DPP - Daily Practice Problems

Chapter-wise Sheets

Date : ______ **Start Time :** ______ **End Time :** ______

PHYSICS

CP24

SYLLABUS : Wave Optics

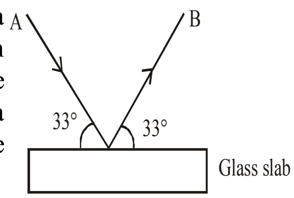
Max. Marks : 180 **Marking Scheme :** (+4) for correct & (–1) for incorrect answer **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 45 MCQs. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. In young's double-slit experiment, the intensity of light at a point on the screen where the path difference is λ is I, λ being the wavelength of light used. The intensity at a point where the path difference is $\frac{\lambda}{4}$ will be

(a) $\frac{I}{4}$ (b) $\frac{I}{2}$ (c) I (d) zero

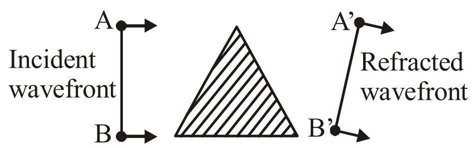
2. A beam of light is incident on a glass slab ($\mu = 1.54$) in a direction as shown in the figure. The reflected light is analysed by a polaroid prism. On rotating the polaroid, ($\tan 57° = 1.54$)



(a) the intensity remains unchanged
(b) the intensity is reduced to zero and remains at zero
(c) the intensity gradually reduces to zero and then again increase
(d) the intensity increases continuously

3. 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) 3rd order of 1st source and 5th of the 2nd
(b) 7th order of 1st and 5th order of 2nd
(c) 5th order of 1st and 3rd order of 2nd
(d) 5th order of 1st and 7th order of 2nd

4. Figure shows behavior of a wavefront when it passes through a prism.



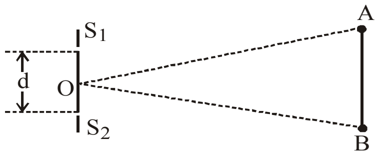
Which of the following statements is/are correct ?
(a) Lower portion of wavefront (B') is delayed resulting in a tilt.
(b) Time taken by light to reach A' is equal to the time taken to reach B' from B.
(c) Speed of wavefront is same everywhere.
(d) A particle on wavefront A' B' is in phase with a particle on wavefront AB.

5. When the angle of incidence is 60° on the surface of a glass slab, it is found that the reflected ray is completely polarised. 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) $3 \times 10^8 \, ms^{-1}$

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ

6. Figure shows two coherent sources S_1 and S_2 vibrating in same phase. AB is an irregular wire lying at a far distance from the sources S_1 and S_2. Let $\frac{\lambda}{d} = 10^{-3}$ and $\angle BOA = 0.12°$. How many bright spots will be seen on the wire, including points A and B?

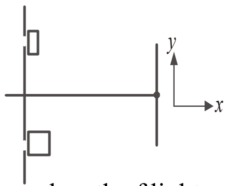


(a) 5
(b) 4
(c) 2
(d) 7

7. Two identical light waves, propagating in the same direction, have a phase difference δ. After they superpose, the intensity of the resulting wave will be proportional to

(a) $\cos\delta$ (b) $\cos(\delta/2)$
(c) $\cos^2(\delta/2)$ (d) $\cos^2\delta$

8. In YSDE, both slits are covered by transparent slab. Upper slit is covered by slab of R.I. 1.5 and thickness t and lower is covered by R.I. $\frac{4}{3}$ and thickness 2t, then central maxima



(a) shifts in +ve y-axis direction
(b) shifts in –ve y-axis direction
(c) remains at same position
(d) may shift in upward or downward depending upon wavelength of light

9. A beam of light of $\lambda = 600$ nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between 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

10. A parallel beam of light of wavelength λ is incident normally on a narrow slit. A diffraction pattern is formed on a screen placed perpendicular to the direction of the incident beam. At the second minimum of the diffraction pattern, the phase difference between the rays coming from the two edges of slit is

(a) $\pi\lambda$ (b) 2π
(c) 3π (d) 4π

11. The diffraction effects in a microscopic specimen become important when the separation between two points is

(a) much greater than the wavelength of light used.
(b) much less than the wavelength of light used.
(c) comparable to the wavelength of light used.
(d) independent of the wavelength of light used.

