PHYSICS

BOOKS - NCERT FINGERTIPS PHYSICS (HINGLISH)

WAVE OPTICS

Huygens Principle

1. The idea of secondary wavelets for the propagation of a wave was first given by

A. Newton

B. Huygens

C. Maxwell

D. Fresnel

Answer: B

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2. Wavefront is the locus of all points, where the particles of the medium vibrate with the same

A. phase

B. amplitude

C. frequency

D. period

Answer: A

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3. Light propagates rectilinearly, due to

A. wave nature

B. wavelengths

C. velocity

D. frequency

Answer: A

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4. Which of the following is correct for light diverging from a point source ?

A. The intensity decreases in proporation for the distance squared.

B. The wavefront is parabolic.

C. The intensity at the wavelength does not depend on the distance.

D. None of these.

Answer: A

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Refraction And Reflection Of A Plane Waves Using Huygens Experiment

1. The refractive index of glass is 1.5 for light waves of $\lambda = 6000$ Ã... in vacuum. Its wavelength in glass is

A. 2000 Ã...

B. 4000 Ã...

C. 1000 Ã...

D. 3000 Ã...

Answer: B

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2. 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 become plane wave fronts.

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

Answer: C

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3. Which of the following phenomenon is not explained by Huygen's construction of wavefront ?

A. reflection

B. diffraction

C. refraction

D. origin of spectra

Answer: D

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4. A plane wave front falls on a convex lens. The emergent wave front is

A. plane

B. diverging spherical

C. converging spherical

D. none of these.

Answer: C

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5. Earth is moving towards a fixed star with a velocity of $30 km s^{-1}$. An observer on earth observes a shift of 0.58Å in wavelength of light coming from star. What is the actual wavelength of light emitted by star ?

A. 5800 Ã...

B. 2400 Ã...

C. 12000 Ã...

D. 6000 Ã...

Answer: A

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6. The spectral line for a given element in the light received from a distant star is shifted towards longer wavelength side by $0.025\,\%$.

Calculate the velocity of star in the line of sight.

A. $7.5 \times 10^4 ms^{-1}$

B. $-7.5 \times 10^4 ms^{-1}$

C. $3.7 \times 10^4 ms^{-1}$

D. $-3.7 \times 10^4 ms^{-1}$

Answer: B

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7. With what speed should a galaxy move with respect to us to that the sodium line at $589.0nm$ is observed at $589.6nm$?

A. 206 km s^{-1}

B. 306 km s^{-1}

C. 103 km s^{-1}

D. 51 km s^{-1}

Answer: B

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8. The $6563\text{Å} H_2$ line emitted by hydrogen in a star is found to be red shifted by 15Å. Estimate the speed with which the star is receding from earth.

A. $3.2 \times 10^5 ms^{-1}$

B. $6.87 \times 10^5 ms^{-1}$

C. $2 \times 10^5 ms^{-1}$

D. $12.74 \times 10^5 ms^{-1}$

Answer: B

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9. The wavelength of spectral line coming from a distant star shifts from 600 nm to 600.1 nm. The velocity of the star relative to earth is

A. 50 km s^{-1}

B. 100 km s^{-1}

C. 25 km s^{-1}

D. 200 km s^{-1}

Answer: A

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Coherent And Incoherent Addition Of Waves

1. A laser beam is used for locating distant objects because

A. it is monochromatic

B. it is not chromatic

C. it is not observed

D. it has small angular spread

Answer: D

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2. 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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3. Which of the following is the path difference for destructive interference ?

A. $n(\lambda + 1)$

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

C. $n\lambda$

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

Answer: B

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4. Answer the following questions :

(a) When a low flying aircraft passes overhead, we sometimes notice a slight shaking of the piture on our TV screen. Suggest a possible expanation.

(b) As you have learnt in the text, the principle of linear superposition of wave displacement is basic to understanding intensity distributions in diffractions and interference patterns. What is the justification of this principle ?

A. interference

B. diffraction

C. polarisation of direct signal

D. Both (b) and (c)

Answer: A

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5. Two light waves superimposing at the mid-point of the screen are coming from coherent sources of light with phase difference 3π rad. Their amplitudes are 1 cm each. The resultant amplitude at the given point will be.

A. 5 cm

B. 3 cm

C. 2 cm

D. zero

Answer: D

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6. Two beam of light having intensities I and 4I interfere 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 resultant intensities at A and B is : $(2001, 2M)$

A. 2I

B. 4I

C. 5I

D. 7I

Answer: B

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7. 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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Diffraction

1. A slit of width is illuminated by white light. For red light $(\lambda = 6500\text{Å})$, the first minima is obtained at $\theta = 30^{\circ}$. Then the value of will be

A. 3200 Ã...

B. $6.5 \times 10^{-4} mm$

C. 1.3 micron

D. $2.6 \times 10^{-4} cm$

Answer: C

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2. A parallel beam of light of wavelength 600 nm is incident normally on a slit of width d. If the distance between the slits and the screen is 0.8 m and the distance of 2^{nd} order maximum from the centre of the screen is 15 mm. The width of the slit is

A. $40\mu m$

B. $80\mu m$

C. $160\mu m$

D. $200\mu m$

Answer: B

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3. A screen is placed $50cm$ from a single slit, which is illuminated with 6000Å light. If the distance between the first and third minima in the diffraction pattern is $3.00mm$, what is the width of the slit ?

