PHYSICS

BOOKS - SARAS PUBLICATION

OPTICS

Example

1. The frequency of a light wave in a material is 2×10^{14} Hz and wavelength is 5000 $\overset{\circ}{A}$.The refractive index of material will be

A. 1.33

B. 1.40

C. 1.50

D. 3

Answer:

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2. Monochromatic light of frequency 6×10^{14}Hz is produced by a laser. The power emitted is $2.0 \times 10^{-3}W$. How many photons per second on an average are emitted by the source ?

A. 5×10^{14}

B. 5×10^{15}

C. 5×10^{16}

D. 5×10^{17}

Answer:

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3. Two lenses of focal legths f_1 and f_2 are kept in contact coaxially. The resultant power of combination willl be

A. $\sqrt{\frac{f_1}{f_2}}$

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

C. $\frac{f_1 + f_2}{2}$

D. $\frac{f_1 + f_2}{f_1 f_2}$

Answer:

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

A. 9.2×10^{-4}m

B. 6.5×10^{-4}m

C. 6.5×10^{-5}m

D. 12.4×10^{-4}m

Answer:

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5. The number of photo-electrons emitted for light of a frequency v (higher than the threshold frequency v_0) is proportional to

A. Threshold frequency

B. Intensity of light

C. Frequency of light

D. $v - v_0$

Answer:

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6. A ray of light travelling in a transparent medium of refractive index n falls, on a surface separating the medium from air at an

angle of incidents of 45°. The ray can undergo total internal reflection for the following n,

A. $\mu = 1.33$

B. $\mu = 1.40$

C. $\mu = 1.50$

D. $\mu = 1.25$

Answer:

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7. A lens having focal length f and aperture of diameter d forms an image od intensity I, Aperture of diameter $d/2$ in central region of lens is covered by a block paper. Focal length of lens intensity of image now will be respectively :

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

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

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

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

Answer:

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

A. Brilliance of diamond

B. Working of optical fibre

C. Difference between apparent and real depth of a pond

D. Mirage on hot summer days

Answer:

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9. A biconvex lens has a radius of curvature of magnitude 20 cm.Which one of the following options describe best the image formed of an object of height 2 cm placed 30 cm from the lens?

A. Real, inverted, height =1 cm

B. Virtual, upright, height -1 cm

C. Virtual, upright, height= 0.5 cm

D. Real, inverted, height = 4 cm

Answer:

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10. Light of two different frequencies whose photons have energies 1 eV and 2.5 eV respectively illuminate a metallic surface whose work function is 0.5 eV successively. Find the ratio of maximum speeds of emitted electrons.

A. $1:5$

B. $1:4$

C. $1:2$

D. $1:1$

Answer:

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11. A ray of light is incident at angle of incident ,I, on one face of a prism of angle A (assumed to be small) and emerges normally from the opposite face. If the refractive index of the prism is μ the angle of incidence i, is nearly equal to:

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

B. $A\mu$

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

D. μA

Answer:

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12. A concave mirror of focal length 'f_1' is placed at a distance'd' from a convex lens length 'f_2'. A beam of light coming from infinity and falling on this convex lens concave mirror combination returns to infinity. The distance 'd' must be.

A. $-f_1 + f_2$

B. $2f_1 + f_2$

C. $-2f_1 + f_2$

D. $f_1 + f_2$

Answer:

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13. A source of light is placed at a distance of 50 cm from a photo cell and the stopping Potential is found to be V_0. If the distance between the light surface and photo cell is made 25 cm, the new stopping potential will be

A. V_0

B. $\frac{V_0}{2}$

C. V_0

D. $4V_0$

Answer:

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14. Two plane mirrors are inclined at 70°. A ray incident on one mirror at angle θ after reflection falls on second mirror and is reflected from there parallel to first mirror. The vaule of θ is

A. 50°

B. 45°

C. 30°

D. 55°

Answer:

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15. The reddish appearance of rising and setting sun is due to

A. The colour of the sky

B. The scattering of light

C. The polarisation of light

D. The colour of the sun

Answer:

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16. In Young 's double slit experiment the distance between the slits and the screen is doubled the separation between the slits is reduced to half. As a result the fringe width.

