PhysicsByAaryan

CSIR NET . GATE . JEST . BARC - Physics

Interference and diffraction - CSIR NET Physics PYQs

Optics . All PYQs (2015-2025) with answer key

15 questions . Answer key included

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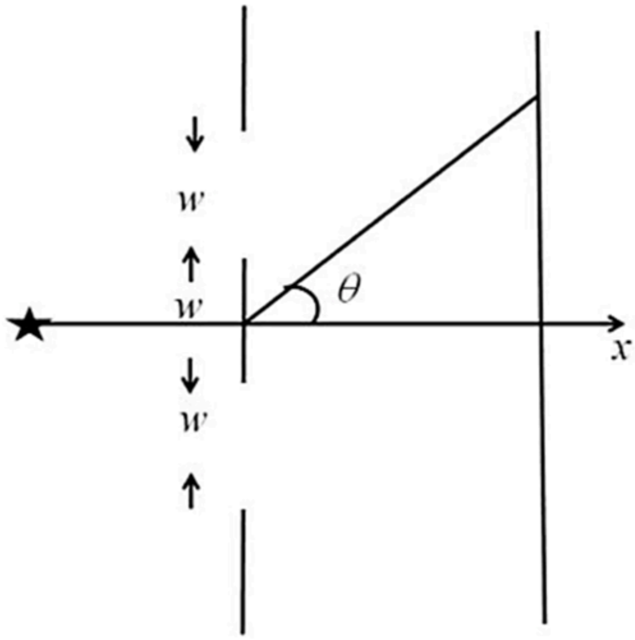
Q1. [Dec 2016] . 3.5 marks

Optics > Interference and diffraction

CSIR NET	2016 Dec	3.5M

A screen has two slits, each of width w, with their centres at a distance $2w$ apart. It is illuminated by a monochromatic plane wave travelling along the x-axis. The intensity of the interference pattern, measured on a distant screen, at an angle $\theta = n\lambda/w$ to the x-axis is



1. zero for $n = 1,2,3 \ldots$
2. maximum for $n = 1,2,3 \ldots$
3. maximum for $n = \frac{1}{2}, \frac{3}{2}, \frac{5}{2} \ldots$
4. zero for $n = 0$ only

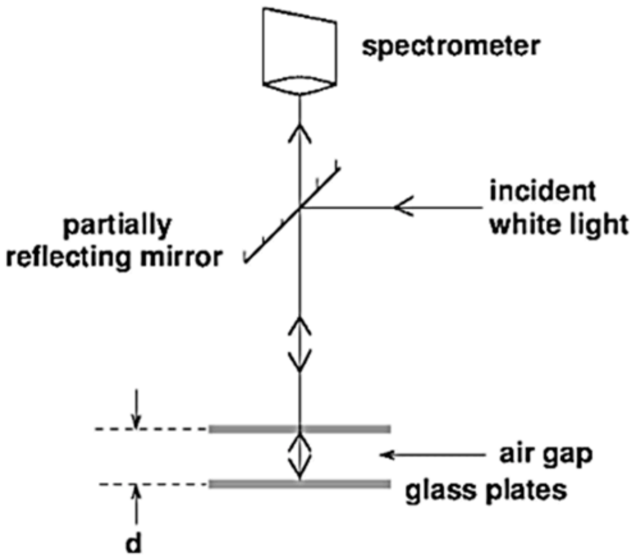
Q2. [Dec 2016] . 3.5 marks

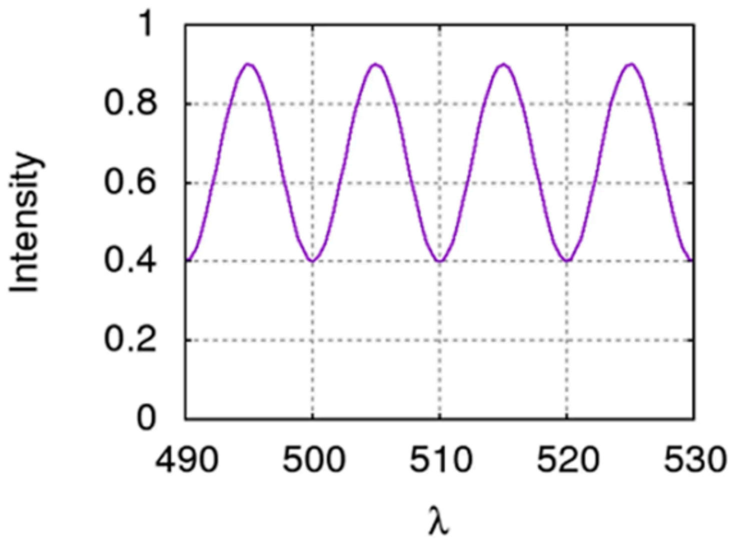
Optics > Interference and diffraction

CSIR NET	2016 Dec	3.5M

A pair of parallel glass plates separated by a distance d is illuminated by white light as shown in the figure below. Also shown is the graph of the intensity of the reflected light I as a function of the wavelength λ recorded by a spectrometer.