A. $1 \times 10^{-4}m$

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

C. $0.5 \times 10^{-4}m$

D. $4 \times 10^{-4}m$

Answer: B

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4. Consider sunlight incident on a slit of width 10^4Å . The image seen through the slit shall

A. be a fine sharp slit white in colour at the centre

B. a bright slit white at the centre diffusing to zero intensities at the edges

C. a bright slit white at the centre diffusing to regions of different colours

D. only be a diffused slit white in colour

Answer: A

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5. 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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6. In a single slit diffraction experiment, the width of the slit is made double its original width. Then the central maximum of the diffraction pattern will become

A. narrower and fainter

B. narrower and brighter

C. broader and fainter

D. broader and brighter

Answer: B

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7. To observe diffraction, the size of the obstacle

A. should be $\lambda/2$, where λ is the wavelength.

B. should be of the order of wavelength.

C. has no relation to wavelength.

D. should be much larger than the wavelength.

Answer: B

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8. In Young's double slit experiment, the distance d between the slits S_1 and S_2 is 1 mm. What should the width of each slit be so as to obtain 10 maxima of the double slit pattern within the central maximum of the single slit pattern ?

A. 0.9 mm

B. 0.8 mm

C. 0.2 mm

D. 0.6 mm

Answer: C

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9. A single slit is illuminated by light of wavelength 6000 Å. The slit width is 0.1 cm and the screen is placed 1 m away. The angular position of 10^{th} minimum in radian is

A. 2×10^{-4}

B. 6×10^{-3}

C. 3×10^{-3}

D. 1×10^{-4}

Answer: B

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10. A parallel beam of light of wavelength 500 nm falls on a narrow slit and the resulting diffraction pattern is observe on screen 1 m away. It is observed that the first minimum is at a distance of $2.5mm$ from the centre of the screen. Find the width of the slit.

A. 0.2 mm

B. 1 mm

C. 2 mm

D. 1.5 mm

Answer: A

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11. In a Fraunhofer diffraction at single slit of width d with incident light of wavelength 5500 Ã..., the first minimum is observed, at angle

30°. The first secondary maximum is observed at an angle $\theta =$

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

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

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

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

Answer: C

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12. A diffraction pattern is obtained using a beam of red light. 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 farther apart.

D. Bands disappear altogether.

Answer: B

13. In a Fresnel biprism experiment, the two positions of lens give separation between the slits as 16cm and 9cm respectively. What is the actual distance of separation?

A. 12 cm

B. 12.5 cm

C. 13 cm

D. 14 cm

Answer: A

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14. The angular resolution of a $10cm$ diameter telescope at a wavelength 5000Å is of the order

A. 10^6 rad

B. 10^{-2} rad

C. 10^{-4} rad

D. 10^{-6} rad

Answer: D

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15. For the same objective, what is the ratio of the least separation between two points to be distinguished by a microscope for light of 5000 Ã... and electrons accelerated through 100 V used as an illuminating substance?

A. 3075

B. 3575

C. 4075

D. 5075

Answer: C

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16. A telescope is used to resolve two stars separated by 4.6×10^{-6} rad. If the wavelength of light used is 5460Å , what should be the aperture of the objective of the telescope ?

A. 0.1488 m

B. 0.567 m

C. 1 m

D. 2 m

Answer: A

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17. The diameter of the pupil of human eye is about $2mm$. Human eye is most sensitive to the wavelength $555 nm$. Find the limit of resolution of human eye.

A. 1.2 min

B. 2.4 min

C. 0.6 min

D. 0.3 min

Answer: A

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18. Two points separated by a distance of $0.1 mm$ can just be resolved in a microscope when a light of wavelength 6000Å is used. If the light of wavelength 4800Å is used this limit of resolution becomes

A. 0.8 mm

B. 0.12 mm

C. 0.1 mm

D. 0.08 mm

Answer: D

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19. Two towers on the top of two hills are 40 km apart. The line joining them presses 50 m above a hill half way between the towers. What is the longest wavelength of radiowaves which can be send between the towers without appreciabe fiffraction effects?

A. 1.25 m

B. 0.125 m

C. 2.50 m

D. 0.250 m

Answer: B

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20. Light of wavelength $600nm$ is incident on an aperture of size $2mm$. Calculate the distance light can travel before its spread is more than the size of aperture.

