KCET

Ultimate KCET Crash Course 2026

PHYSICS

Wave optics

DPP :- 01

Q1 Choose the incorrect statement for the polarization by reflection.

(A) The reflected light and refracted light is at 90° in complete polarization by reflection.

(B) If θ_P is angle of polarization, then refractive index should always be greater than tan θ_P.

(C) At the angle of polarization, the percentage of the polarized light in the reflected beam is greatest.

(D) Both (A) & (C)

Q2 The polarising angle for transparent medium is θ, v is the speed of light in that medium. Then the relation between θ and v is (c = velocity of light in air)

(A) $\theta = \tan^{-1}\left(\frac{v}{c}\right)$

(B) $\theta = \cot^{-1}\left(\frac{v}{c}\right)$

(C) $\theta = \sin^{-1}\left(\frac{v}{c}\right)$

(D) $\theta = \cos^{-1}\left(\frac{v}{c}\right)$

Q3 Shape of wavefront in case of

I. light diverging from a point source is spherical

II. light emerging out of a convex lens when a point source is placed at its focus is plane

III. the portion of the wavefront of light from a distant star intercepted by the Earth is plane.

Which of the above statements are correct?

(A) I and II (B) I and III

(C) II and III (D) I, II and III

Q4 Two coherent sources of different intensities send waves that interfere. The ratio of maximum to minimum intensity is 25. The intensity ratio of the sources is

(A) 25 : 1 (B) 5 : 1

(C) 9 : 4 (D) 625 : 1

Q5 The wavelength of the light used in Youngs double slit experiment is λ. The intensity at a point on the screen is I, where the path difference is $\frac{\lambda}{6}$. If I_0 denotes the maximum intensity, then the ratio of I and I_0 is:

(A) 0.866 (B) 0.5

(C) 0.707 (D) 0.75

Q6 The Brewster's angle (i_b) for an interface should be:

(A) 30° < i_b < 45°

(B) 45° < i_b < 90°

(C) i_b = 90°

(D) 0° < i_b < 30°

Q7 Monochromatic green light of wavelength 5×10^{-7} m illuminates a pair of slits 1 mm apart. The separation of bright lines on the interference pattern formed on a screen 2 m away is:

(A) 0.25 mm (B) 0.1 mm

(C) 1.0 mm (D) 0.01 mm

Q8 If the amplitude ratio of two sources producing interference is 3 : 5, the ratio of intensities at maxima and minima is

(A) 25 : 16 (B) 5 : 3

(C) 16 : 1 (D) 25 : 9

Q9 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 **[NEET 2016 P-II]**

(A) $\frac{\sqrt{n}}{n+1}$ (B) $\frac{2\sqrt{n}}{n+1}$

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

Q10 If the monochromatic source in Young's double slit experiment is replaced by white light, then:

(A) Interference pattern will disappear.
(B) There will be a central dark fringe surrounded by a few coloured fringes.
(C) There will be a central bright white fringe surrounded by a few coloured fringes.
(D) All bright fringes will be of equal width.

Q11 Unpolarized light is incident first on polarizer (*P*) and then on analyzer (*A*). If the intensity of light emerging from the analyzer is $\left(\frac{1}{8}\right)^{\text{th}}$ of the incident unpolarized light, then the angle between the optical axes of *P* and *A* will be:
(A) 30° (B) 45°
(C) 0° (D) 60°

Q12 Two polaroids are kept crossed to each other. Now one of them is rotated through an angle of 45°. The percentage of incident light now transmitted through the system is
(A) 15% (B) 25%
(C) 50% (D) 60%

Q13 The two slits at a distance of $1\ \mathrm{mm}$ are illuminated by the light of wavelength $6.5 \times 10^{-7}\ \mathrm{m}$. The interference fringes are observed on a screen placed at a distance of 1 m. The distance between third dark fringe and fifth bright fringe will be
(A) $0.65\ \mathrm{cm}$
(B) $4.8\ \mathrm{mm}$
(C) $1.63\ \mathrm{mm}$
(D) $3.25\ \mathrm{cm}$

Q14 A double slit experiment is performed with light of wavelength $500\ \mathrm{nm}$. A thin film of thickness $2 \mu\mathrm{m}$ and refractive index 1.5 is introduced in the path of the upper beam. The location of the central maximum will :
(A) Remain unshifted
(B) Shift downward by nearly two fringes
(C) Shift upward by nearly two fringes
(D) Shift downward by 10 fringes