Assuming that the interference takes place only between light reflected by the bottom surface of the top plate and the top surface of bottom plate, the distance d is closest to





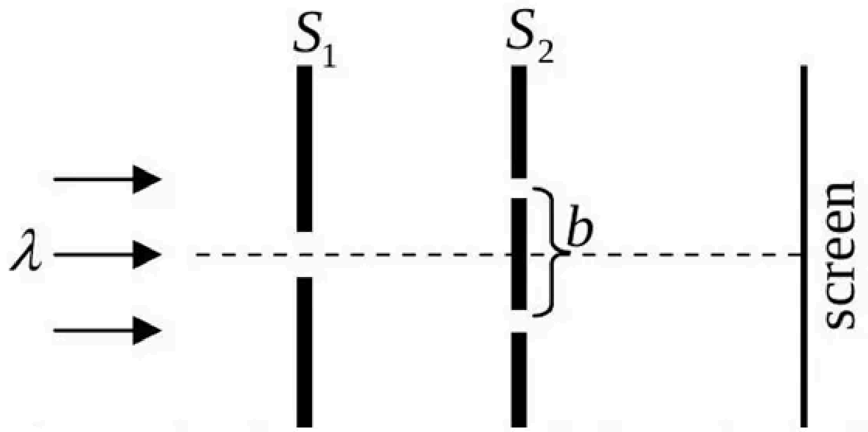
1. 12μ m
2. 24μ m
3. 60μ m
4. 120μ m

Q3. [June 2017] . 5.0 marks

Optics > Interference and diffraction

CSIR NET	2017 June	5M

The figure below describes the arrangement of slits and screens in a Young's double slit experiment. The width of the slit in S_1 is a and the slits in S_2 are of negligible width.



If the wavelength of the light is λ, the d for which the screen would be dark is

1. $b\sqrt{\left(\frac{a}{\lambda}\right)^2 - 1}$
2. $\frac{b}{2}\sqrt{\left(\frac{a}{\lambda}\right)^2 - 1}$
3. $\frac{a}{2}\left(\frac{b}{\lambda}\right)^2$
4. $\frac{ab}{\lambda}$

Q4. [Dec 2018] . 3.5 marks

Optics > Interference and diffraction

CSIR NET	2018 Dec	3.5M

A monochromatic and linearly polarized light is used in a Young's double slit experiment. A linear polarizer, whose pass axis is at an angle 45^0 to the polarization of the incident wave, is placed in front of one of the slits. If $I_{\max}$ and $I_{\min}$, respectively, denote the maximum and minimum intensities of the interference pattern on the screen, the visibility, defined as the ratio $\frac{I_{max}-Imin}{I_{max}+Imi_n}$, is

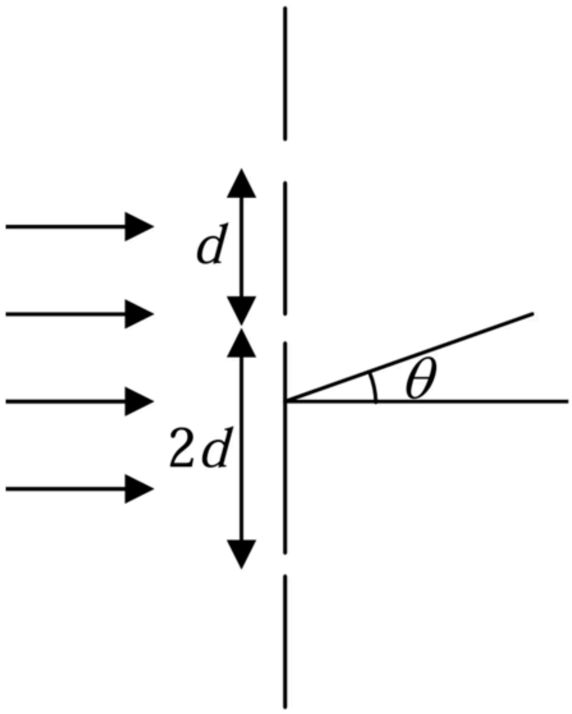
1. $\frac{\sqrt{2}}{3}$
2. $\frac{2}{3}$
3. $\frac{2\sqrt{2}}{3}$
4. $\sqrt{\frac{2}{3}}$