A. 12.13 m

B. 6.67 m

C. 3.33 m

D. 2.19 m

Answer: B

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

A. 22 m

B. 32 m

C. 42 m

D. 52 m

Answer: B

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22. The human eye has an approximate angular resolution of $\phi = 5.8 \times 10^{-4}$ rad and a typical photo printer prints a minimum of

300 dpi (dots per inch, $= 2.54cm$). Aminimum distance 'z' should a printed page be held so that one doesnot see the indivdual dots is ______ .

A. 14.5 cm

B. 20.5 cm

C. 29.5 cm

D. 28 cm

Answer: A

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Polarisation

1. Which phenomenon leads us to the conclusion that light is transverse in nature ?

A. refraction of light

B. diffraction of light

C. dispersion of light

D. polarization of light.

Answer: D

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2. If the angle between the pass axis of polarizer and analyzer is 45°, write the ratio of intensities of original light and the transmitted light after passing through analyzer.

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

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

C. I

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

Answer: D

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3. The angle between pass axis of polarizer and analyzer is 45°. The percentage of polarized light passing through analyzer is

A. 75%

B. 25%

C. 50%

D. 100%

Answer: C

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4. 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 unpolarized 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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5. Unpolarized light of intensity 32 W m^{-2} passes through three polarizers such that transmission axis of first is crossed with third. If intensity of emerging light is 2 W m^{-2}, what is the angle of transmission axis between the first two polarizers?

A. 30°

B. 45°

C. 22.5°

D. 60°

Answer: C

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6. Light from sodium lamp is made to pass through two polaroid placed one after the other in the path of light. Taking the intensity of the incident light as 100%, the intensity of the out coming light that can be varied in the range

A. 0% to 100%

B. 0% to 50%

C. 0% to 25%

D. 0% to 75%

Answer: B

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7. From Brewster's law, except for polished metallic surfaces, the polarizing angle

A. depends on wavelength and si different for different colours

B. independent of wavelength and is different for different colours

C. independent of wavelength and is same for different colours

D. depends on wavelength and is same for different colours

Answer: A

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8. In case of linearly polarized light, the magnitude of the electric field vector

A. is parallel to the direction of propagation

B. does not change with time

C. increases linearly with time

D. varies perodically with time

Answer: D

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9. When ordinary light is made incident on a quarter wave plate, the emergent light is

A. linearly polarised

B. circularly polarised

C. unpolarised

D. elliptically polarised

Answer: D

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10. At what angle of incidence will the light reflected from glass$(\mu = 1.5)$ be completely polarized

A. 72.8°

B. 51.6°

C. 40.3°

D. 56.3°

Answer: D

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

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

B. the reflected beam 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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12. Unpolarized light is incident on a plane glass surface. The angle of incidence so that reflected and refracted rays and perpendicular to each other, then

A. $\tan i_{\beta} = \frac{\mu}{2}$

B. $\tan i_{\beta} = \mu$

C. $\sin i_{\beta} = \mu$

D. $\cos i_{\beta} = \mu$

Answer: B

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13. The refractive index of a medium is $\sqrt{3}$. What is the angle of refraction, if unpolarizing light is incident on the polarizing angle of the medium ?

A. 60°

B. 45°

C. 30°

D. 0°

Answer: C

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14. 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 polarizing angle of incidence.

A. 45°

B. 50°

C. 53.74°

D. 63°

Answer: C

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15. When the angle of incidence is 60° on the surface of a glass slab, it is found that the reflected ray is completely polarized. 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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16. The critical angle of a certain medium is $\sin^{-1}\left(\frac{3}{5}\right)$. The polarizing angle of the medium is :

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

B. $\tan^{-1}\left(\frac{5}{3}\right)$

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

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

Answer: B

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17. Light is incident on a glass surface at polarizing 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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18. An optically active compound

A. rotates the plane of polarised light

B. changes the direction of polarised light

C. does not allow plane polarised light to pass through

D. none of these.

Answer: A

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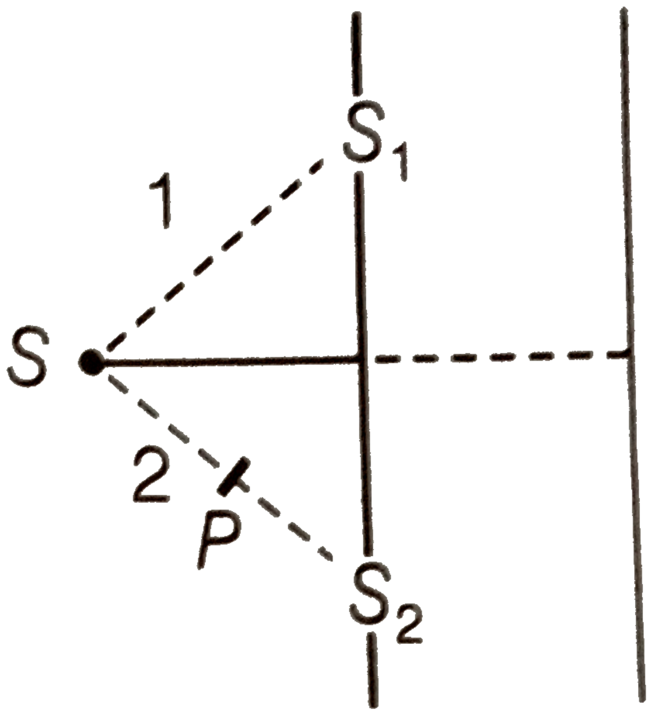
Higher Order Thinking Skills

1. Figure shown a two slit arrangement with a source which emits unpolarised light. P is a polariser with axis whose direction is not given. If I_0 is the intensity of the principal maxima when no polariser is present, calculte in the present case, the intensity of the principal maxima as well as the first minima.