Q15 An unpolarised beam of light is incident on a group of four polarising sheets which are arranged in such a way that the characteristic direction of each polarising sheet makes an angle of 30° with that of the preceding sheet. The percentage of incident light transmitted by the first polariser will be
(A) 100% (B) 50%
(C) 25% (D) 125%

Q16 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 $5 \times 10^{-2}\ \mathrm{m}$ towards the slits, the change in fringe width is $10^{-3}\ \mathrm{m}$. Then the wavelength of light used is (given that distance between the slits is $0.03\ \mathrm{mm}$)
(A) 4500 Å
(B) 5000 Å
(C) 5500 Å
(D) 6000 Å

Q17 Choose correct conditions of diffraction (here *a* = slit width, λ = wavelength of light)
(A) $\frac{a}{\lambda} = 1$
(B) $\frac{a}{\lambda} \gg 1$
(C) $\frac{a}{\lambda} \ll 1$
(D) $\frac{a}{\lambda} = 0$

Q18 Monochromatic light from a narrow slit illuminates two parallel slits producing an interference pattern on a screen. The separation between the screen and the slits is reduced to half. The fringe width
(A) Is doubled
(B) Becomes four times
(C) Becomes one fourth
(D) Becomes half

Q19 If a thin mica sheet of thickness t and refractive index μ is placed in the path of one of the waves producing interference, then the whole interference pattern shift towards the side of the sheet by a distance;
(A) $\frac{\mathrm{d}}{\mathrm{D}}(\mu - 1)\mathrm{t}$ (B) $\frac{\mathrm{D}}{\mathrm{d}}(\mu - 1)\mathrm{t}$
(C) $\mathrm{Dd}(\mu - 1)\mathrm{t}$ (D) $(\mu - 1)\mathrm{t}$

Q20 Unpolarized light of intensity *I* passes through an ideal polarizer *A*. Another identical polarizer *B* is placed behind *A*. The intensity of light beyond *B* is found to be $\frac{I}{2}$. Now another identical polarizer *C* is placed between *A* and *B*. The intensity beyond *B* is now found to be $\frac{I}{8}$. The angle between polarizer *A* and *C* is:

(A) 45° (B) 60°
(C) 0° (D) 30°

Q21 **Statement-I:** Shape of wave front depends on type of source.
Statement-II: Wavefront is a locus of all those points, which are oscillating in same phase.

(A) Statement I is true, Statement II true, Statement II is correct explanation for statement I.
(B) Statement I is true, Statement II true, Statement II is not the correct explanation for statement I.
(C) Statement I is true, Statement II is false.
(D) Statement I is false, Statement II is true.

Q22 If the separation between slits in Young's double experiment reduced to 1/3 rd the fringe width becomes *n* times. The value of *n* is

(A) 3 (B) 1/3
(C) 9 (D) 1/9

Q23 The intensity of light coming from one of the slits in Young's double slit experiment is double the intensity from the other slit. The ratio of maximum intensity to minimum intensity in the interference pattern will be

(A) 14 (B) 34
(C) 24 (D) 44

Q24 In Young's double slit experiment maximum intensity is *I* than the angular position where the intensity becomes $\frac{1}{4}$ is

(A) $\sin^{-1}\left(\frac{\lambda}{d}\right)$
(B) $\sin^{-1}\left(\frac{\lambda}{3d}\right)$
(C) $\sin^{-1}\left(\frac{\lambda}{2d}\right)$
(D) $\sin^{-1}\left(\frac{\lambda}{4d}\right)$

Q25 Two coherent sources are placed 0.9 mm apart and the fringes are observed one metre away. The wavelength of monochromatic light used if it produces the second dark fringe at a distance of 10 mm from the central fringe will be

(A) 6×10^{-4} cm
(B) 6×10^{-6} cm
(C) 6×10^{-7} cm
(D) 1.2×10^{-4} cm

Q26 In the Young's double slit experiment, the spacing between two slits is 0.1 mm. If the screen is kept at a distance of 1.0 m from the slits and the wavelength of light is 5000 Å, then the fringe width is

(A) 1.0 cm (B) 1.5 cm
(C) 0.5 cm (D) 2.0 cm

Q27 Which of the following is correct for "Malus Law"?