Q5. [June 2018] . 3.5 marks

Optics > Interference and diffraction

CSIR NET	2018 June	3.5M

The following configuration of three identical narrow slits are illuminated by monochromatic light of wavelength λ (as shown in the figure below). The intensity is measured at an angle θ (where θ is the angle with the incident beam) at a large distance from the slits. If $\delta = \frac{2\pi d}{\lambda}\sin\theta$, the intensity is proportional to



1. $2cos\,\delta + 2cos\,2\delta$

2. $3 + \frac{1}{\delta^2}\sin^2 3\delta$

3. $3 + 2cos\,\delta + 2cos\,2\delta + 2cos\,3\delta$

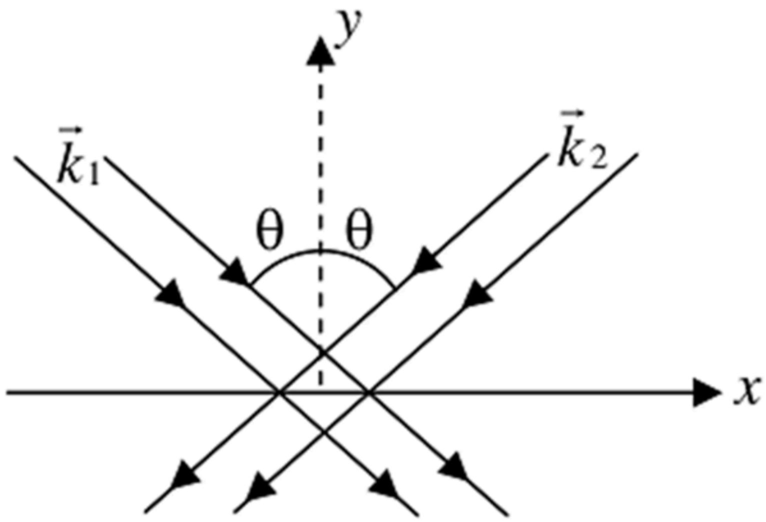
4. $2 + \frac{1}{\delta^2}\sin^2 3\delta$

Q6. [June 2019] . 3.5 marks

Optics > Interference and diffraction

CSIR NET	2019 June	3.5M

Two coherent plane electromagnetic waves of wavelength $0.5\mu m$ (both have the same amplitude and are linearly polarized along the z-direction) fall on the $y = 0$ plane. Their wave vectors k_1 and k_1 are as shown in the figure



If the angle θ is $30°$, the fringe spacing of the interference

pattern produced on the plane is

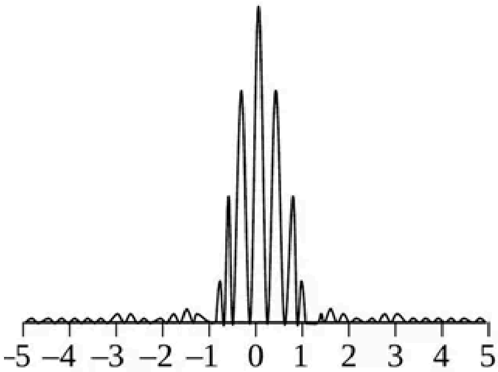
1. 1.0μ m
2. 0.29μ m
3. 0.58μ m
4. 0.5μ m