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

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

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

D. $\frac{2}{5}I_0$

Answer: A

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2. A beam of light consisting of two wavelengths $650nm$ and $520nm$ is used to obtain interference fringes in a Young's double slit experiment.

(a) Find the distance of the third bright fringe on the screen from the central maximum for the wavelength $650nm$.

(b) What is the least distance from the central maximum where the bright fringes due to both the wavelengths coincide? The distance between the slits is $2mm$ and the distance between the plane of the slits and screen is $120cm$.

A. 1.17 mm

B. 2.52 mm

C. 1.56 mm

D. 3.14 mm

Answer: C

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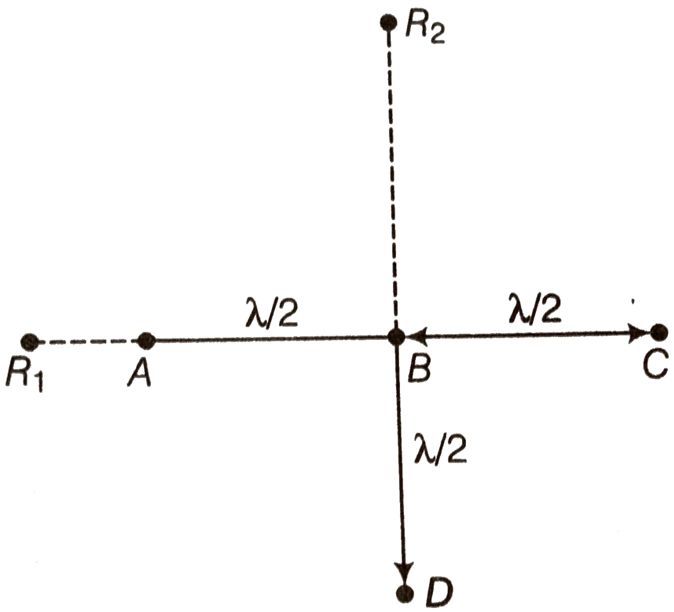
3. Four identical monochromatic sources A,B,C,D as shown in the (figure) produce waves of the same wavelength λ and are coherent. Two receiver R_1 and R_2 are at great but equal distances from B.

(i) Which of the two receivers picks up the larger signal when B is turned off?

(iii) Which of the two receivers picks up the larger singnal when D is turned off ?

(iv) Which of the two receivers can distinguish which of the sources B or D has been turned off ?



A. R_1

B. R_2

C. R_1 and R_2

D. None of these.

Answer: B

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4. In question number 3, which of the two receivers picks up the larger signal when B is turned off?

A. R_1

B. R_2

C. R_1 and R_2

D. None of these.

Answer: C

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5. In question number 3, which of the two receivers picks up the larger signal when D is turned off?

A. R_1

B. R_2

C. R_1 and R_2

D. None of these.

Answer: B

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6. To ensure almost 100% transmittivity, photographic lenses are often coated with a thin layer of dielectric material, like

$MgF_2(\mu = 1.38)$. The minimum thickness of the film to be used so that at the centre of visible spectrum $(\lambda = 5500\text{Å})$ there is maximum transmission.

A. 5000 Ã...

B. 2000 Ã...

C. 1000 Ã...

D. 3000 Ã...

Answer: C

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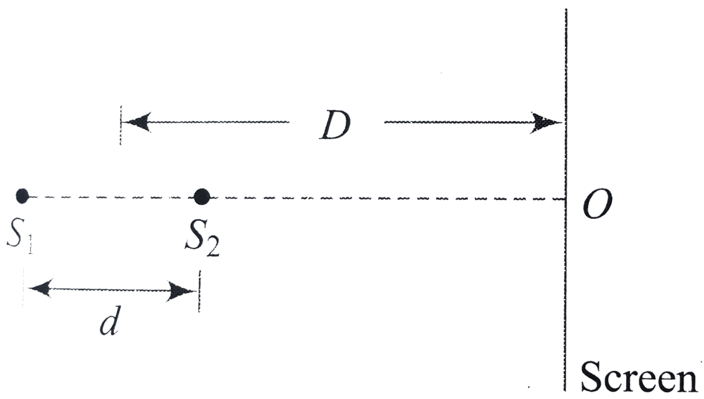
7. Two points nonochromatic and coherent sources of light of wavelength λ each are placed as shown in figure. The initial phase difference between the sources is zero O. $(d > \, > d)$. Mark the correct statement(s).