12. On a rainy day, if there is an oil drop on tar road coloured rings are seen around this drop. This is due to

(a) total internal reflection of light
(b) polarisation
(c) diffraction pattern
(d) interference pattern produced due to oil film

13. In a Young's double slit experiment, the intensity at a point where the path difference $\frac{\lambda}{6}$ (λ – is wavelength of the light) is I. If I_0 denotes the maximum intensity, then $\frac{I}{I_0}$ is equal to

(a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\frac{1}{\sqrt{2}}$ (d) $\frac{3}{4}$

14. According to Huygens, medium through which light waves travel is

(a) vacuum only (b) luminiferous ether
(c) liquid only (d) solid only

15. If we observe the single slit Fraunhofer diffraction with wavelength λ and slit width b, the width of the central maxima is 2θ. On decreasing the slit width for the same λ

(a) θ increases
(b) θ remains unchanged
(c) θ decreases
(d) θ increases or decreases depending on the intensity of light

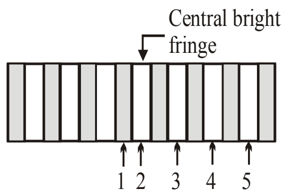
16. Aperture of the human eye is 2 mm. Assuming the mean wavelength of light to be 5000 Å, the angular resolution limit of the eye is nearly

(a) 2 minute (b) 1 minute
(c) 0.5 minute (d) 1.5 minute

17. Unpolarised light is incident on a dielectric of refractive index $\sqrt{3}$. What is the angle of incidence if the reflected beam is completely polarised?

(a) 30° (b) 45°
(c) 60° (d) 75°

18. The figure shows the interference pattern obtained in a double-slit experiment using light of wavelength 600nm. 1, 2, 3, 4 and 5 are marked on five fringes.



The third order bright fringe is

(a) 2 (b) 3 (c) 4 (d) 5

RESPONSE GRID					
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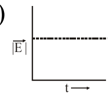
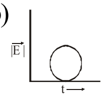
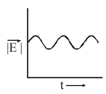
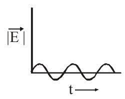
	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ	15. ⓐⓑⓒⓓ
	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ		

Space for Rough Work

19. Which of the following diagrams represent the variation of electric field vector with time for a circularly polarised light ?

(a) 
(b) 
(c) 
(d) 

20. With a monochromatic light, the fringe-width obtained in a Young's double slit experiment is 0.133 cm. The whole set-up is immersed in water of refractive index 1.33, then the new fringe-width is

(a) 0.133 cm (b) 0.1 cm
(c) 1.33 cm (d) 0.2 cm

21. The condition for obtaining secondary maxima in the diffraction pattern due to single slit is

(a) $a\sin\theta = n\lambda$ (b) $a\sin\theta = (2n-1)\dfrac{\lambda}{2}$

(c) $a\sin\theta = (2n-1)\lambda$ (d) $a\sin\theta = \dfrac{n\lambda}{2}$

22. In double slit experiment, the angular width of the fringes is 0.20° for the sodium light $(\lambda = 5890\text{Å})$. In order to increase the angular width of the fringes by 10%, the necessary change in wavelength is

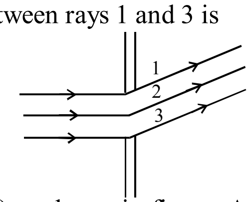
(a) zero (b) increased by 6479 Å
(c) decreased by 589 Å (d) increased by 589 Å

23. In Young's double slit experiment with sodium vapour lamp of wavelength 589 nm and the slits 0.589 mm apart, the half angular width of the central maximum is