Q7. [June 2020] . 3.5 marks

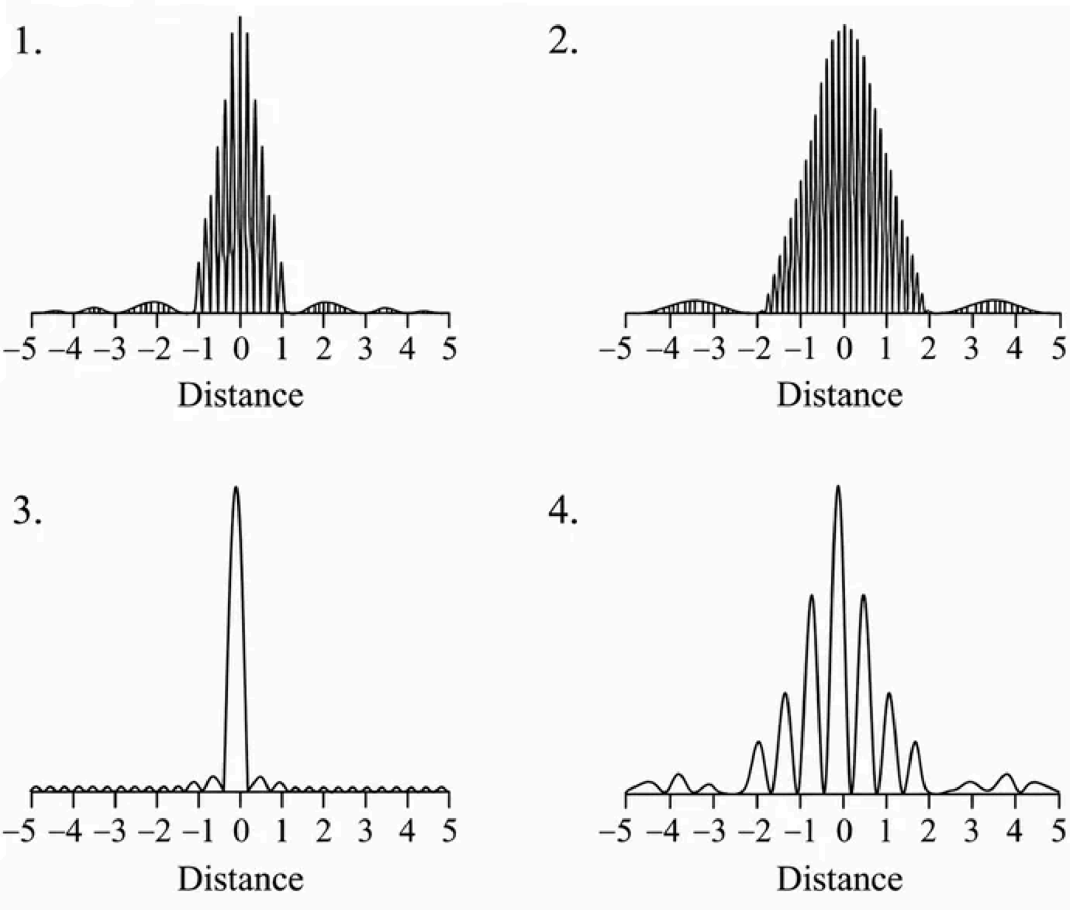
Optics > Interference and diffraction

CSIR NET	2020 June	3.5M

The following figure shows the intensity of the interference pattern in the Young's double-slit experiment with two slits of equal width is observed on a distant screen.



If the separation between the slits is doubled and the width of each of the slits is halved, then the new interference pattern is best represented by

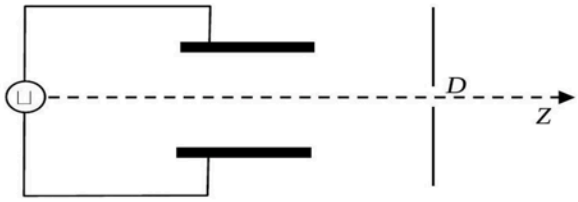


Q8. [June 2022] . 5.0 marks

Optics > Interference and diffraction

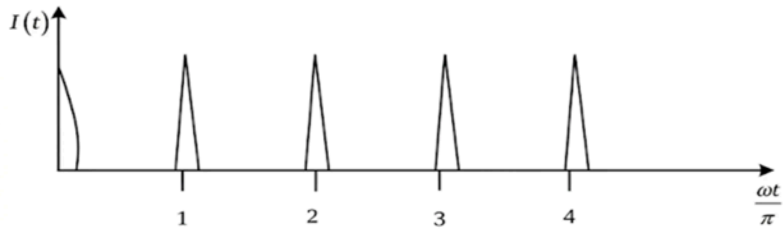
CSIR NET	2022 June	5M

A high frequency voltage signal $V_i = V_m \sin \omega t$ is applied to a parallel plate deflector as shown in the figure.