A. If $d = \frac{7\lambda}{2}$, O will be minima.

B. If $d = \lambda$, only one maxima can be observed on screen.

C. If $d = 4.8\lambda$ then total 10 minimas would be there on screen.

D. If $d = \frac{5\lambda}{2}$, then intensity at O would be maximum.

Answer: D

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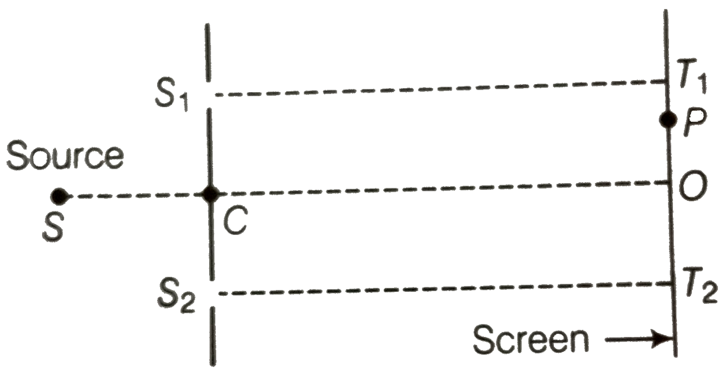
8. Consider a two slit interference arrangements (figure) such that the distance of the screen from the slits is half the distance between the slits. Obtain the value of D in terms of λ such that the first minima on the screen falls at a distance D from the centre O.



A. $\frac{\lambda}{2.472}$

B. $\frac{\lambda}{2.236}$

C. $\frac{\lambda}{1.227}$

D. $\frac{\lambda}{3.412}$

Answer: A

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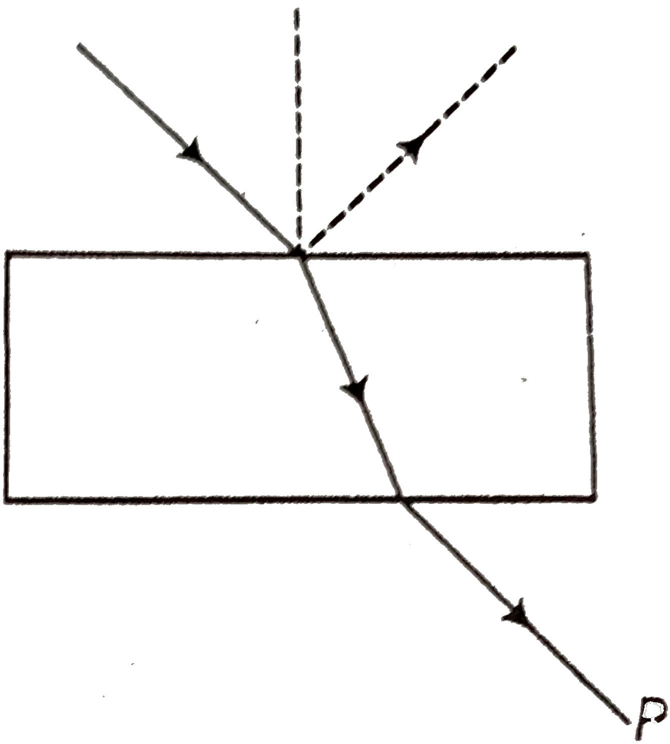
Ncert Exemplar

1. Consider a light beam incident from air to a glass slab at Brewster's angle as shown in figure.

A polaroid is placed in the path of the emergent ray at point P and rotated about an axis passing through the centre and pependicular to the plane of the plaroid.



A. For a paricular orientation there shall be darkness as observed through the polaroid.

B. The intensity of light as seen through the polaroid shall be independent of the rotation.

C. The intensity of light as seen through the polaroid shall go through a minimum but not zero for two orientations of the polaroid.

D. The intensity of light as seen through the polaroid shall go through a minimum for four orientations of the polaroid.

Answer: C

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2. Consider sunlight incident on a slit of width $10^4 \mathring{A}$. The image seen through the slit shall

A. be a fine sharp slit white in colour at the centre

B. a bright slit white at the centre diffusing to zero intensities at the edges

C. a bright slit white at the centre diffusing to regions of different colours

D. only be a diffused slit white in colour

Answer: A

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3. Consider a ray of light incident from air onto a slab of glass (refractive index n) of width d, at an angle θ . The phase difference between the ray reflected by the top surface of the glass and the bottom surface is

A. $\frac{4\pi d}{\lambda}\left(1-\frac{1}{n^2}\sin^2\theta\right)^{1/2}+\pi$

B. $\frac{4\pi d}{\lambda}\left(1-\frac{1}{n^2}\sin^2\theta\right)^{1/2}$

C. $\frac{4\pi d}{\lambda}\left(1-\frac{1}{n^2}\sin^2\theta\right)^{1/2}+\frac{\pi}{2}$

D. $\frac{4\pi d}{\lambda}\left(1-\frac{1}{n^2}\sin^2\theta\right)^{1/2}+2\pi$

Answer: A

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4. In a Young's double slit experiment, the source is white light. One of the holes is covered by a red filter and another by a blue filter. In this case

A. there shall be alternate interference patterns of red and blue

B. there shall be an interference pattern for red distinct from that for blue

C. there shall be no interference fringes

D. there shall be an interference pattern for red mixing with one for blue.

Answer: C

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5. Figure shows a standard two slit arrangement with slits S_1, S_2. P_1, P_2 are the two minima points on either side of P (Figure). At P_2 on the screen, there is a hole and behind

P_2 is a second 2-slit arrangement with slits S_3, S_4 and a second screen behind them.

