PHYSICS

RESONANCE ENGLISH

WAVE OPTICS

Exercise

1. If the relative permitivity and relative permeability of a medium are 2 and 1.28

respectively, then refractive index of that material is:

A. 1.25

B. 25/16

C. $\frac{5}{8}$

D. 1.6

Answer: D

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2. Two light waves travelling in same medium are given by $E_1 = 2\sin(100\pi t - kx + 30^\circ)$ and $E_2 = 3\cos\left(200\pi t - k'x + 60^\circ\right)$. The ratio of intensity of first wave to that of second wave is:

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

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

C. $\frac{1}{9}$

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

Answer: B

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3. If the ratio of the intensity of two coherent sources is 4 then the visibility $[(I_{\max} - I_{\min}) / (I_{\max} + I_{\min})]$ of the fringes is

A. 4

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

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

D. 9

Answer: B

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4. The distance of n^{th} bright fringe to the $(n+1)^{th}$ dark fringe in Young's experiment is equal to:

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

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

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

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

Answer: C

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5. In Young's double slit experiment, we get 60 fringes in the field of view of monochromatic light of wavelength 4000Å. If we use monochromatic light of wavelength 6000Å, then the number of fringes obtained in the same field of view is

A. 60

B. 90

C. 40

D. 1.5

Answer: C

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6. If the distance between the first maxima and fifth minima of a double-slit pattern is 7 mm and the slits are separated by 0.15 mm with

the screen 50 cm from the slits, then wavelength of the light used is

A. 600 nm

B. 525 nm

C. 467 nm

D. 420 nm

Answer: A

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7. In Young'double-slit interference experiment, if the slit separation is made threefold, the fringe width becomes

A. 6 fold

B. 3 fold

C. 3/6 fold

D. 1/3 fold

Answer: D

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8. The path difference between two interfering waves at a point on the screen is $\lambda/6$, The ratio of intensity at this point and that at the central bright fringe will be (assume that intensity due to each slit is same)

A. 0.853

B. 8.53

C. 0.75

D. 7.5

Answer: C

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9. If the first minima in Young's double-slit experiment occurs directly in front of one of the slits (distance between slit and screen $D = 12cm$ and distance between slits $d = 5cm$), then the wavelength of the radiation used can be

A. 2 cm only

B. 4 cm only

C. $2m, \frac{2}{3}cm, \frac{2}{5}cm$

D. $4cm, \frac{4}{3}cm, \frac{4}{5}cm$

Answer: C

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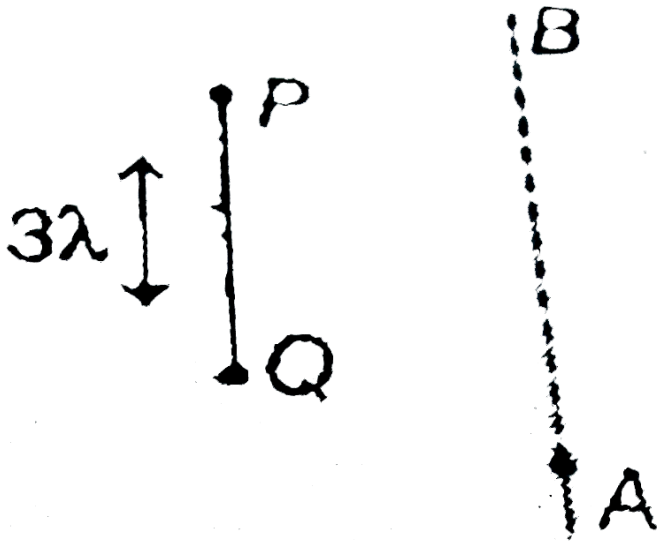
10. Two coherent ligh sources each of wavelength λ are separated by a distance 3λ. The maximum number of minimas formed on

line AB which runs from $-\infty$ to $+\infty$ is



A. 2

B. 4

C. 6

D. 8

Answer: C

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11. A thin oil film of refracting index 1.2 floats on the surface of water $\left(\mu = \frac{4}{3}\right)$. When a light of wavelength $\lambda = 9.6 \times 10^{-7} m$ falls normally on the film air, then it appears dark when seen normally. The minimum change in its thickness for which it will appear bright in normally reflected light by the same light is $Z \times 10^{-7} m$. Then find Z.