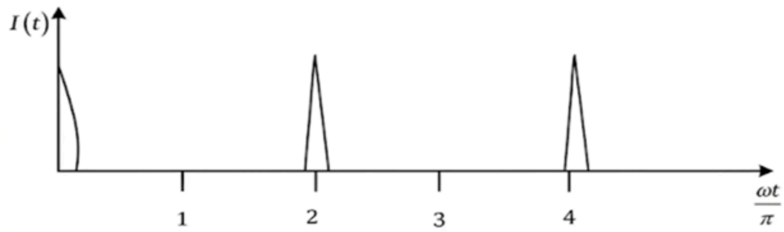


An electron beam is passing through the deflector along the central line. The best qualitative representation of the intensity $I(t)$ of the beam after it goes through the narrow circular aperture D, is

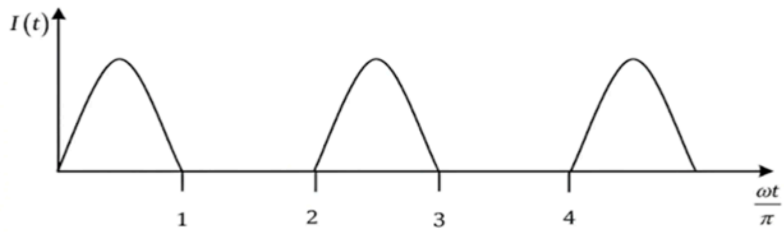
1.



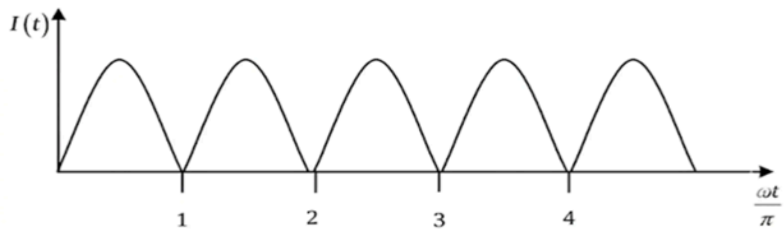
2.



3.



4.

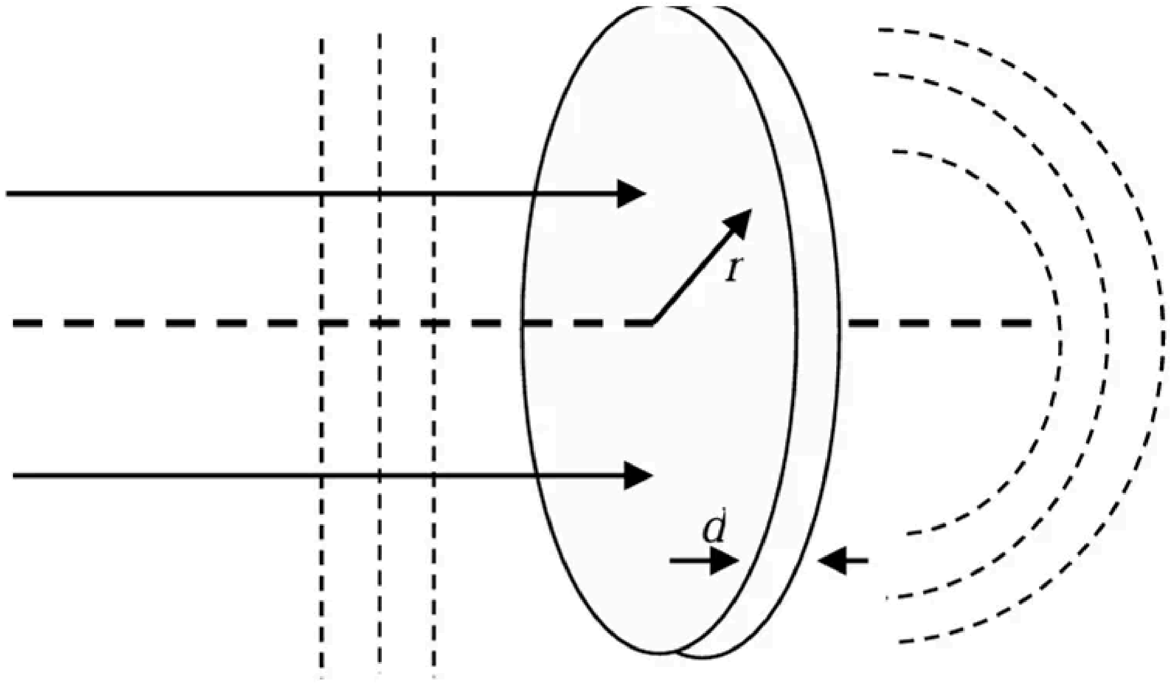


Q9. [Dec 2023] . 3.5 marks

Optics > Interference and diffraction

CSIR NET	2023 Dec	3.5 M

For a flat circular glass plate of thickness d, the refractive index $n(r)$ varies radially, where r is the radial distance from the centre of the plate. A coherent plane wavefront is normally incident on this plate as shown in the figure below.



