pattern must always be of zero intensity.

Answer: D

View Text Solution

143. Two sources of light of wavelengths 2500 Å and 3500 Å are used in Young's double slit expt. simultaneously. Which orders of fringes of two wavelength patterns coincide?

A. 3^{rd} order of 1^{st} source and 5^{th} of the 2^{nd}

B. 7^{th} order of 1^{st} and 5^{th} order of 2^{nd}

C. 5^{th} order of 1^{st} and 3^{rd} order of 2^{nd}

D. 5^{th} order of 1^{st} and 7^{th} order of 2^{nd}

Answer: B

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144. The two slits are 1 mm apart from each other and illuminated with a light of wavelength 5×10^{-7} m. If the distance of the screen is 1 m from the slits, then the distance between third dark fringe and fifth bright fringe is

A. 1.5 mm

B. 0.75 mm

C. 1.25 mm

D. 0.625 mm

Answer: C

Watch Video Solution

145. In Young's double slit experiment, the distance between the two slits is $0.1 mm$ and the wavelength of light used is $4 \times 10^{-7} m$. If the width of the fringe on the screen is 4 mm , the distance between screen and slit is

A. 0.1 mm

B. 1 cm

C. 0.1 cm

D. 1 m

Answer: D

Watch Video Solution

146. In double slit experiment fringes are obtained using light of wavelength 4800Å One slit is covered with a thin glass film of refractive index. 1.4 and another slit is covered by a film of same thickness but refractive index 1.7. By doing so, the central fringe is shifted to fifth bright fringe in the original pattern. The thickness of glass film is

A. 2×10^{-3} mm

B. 4×10^{-3} mm

C. 6×10^{-3} mm

D. 8×10^{-3} mm

Answer: D

Watch Video Solution

147. In Young's double-slit experiment, the slit are 0.5 mm apart and the interference is observed on a screen at a distance of 100 cm from the slits, It is found that the ninth bright fringe is at a distance of 7.5 mm from the second dark fringe from the center of the fringe pattern. The wavelength of the light used is

A. $\frac{2500}{7}$

B. 2500

C. 5000

D. $\frac{5000}{7}$

Answer: C

Watch Video Solution

148. In certain Young's double slit experiment, the slit separation is 0.05 cm. The slit to screen distance is 100 cm. When blue light is used, the distance from central fringe to the fourth order bright fringe is 0.36 cm. what is thr wavelength of blue light

A. $4000 \AA$

B. $4300 \AA$

C. $4400 \AA$

D. $4500 \AA$

Answer: D

Watch Video Solution

149. The intensity ratio of the maxima and minima in an interference pattern produced by two coherent sources of light is $9:1$. The intensities of the used light sources are in ratio

A. $3:1$

B. $4:1$

C. $9:1$

D. $10:1$

Answer: B

Watch Video Solution

150. In $YDSE$ ratio of width of slit is $4:1$, then ratio of maximum to minimum intensity

A. $2:1$

B. $4:1$

C. $9 : 1$

D. $8 : 1$

Answer: C

Watch Video Solution

151. Young's double slit experiment is made in a liquid. The tenth bright fringe in liquid lies in screen where 6th dark fringe lies in vacuum. The refractive index of the liquid is approximately

A. 1.2

B. 1.6

C. 1.5

D. 1.8

Answer: D

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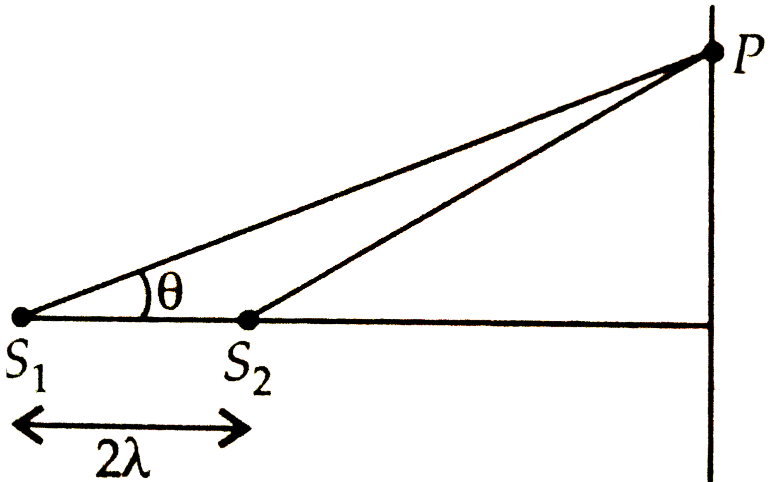
152. In Young's double slit experiment, the slits are horizontal. The intensity at a point P as shown in figure is $\frac{3}{4}I_0$,whereI_0 is the maximum intensity.

Then the value of θ is,

(Given the distance between the two slits S_1 and S_2 is 2λ)



A. $\cos^{-1}\left(\frac{1}{12}\right)$

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

C. $\tan^{-1}\left(\frac{1}{12}\right)$

D. $\sin^{-1}\left(\frac{3}{5}\right)$

Answer: A

Watch Video Solution

153. The slits in Young's double slit experiment are illuminated by light of wavelength 6000 Ã.... If the path difference at the central bright fright fringe is zero, what is the path difference for light from the slits at the fourth bright frings?