(a) $\sin^{-1}(0.01)$ (b) $\sin^{-1}(0.0001)$
(c) $\sin^{-1}(0.001)$ (d) $\sin^{-1}(0.1)$

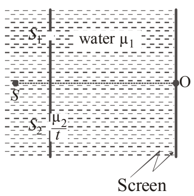
24. The adjacent figure shows Fraunhoffer's diffraction due to a single slit. If first minimum is obtained in the direction shown, then the path difference between rays 1 and 3 is

(a) 0
(b) $\lambda/4$
(c) $\lambda/2$
(d) λ



25. A YDSE is conducted in water (μ_1) as shown in figure. A glass plate of thickness t and refractive index μ_2 is placed in the path of S_2. The optical path difference at O is

(a) $(\mu_2 - 1)t$
(b) $(\mu_1 - 1)t$
(c) $\left(\dfrac{\mu_2}{\mu_1} - 1\right)t$
(d) $(\mu_2 - \mu_1)t$



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

(a) 12.5 cm (b) 12 cm (c) 13 cm (d) 14 cm

27. If two waves represented by $y_1 = 4\sin\omega t$ and $y_2 = \left(\omega t + \dfrac{\pi}{3}\right)$ interfere at a point, then the amplitude of the resulting wave will be about

(a) 7 (b) 6 (c) 5 (d) 3.5

28. In Young's double slit experiment, the separation between the slits is halved and the distance between the slits and screen is doubled. The fringe width will

(a) be halved (b) be doubled
(c) be quadrupled (d) remain unchanged

29. At the first minimum adjacent to the central maximum of a single-slit diffraction pattern, the phase difference between the Huygen's wavelet from the edge of the slit and the wavelet from the midpoint of the slit is :

(a) $\dfrac{\pi}{2}$ radian (b) π radian

(c) $\dfrac{\pi}{8}$ radian (d) $\dfrac{\pi}{4}$ radian

30. The central fringe of the interference pattern produced by light of wavelength 6000Å is found to shift to the position of 4th bright fringe after a glass plate of refractive index 1.5 is introduced in front of one of slits in Young's experiment. The thickness of the glass plate will be

(a) 4.8 μm (b) 8.23 μm
(c) 14.98 μm (d) 3.78 μm

31. Sodium light $(\lambda = 6\times10^{-7}\text{m})$ is used to produce interference pattern. The observed fringe width is 0.12 mm. The angle between two interfering wave trains, is

(a) 1×10^{-3} rad (b) 1×10^{-2} rad
(c) 5×10^{-3} rad (d) 5×10^{-2} rad

32. The Young's double slit experiment is performed with blue and with green light of wavelengths 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) > x (green)

(c) x (blue) < x (green) (d) $\dfrac{x(\text{blue})}{x(\text{green})} = \dfrac{5460}{4360}$

33. If yellow light emitted by sodium lamp in Young's double slit experiment is replaced by a monochromatic blue light of the same intensity

(a) fringe width will decrease
(b) finge width will increase
(c) fringe width will remain unchanged
(d) fringes will become less intense

RESPONSE GRID					
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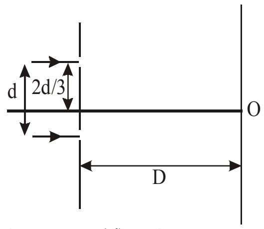
	24. ⓐⓑⓒⓓ	25. ⓐⓑⓒⓓ	26. ⓐⓑⓒⓓ	27. ⓐⓑⓒⓓ	28. ⓐⓑⓒⓓ
	29. ⓐⓑⓒⓓ	30. ⓐⓑⓒⓓ	31. ⓐⓑⓒⓓ	32. ⓐⓑⓒⓓ	33. ⓐⓑⓒⓓ

Space for Rough Work

34. When unpolarised light is incident on a plane glass plate at Brewster's angle, then which of the following statements is correct?
(a) Reflected and refracted rays are completely polarised with their planes of polarization parallel to each other
(b) Reflected and refracted rays are completely polarised with their planes of polarization perpendicular to each other
(c) Reflected light is plane polarised but transmitted light is partially polarised
(d) Reflected light is partially polarised but refracted light is plane polarised