If the emergent wavefront is spherical and centered on the axis of the plate, then $n(r) - n(0)$ should be proportional to

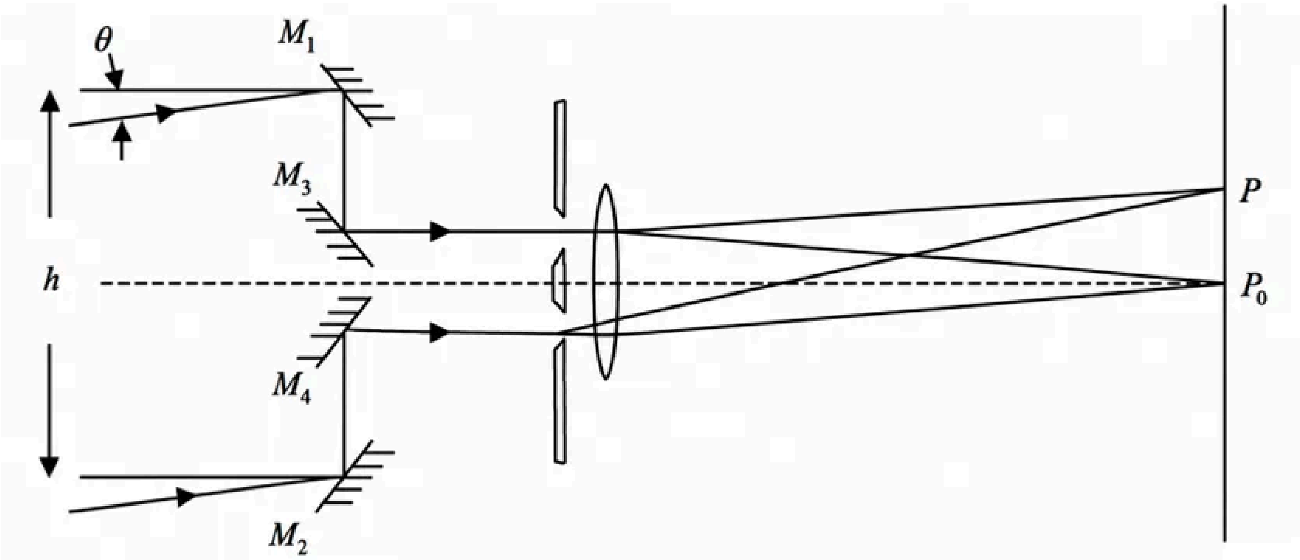
1. $r^{1/2}$
2. r
3. r^2
4. $r^{3/2}$

Q10. [June 2023] . 5.0 marks

Optics > Interference and diffraction

CSIR NET	2023 June	5M

The angular width θ of a distant star can be measured by the Michelson radiofrequency stellar interferometer (as shown in the figure below).



The distance h between the reflectors M_1 and M_2 (assumed to be much larger than the aperture of the lens), is increased till the interference fringes (at P_0, P on the plane as shown) vanish for the first time. This happens for $h = 3$ m for a star which emits radiowaves of wavelength 2.7 cm. The measured value of θ (in degrees) is closest to