A. 10^{-7}m

B. $2 \times 10^{-7}m$

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

D. $5 \times 10^{-7}m$

Answer: B

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12. The wavefront of a light beam is given by the equation $x + 2y + 3x = c$ (where c is

arbitrary constant), then the angle made by the direction of light with the y-axis is

A. $\cos^{-1}.\frac{1}{\sqrt{14}}$

B. $\sin^{-1}.\frac{2}{\sqrt{14}}$

C. $\cos^{-1}.\frac{2}{\sqrt{14}}$

D. $\sin^{-1}.\frac{3}{\sqrt{14}}$

Answer: C

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13. In a single-slit diffraction experiment, the width of the slit is made half of the original width:

A. the width of the central maxima becomes double

B. the width of the maxima becomes half

C. the width of the central maxima becomes one fourth

D. the width of the central maxima becomes four times.

Answer: A

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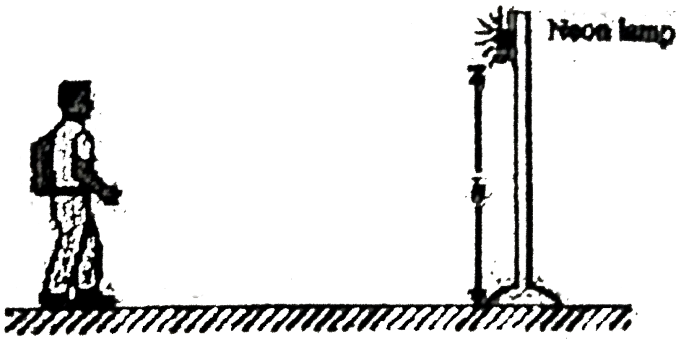
14. On a very hot day, a boy standing at a large distance observers a neon monochromatic lamp hanging at a height h above the ground. He observe the lamp as shown in the figure



A. at a height h

B. at a height more than h.

C. at a height less than h.

D. at a height that is varying with time, sometimes more than h and sometimes less than h.

Answer: C

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15. If torch is used in place of monochromatic light in Young's experiment what will happen

A. fringe will appear for a moment and then it will disppear

B. fringe will occure as from monochromatic source

C. only bright fringes will appear

D. no fringe will appear

Answer: D

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16. White light is used to illuminate the two slits in a Young's double slit experiment. The separation between the slits is b and the screen is at a distance $d(>>b)$ from the slits At a point on the screen directly in front of one of the slits, certain wavelengths are missing some of these missing wavelengths are

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

B. $\lambda = \frac{2b^2}{d}$

C. $\lambda = \frac{b^2}{3d}$

D. $\lambda = \frac{2b^2}{3d}$

Answer: C

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17. The ratio of intensities of two waves are given by $4:1$. The ratio of the amplitudes of the two waves is

A. $2:1$

B. $1:2$

C. $4:1$

D. $1:4$

Answer: A

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18. Two coherent monochromatic light beams of intensities I and 4I are superposed. The

maximum and minimum possible intensities in the resulting beam are

A. 5I and I

B. 5I and 3I

C. 9I and I

D. 9I and 3I

Answer: C

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19. The contrast in the fringes in any interference pattern depends on -

A. fringe width

B. wavelength

C. intensity ratio of the sources

D. distance between the source

Answer: C

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20. Young's experiment is performed in air and then performed in water, the fringe width:

A. will remain same

B. will decreases

C. will increases

D. all the above types of waves

Answer: B

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21. The Youn'g double slit experiment is performed with blue and green light of wavelength 4360Å and 5460Å respectively, if x is the distance of 4th maxima from the central one, then

A. X(blue)=X(green)

B. X(blue) gt X(green)

C. X(blue) lt X(green)

D. $\frac{\mathrm{X(blue)}}{\mathrm{X(green)}} = \frac{5460}{4360}$

Answer: C

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22. A light ray incidents on water $\left(n = \frac{4}{3}\right)$ surface from air and reflected from air and reflected part of it is found to be polarized. Find the deviation of refracted light from its original path:

A. 53°

B. 90°

C. 74°

D. 16°

Answer: D

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

A. 10.5 cm

B. 12 cm

C. 13 cm

D. 14 cm

Answer: B

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24. The ratio of diameters of fourth and ninth half period zones is:

A. $2/3$

B. $4/9$

C. $1/4$

D. $16/81$

Answer: A

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25. The maximum numbers of possible interference maxima for slit separation equal to twice the wavelength in Young's double slit experiment is

A. infinite

B. five

C. three

D. zero

Answer: B

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26. Calculate the width of central maxima, if light of 9000Å incidents upon a slit of width

1.5 mm. Screen is kept 150 cm away from the slit.