(A) $I = I_0^2 \cos^2\theta$
(B) $I = I_0 \cos^2\theta$
(C) $I = I_0^2 \sin^2\theta$
(D) $I = I_0 \tan^{-1}\theta$

Q28 The refractive index of glass is 3/2. What is the polarising angle for glass?

(A) 56°18" (B) 60°
(C) 30° (D) None

Q29 Which among the following statement is true about Huygen's principle

(A) Each point on a wavefront is a source of secondary waves
(B) Each point on a wavefront is a sink of secondary waves
(C) No point on a wavefront is a secondary wave
(D) None of the above

Q30 Two sound waves travel in the same direction in a medium. The amplitude of each wave is *A* and the phase difference between the two waves is 120°. The resultant amplitude will be

(A) $\sqrt{2}A$ (B) $2A$
(C) $3A$ (D) A

Answer Key

Q1	(A)
Q2	(B)
Q3	(D)
Q4	(C)
Q5	(D)
Q6	(B)
Q7	(C)
Q8	(C)
Q9	(B)
Q10	(C)
Q11	(D)
Q12	(B)
Q13	(C)
Q14	(C)
Q15	(B)
Q16	(D)
Q17	(A)
Q18	(D)
Q19	(B)
Q20	(A)
Q21	(B)
Q22	(A)
Q23	(B)
Q24	(B)
Q25	(A)
Q26	(C)
Q27	(B)
Q28	(A)
Q29	(A)
Q30	(D)

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

If θ_P is angle of polarization, then refractive index should always be greater than tan θ_P.

Video Solution:

Q2 Text Solution:

The polarising angle is given as $\tan\theta = \mu$

The refractive index is given as

$\mu = \frac{c}{v}$

From equations (i) and (ii)

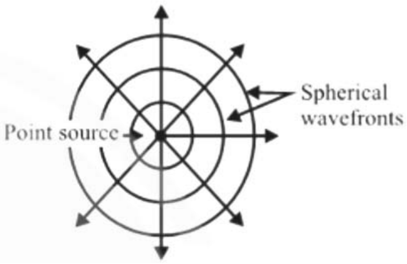
$\tan\ \theta = \frac{c}{v}$ or $\cot\ \theta = \frac{v}{c}$ or $\theta = \cot^{-1}\left(\frac{v}{c}\right)$

Video Solution:

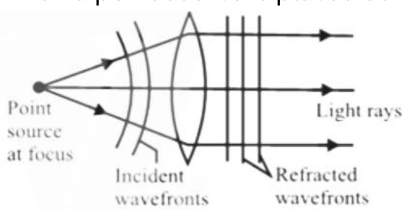
Q3 Text Solution:

(D)

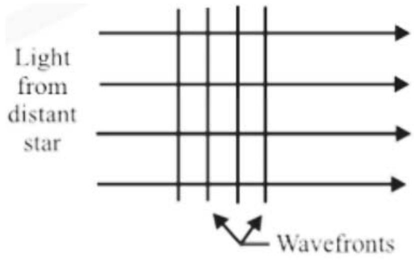
Case I. A light rays divering from a point source.



Case II. A light ray emerging out of convex lens when a point source is placed at its focus.



Case III. A portion of the wavefront of light from a distant star intercepted by the Earth.



Video Solution:

Q4 Text Solution:

The ratio of maximum and minimum intensities is given by,

$$\frac{I_{max}}{I_{min}} = \left(\frac{\sqrt{I_1}+\sqrt{I_2}}{\sqrt{I_1}-\sqrt{I_2}}\right)^2$$

$$25 = \left(\frac{\sqrt{I_1}+\sqrt{I_2}}{\sqrt{I_1}-\sqrt{I_2}}\right)^2$$

$$5 = \frac{\sqrt{I_1}+\sqrt{I_2}}{\sqrt{I_1}-\sqrt{I_2}}$$

$$5\sqrt{I_1} - 5\sqrt{I_2} = \sqrt{I_1} + \sqrt{I_2}$$

$$\sqrt{I_1}\,(5-1) = \sqrt{I_2}\,(1+5)$$

$$\Rightarrow \frac{\sqrt{I_1}}{\sqrt{I_2}} = \frac{6}{4}$$

$$\frac{\sqrt{I_1}}{\sqrt{I_2}} = \frac{3}{2}$$

$$\Rightarrow \frac{I_1}{I_2} = \frac{9}{4}$$

Hence, option C is correct, i.e., 9: 4.