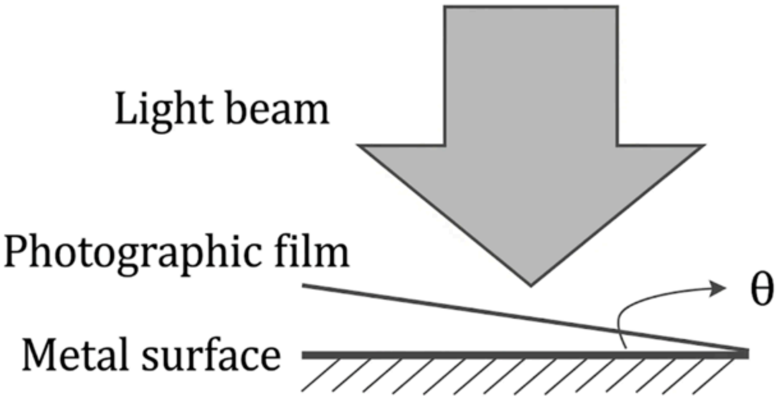
1. 0.63
2. 0.32
3. 0.52
4. 0.26

Q11. [Dec 2024] . 3.5 marks

Optics > Interference and diffraction

CSIR NET	2024 Dec	3.5M

When a photographic film is exposed to light, the electric field of light causes the film to turn dark after chemical processing. A photographic film of thickness 50 *nm* is kept inclined to a shiny metal surface at an angle of θ = 0.01 radian, as shown in the figure. After exposing this film to a linearly polarized beam of light of wavelength 500 *nm* incident normally to the metal surface, it developed periodic bright bands. We can explain this observation as the proof of



1. Interference between the incident wave and the wave reflected from the surface of the metal.
2. Diffraction pattern produced by the photographic film.
3. Interference of light due to the presence of photographic film.
4. Polarization of light due to photographic film.

Q12. [Dec 2024] . 3.5 marks

Optics > Interference and diffraction

CSIR NET	2024 Dec	3.5M

A grating spectrometer in vacuum, illuminated by 500 nm light, gives first-order spectrum at an angle of $20°$. When the vacuum chamber is filled with Argon gas at pressure P, this angle

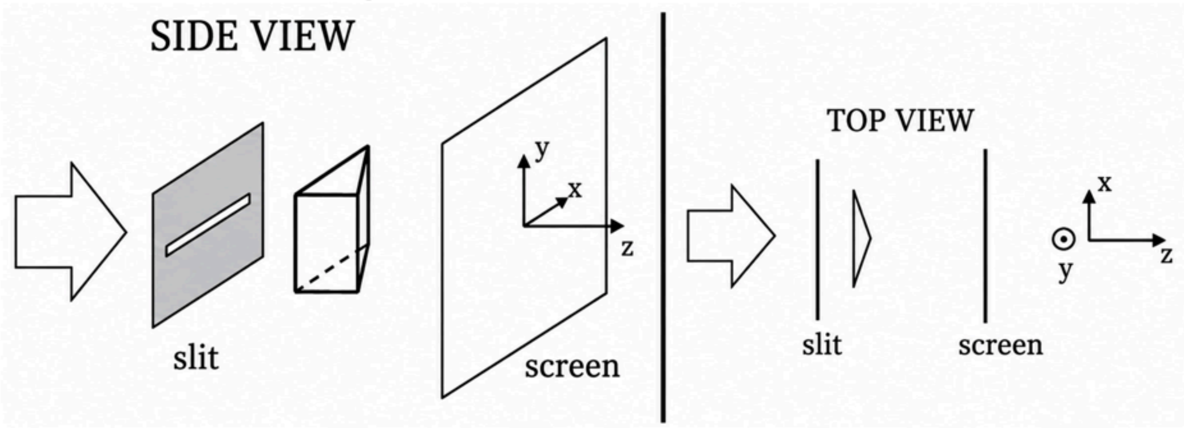
1. increases, due to increase in the refractive index of the medium
2. decreases, due to increase in the refractive index of the medium
3. decreases, due to decrease in the frequency of light in argon gas
4. increases, due to decrease in the frequency of light in argon gas

Q13. [Dec 2024] . 3.5 marks

Optics > Interference and diffraction

CSIR NET	2024 Dec	3.5M

A narrow horizontal slit is illuminated by an extended sodium lamp. A thin Fresnel biprism with its edge aligned perpendicular to the slit is positioned, as shown in the figure. Given that the length of the slit is larger than the base of the biprism, the pattern of illumination on the screen is best described by