A. Is doubled

B. Is halved

C. Is four times

D. Remains unchanged

Answer:

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17. Ratio of longest wavelength corresponding to Lyman and Baimer series in hydrogen spectrum is

A. $\frac{5}{27}$

B. $\frac{3}{23}$

C. $\frac{7}{29}$

D. $\frac{9}{31}$

Answer:

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18. A Plano-convex lens fits exactly into a plano-concave lens. Three plane surfaces are parallel to each other. If lenses are made of different material of refraction indexes and R is the radius of curvature of the curved surface of the lenses ,then the focal length of the combination

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

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

C. $\frac{R}{\mu_1 - \mu_2}$

D. $2\frac{R}{\mu_2 - \mu_1}$

Answer:

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19. For a normal eye, provides a converging power of 40Dand the least converging power of the eye lens behind the cornea is 20D.usingh this information, the retina and the corner eyes lens can be estimated to be

A. 5 cm

B. 2.5 cm

C. 1.67 cm

D. 1.5 cm

Answer:

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20. A speeding motor cyclist sees traffic jam ahead of him. He slows down to $36km/hour$. He finds that traffic has eased and

car moving ahead of him at $18km/hour$ is honking at a frequency of 1392Hz.If the speed of sound is $343m/s$,the frequency of the honk as heard by him will be

A. 1332 Hz

B. 1372 Hz

C. 1412 Hz

D. 1454 Hz

Answer:

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21. Light with an energy flux of $25 \times 10^4 Wm^{-2}$ falls on a perfectly reflecting surface at normal incidenc .If the surface area $15cm^2$,the average force exerted on the surface is

A. $1.25 \times 10^{-6} N$

B. $2.50 \times 10^{-6} N$

C. $1.20 \times 10^{-6} N$

D. $3.0 \times 10^{-6} N$

Answer:

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22. A beam of light of wavelenght 600 nm from a distant source falls on a single slit 1.00 nm 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. 1.2 cm

B. 1.2 mm

C. 2.4 cm

D. 2.4 mm

Answer:

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23. In the young,s double -slit experiment ,the intensity of light at a point on the screen where the path difference is λ is K,(λ being the wavelenght of light used). The intersity at a point where the path difference is $\lambda/4$, will be

A. K

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

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

D. Zero

Answer:

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24. If the focal lenghth of objective lens is increased then magnifying power of

A. Microscope will increase but that of telescope decrease

B. Microscope and telescope both will increase

C. Microscope and telescope both with decrease

D. Microscope will decrease but that of telescope will increase

Answer:

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25. If the kinetic energy of a particle is increased by 16 times, the percentage change in the de-Broglie wavelength of the particle is

A. 25

B. 75

C. 60

D. 50

Answer:

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26. The refracting angle of a prims is A,and refraction index of the material of the prism is cot $(A/2)$The angle of minimum deviation is

A. $180^\circ - 2A$

B. $90^\circ - A$

C. $180^\circ + 2A$

D. $180^\circ - 3A$

Answer:

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27. Two identical thin planoconvex glass lenses{refractive index 1.5) each having radius of curvature of 20 cm are placed with

their convex surface in contact at the centre .The intervening space is filled with oil of refractive index 1.7.The focal length of the combination is.

A. $-25cm$

B. $-50cm$

C. 50 cm

D. $20cm$

Answer:

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28. At the first minimum adjacent to the central maximum ofa single-slit diffraction pattern the phase difference between the

Huygen's wavelet from the edge of the slit and the wavelet from the mid point of slit is.

A. $\mu = \frac{\pi}{8}$

B. $\mu = \frac{\pi}{4}$

C. $\mu = \frac{\pi}{2}$

D. π

Answer:

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29. The coefficient of performance of a refrigerator is 5. If the temperature inside freezer is $-20^\circ C$, the temperature of the surroundings to which it rejects heat is.

A. $21^\circ C$

B. $31^\circ C$

C. $41^\circ C$

D. $11^\circ C$

Answer:

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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. $\frac{4}{9}$

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

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

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

Answer:

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

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

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

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

D. (L+1)/(L-1)`

Answer:

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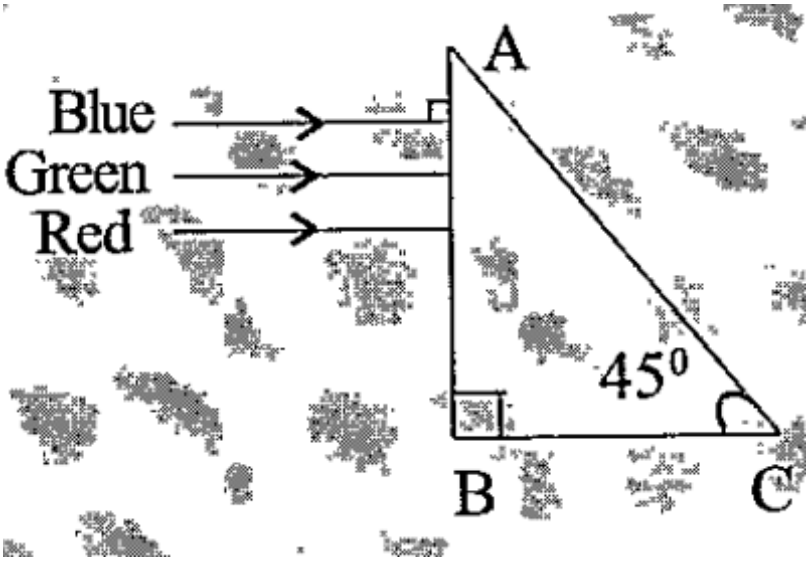
32. A beam of light consisting of red,green and blue colours is incident on a right angled prism.The refractive index of the material of the prism for the above red,green and blue wavelengths are 1.39,1.44 and 1.47,respectively. The prism will:



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

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

C. separate all the three colours from one another

D. not separate the three colours at all

Answer:

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

A. $4f/3$

B. $3f/4$

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

D. f

Answer:

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

A. 12

B. 16

C. 8

D. 10

Answer:

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35. The interference pattern is obtained with two coherent light sources of intensity ratio n.In the interference pattern, the ratio $\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$ will be

A. $\frac{\sqrt{n}}{[n+1]}2$

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

C. $\frac{\sqrt{n}}{[n+1]}$

D. $\sqrt{2}\frac{n}{[n+1]}$

Answer:

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36. A person can see clearly objects only when they lie between 50 cm and 400 cm 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. concave, -0.2 diopter

B. convex, +0.15 diopter

C. convex, + 2.35 diopter

D. concave, -0.25 diopter

Answer:

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37. A screen with linear aperture whose width is 0.02 cm is placed immediately in front of a lens of focal length 60 cm The aperture is illuminated normally by a parallel beam of wavelength 5×10^{-5} cm.The distance of the first dark band of the diffraction pattern from the centre of the screen is.

A. 0.20 cm

B. 0.15 cm

C. 0.10 cm

D. 0.25 cm

Answer:

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38. In a diffraction pattern due to a single slit of width 'a' the first minimum is obsrved at an angle 30° When light of wavelength $5000\mathring{A}$ is incident on the slit.The first secondary maximum is oberved at an angle of :

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

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

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

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

Answer:

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39. Match the corresponding entries of column -1 with column -2 [Where m is the magnification produced by the mirror]

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

A.

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

B.

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

C.

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

D.

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

Answer:

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

A. 54.0cm

B. 37.3 cm

C. 46.0 cm

D. 50.0cm

Answer:

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41. The intensity at the maximum in Young's double slit experiment is I_0 Distance two slits is d = 5λ where λ is the wavelength of light used in the experiment what will be intensity in front of one of the slits on the screen placed at a distance D=10d ?

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

B. I_0

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

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

Answer:

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

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

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

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

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

Answer:

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43. A beam of liht from a souce L is incident normally on a plane mirror fixed at a centain distance x from the source The beam is reflected back as a spot on a scale placed just above the source L. When the mirror is rotated through at 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:

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44. If θ_1 and θ_2 be the apparent angles of dip observed in two vertical planes at right angles to each other,then the true angle of dip is give by :

A. $\tan^2\theta = \tan^2\theta_1 + \tan^2\theta_2$

B. $\cot^2\theta = \cot^2\theta_1 - \cot^2\theta_2$

C. $\tan^2\theta = \tan^2\theta_1 - \tan^2\theta_2$

D. $\cot^2\theta = \cot^2\theta_1 + \cot^2\theta_2$

Answer:

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45. A thin prism having refracting angle 10° is made of glass of refractive index 1.42.This prism is combined with another thin prism of glass of refractive index 1.7.This combination produces

dispersion without deviation The refacting angle of second prism should be :

A. 6°

B. 8°

C. 10°

D. 4°

Answer:

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46. Two polaroids P_1 and P_2 are placed with their axis perpendicular to each other Unpolarised LightI_0 is incident 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. $\frac{I_0}{20}$

Answer:

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