A. 2.4×10^{-6} m

B. 1.2×10^{-6} m

C. 10^{-6} m

D. 0.5×10^{-6} m

Answer: A

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154. In a Young's double slit esperiment, the angular width of a fringe formed on a distant screen is 1° . The slit separation is 0.01 mm. The wavelength of the light is

A. 0.174 nm

B. 0.174Å

C. $0.174\mu m$

D. 0.174×10^{-4} m

Answer: C

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155. Light from two coherent sources of the same amplitude A and wavelength λ illuminates the screen. The intensity of the central maximum is I_0. If the sources were incoherent, the intensity at the same point will be

A. $4I_0$

B. $2I_0$

C. I_0

D. $\frac{I_0}{2}$

Answer: D

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156. In a Young's double slit experiment, let S_1 and S_2 be the two slits, and C be the centre of the screen. If $\angle S_1CS_2 = \theta$ and λ is the wavelength, the fringe width will be

A. $\frac{\lambda}{\theta}$

B. $\lambda\theta$

C. $\dfrac{2\lambda}{\theta}$

D. $\dfrac{\lambda}{2\theta}$

Answer: A

Watch Video Solution

157. When interference of light takes place

A. energy is created in the region of maximum intensity

B. energy is destroyed in the region of maximum intensity

C. conservation of energy holds good and energy is redistributed

D. conservation of energy does not hold good.

Answer: C

Watch Video Solution

158. The path difference between two interfering waves of equal intensities at a point on the screen is $\lambda / 4$. The ratio of intensity at this point and that at the central fringe will be

A. 1

B. 0.5

C. 1.5

D. 2.0

Answer: B

Watch Video Solution

159. The ratio of maximum and minimum intensities in the imterference pattern of two sources is $4:1$. The ratio of their amplitudes is

A. $1:3$

B. $3:1$

C. $1:9$

D. $1:16$

Answer: B

Watch Video Solution

160. In Young's double slit experiment, one of the slit is wider than other, so that amplitude of the light from one slit is double of that from other slit. If I_m be the maximum intensity, the resultant intensity I when they interfere at phase difference ϕ is given by:

A. $\frac{I_m}{3}\left(1+2\cos^2.\ \frac{\phi}{2}\right)$

B. $\frac{I_m}{5}\left(1+4\cos^2.\ \frac{\phi}{2}\right)$

C. $\frac{I_m}{9}\left(1+8\cos^2.\ \frac{\phi}{2}\right)$

D. $\frac{I_m}{9}\left(8+\cos^2.\ \frac{\phi}{2}\right)$

Answer: C

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161. Interference fringes were produced in Young's double slit experiment using light of wavelength 5000 Ã.... When a film of material $2.5 \times 10^{-3} cm$ thick was placed over one of the slits, the fringe pattern shifted by a distance equal to 20 fringe widths. The refractive index of the material of the film is

A. 1.25

B. 1.33

C. 1.4

D. 1.5

Answer: C

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162. Two monochromatic light waves of amplitude 3A and 2A interfering at a point have a phase difference of 60°. The intensity at that point will be proportional to:

A. $3A^2$

B. $5A^2$

C. $7A^2$

D. $9A^2$

Answer: C

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163. In a double slit experiment , the coherent sources are spaced 2d apart and the screen is placed a distance D from the slits. If n^{th} bright fringe is formed on the screen exactly opposite to a slit , the value of n must be -

A. $\dfrac{d^2}{2\lambda D}$

B. $\dfrac{2d^2}{\lambda D}$

C. $\dfrac{d^2}{\lambda D}$

D. $\dfrac{d^2}{4\lambda D}$

Answer: B

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164. In an interference experiment , two parallel verticals slits S_1 and S_2 are used. A thin glass plate is introduced in the path of light from S_1. Then

A. fringe pattern remains unaltered

B. fringe pattern as a whole is laterally shifted towards S_1

C. fringe pattern as a whole is laterally shifted towards S_2

D. fringe width decrease.

Answer: B

View Text Solution

165. In Young's double slit experiment, if d, D and λ represent the distance between the slits, the distance of the screen from the slits and wavelength of light used respectively, then the fringe width is inversely proportional to

A. λ

B. d

C. D

D. λ^2

Answer: B

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166. Young's experiment is performed with light of wavelength 6000 Ã... wherein 16 fringes occupy a certain region on the screen. If 24 frings occupy the same region with another light of wavelength λ, then λ is

A. $6000 \mathrm{~\AA}$

B. $4500 \mathrm{~\AA}$

C. $5000 \mathrm{~\AA}$

D. $4000 \mathrm{~\AA}$

Answer: D

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167. in a two-slit experiment with monochromatic light, fringes are obtained on a screen placed at some distance from the slits. If the screen is moved by 5×10^{-2} m towards the slits, the change in fringe width is 3×10^{-5}. If the distance between the slits is 10^{-3}m, calculate the wavelength of the light used.