Video Solution:

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Q5 Text Solution:

The phase difference is given by

$\Delta\phi = \frac{2\pi}{\lambda}\Delta \mathrm{x}$

$\text{Here, } \Delta \mathrm{x} = \frac{\lambda}{6}$

$\text{So, } \Delta\phi = \frac{2\pi}{\lambda} \times \frac{\lambda}{6} = \frac{\pi}{3}$

Now, intensity is given by

$\mathrm{I} = \mathrm{Io}\ \cos^2\left(\frac{\Delta\phi}{2}\right)$

$\frac{\mathrm{I}}{\mathrm{Io}} = \cos^2\left(\frac{\pi}{2\times3}\right)$

$\frac{\mathrm{I}}{\mathrm{Io}} = \frac{3}{4} = 0.75$

Video Solution:

Q6 Text Solution:

(B)

In the interface of 2 media, Brewster's angle is written as;

$\mu = \tan\ i_b$ ___(1)

here, μ is the refractive index of the given material.

where μ lies between 1 to ∞.

$1 < \mu < \infty$

putting equation (1) in the above equation we have;

$1 < \tan\ i_b < \infty$

where i_b is the polarization angle.

$\Rightarrow \tan^{-1}(1) < i_b < \tan^{-1}(\infty)$

$\Rightarrow 45^\circ < i_b < 90^\circ$

Video Solution:

Q7 Text Solution:

$\beta = \frac{\lambda D}{d} = \frac{5\times10^{-7}\times2}{10^{-3}}\mathrm{m} = 10^{-3}\mathrm{m} = 1.0\,\mathrm{mm}.$

Video Solution:

Q8 Text Solution:

(C)

$\frac{a_1}{a_2} = \frac{3}{5}$

$\therefore \frac{I_{\max}}{I_{\min}} = \frac{(a_1+a_2)^2}{(a_1-a_2)^2} = \frac{(3+5)^2}{(3-5)^2} = \frac{16}{1}$

Video Solution:

Q9 Text Solution:

(B)

Maximum intensity is given as

$I_{max} = \left(\sqrt{I_1} + \sqrt{I_2}\right)^2$

Minimum intensity is given as

$I_{min} = \left(\sqrt{I_1} - \sqrt{I_2}\right)^2$

Given $\frac{I_1}{I_2} = n$

$\frac{I_{max}}{I_{min}} = \left(\frac{\sqrt{I_1}+\sqrt{I_2}}{\sqrt{I_1}-\sqrt{I_2}}\right)^2$

$= \left(\frac{\sqrt{\frac{I_1}{I_2}}+1}{\sqrt{\frac{I_1}{I_2}}-1}\right)^2 = \left(\frac{\sqrt{n}+1}{\sqrt{n}-1}\right)^2$

$\frac{I_{max}-I_{min}}{I_{max}+I_{min}} = \frac{\frac{I_{max}}{I_{min}}-1}{\frac{I_{max}}{I_{min}}+1}$

$= \frac{\left(\frac{\sqrt{n}+1}{\sqrt{n}-1}\right)^2-1}{\left(\frac{\sqrt{n}+1}{\sqrt{n}-1}\right)^2+1}$

$= \frac{(\sqrt{n}+1)^2-(\sqrt{n}-1)^2}{(\sqrt{n}+1)^2+(\sqrt{n}-1)^2}$

$= \frac{4\sqrt{n}}{2(n+1)} = \frac{2\sqrt{n}}{n+1}$

Video Solution:

Q10 Text Solution:

- In YDSE with white light, the central fringe (path difference = 0) is white because all colours interfere constructively. Fringes on either side are coloured due to different path differences for different wavelengths.
- Central bright white fringe surrounded by coloured fringes.

Video Solution:

Q11 Text Solution:

$I_0/2$

$I = I_P \cos^2\theta$

$\frac{I_0}{2}\cos^2\theta = \frac{I_0}{8} \Rightarrow \cos^2\theta = \frac{1}{4} \Rightarrow \theta = 60^\circ.$

Video Solution:

Q12 Video Solution:

Q13 Text Solution:

Option (C) is correct.