A. 1.8 mm

B. 1.30 mm

C. 0.9 mm

D. 0.9 cm

Answer: A

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27. Two slits at a distance of $1mm$ are illuminated by a light of wavelength $6.5 \times 10^{-7}m$. The interference fringes are observed on a screen placed at a distance of $1m$. The distance between third dark fringe and fifth bright fringe will be

A. 0.65 mm

B. 1.30 mm

C. 1.625 mm

D. 0.975 mm

Answer: C

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28. A parallel beam of monochromatic light is used in a Young's double slit experiment. The slits are separated by a distance d and the screen is placed parallel to the plane of the slits. Show that if the incident beam makes an angle $\theta = \sin^{-1}\left(\frac{\lambda}{2d}\right)$ with the normal to the plane of the slits, there will be a dark fringe at the centre Po of the pattern.

A. $4I_0$

B. $2I_0$

C. I_0

D. zero

Answer: D

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29. Which of the following statement is correct?

A. if two polariods are placed at 90° to each other then , the transmitted intensity is zero.

B. if two polariods are placed at 90° to each other and one more polaroid is placed between these two (bisecting the angle between them), then intensity of light will be half.

C. polarized light has angle of electric field along the propagation of light.

D. All of them

Answer: A

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30. A single slit of width 0.1mm is illuminated by parallel light of wavelength 6000Å, and diffraction bands are observed on a screen 40cm from the slit. The distance of third dark band from the central bright band is:

A. 7.2 mm

B. 3.6 mm

C. 2.4 mm

D. 0.6 mm

Answer: A

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31. A light wave of frequency 5×10^{14} Hz enters a medium of refractive index 1.5. In the medium, the velocity of the ligth of wave is _____ and its wavelength _____,

A. 3×10^{10} cm/sec

B. 2×10^{10} cm/sec

C. 3×10^{8} cm/sec

D. 2×10^{8} cm/sec

Answer: B

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32. If one of the slit of a standard Young's double slit experiment is covered by a thin parallel sided glass slab so that it transmits

only one-half the light intensity of the other, then

A. The fringe pattern will get shifted towards the covered slit

B. The fringe pattern will get shifted away from the covered slit

C. The bright fringe will becomes more bright and the dark ones will becomes less bright

D. The fringe width will be change

Answer: A

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33. A Young's double slit experiment is performed with white light.

A. The maxima next to the will be red.

B. The central maxima will be violet

C. The maxima next to the central will be green

D. There will not be a completely dark fringe.

Answer: D

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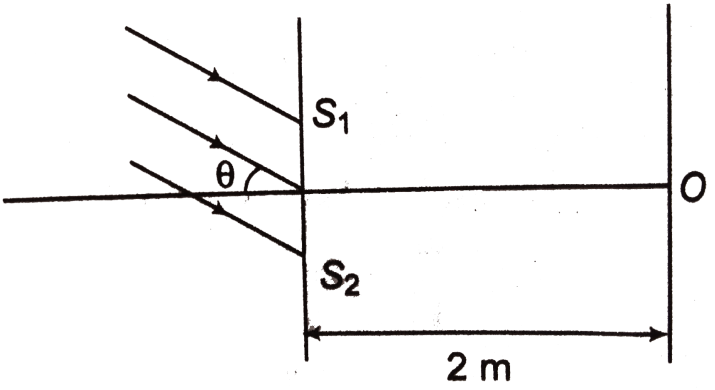
34. A parallel beam of light $(\lambda = 5000\text{Å})$ is incident at an angle $\theta = 30^\circ$ with the normal to the slit plane in a Young's double slit experiment. The intensity due to each slit is I_0. Point O is equidistant from S_1 and S_2. The

distance between slits is 1mm.



A. the intensity at O is $2I_0$

B. the intensity at O is zero

C. the intensity at a point on the screen 4m from O is $4I_0$

D. the intensity at a point on the screen 4m from O is zero

Answer: C

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35. Statement I: Two coherent point sources of light having no-zero phase difference are separated by a small distance. Then, on the perpendicular bisector of line segment joining both the point sources, constructive

interference cannot be obtained.

Statement II: For two waves from coherent point sources to interfere constructively at a point, the magnitude of their phase difference at that point must be $2m\pi$ (where m is non-negative integer).

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

B. Statement-1 is true, Statement-2: is true, Statement-2 is NOT a correct explanation

for Statement-1.

C. Statement-1 is true but statement-2 is false

D. Statement-1 is false, Statement-2 is true

Answer: D

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