A. 3000Å

B. 4000Å

C. 6000Å

D. 7000Å

Answer: C

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168. In a Young's double slit experiment, (slit distance d) monochromatic light of wavelength λ is used and the fringe pattern observed at a distance D from the slits. The angular position of the bright fringes are

A. $\sin^{-1}\left(\frac{N\lambda}{d}\right)$

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

C. $\sin^{-1}\left(\frac{N\lambda}{L}\right)$

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

Answer: A

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169. In Young's double slit experiment, the fringe width is $1 \times 10^{-4} m$ if the distance between the slit and screen is doubled and the distance between the two slit is reduced to half and wavelength is changed from $6.4 \times 10^{7} m$ to $4.0 \times 10^{-7} m$, the value of new fringe width will be

A. 0.10 mm

B. 0.15 mm

C. 0.20 mm

D. 0.25 mm

Answer: D

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170. What is the minimum thickness of thin film required for constructive interference in the reflected light through it ?

(Given, the refractive index of the film $= 1.5$, wavelength of the lilght incident on the film $= 600$ nm.

A. 100 m,

B. 300 nm

C. 50 nm

D. 200 nm

Answer: A

Watch Video Solution

171. In a double-slit experiment, the two slits are separated by one milimeter and the screen is placed one meter away. The fringe separation for blue green light of wavelength 500 nm is

A. 10 mm

B. 0.5 mm

C. 20 mm

D. 15mm

Answer: B

Watch Video Solution

172. In the case of light waves from two coherent sources S_1 and S_2, there will be constructive interference at an arbitrary point P, the path difference $S_1P - S_2P$ is

A. $\left(n + \frac{1}{2}\right)\lambda$

B. $n\lambda$

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

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

Answer: B

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173. Two beams of ligth having intensities I and 4I interface to produce a fringe pattern on a screen. The phase difference between the beams is $\frac{\pi}{2}$ at point A and π at point B. Then the difference between the resultant intensities at A and B is

A. $2I$

B. $4I$

C. $5I$

D. $7I$

Answer: B

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174. In Young's double slit experimental setup, if the wavelength alone is doubled, the band width β becomes

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

B. 2β

C. 4β

D. β

Answer: B

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175. A beam of light of wavelength 600 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. What is the distance between the first dark fringe on either side of the central bright fringe?

A. 1.2 cm

B. 1.2 mm

C. 2.4 cm

D. 2.4 mm

Answer: D

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176. A single slit of width a is illuminated by violet light of wavelength $400 nm$ and the width of the diffraction pattern is measured as y. When half of the slit width is covered and illuminated by yellow light of wavelength $600 nm$, the width of the diffraction pattern is

A. zero and the diffraction pattern vanishes

B. $y / 3$

C. $3 y$

D. none of these

Answer: C

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177. For what distance is ray optics a good approximation when the aperture is 4 mm wide and the wavelength is 500 nm?

A. 20 m

B. 40 m

C. 30 m

D. 50 m

Answer: B

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178. Light of wavelength λ is incident on a slit width d. The resulting diffraction pattern is observed on a screen at a distance D. The linear width of the principal maximum is then equal to the width of the slit if D equals

A. $\frac{d^2}{2\lambda}$

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

C. $\frac{2\lambda^2}{d}$

D. $\frac{2\lambda}{d}$

Answer: A

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179. If I_0 is the intensity of the principal maximum in the single slit diffraction pattern. Then what will be its intensity when the slit width is doubled?

A. $3I_0$

B. I_0

C. $4I_0$

D. $2I_0$

Answer: B

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180. A narrow slit of width 2 mm is illuminated by monochromatic light fo wavelength 500nm.

The distance between the first minima on either side on a screen at a distance of 1 m is

A. 5 mm

B. 0.5 mm

C. 1 mm

D. 10 mm

Answer: B

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181. A diffraction pattern is obtained using a beam of redlight. What happens if the red light is replaced by blue light

A. No change.

B. Diffraction bands become narrower and crowded together.

C. Band become broader and father apart.

D. Bands disappear altogether.

Answer: B

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182. A parallel beam of light of wavelength 6000Å gets diffracted by a single slit of width 0.3 mm. The angular position of the first minima of diffracted light is :

A. 2×10^{-3} rad

B. 3×10^{-3} rad

C. 1.8×10^{-3} rad

D. 6×10^{-3} rad

Answer: A

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183. A parallel monochromatic beam of light is incident normally on a narrow slit. A diffraction pattern is formed on a screen placed perpendicular to the direction of the incident beam. At the first minimum of the diffraction pattern, the phase difference between the rays coming from the two edges of the slit is

A. zero and the diffraction pattern vanishes

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

C. π

D. 2π

Answer: D

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184. A telescope, whose objective lens has an apertune of 1 mm for the wavelength of light

500 A, then limiting resolving power of the telescope is

A. 2.1×10^{-5} rad

B. 4.1×10^{-5} rad

C. 5.1×10^{-5} rad

D. 6.1×10^{-5} rad

Answer: D

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185. The head lights of a jeep are 1.2 m apart. If the pupil of the eye of an observer has a diameter of 2 mm and light of wavelength $5896 Å$, is used, what should be the maximum distance of the jeep from the observer if the two head lights are just separated ?