A. There would be no interference pattern on the second screen but it would be lighted.

B. The second screen would be totally dark.

C. There would be a single bright point on the second screen.

D. There would be a regular two slit pattern on the second screen.

Answer: D

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Assertion And Reason

1. Assertion : The frequencies of incident, reflected and refracted beam of monochromatic light are same.

Reason : The incident, reflected and refracted rays are coplanar.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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2. Assertion: When a light wave travels from a rarer to a denser medium, it loses speed. The reduction in speed imply a reduction in energy carried by the light wave.

Reason: The energy of a wave is proportional to velocity of wave.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: D

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3. Assertion : Wavefronts obtained from light emitted by a point source in an isotropic medium are always spherical.

Reason : Speed of light in isotropic medium is constant.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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4. Assertion : When a plane wave passes through a thin prism, the emerging wavefront gets tilted.

Reason : Speed of light is less is glass than in air.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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5. Assertion : The increase in wavelength due to doppler effect is termed as red shift.

Reason : In red shift, a wavelength in the middle of the visible region of the spectrum moves towards the violet end of the spectrum.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

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6. Assertion : Interference is not observed if the two coherent slit sources are broad.

Reason : A broad source is equivalent to many narrow slit sources.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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7. Assertion : When a thin transparent sheet is placed in front of both the slits of Young's experiment, the fringe width will remains same.

Reason : In Young's experiment, the fringe width is directly proportional to wavelength of the source used.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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8. Statement-I : In Young's double slit experiment interference pattern disappears when one of the slits is closed

Statement-II : Interference is observed due to superposition of light waves from two coherent source

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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9. Assertion : The fringe closest on either side of the central white fringe in case of interference pattern due to white light is red and the farthest appears blue.

Reason : The interference patterns due to different component colours of white light overlap.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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10. Assertion : All bright interference bands have same intensity.

Reason : Because all bands do not receive same light from two sources.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

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11. Assertion : If we look clearly at the shadow cast by an opaque object, close to the region of geometrical shadow, alternate dark and bright regions can be seen.

Reason : This happens due to the phenomenon of interference.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: C

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12. Assertion : If the light from an ordinary source passes through a polaroid sheet, its intensity is reduced by half.

Reason : The electric vectors associated with the light wave along the direction of the aligned molecules get absorbed by polaroid.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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13. Assertion : Sound waves cannot be polarized.

Reason : Sound waves are longitudinal in nature.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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14. Assertion : In interference and diffraction, light energy is redistributed.

Reason : There is no gain or loss of energy, which is consistent with the principle of conservation of energy.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: A

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15. Assertion : Intensity pattern of interference and diffraction are not same.

Reason : When there are few sources of light, then the result is usually called interference but if there is a large number fo them, the word diffraction is more often used.

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

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

C. If assertion is true but reason is false.

D. If both assertion and reason are false.

Answer: B

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Others

1. Consider the following statements in case of Young's double slit experiment.

(1) A slit S is necessary if we use an ordinary extended source of light.

(2) A slit S is not needed if we use an ordinary but well collimated beam of light.

(3) A slit S is not needed if we use a spatially coherent source of light.

Which of the above statements are correct?

A. (1), (2) and (3)

B. (1) and (2) only

C. (2) and (3) only

D. (1) and (3) only

Answer: A

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2. In Young's double slit experiment two disturbances arriving at a point P have phase difference of $\frac{\pi}{3}$. The intensity of this point expressed as a fraction of maximum intensity I_0 is

A. $\frac{3}{2}I_0$

B. $\frac{1}{2}I_0$

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

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

Answer: D

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3. In young's double slit experiment using monochromatic light of wavelengths λ, the intensity of light at a point on the screen with path difference λ is M units. The intensity of light at a point where path difference is $\lambda/3$ is