Explanation:

Position of nth dark fringe from the center is given by

$$x_n = \frac{(2n-1)\lambda D}{2d}$$

So, for third dark fringe, $n = 3$

$$x_3 = \frac{(2\times3-1)6.5\times10^{-7}\times1}{2\times10^{-3}} = 1.62\times10^{-3}m$$

Position of nth bright fringe from the center is given by

$$x_3 = \frac{n\lambda D}{d}$$

So, for 5th bright fringe, $n = 5$

$$x_5 = \frac{5\times6.5\times10^{-7}\times1}{10^{-3}} = 3.25\times10^{-3}m$$

Therefore distance between third dark fringe and fifth bright fringe $= (x_3 - x_5) = 1.63\ mm$

Video Solution:

Q14 Video Solution:

Q15 Video Solution:

Q16 Video Solution:

Q17 Text Solution:

For diffraction size of the obstacle must be of the order of wavelength of wave i.e. $a \approx \lambda$

Video Solution:

Q18 Text Solution:

Formula Based

Video Solution:

Q19 Text Solution:

Central maxima is formed where path difference is zero.

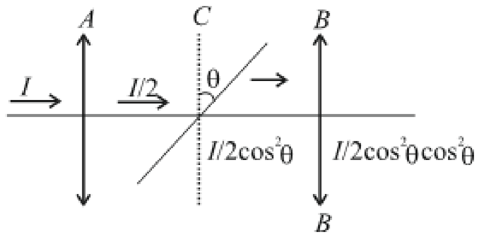
$$\left(\mu - 1\right)\mathrm{t} = \frac{\mathrm{dy}}{\mathrm{D}}$$

$$\mathrm{y} = \frac{\mathrm{D}(\mu-1)\mathrm{t}}{\mathrm{d}}$$

Video Solution:

Q20 Text Solution:

(A)



$$\frac{I}{2}\cos^2\theta = \frac{I}{8}$$

$$\cos^2\theta = \frac{1}{4}$$

$$\cos\theta = \frac{1}{\sqrt{2}} \quad \Rightarrow \quad \theta = 45^\circ$$

Video Solution:

Q21 Video Solution:

Q22 Video Solution:

Q23 Text Solution:

Given $I_1 = 2I_2$; the required ratio is given by

$$\frac{I_{\max}}{I_{\min}} = \frac{\left(\sqrt{2I_2}+\sqrt{I_2}\right)^2}{\left(\sqrt{2I_2}-\sqrt{I_2}\right)^2} = \frac{\left(\sqrt{2}+1\right)^2}{\left(\sqrt{2}-1\right)^2} = \frac{3+2\sqrt{2}}{3-2\sqrt{2}}$$

or by $\frac{I_{\max}}{I_{\min}} = \frac{3+2\times1.414}{3-2\times1.414} = \frac{5.828}{0.172} \approx 34$

Video Solution:

Q24 Video Solution:

Q25 Text Solution:

Given that d = 0.9 mm = 0.09 cm

D =1 m = 100cm; y_n =10 mm = 1 cm; n = 2

$$Y_n = \frac{(2n-1)\lambda D}{2d} \Rightarrow \lambda = \frac{Y_n 2d}{(2n-1)D}$$

$$= \frac{1 \times 2 \times 0.09}{(2 \times 2-1) \times 100}$$

$$\lambda = 6 \times 10^{-4} cm$$

Video Solution:

Q26 Video Solution:

Q27 Text Solution:

$$I = I_o \cos^2 \theta$$

Video Solution:

Q28 Text Solution:

We know that the relation between m and i_p is

μ = tan i_p

$$\Rightarrow \frac{3}{2} = \tan i_p \Rightarrow i_p = \tan^{-1}(1.5) = 56^{\circ}18'$$

Video Solution:

Q29 Text Solution:

Each point on a wavefront is a source of secondary waves

Video Solution:

Q30 Text Solution:

Here, $A_1 = A, A_2 = A, \phi = 120^{\circ}$

The amplitude of the resultant wave is

$$A_2 = \sqrt{A_1^2 + A_2^2 + 2A_1 A_2 \cos\theta}$$

$$= \sqrt{A^2 + A^2 + 2AA\cos 120^{\circ}}$$

$$= \sqrt{A^2 + A^2 - A^2} \quad \left(\because \cos 120^{\circ} = -\frac{1}{2}\right)$$

$$A_R = A$$

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