A. 33.4 km

B. 33.4 m

C. 3.34 km

D. 3.34 m

Answer: C

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

A. 6 m

B. 3 m

C. 5 m

D. 1 m

Answer: C

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187. When the object is self-luminous, the resolving power of a microscope is given by the expression

A. inversely proportional to numerical aperture

B. directly proportional to wavelength

C. directly proportional to numerical aperture

D. independent of numerical aperture.

Answer: C

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188. The angle of incidence at which reflected light is totally polarized for reflection from air to glass (refractive index n),

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

B. $\sin^{-1}(1/\mu)$

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

D. $\tan^{-1}(\mu)$

Answer: D

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189. A ray of light is incident on the surface of plate of glass of refractive index 1.5 at the polarising angle. The angle of refraction of the ray will be

A. $75^\circ 11'$

B. $32^\circ 50'$

C. $147^\circ 11'$

D. 0°

Answer: B

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190. The critical angle of a certain medium is $\sin^{-1}\left(\frac{3}{5}\right)$. The polarizing angle of the medium is :

A. $\sin^{-1}(4/5)$

B. $\tan^{-1}(5/3)$

C. $\tan n^{-1}(3/4)$

D. $\tan^{-1}(4/3)$

Answer: B

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191. When light is incident at polarizing angle, which one is completely polarized ?

A. Reflected light

B. Refracted light

C. (a) and (b) both

D. Neither (a) and (b)

Answer: A

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192. When the angle of incidence is 60° on the surface of a glass slab, it is found that the reflected ray is completely polarised. The velocity of light in glass is

A. $\sqrt{2} \times 10^{8} ms^{-1}$

B. $\sqrt{3} \times 10^{8} ms^{-1}$

C. $2 \times 10^{8} ms^{-1}$

D. $3 \times 10^{8} ms^{-1}$

Answer: B

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193. If the polarizing angle of a piece of glass for green light is 54.74°, then the angle of minimum deviation for an equilateral prism made of same glass is : $[\text{Given}: \tan 54.74^{\circ} = 1.414]$

A. 45°

B. 54.74°

C. 60°

D. 30°

Answer: D

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194. In the propagation of polarised light waves, the angle between the plane of vibration and the plane of polarization is

A. 30°

B. 90°

C. 60°

D. 70°

Answer: B

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195. An upolarized light beam is incident on a surface at an angle of incidence equal to Brewster's angle. Then,

A. the reflected and the refracted beans are both partially polarized.

B. the reflected beans is partially polarized and the refracted beam is completely polarized and are at right angles to each other.

C. the reflected beam is completely polarized and the refracted beam is partially polarized and are at right angles to each other.

D. both the reflected and the refracted beams are completely polarized and are at right angles to each other.

Answer: C

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196. An unpolarised beam of intensity I_0 is incident on a pair of nicols making an angle of 60° with each other. The intensity of light emerging from the pair is

A. 9

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

C. $\frac{1}{8}$

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

Answer: B

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197. A beam of natural light falls on a system of 5 polaroids, which are arranged in succession such that the pass axis of each polaroid is turned through 60° with respect to the precending one. The friction of the incident light intensity that passes through the system is :

A. $\frac{1}{64}$

B. $\frac{1}{32}$

C. $\frac{1}{256}$

D. $\frac{1}{512}$

Answer: D

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198. A transparent thin plate of a polaroid is placed on another similar plate such that the angle between their axes is 30°. The intensities of the emergent and the upolarized incident light will be in the ratio of

A. $1:4$

B. $1:3$

C. $3:4$

D. $3:8$

Answer: D

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199. Light is incident on a glass surface at polarising angle of 57.5° Then the angle between the incident ray and the refracted ray is

A. 57.5°

B. 115°

C. 205°

D. 145°

Answer: C

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200. The velocity of light in air is $3 \times 10^{8} ms^{-1}$ and that in water is $2.2 \times 10^{8} ms^{-1}$. Find the polrising an gle of incidence.

A. 45°

B. 50°

C. 53.74°

D. 63°

Answer: C

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Check Your Neet Vitals

1. A person wants a real image of his own, 3 times enlarged. Where should he stand in front of a concave mirror of radius of curvature of 30cm.

A. 10 cm

B. 30 cm

C. 90 cm

D. 20 cm

Answer: A

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2. A metal plate is lying at the bottom of a tank full of a transparent liquid. Height of tank is 100 cm but the plate appears to be at 45 cm above bottom. The rerfractive index of liquid is

A. 1.00

B. 1.53

C. 1.81

D. 1.32

Answer: C

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3. A ray of light when falls on a liquid A-air interface at angle 45°, it just gets total reflection. When a ray of light falls on liquid B - air interface at angle 30°, it does not emerge out. We can infer that

A. $\mu_A > \mu_B$

B. $\mu_A < \mu_B$

C. $\mu_A = \mu_B$

D. can't be inferred

Answer: B

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4. A ray of light falls on a glass slab making an angle of 45° with normal. The emergent ray makes the same angle with normal. It shows that