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

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

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

D. $\frac{M}{16}$

Answer: B

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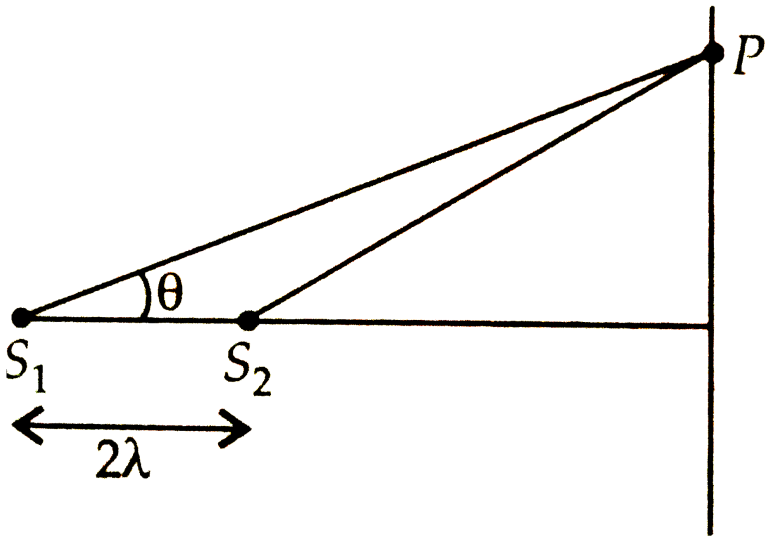
4. In Young's double slit experiment, the slits are horizontal. The intensity at a point P as shown in figure is $\frac{3}{4}I_0$,where I_0 is the maximum intensity.

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

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5. Two slits in Young's double slit experiment have widths in the ratio 81:1. What is the the ratio of amplitudes of light waves coming from them ?

A. $3:1$

B. $3:2$

C. $9:1$

D. $6:1$

Answer: C

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6. 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

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7. 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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8. The ratio of intensity at maxima and minima in the interference pattern is 25:9. What will be the widths of the two slits in Young's interference experiment ?

A. $18:3$

B. $4:1$

C. $8:1$

D. $16:1$

Answer: D

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9. 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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10. In a Young's double-slit experiment , the slits are separated by 0.28 mm and screen is placed 1.4 m away . The distance between the central bright fringe and the fourth bright fringe is measured to be 1.2 cm . Determine the wavelength of light used in the experiment .

A. $6 \times 10^{-7} m$

B. $3 \times 10^{-7} m$

C. $1.5 \times 10^{-7} m$

D. $5 \times 10^{-6} m$

Answer: A

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

A. $2.4 \times 10^{-6} m$

B. $1.2 \times 10^{-6} m$

C. $10^{-6} m$

D. $0.5 \times 10^{-6} m$

Answer: A

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12. In a double slit experiment, the distance between the slits is d. The screen is at a distance D from the slits. If a bright fringe is formed opposite to one of the slits, its order is

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

B. $\frac{\lambda^2}{dD}$

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

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

Answer: D

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13. In Young's double slit experiment, the 10^{th} maximum of wavelength λ_1 is at a distance y_1 from its central maximum and the 5^{th} maximum of wavelength λ_2 is at a distance y_2 from its central maximum. The ratio y_1 / y_2 will be

A. $\frac{2\lambda_1}{\lambda_2}$

B. $\frac{2\lambda_2}{\lambda_1}$

C. $\frac{\lambda_1}{2\lambda_2}$

D. $\frac{\lambda_2}{2\lambda_1}$

Answer: A

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14. A narrow slit of width 2 mm is illuminated by monochromatic light of 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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15. 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. 1.2 mm

B. 0.75 mm

C. 1.25 mm

D. 0.625 mm

Answer: C

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

A. 6000 Å

B. 4500 Å

C. 5000 Å

D. 4000 Å

Answer: D

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17. 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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18. A Young's double slit experiment uses a monochromatic source. The shape of the interference fringes formed on a screen is

A. parabola

B. straight line

C. circle

D. hyperbola

Answer: D

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19. When interference of light takes place

A. energy is created in the region of maximum intensity

B. energy is distroyed 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

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20. Two slits are made one millimeter apart and the screen is placed one metre away.

When blue-green light of wavelength 500 nm is used, the fringe separation is

A. $5 \times 10^{-4} m$

B. $2.5 \times 10^{-3} m$

C. $2 \times 10^{-4} m$

D. $10 \times 10^{-4} m$

Answer: A

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21. In Young's double slit experiment, light waves of $\lambda = 5.4 \times 10^2$ nm and $\lambda = 6.85 \times 10^1$ nm are used in turn, keeping the same geometry of the set up. Calculate the ratio of the fringe widths in the two cases.

A. 1.3

B. 4.3

C. 7.9

D. 9.5

Answer: C

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22. The fringe width in YDSE is $2.4 \times 10^{-4} m$, when red light of wavelength 6400Å is used. By how much will it change, if blue light of wavelength 4000Å is used ?

