DPP
DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 5

Topic :- WAVE OPTICS

1 **(c)**

Speed of EM waves in vacuum $= \frac{1}{\sqrt{\mu_0 \varepsilon_0}} =$ constant

2 **(b)**

$\frac{I_{\max}}{I_{\min}} = \left(\frac{a_1 + a_2}{a_1 - a_2}\right)^2 = \left(\frac{3a + a}{3a - a}\right)^2 = \frac{4}{1}$

3 **(c)**

The intensity of illumination is given by

$I = \frac{P \cos\theta}{r^2}$

Where $P =$ power of the source

$r =$ distance between source and point

$\theta =$ angle of incidence

When $\theta = 0$, I will be maximum. Hence, the rays from the sun are incident normally on the earth surface

4 **(b)**

$I' = I\, e^{-\mu x} \Rightarrow x = \frac{1}{\mu}\log_e \frac{I}{I'}$ (where $I =$ original intensity, $I' =$ changed intensity)

$36 = \frac{1}{\mu}\log_e \frac{I}{I/8} = \frac{3}{\mu}\log_e 2$ ...(i)

$x = \frac{1}{\mu}\log_e \frac{I}{I/2} = \frac{1}{\mu}\log_e 2$ ...(ii)

From equation (i) and (ii), $x = 12mm$

6 **(c)**

Here, $X_3 = X_5$

$\frac{3D\lambda}{2d} = \frac{5D\lambda'}{2d}$

$\Rightarrow 3\lambda = 5\lambda'$ or $\frac{\lambda}{\lambda'} = \frac{3}{5}$

$\lambda' = \frac{3}{5} \times 700 \text{ nm} = 420 \text{ nm}$

7 **(b)**

Width of the central maximum,

$\beta_0 = \frac{2D\lambda}{a}$

$\beta_0 \propto \frac{1}{a}$

$\therefore$ To increase the width of the central maximum one should decrease a.

8 **(d)**

The rays of light from two coherent sources superimpose each other on the screen forming alternate maxima (with maximum intensity I_0) and minima (with intensity zero). If two non-coherent sources superimpose, there will be no maxima and minima, instead the intensity will be $\frac{I_0}{2}$ throughout.

9 **(a)**

Distance between two consecutive

Dark fringes $= \frac{\lambda D}{d} = \frac{6000 \times 10^{-10} \times 1}{0.6 \times 10^{-3}}$

$= 1 \times 10^{-3} m = 1mm$

11 **(c)**

Transverse waves can be polarized only

13 **(a)**

For interference frequency must be same and phase difference must be constant

14 **(b)**

$\vec{E} \times \vec{B}$ points in the direction of wave propagation

15 **(c)**

In Youngs's double slit experiment half angular width is given by

$\sin\theta = \frac{\lambda}{d}$

$= \frac{589 \times 10^{-9}}{0.589 \times 10^{-3}} = 10^{-3}$

$\Rightarrow \theta = \sin^{-1}(0.001)$

16 **(c)**

$I = 4I_0 \cos^2(\phi/2) \Rightarrow \phi = 2\pi/3$

$\Rightarrow \Delta x \times (2\pi/\lambda) \Rightarrow 2\pi/3 = \lambda/3$

$\sin\theta = \Delta x/d \Rightarrow \sin\theta = \lambda/3d$

17 **(a)**

$\beta \propto \frac{\lambda}{d}$ as $d \rightarrow \frac{d}{3}$ so $\beta \rightarrow 3\beta$ $\therefore n = 3$

18 **(c)**

Interference is explained by wave nature of light

19 **(b)**

Infrared causes heating effect

20 **(d)**

According to Rayleigh scattering formula, Intensity of scattered light $I \propto \frac{1}{(\lambda)^4} \propto f^4$

$$\frac{f_1}{f_2} = \left[\frac{I_1}{I_2}\right]^{-1/4}$$

$$= \left[\frac{256}{81}\right]^{-1/4}$$

$$= \frac{4}{3}$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	C	B	C	B	C	C	B	D	A	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	C	A	B	C	C	A	C	B	D