A. there is no refraction taking place

B. incident ray is perpendicular to emergent ray

C. emergent ray is parallel to the incident ray

D. the given case is not possible.

Answer: C

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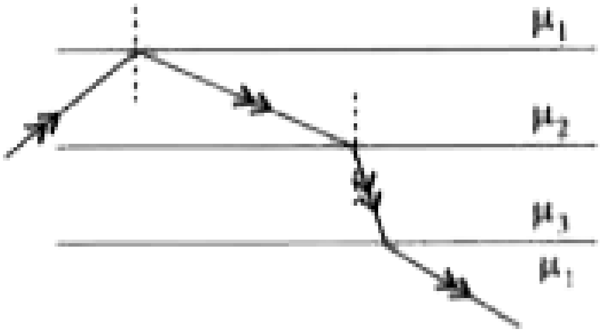
5. Figure shows two glass slabs placed one above the other in air. Refractive indices of glass slabs are μ_2 and μ_3 and that of air is μ_1. A ray of light enters and follows a path as shown in figure. It can be concluded that



A. $\mu_1 = \mu_2 = \mu_3$

B. $\mu_1 < \mu_2 < \mu_3$

C. $\mu_1 > \mu_2 = \mu_3$

D. $\mu_1 > \mu_2 > \mu_3$

Answer: B

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6. Two thin convex lenses of focal length 20 cm and 25 cm are placed at a finite distance apart. The power of the combination is 8 D. Distance between the lenses is

A. 5 cm

B. 10 cm

C. 8 cm

D. 4 cm

Answer: A

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7. When a ray of light falls on a prism of angle 48° , it suffers minimum deviation. Refractive index of the material of prism is 1.6. The angle of incidence is nearly

A. 16°

B. 48°

C. 30°

D. 41°

Answer: D

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8. Which of the following colours suffers maximum deviation in a prism

A. Red

B. Violet

C. Green

D. Blue

Answer: B

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9. A ray of light incident on a prism of angle 60°, does not emerge out. Refractive index of material of prism may be

A. 1.50

B. 2.30

C. 1.80

D. 1.20

Answer: B

View Text Solution

10. In going from a rarer to a denser medium, light loses some speed. What happens to energy carried by light waves ?

A. Greater in rarer medium

B. Greater in denser medium

C. equal in both mediums

D. can not be said

Answer: C

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11. Laser light of wavelength 630 mm incident on a pair of slits produces as interference pattern in which the bright fringes are separated by 8.1 mm. A second light produces an interference pattern in which the fringes are separated by 7.2 mm. Calculate the wavelength of the second light.

A. 420 nm

B. 560 nm

C. 810 nm

D. 980 nm

Answer: B

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12. In Young's double slit experiment, light of wavelength 6000Å is used to get an interference pattern on a screen. The fringe width changes by 1.5 mm, when the screen is brought towards the double slit by 50 cm. The distance between the two slits is

A. 0.2 mm

B. 0.4 mm

C. 0.6 mm

D. 0.8 mm

Answer: A

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13. If ε_0 and μ_0 are respectively the electric permittivity and the magnetic permeability of free space and ε and μ the corresponding quantities in a medium, the refractive index of the medium is

A. $\sqrt{\dfrac{\mu_0\varepsilon_0}{\mu\varepsilon}}$

B. $\sqrt{\dfrac{\mu_0\varepsilon_0}{\mu_0\varepsilon_0}}$

C. 1

D. insufficient information

Answer: B

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14. Out of the following, which can be used as coherent sources required to produce interference pattern of light ?

A. Two indentical and independent sodium lamps

B. One yellow light and one green light source

C. Two light sources with unequal amplitude

D. None of these

Answer: D

View Text Solution

15. किसी माध्यम के लिए ध्रुवण -कोण 60° है I उसके लिए क्रांतिक कोण कितना होगा ?

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

B. $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

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

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

Answer: D

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16. A beam of light travelling in water falls on a glass plate immersed in water. When the incidence angle is 51°, then the reflected beam of light is found polarized. Calculate μ of glass. Given μ of water is $4/3$.

A. 1.091

B. 2.312

C. 1.647

D. 5.734

Answer: C

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17. Which of the following can not be polarised

?

A. Radiowaves

B. Infrared waves

C. Ultrasonic waves

D. Microwaves

Answer: C

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18. If a concave mirror is held in water, then its focal length

A. increases

B. decreases

C. remains unchanged

D. may increase or decrease depending upon the level of water

Answer: C

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19. If a convex lens is immersed in water, then its focal length

A. increases

B. decreases

C. remains unchanged

D. may increase or decrease depending upon the level of water

Answer: A

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

A. half the image will disappear

B. no image will be formed

C. intensity of image will decrease

D. intensity of image will increase

Answer: C

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21. In the Young's double slit experiment using a monochromatic light of wavelength λ, the path difference (in terms of an integer n) corresponding to any point having half the peak

A. $(2n+1)\frac{\lambda}{2}$

B. $(2n+1)\frac{\lambda}{4}$

C. $(2n+1)\frac{\lambda}{8}$

D. $(2n+1)\frac{\lambda}{16}$

Answer: B

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22. A girl wearing coloured contact lens, blue for the left eye and green for the right eye, is standing in front of a plane mirror. In the image, she observes

A. the left eye as green and right eye as blue

B. the lift eye as blue and right eye as green

C. both the eyes as green

D. both the eyes as blue

Answer: A

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23. Diffraction pattern from a single slit of width 0.25 mm is observed with light of wavelength 5890Å . Angular separation between first order minimum and third order maximum, falling on the same side, is