A. $9 \times 10^{-4} m$

B. $0.9 \times 10^{-4} m$

C. $4.5 \times 10^{-4} m$

D. $0.45 \times 10^{-4} m$

Answer: B

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23. In a double slit experiment, the distance between slits in increased ten times whereas their distance from screen is halved then the fringe width is

A. becomes $\frac{1}{20}$

B. becomes $\frac{1}{90}$

C. it remains same

D. becomes $\frac{1}{10}$

Answer: A

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24. Yellow light of wavelength 6000 Å produces fringes of width 0.8 mm in Young's double slit experiment. If the source is replaced by another monochromatic source of wavelength 7500 Å and the separation between the slits is doubled then the fringe width becomes

A. 0.1 mm

B. 0.5 mm

C. 4.3 mm

D. 1 mm

Answer: B

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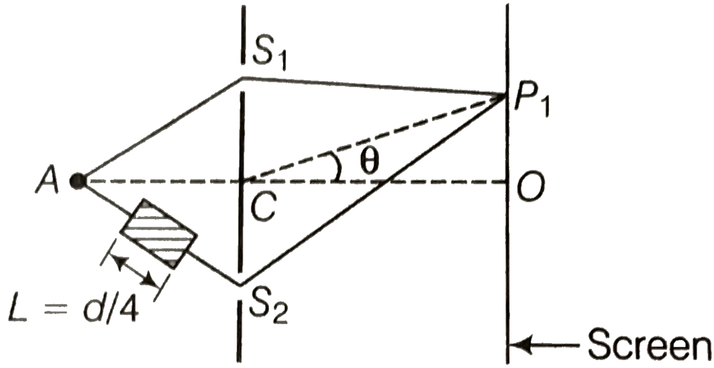
25.



A small transparent slab containing material of $\mu = 1.5$ is placed along AS_2(figure). What will be the distance from O of the principle maxima and of the first minima on either side of the principal maxima obtained in the absence of the glass slab ?

A. 0.19 D and -0.33 D

B. 0.19 D and -0.55 D

C. 0.33 D and -0.65 D

D. 0.33 D and -0.75 D

Answer: A

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26. 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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27. 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. 3000 Ã...

B. 4000 Ã...

C. 6000 Ã...

D. 7000 Ã...

Answer: C

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28. In a Young's double slit experiment an electron beam is used to obtain interference pattern. If the speed of electron decreases then

A. distance between two consecutive fringes remains the same

B. distance between two consecutive fringes decreases

C. distance between two consecutive fringes increases

D. None of these.

Answer: C

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29. In a double slit interference pattern, the first maxima for infrared light would be

A. at the same place as the first maxima for green light

B. closer to the centre than the first maxima for green light

C. farther from the centre than the first maxima for green light

D. infrared light does not produce an interference pattern

Answer: C

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30. In double slit experiment using light of wavelength $600nm$, the angular width of a fringe formed on a distant screen is 0.1°. What is the spacing between the two slits ?

A. $3.44 \times 10^{-4}m$

B. $1.54 \times 10^{-4}m$

C. $1.54 \times 10^{-3}m$

D. $1.44 \times 10^{-3} m$

Answer: A

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31. In Young's double slit experiment, the distance between two sources is $0.1 mm$. The distance of screen from the sources is $20 cm$. Wavelength of light used is $5460 Å$. Then angular position of the first dark fringe is

A. 0.08°

B. 0.16°

C. 0.20°

D. 0.31°

Answer: B

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32. In a double slit experiment the angular width of a fringe is found to be 0.2° on a screen placed I m away. The wavelength of light used in 600 nm. What will be the angular width of the fringe if the entire experimental apparatus is immersed in water ? Take refractive index of water to be $4/3$.

A. 0.15°

B. 1°

C. 2°

D. 0.3°

Answer: A

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33. In a Young's double slit experiment, 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. 0.174 Ã…

C. 0.174 μm

D. $0.174 \times 10^{-4} m$

Answer: C

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34. 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. $\frac{2\lambda}{\theta}$

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

Answer: A

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

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

Answer: A

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36. In Young's double slit experiment, the fringe width with light of wavelength 6000 Ã... is 3 mm. The fringe width, when the wavelength of light is changed to 4000 Ã... is

A. 3 mm

B. 1 mm

C. 2 mm

D. 4 mm

Answer: C

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37. The colours seen in the reflected white light from a thin oil film are due to

A. Diffraction

B. Interference

C. Polarisation

D. Dispersion

Answer: B

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38. What is the minimum thickness of a soap bubble needed for constructive interference in reflected light, if the light incident on the film is 750 nm? Assume that the refractive index for the film is $n = 1.33$

A. 282 nm

B. 70.5 nm

C. 141 nm

D. 387 nm

Answer: C

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39. A parallel beam of sodium light of wavelength $6000\mathring{A}$ is incident on a thin glass plate of $\mu = 1.5$, such that the angle of refraction in the plate is 60°. The smallest thickness of the plate which will make it appear dark by reflected light is

A. $4000\mathring{A}$

B. $40\mathring{A}$

C. $400\mathring{A}$

D. $4\mathring{A}$

Answer: A

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40. On introducing a thin film in the path of one of the two interfering beam, the central fringe will shift by one fringe width. If $\mu = 1.5,$ the thickness of the film is (wavelength of monochromatic light is λ)

A. 4λ

B. 3λ

C. 2λ

D. λ

Answer: C

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