Physicsaholics

DPP – 2 (Waves Optics)

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Q 1. In Young's experiment, the fringe width was found to be 0.4mm. If the whole apparatus is immersed in water of refractive index $\frac{4}{3}$, the new fringe width in mm is:

(a) 0.25 (b) 0.30
(c) 0.40 (d) 2.00

Q 2. In YDSE performed with wavelength λ=5890Å the angular fringe width is 0.40°. What is the angular fringe width if the entire set-up is immersed in water? $\left(\mu_w = \frac{4}{3}\right)$

(a) 0.30° (b) 0.16°
(c) 0.90° (d) 58.9°

Q 3. A Young's double slit experiment is conducted with slit separation 10mm, where the screen is 2m away from the slits. If wavelength of light used is 7000Å, and the whole apparatus is placed in water of refractive index 4/3 , the fringe width in mm is

(a) 0.210 (b) 0.105
(c) 0.315 (d) 0.420

Q 4. A double slit experiment is done with monochromatic light of wavelength 6000Å. Slits are 2 mm apart and fringes are observed on a screen placed 10 cm away from the slits. If a transparent plate of thickness 0.5 mm is placed in front of one of the slit, interference pattern shifts by 5 mm. Then refractive index of transparent plate should be :

(a) 1.1 (b) 1.2
(c) 1.3 (d) 1.5

Q 5. A light of wavelength 6000Å shines on two narrow slits separated by a distance 1.0 mm and illuminates a screen at a distance 1.5 m away. When one slit is covered by a thin glass plate of refractive index 1.8 and other slit by a thin glass plate of refractive index μ, the central maxima shifts by 0.1 rad. Both plates have the same thickness of 0.5 mm. The value of refractive index μ of the glass is

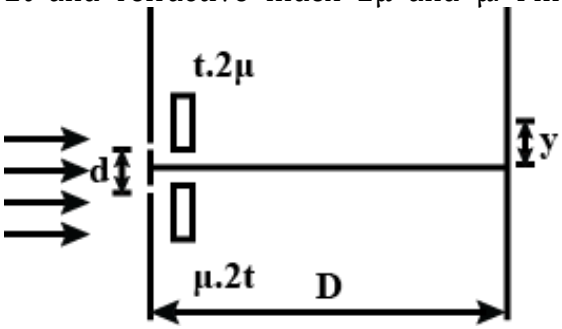
(a) 1.4 (b) 1.5
(c) 1.6 (d) none of these

Q 6. In a double slit experiment, when a thin film of thickness t having refractive index μ is introduced in front of one of the slits, the maximum at the center of the fringe pattern shifts by one fringe width. The value of t is (λ is the wavelength of the light used):

(a) $\frac{\lambda}{2(\mu-1)}$ (b) $\frac{\lambda}{(2\mu-1)}$

(c) $\frac{2\lambda}{(\mu-1)}$ (d) $\frac{\lambda}{(\mu-1)}$

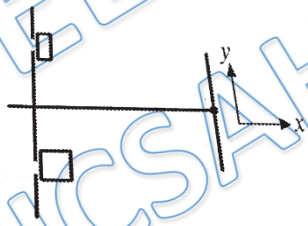
Q 7. In the YDSE shown the two slits are covered with thin sheets having thickness t & 2t and refractive index 2μ and μ. Find the position (y) of central maxima.



(a) zero (b) $\frac{tD}{d}$

(c) $\frac{tD}{2d}$ (d) $\frac{2tD}{d}$

Q 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



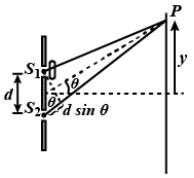
(a) Shifts in +ve y-axis direction
(b) Shifts in -ve y-axis direction
(c) Remains at same position
(d) may shift in upward or downward depending upon wavelength of light

Q 9. In YDSE, slab of thickness t and refractive index μ is placed in front of any slit. Then displacement of central maximum in terms of fringe width (β) when light of wavelength λ is incident on system is

(a) $\frac{\beta(\mu-1)t}{2\lambda}$ (b) $\frac{\beta(\mu-1)t}{\lambda}$

(c) $\frac{\beta(\mu-1)t}{3\lambda}$ (d) $\frac{\beta(\mu-1)t}{4\lambda}$

Q 10. In a YDSE, the light of wavelength λ=5000 Å is used, which emerges in phase from two slits a distance d = 3×10^{-7} m apart. A transparent sheet of thickness t = 1.5×10^{-7} m refractive index μ = 1.17 is placed over one of the slits. What is the new angular position of the central maxima of the interference pattern, from the center of the screen? Find the value of y (for central maxima).



(a) 4.9^0 and $\frac{D(\mu-1)t}{2d}$

(b) 4.9^0 and $\frac{D(\mu-1)t}{d}$

(c) 3.9^0 and $\frac{D(\mu+1)t}{2d}$

(d) 2.9^0 and $\frac{D(\mu+1)t}{d}$

Q 11. When a thin transparent plate of Refractive Index 1.5 is introduced in one of the interfering beam produces shift of 20 fringe width. If it is replaced by refractive index 1.7 but same thickness, the number of fringes that undergo displacement is

(a) 23 (b) 14

(c) 28 (d) 7

Q 12. In Young's double slit experiment, the fringes are displaced by a distance x when a glass plate of refractive index 1.5 is introduced in the path of one of the beams. When this plate is replaced by another plate of the same thickness, the shift of fringes is (3/2) x. The refractive index of the second plate is

(a) 1.75 (b) 1.50

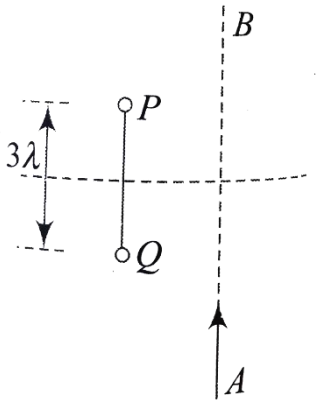
(c) 1.25 (d) 1.00

Q 13. A monochromatic beam of light of wavelength 5000Å is used in young's double slit experiment. If one of the slits is covered by a transparent sheet of thickness 1.4×10^{-5} m, having refractive index of its medium 1.25. Then the number of fringes shifted is

(a) 19 (b) 23

(c) 13 (d) 7

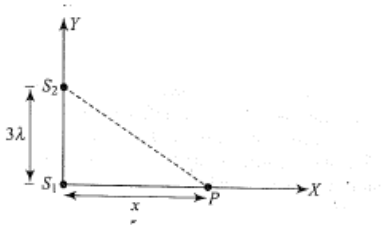
Q 14. Two coherent light sources, each of wavelength λ, are separated by a distance 3λ, The maximum number of minima formed on line AB, which runs from $-\infty$ to $+\infty$, is



(a) 7 (b) 4

(c) 6 (d) 8

Q 15. Total number of bright points observed by the observer on positive x-axis including origin is



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

Answer Key

Q.1 b	**Q.2 a**	**Q.3 b**	**Q.4 b**	**Q.5 c**
Q.6 d	**Q.7 b**	**Q.8 b**	**Q.9 b**	**Q.10 b**
Q.11 c	**Q.12 a**	**Q.13 d**	**Q.14 c**	**Q.15 b**