A. 5.89×10^{-3}rad

B. 5.89×10^{-7}rad

C. 5.89×10^{-10}rad

D. 5.89×10^{-4}rad

Answer: A

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

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

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

A. 33.6

B. 66.12

C. 22.6

D. 11.6

Answer: A

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25. Two point white dots are 1 mm apart on a black paper. They are viewed by eye of pupil diameter 3 mm approximately. The maximum distance at which these dots can be resolved by the eye is, (take wavelength of light, λ = 500 nm)

A. $5m$

B. $1m$

C. $6m$

D. $3m$

Answer: C

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Aipmt Neet

1. A ray of light travelling in a transparent medium f 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. $\mu = 1.33$

B. $\mu = 1.40$

C. $\mu = 1.50$

D. $\mu = 1.25$

Answer: C

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

A. $f \text{and} \frac{I}{4}$

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

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

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

Answer: C

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3. The speed of light in media M_1 and M_2 are $1.5 \times 10^8 m/s$ and $2.0 \times 10^8 m/s$ respectively. A ray of light enters from medium M_1 to M_2 at an incidence angle i. If the ray suffers total internal reflection, 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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4. 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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5. Which of the following is not due to total internal reflection ?

A. Working of optical fibre

B. Difference between apparent and real depth of a pond

C. Mirage on hot summer days

D. Brilliance of diamond

Answer: B

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6. A biconvex lens has a radius of curvature of magnitude $20cm$. Which one of the following options describes best the image formed of an object of height $2cm$ place $30cm$ from the lens ?

A. Virtual, upright, height $= 1cm$

B. Virtual, upright, height $= 0.5cm$

C. Real, inverted height $= 4cm$

D. Real, inverted, height $= 1cm$

Answer: C

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7. 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 prism produces dispersion without deviation. The angle of the second prism should be

A. 5°

B. 7°

C. 10°

D. 12°

Answer: C

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8. A converging beam of rays in 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. 5 cm

B. -10 cm

C. 20 cm

D. -30 cm

Answer: D

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9. 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 than one

C. greater that that of glass

D. less than that of glass

Answer: A

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10. A ray is incident at an angle of incidence i on one surfcae of a small angle prism (with angle of prism A) and emerges normally from opposite surface. If refractive index of material of prism is μ then the angle of incidence is nearly equal to

A. μA

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

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

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

Answer: A

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11. A concave mirrorr 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 mirrorr combination returns to infinity. The distance d must equal.

A. $f_1 + f_2$

B. $-f_1+f_2$

C. $2f_1+f_2$

D. $-2f_1+f_2$

Answer: C

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12. The magnifying power of a telescope is 9. When it is adjusted for parallel rays the distance between the objective and eyepiece is $20cm$. The focal lengths of lenses are

A. $10cm, 10cm$

B. $15cm, 5cm$

C. $18cm, 2cm$

D. $11cm, 9cm$

Answer: C

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13. 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 then 2

Answer: B

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14. 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. $10cm$

B. $15cm$

C. $2.5cm$

D. $5cm$

Answer: D

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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 the lenses are made of different material of refractive indices μ_1 and μ_2 and R is the radius of curvature of the curved surface of the lenses, then focal length of the combination is

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

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

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

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

Answer: A

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16. In Young's double-slit experiment, the slits are $2mm$ apart and are illuminated by photons of two wavelengths $\lambda_1 = 12000\text{Å}$ and $\lambda_2 = 10000\text{Å}$. At what minimum distance from the common central bright fringe on the screen $2m$ from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other?

A. $4mm$

B. $3m$

C. $8mm$

D. $6mm$

Answer: D

Watch Video Solution

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

A. 1.67 cm

B. 1.5 cm

C. 5 cm

D. 2.5 cm

Answer: A

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18. A parallel beam of fast moving electrons is incident normally on a narrow slit. A fluorescent screen is placed at a large distance from the slit. If the speed of the electrons is increased, which of the following statements is correct?

A. The angular width of the central maximum will decrease.

B. The angular width of the central maximum will be unaffected.

C. Diffraction pattern is not observed on the screen in the case of electrons.

D. The angular width of the central maximum of the diffraction pattern will increase.

Answer: A

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19. A beam of light $(\lambda = 600nm)$ from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between the first dark fringes on either side of the central bright fringe is

A. $1.2cm$

B. 1.2 mm

C. 2.4 cm

D. 2.4 mm

Answer: D

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20. In a Young's double slit experiment , the intensity of light at a point on the screen where the path difference is λ is k units. Find the intensity at a point where the path difference is (a) $\frac{\lambda}{4}$ (b) $\frac{\lambda}{3}$ and (c) $\frac{\lambda}{2}$

A. K

B. $K/4$

C. $K/2$

D. zero

Answer: C

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21. If the focal length of the objective lens is increased then

A. microscope will increases 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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22. The angle of a prism is A . One of its refracting surfaces is silvered. Lihgt rays falling at an angle of incidence 2A on the first surface returns back through the same path after suffering reflection at the silvered surface. The refractive index. μ, of the prism is