35. The maximum number 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

36. In the figure shown if a parallel beam of white light is incident on the plane of the slits then the distance of the nearest white spot on the screen from O is d/A. Find the value of A. (assume d << D, λ << d]

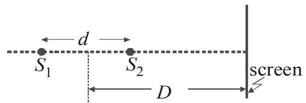


(a) 3 (b) 5 (c) 6 (d) 4

37. 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

38. 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 remain spherical, with the same curvature, but sign of curvature reversed.
(d) They will remain spherical, but with different curvature, both in magnitude and sign.

39. Two coherent point sources S_1 and S_2 are separated by a small distance d as shown. The fringes obtained on the vertical screen will be :
(a) points
(b) straight bands
(c) concentric circles
(d) semicircles



40. In the phenomena of diffraction of light, when blue light is used in the experiment in spite of red light, then
(a) fringes will become narrower
(b) fringes will become broader
(c) no change in fringe width
(d) None of these

41. On a hot summer night, the refractive index of air is smallest near the ground and increases with height from the ground. When a light beam is directed horizontally, the Huygens' principle leads us to conclude that as it travels, the light beam :
(a) bends downwards
(b) bends upwards
(c) becomes narrower
(d) goes horizontally without any deflection

42. If I_0 is the intensity of the principal maximum in the single slit diffraction pattern, then what will be its intensity when the slit width is doubled?
(a) $4I_0$ (b) $2I_0$ (c) $\frac{I_0}{2}$ (d) I_0

43. Conditions of diffraction is
(a) $\frac{a}{\lambda}=1$ (b) $\frac{a}{\lambda}>>1$ (c) $\frac{a}{\lambda}<<1$
(d) None of these

44. In Fresnel's biprism expt., a mica sheet of refractive index 1.5 and thickness 6×10^{-6} m is placed in the path of one of interfering beams as a result of which the central fringe gets shifted through 5 fringe widths. The wavelength of light used is
(a) 6000 Å (b) 8000 Å (c) 4000 Å (d) 2000 Å

45. Two nicols are oriented with their principal planes making an angle of 60°. Then the percentage of incident unpolarised light which passes through the system is
(a) 100 (b) 50 (c) 12.5 (d) 37.5

RESPONSE GRID					
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	39. ⓐⓑⓒⓓ	40. ⓐⓑⓒⓓ	41. ⓐⓑⓒⓓ	42. ⓐⓑⓒⓓ	43. ⓐⓑⓒⓓ
	44. ⓐⓑⓒⓓ	45. ⓐⓑⓒⓓ			

DAILY PRACTICE PROBLEM DPP CHAPTERWISE CP24 - PHYSICS			
Total Questions	45	Total Marks	180
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	45	Qualifying Score	60
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

Space for Rough Work

1. **(b)** For path difference λ, phase

difference $= 2\pi\left(Q = \frac{2\pi}{\lambda}x = \frac{2\pi}{\lambda}.\lambda = 2\pi\right)$

$\Rightarrow I = I_0 + I_0 + 2I_0 \cos 2\pi$

$\Rightarrow I = 4I_0 \qquad (\therefore \cos 2\pi = 1)$

For $x = \frac{\lambda}{4}$, phase difference $= \frac{\pi}{2}$

$\therefore I' = I_1 + I_2 + 2\sqrt{I_1}\sqrt{I_2}\cos\frac{\pi}{2}$

If $I_1 = I_2 = I_0$ then $I' = 2I_0 = 2.\frac{I}{4} = \frac{I}{2}$

2. **(c)** Here Angle of incidence, i = 57
$\tan 57° = 1.54$
$u_{glass} = \tan i$
It means, Here Brewster's law is followed and the reflected ray is completely polarised.
Now, when reflected ray is analysed through a polaroid then intensity of light is given by malus law.
i.e. $I = I_0 \cos^2\theta$
on rotating polaroid 'θ' changes. Due to which intensity first decreases and then increases.

