Worksheet: Two-Slit Interference

Q1: Light passes through a sheet in which there are two parallel narrow slits 12.8 μm apart. The light from the slits is incident on a screenparallel to the sheet, where a pattern of light and dark fringes isobserved. A line L runs perpendicular to the surface of the sheet and the direction of the slits. The line L intersects the central bright fringe of the pattern on the screen. The angle between L and a line that intersects the center of the bright fringe closest to the central bright fringe is 3.09°. What is thewavelength of the light? Give your answer to three significant figures.

A 560 nm

B 690 nm

C 0.350 nm

D 345 nm

E 0.690 nm

Q2: Light with a wavelength of 636 nmpasses through a sheet in which there are two parallel narrow slits. The lightfrom the slits is incident on a screen parallel to the sheets, 1.08 m away,where a pattern of light and dark fringes is observed. A line L runs perpendicular to the surface of the sheet and the direction of the slits. The line L intersects thecentral bright fringe of the pattern on the screen. The distance on the screenfrom L to the center of the bright fringe nearest to the central bright fringe is 6.11 cm. What is the distancebetween the slits?

A 1.12×10^{-5} m

B 3.36×10^{-5} m

C 56.1×10^{-5} m

D 1.08×10^{-5} m

E 6.36×10^{-5} m

Q3: Light with a wavelength of 625 nm passes through a sheet inwhich there are two parallel narrow slits. The light from the slits is incidenton a screen parallel to the sheet, where a pattern of light and dark fringes isobserved. A line L runs perpendicular to the surface of the sheet and the direction of the slits. The line L intersects the central bright fringe of the pattern on the screen. The angle between L and a line that intersects the center of the bright fringe closest to the central bright fringe is 2.67°. Whatdistance separates the slits on the sheet? Give your answer to three significant figures.

A 13.4 μm

B 78.4 μm

C 26.8 μm

D 10.9 μm

E 48.1 μm

Q4: Light with a wavelength of 597 nm passes through a sheet in which there are two parallel narrow slits 7.64 μmapart. The light from the slits is incident on a screen parallel to the sheet, where a pattern of light and dark fringes is observed. A line L runs perpendicular to the surface of the sheet and the direction of theslits, intersecting thecentral bright fringe of the pattern on the screen. Two lines, line I and lineII, intersect L at the position ofthe sheet. Line I intersects the center of the dark fringe closest to thecentral bright fringe and line II intersects the center of the bright fringeclosest to the central bright fringe. What is the angle between line I and lineII? Give your answer to three significant figures.

A 9.12°

B 2.24°

C 18.2°

D 8.99°

E 4.48°

Q5: Which of the following formulas correctly relates the angle θ at which light with a wavelength λ emerges from a pair of narrow slits separated by a distance d to the order n of a bright fringe of an interference pattern produced by thelight on a screen?

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

B $d\lambda = n \sin\theta$

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

D $d = n\lambda \sin\theta$

E $\sin\theta = dn\lambda$

Q6: Light with a wavelength of 675 nm passes through a sheet in which there are two parallel narrow slits 10.5 μm apart. The light from theslits is incident on a screen parallel to the sheet, where a pattern of lightand dark fringes is observed. A line L runs perpendicular to the surface ofthe sheet and the direction of the slits. The line L intersects the central bright fringe of the pattern on thescreen. What is the angle between $L$and a line that intersects the center of the bright fringe closest to thecentral bright fringe? Give your answer to three significant figures.

A 2.64°

B 7.38°

C 4.66°

D 3.69°

E 1.84°

Q7: Light with a wavelength of 604 nm passes through a sheet in which there are two parallel narrow slits 9.44 μmapart. The light from the slits is incident on a screen parallel to the sheets, 1.25 m away, where a pattern of light and dark fringes is observed. A line L runs perpendicular to the surface of the sheet and the direction of the slits. The line L intersects thecentral bright fringe of the pattern on the screen. What is the distance on thescreen from L to the center of thebright fringe nearest to the central bright fringe?

A 8.00 cm

B 0.160 cm

C 4.50 cm

D 16.0 cm

E 0.800 cm

Q8: Which of the following formulas correctlyrelates λ, the wavelength of light that emerges from a pair ofnarrow slits; s, the separation between the slits; d, thedistance from the center of an interference pattern produced by the lighton a screen; and D, the distance from the slits to a bright fringe in the pattern of order n?

A $s = \frac{ndD}{\lambda}$

B $s = \frac{n\lambda D}{d}$

C $s = \frac{n\lambda}{dD}$

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

E $s = \frac{\lambda D}{nd}$

Q9: Light passes through a sheet inwhich there are two parallel narrow slits, 5.28 μm apart. The light from theslits is incident on a screen parallel to the sheets, 1.16 m away, where apattern of light and dark fringes is observed. A line L runs perpendicular to the surface of the sheet and the direction of the slits. The line L intersects the central bright fringe of the pattern on the screen. The distance on the screen from L to the center of the dark fringenearest to the central bright fringe is 4.77 cm. What is the wavelength of thelight?

A 2.17×10^{-7} m

B 8.68×10^{-7} m

C 4.34×10^{-7} m

D 5.43×10^{-8} m

E 1.09×10^{-7} m