A. $2 \sin A$

B. $2 \cos A$

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

D. $\tan A$

Answer: B

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23. For a parallel beam of monochromatic light of wavelength $'\lambda'$ diffraction is produced by a single slit whose width $'a'$ is of the order of the wavelength of the light. If $'D'$ is the distance of the screen from the slit, the width of the central maxima will be

A. $\frac{Da}{\lambda}$

B. $\frac{2Da}{\lambda}$

C. $\frac{2D\lambda}{a}$

D. $\frac{D\lambda}{a}$

Answer: C

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

A. $-50cm$

B. $50cm$

C. $-20cm$

D. $-25cm$

Answer: A

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25. In a double slit experiment, the two slits are $1mm$ apart and the screen is placed $1m$ away. A monochromatic light of wavelength $500nm$ is used. What will be the width of each slit for obtaining ten maxima of double slit within the central maxima of single-slit pattern?

A. 0.5 mm

B. 0.02 mm

C. 0.2 mm

D. 0.1 mm

Answer: C

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26. The refracting angle of a prism is A, and refractive index of the material of the prism is $\frac{\cot(A)}{2}$. The angle of minimum deviation is

A. $90^{\circ} - A$

B. $180^{\circ} + 2A$

C. $180^\circ - 3A$

D. $180^\circ - 2A$

Answer: D

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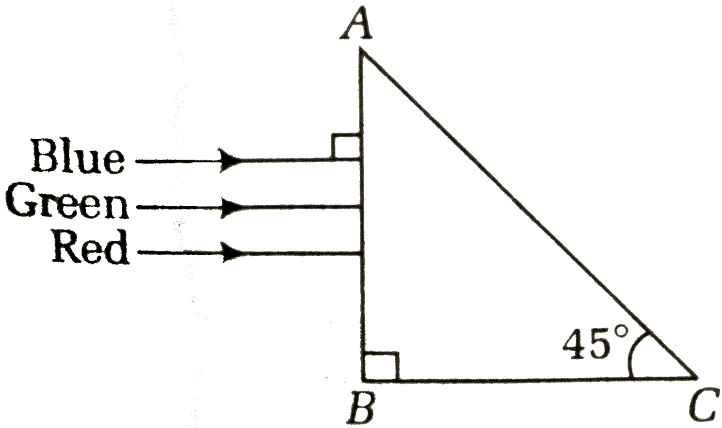
27. A beam of light consisting of red, green and blue colours is incident on a right angled prism. The refractive index of the material of the prism for the above red, green and blue wavelengths are 1.39, 1.44 and 1.47, respectively.



A. not separate the three colours at all

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

C. separate the red colour part from the red and green colours

D. separate all the three colours from one another

Answer: B

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28. At the first minimum adjacent to the central maximum of a single-slit diffraction pattern the phase difference between the Huygens wavelet from the edge of the slit and the wavelet from the mid-point of the slit is

A. π radian

B. $\frac{\pi}{8}$ radian

C. $\frac{\pi}{4}$ radian

D. $\frac{\pi}{2}$ radian

Answer: A

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

A. $\dfrac{L+I}{L-I}$

B. $\dfrac{L}{I}$

C. $\dfrac{L}{I}+1$

D. $\dfrac{L}{I}-1$

Answer: B

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30. Two slits in Young's experiment have widths in the ratio $1:25$. The ratio of intensity at the maxima and minima in the interference pattern $\frac{I_{\max}}{I_{\min}}$ is

A. $\frac{49}{121}$

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

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

D. $\frac{121}{49}$

Answer: C

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31. Match the corresponding entries of column 1 with column 2. [where m is the magnification produced by the mirror

Column 1	Column 2
(A) $m = -2$	(p) Convex mirror
(B) $m = -\frac{1}{2}$	(q) Concave mirror
(C) $m = +2$	(r) Real image
(D) $m = +\frac{1}{2}$	(s) Virtual image

(a) $A \rightarrow$ p and s; $B \rightarrow$ q and r; $C \rightarrow$ q and s; $D \rightarrow$ q and r
(b) $A \rightarrow$ r and s; $B \rightarrow$ q and s; $C \rightarrow$ q and r; $D \rightarrow$ p and s
(c) $A \rightarrow$ q and r; $B \rightarrow$ q and r; $C \rightarrow$ q and s; $D \rightarrow$ p and s
(d) $A \rightarrow$ p and r; $B \rightarrow$ p and s; $C \rightarrow$ p and q; $D \rightarrow$ r and s

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32. In a diffraction pattern due to a single slit of width a, the first minimum is observed at an angle 30° when light of wavelength 5000 Å is incident on the slit. The first secondary minimum is observed at an angle of

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

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

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

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

Answer: B

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33. The intensity at the maximum in a Young's double slit experiment is I_0. Distance between two slits is $d = 5\lambda$, where λ is the wavelength of light used in the experment. What will be that intensity in front of one of the slit on the screen placed at a distance at a distance D=10 d ?