3. **(b)** Let nth fringe of 2500 Å coincide with (n – 2)th fringe of 3500Å.
$\therefore$ 3500 (n – 2) = 2500 × n
1000 n = 7000, n = 7
$\therefore$ 7th order fringe of 1st source will coincide with 5th order fringe of 2nd source.

4. **(a)** When incident wavefronts passes through a prism, then lower portion of wavefront (B) is delayed resulting in a tilt. So, time taken by light to reach *A'* from *A* is equal to the time taken to reach *B'* from *B*.

5. **(b)** ${}^a\mu_g = \tan\theta_P$ where θ_P = polarising angle.
or, ${}^a\mu_g = \tan 60°$

or, $\frac{c}{v_g} = \sqrt{3}$

or, $v_g = \frac{c}{\sqrt{3}} = \frac{3\times10^8}{\sqrt{3}} = \sqrt{3}\times10^8\,ms^{-1}$

6. **(c)** Angular width $= \frac{\lambda}{d} = 10^{-3}$ (given)

$\therefore$ No. of fringes within 0.12° will be

$n = \frac{0.12\times2\pi}{360\times10^{-3}} = [2.09]$

$\therefore$ The number of bright spots will be two.

7. **(c)** Here $A^2 = a_1^2 + a_2^2 + 2a_1a_2\cos\delta$
$\because a_1 = a_2 = a$

$\therefore A^2 = 2a^2(1+\cos\delta) = 2a^2\left(1+2\cos^2\frac{\delta}{2}-1\right)$

$\Rightarrow A^2 \propto \cos^2\frac{\delta}{2}$

Now, $I \propto A^2 \quad \therefore I \propto A^2 \propto \cos^2\frac{\delta}{2}$

$\therefore I \propto \cos^2\frac{\delta}{2}$.

8. **(b)** $\Delta x_1 = (\mu_1 - 1)t = (1.5-1)t = 0.5t$

and $\Delta x_2 = (\mu_2 - 1)\times 2t = \left(\frac{4}{3}-1\right)\times 2t = \frac{2}{3}t$.

As $\Delta x_2 > \Delta x_1$, so shift will be along –ve *y*-axis.

9. **(d)** Given: D = 2m; d = 1 mm = 1×10^{-3} m
$\lambda = 600$ nm $= 600\times10^{-6}$ m
Width of central bright fringe (= 2β)

$= \frac{2\lambda D}{d} = \frac{2\times600\times10^{-6}\times2}{1\times10^{-3}}$ m = 2.4 mm

10. **(d)** Conditions for diffraction minima are
Path diff. $\Delta x = n\lambda$ and Phase diff. $\delta\phi = 2n\pi$
Path diff. $= n\lambda = 2\lambda$
Phase diff. $= 2n\pi = 4\pi \quad (\because n = 2)$

11. **(c)** When the wavelength of light used is comparable with the separation between two points, the image of the object will be a ϕ diffraction pattern whose size will be

$\theta = \frac{1.22\lambda}{D}$

where λ = wavelength of light used
D = diameter of the objective
Two objects whose images are closer than this distance, will not be resolved.

12. **(d)** The waves reflected from the top layer of oil interfere with the wave train reflected from the lower surface of thin oil film producing light and dark coloured pattern.

13. **(d)** Phase difference, $\phi = \frac{2\pi}{\lambda}\times$ Path difference

$\phi = \frac{2\pi}{\lambda}\times\frac{\lambda}{6} = \frac{\pi}{3} = 60°$

As, $I = I_{max}\cos^2\frac{\phi}{2}$

$I = I_0\cos^2\frac{60°}{2} = I_0\times\left(\frac{\sqrt{3}}{2}\right)^2 = \frac{3}{4}I_0 \quad \frac{I}{I_0} = \frac{3}{4}$

14. **(b)**

15. (a) We know that for maxima

$$b\sin\theta = (2n+1)\frac{\lambda}{2}$$

or $\sin\theta = \frac{2n+1}{2}\left(\frac{\lambda}{b}\right)$

So on decreasing the slit width, 'b', keeping λ same, sin θ and hence θ increases.

