Q.1 Young's double slit experiment is being performed by illuminating the two slits with a monochromatic source of light.
When a glass plate of thickness 24 μm is placed in front of one of the slits, the entire pattern shifts through a distance of 5 mm. What should be the thickness of the glass plate made of the same material so that the pattern shifts by 15 mm?.
(A) 8 μm **(B)** 12 μm **(C)** 48 μm **(D)** 72 μm

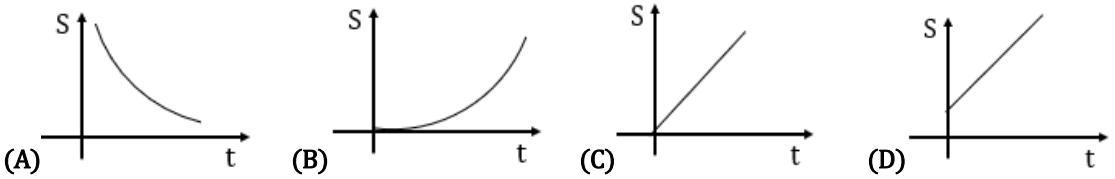
Q.2 Interference pattern is produced in a Young's double slit experiment and a thin piece of plane parallel glass slab ($\mu = 1.5$) is placed in front of one of the slits. If the fringes are displaced through a distance equal the fringe width, find the thickness of the glass slab. Take wavelength of light $\lambda = 6000\ ^{\circ}A$.
(A) 1.2 μm **(B)** 0.6 μm **(C)** 1.8 μm **(D)** 3.6 μm

Q.3 In a standard Young's double-slit experiment with coherent light of wavelength 600 nm, the fringe width in the central region (near the central fringe, P_0) is observed to be 3 mm. An extremely thin glass plate is introduced in front of the first slit S_1, and the fringes are observed to be displaced by 11 mm. Another thin plate is placed before the second slit S_2, and it is observed that the fringes are now displaced by an additional 12 mm. If optical paths due to introduction of the glass plates are are Δx_1 and Δx_2 respectively, then:
(A) $11\Delta x_1 = 12\Delta x_2$ **(B)** $11\Delta x_1 > 12\Delta x_2$ **(C)** $12\Delta x_1 = 11\Delta x_2$ **(D)** None of the above

Q.4 In a 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 $3x/2$. The refractive index of the second plate is
(A) 1 **(B)** 1.25 **(C)** 1.50 **(D)** 1.75

Q.5 In the ideal double-slit experiment, when a glass plate (refractive index 1.5) of thickness t is introduced in the path of one of the interfering beams (wavelength λ), the intensity at the position where the central maximum occurred previously, remains unchanged. The minimum thickness of the glass plate is,
(A) 2λ **(B)** $2\lambda/3$ **(C)** $\lambda/3$ **(D)** λ

Q.6 A transparent film of thickness t and refractive index μ is placed in front of one of the slits in a Young's double slit experiment. As a result, the interference pattern shifts through a distance S. Which of the following graphs correctly represents the variation of S with t, as other parameters remain constant?



Q.7 A glass plate of thickness t is placed in front of one of the slits in a Young's double slit experiment. It is found that the interference pattern is shifted through a distance d. If this whole setup is immersed in water, the shift in pattern will be:
[Given: Refractive index of glass, $\mu_g = 3/2$,
Refractive index of water $\mu_w = 4/3$]
(A) d/4 **(B)** d/2 **(C)** 4 d **(D)** 2 d

Q.8 In Young's double slit experiment, two slits of equal intensities produce interference pattern forming central maxima at point O. A transparent film ($\mu = 1.5$) is placed in front of one of the slits. Now the

intensity of light at point O is 75% of the intensity of a bright fringe. The wavelength of light used is 6000 ˚A. The thickness of the film cannot be,

(A)0.2 um **(B)**1.0 um **(C)**1.4 um **(D)**1.6 um

Q.9 A monochromatic light of $\lambda = 6000$ ˚A is incident on the slits. The interference pattern is observed on a screen and central maxima is formed at point O. A thin glass plate of thickness 0.4 μm and refractive index 1.5 is placed in front of one of the slits. If the intensity at point O is I_0 initially, what will be the intensity at O after placing the glass plate?

(A)I_0 **(B)**$I_0/2$ **(C)**$I_0/4$ **(D)**$I_0/\sqrt{2}$

Q.10 In a Young's double slit experiment, the distance between the slits & the screen is 100 cm. For a certain distance between the slits, an interference pattern is observed on the screen with the fringe width 0.25 mm. When the distance between the slits is increased by 1.2 mm, the fringe width decreased to 2/3 of the original value. In the final position, a thin glass plate of refractive index 1.5 is kept in front of one of the slits & the shift of central maximum is observed to be 20 $times$ the initial fringe width. Find the thickness of the plate.

(A)24um **(B)**20um **(C)**30um **(D)**12um

ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(D)	(A)	(B)	(D)	(A)	(C)	(A)	(D)	(C)	(A)