A. $\frac{3}{4}I_0$

B. $\frac{I_0}{2}$

C. I_0

D. $\frac{I_0}{4}$

Answer: B

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34. An astronomical telesope has objective and eyepiece of focal lengths $40cm$ and $4cm$ respectively. To view an object $200cm$ away from the objective, the lenses must be separated by a distance :

A. 50.0 cm

B. 54.0 cm

C. 37.3 cm

D. 46.0 cm

Answer: B

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

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

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

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

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

Answer: D

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36. Two identical glass $\left(\mu_g = 3/2\right)$ equi-convex lenses of focal length f each are kept in contact. The space between the two lenses is also filled with water $\left(\mu_g = 4/3\right)$. The focal length of the combination is

A. $f/3$

B. f

C. $4f/3$

D. $3f/4$

Answer: D

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37. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is $5cm$ deep when viewed from 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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38. The interference pattern is obtained with two coherent light sources of intensity ratio n. In the interference patten, the ratio $\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$ will be

A. $\frac{\sqrt{n}}{n+1}$

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

C. $\frac{\sqrt{n}}{(n+1)^2}$

D. $\frac{2\sqrt{n}}{(n+1)^2}$

Answer: B

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39. A person can see objects clearly only when they lie between $50cm$ and $400cm$ from his eyes. In order to increase the maximum distance of distinct vision to infinity, the type and power of the correcting lens, 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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40. A linear aperture whose width is $0.02cm$ is placed immediately in front of a lens of focal length $60cm$. The aperture is illuminated normally by a parallel beam of wavelength $5 \times 10^{-5} cm$. The distance of the first dark band of the diffraction pattern from the centre of the screen is

A. $0.10 cm$

B. $0.25 cm$

C. $0.20 cm$

D. $0.15 cm$

Answer: D

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41. The ratio of resolving power of an optical microscope for two wavelength $\lambda_1 = 4000 \text{Å}$ and $\lambda_2 = 6000 \text{Å}$ is:

A. $9 : 4$

B. $3 : 2$

C. $16 : 81$

D. $8 : 27$

Answer: B

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42. Young's double slit experiment is first performed in air and then in a medium other than air. It is found that 8^{th} bright fringe in the medium lies where 5^{th} dark fringe lies in air. The refractive index of the medium is nearly

A. 1.59

B. 1.69

C. 1.78

D. 1.25

Answer: C

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

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

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

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

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

Answer: D

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

A. 6°

B. 8°

C. 10°

D. 4°

Answer: A

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45. Two Polaroids P_1 and P_2 are placed with their axis perpendicular to eachother. Unpolarised light I_0 is nicident on P_1. A third polaroid P_3 is kept in between P_1 and P_2 such that its axis makes an angle 45° with that of P_1. The intensity of transmitted light through P_2 is

A. $\frac{I_0}{4}$

B. $\frac{I_0}{8}$

C. $\frac{I_0}{16}$

D. $\frac{I_0}{2}$

Answer: B

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

A. 60°

B. 45°

C. 30°

D. zero

Answer: B

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

A. 30 cm away from the mirror

B. 36 cm away from the mirror

C. 30 cm towards the mirror

D. 36 cm towards the mirror

Answer: B

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48. Unpolarised light is incident from air on a plane surface of a meterial of refractive index $'\mu'$. At a particular angle of incidence $'I'$, it is found that the reflected and refracted rays are perpendicular to each other.

Which of the following options is correct for this situation?

A. Reflected light is polarised with its electric vector parallel to the plane of incidence.

B. Reflected light is polarised with its electric vector perpendicular to the plane of incidence.

C. $i = \sin^{-1}\left(\frac{1}{\mu}\right)$

D. $i = \tan^{-1}\left(\frac{1}{\mu}\right)$

Answer: B

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49. In young's double slit experiment the separation d between the slits is $2mm$, the wavelength λ of the light used is 5896Å and distance D between the screen and slits is $100cm$. It is found that the angular width of the fringes is 0.20°. To increases the fringe angular width to 0.21° (with same λ and D) the separtion between the slits needs to be changed to

A. 1.8 mm

B. 1.9 mm

C. 2.1 mm

D. 1.7 mm

Answer: B

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50. An astronomical refracting telescope will have large angular magnification and high angular resolution, when it has an objective lens of

A. small focal length and large diameter

B. large focal length and small diameter

C. large focal length and large diameter

D. small focal length and small diameter

Answer: C

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

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

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

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

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

Answer: D

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52. Which colour of the light has the longest wavelength?

A. Violet

B. red

C. blue

D. green

Answer: B

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53. In total internal reflection when the angle of incidence is equal to the critical angle for the pair of medium in contact, what will be angle of refraction? In total internal reflection when the angle of incidence is equal to the critical angle for the pair of medium in contact, what will be angle of refraction? In total internal reflection when the angle of incidence is equal to the critical angle for the pair of medium in contact, what will be angle of refraction?

A. 90°

B. 180°

C. 0°

D. equal to angle of incidence

Answer: A

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54. In a double slit experiment, when light of wavelength 400 nm was used, the angular width of the first minima formed on a screen placed 1 m away, was found to be 0.2°, what will be the angular width of the first minima, if the entire experimental apparatus is immersed in water ? $(\mu_{\text{water}} = 4/3)$

A. 0.1°

B. 0.266°

C. 0.15°

D. 0.05°

Answer: C

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

A. $3:4$

B. $2:1$

C. $1:2$

D. $2:3$

Answer: C

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