16. (b) If the angular limit of resolution of human eye is R then

$$R = \frac{1.22\lambda}{a} = \frac{1.22\times5\times10^{-7}}{2\times10^{-3}} \text{ rad}$$

$$= \frac{1.22\times5\times10^{-7}}{2\times10^{-3}}\times\frac{180}{\pi}\times60 \text{ minute} = 1 \text{ minute}$$

17. (c) $\mu = \tan i$

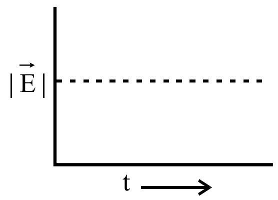
$\Rightarrow i = \tan^{-1}(\mu) = \tan^{-1}(\sqrt{3}) = 60°.$

18. (d) Order of the fringe can be counted on either side of the central maximum. For example, no. 3 is first order bright fringe.

$$\Delta X_C = \lambda,\ \Delta X_A = \frac{\lambda}{2}$$

$$\Delta X_C - \Delta X_A = \frac{\lambda}{2} = 300\text{nm}$$

19. (a) For a circularly polarised light electric field remains constant with time.



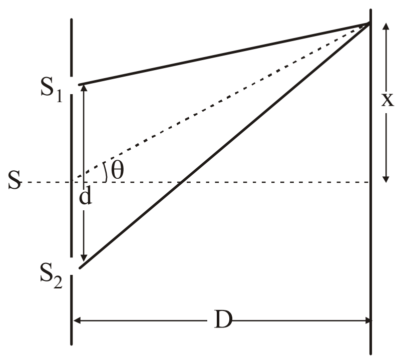
20. (b) $\beta' = \frac{\beta}{\mu} = \frac{0.133}{1.33} = 0.1$ cm

21. (b)

22. (d) Let λ be wavelength of monochromatic light incident on slit S, then angular distance between two consecutive fringes, that is the angular fringe width is

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

where d is distance between coherent sources.



Give, $\frac{\Delta\theta}{\theta} = \frac{10}{100}$

So, from eq. (1),

$$\frac{\Delta\lambda}{\lambda} = \frac{\Delta\theta}{\theta} = \frac{10}{100} = 0.1$$

$\Rightarrow \Delta\lambda = 0.1\lambda = 0.1\times5890\text{Å} = 589\text{Å}$ (increases)

Note : Since, $\theta \propto \lambda$, as θ increases, λ increases.

23. (c) $\sin\theta = \frac{\lambda}{d} = \frac{589\times10^{-9}}{0.589\times10^{-3}} = 10^{-3} = \frac{1}{1000} = 0.001$

24. (c) In Fraunhoffer diffraction, for minimum intensity,

$$\Delta x = m\frac{\lambda}{2}$$

For first minimum, m = 1

$$\therefore\ \Delta x = \frac{\lambda}{2}$$

25. (d) Optical path difference

$\Delta x = (\mu_2 - \mu_1)t$.

26. (b) Separation between slits are (r_1=) 16 cm and (r_2=) 9 cm.

Actual distance of separation

$$= \sqrt{r_1 r_2} = \sqrt{16\times9} = 12\text{cm}$$

27. (b) $\phi = \frac{\pi}{3}$, $a_1 = 4, a_2 = 3$

So, $A = \sqrt{a_1^2 + a_2^2 + 2a_1a_2\cos\phi} \approx 6$

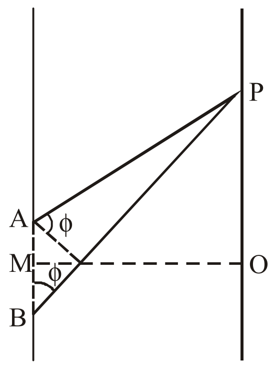
28. (c) $\beta = \frac{D\lambda}{d}$, where D is the distance between the slits & screen and d is the separation between the slits.

$$\beta' = \frac{2D\lambda}{d/2} = \frac{4D\lambda}{d} = 4\beta$$

29. (b) For first minima at P

AP – BP = λ

$$AP - MP = \frac{\lambda}{2}$$



So phase difference, $\phi = \frac{2\pi}{\lambda}\times\frac{\lambda}{2} = \pi$ radian

30. (a) Shift $= \frac{D}{d}(\mu-1)\,t = \frac{\beta}{\lambda}(\mu-1)\,t = 4\beta$

$$t = \frac{4\lambda}{\mu-1} = \frac{4\times 6000\times 10^{-10}}{1.5-1} = 4.8\,\mu\text{m}$$

31. (c) The fringe width is given by, $\beta = \frac{\lambda D}{d}$

The angular width of fringe is given by

$$\frac{d}{D} = \frac{\lambda}{\beta} = \frac{6\times 10^{-7}}{0.12\times 10^{-3}} = 5\times 10^{-3}\text{ rad.}$$

32. (c) Distance of nth maxima, $x = n\lambda\frac{D}{d} \propto \lambda$

As $\lambda_b < \lambda_g$ $\therefore$ $x_{blue} < x_{green}$

33. (a) As $\beta = \frac{\lambda D}{d}$ and $\lambda_b < \lambda_y$,

$\therefore$ fringe width β will decrease

34. (c) At Brewster's angle, only the reflected light is plane polarised, but transmitted light is partially polarised.

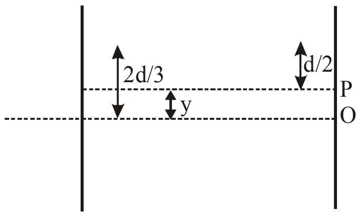
35. (b) $\Delta x_{max} = 2\lambda$.

So there are five maxima.

These are for $\Delta x = 0, \pm\lambda, \pm 2\lambda$.

36. (c) The nearest white spot will be at P, the central maxima.

$$\therefore\ y = \frac{2d}{3} - \frac{d}{2} = \frac{d}{6}$$



37. (d) : Resultant amplitude,

$$A = \sqrt{(A_1)^2 + (A_2)^2 + 2A_1A_2\cos\theta}$$

Here, $A_1 = A_2 = 1$ cm, $\phi = 3\pi$ rad

$$\therefore\ A = \sqrt{1^2 + 1^2 + 2\times 1\times 1\times \cos 3\pi}$$

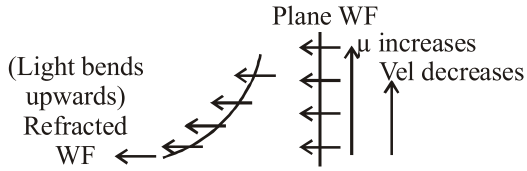
$$= \sqrt{2 + 2\times(-1)} = 0$$

38. (c)

39. (c)

40. (c)

41. (b)



42. (a) $I = I_0\left(\frac{\sin\phi}{\phi}\right)^2$ and $\phi = \frac{\pi}{\lambda}(b\sin\theta)$

When the slit width is doubled, the amplitude of the wave at the centre of the screen is doubled, so the intensity at the centre is increased by a factor 4.

43. (a)

44. (a) Where n is equivalent number of fringe by which the centre fringe is shifted due to mica sheet

$$\lambda = \frac{(\mu-1)t}{n} = \frac{(1.5-1)6\times 10^{-6}}{5}$$

$$= 6\times 10^{-7}\text{ m} = 6000\text{ Å}$$

45. (c) Suppose intensity of unpolarised light = 100.

$\therefore$ Intensity of polarised light from first nicol prism

$$= \frac{I_0}{2} = \frac{1}{2}\times 100 = 50$$

According to law of Malus,

$$I = I_0\cos^2\theta = 50\,(\cos 60^\circ)^2 = 50\times\left(\frac{1}{2}\right)^2 = 12.5$$