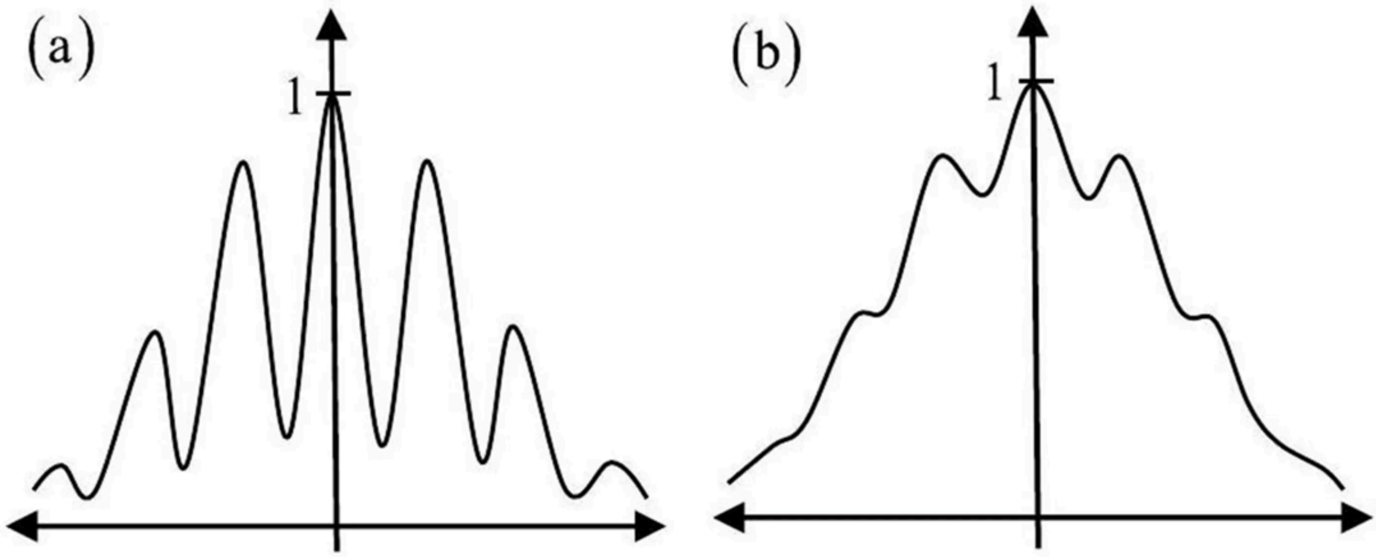
1. Fringes in both x and y direction.
2. Almost uniform illumination.
3. Horizontal fringes periodic only along the x-axis.
4. Horizontal fringes periodic only along the y-axis

Q14. [June 2024] . 3.5 marks

Optics > Interference and diffraction

CSIR NET	2024 June	3.5M

A finite sized light source is used in a double slit experiment. The observed intensity pattern changes from figure (a) to figure (b), as shown below.



The observed change can occur due to

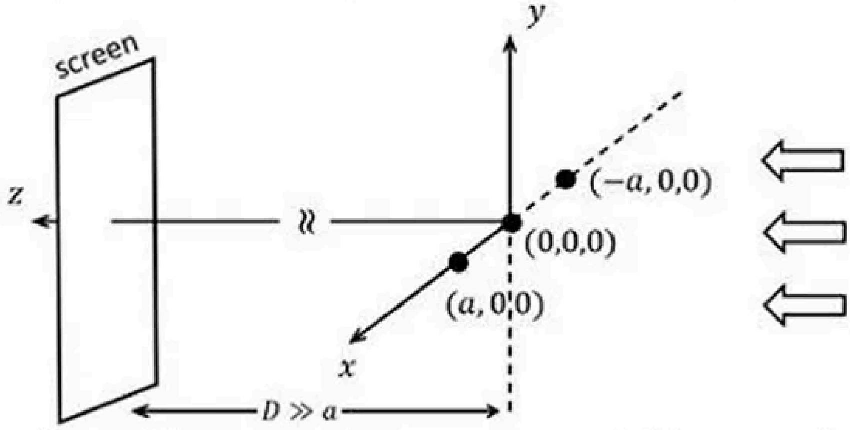
1. narrowing of the slits
2. a reduction in the distance between the slits
3. a decrease in the coherence length of the light source
4. a reduction in the size of the light source

Q15. [Dec 2025] . 3.5 marks

Optics > Interference and diffraction

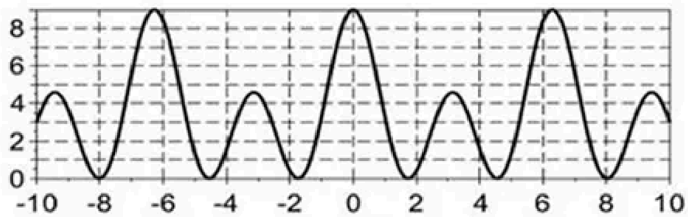
CSIR NET	2025 Dec	3.5M	Wave/Optic

Three identical pinholes separated by distance a along the x-axis are illuminated by a collimated monochromatic coherent beam of light (wavelength λ) as shown in the figure below.

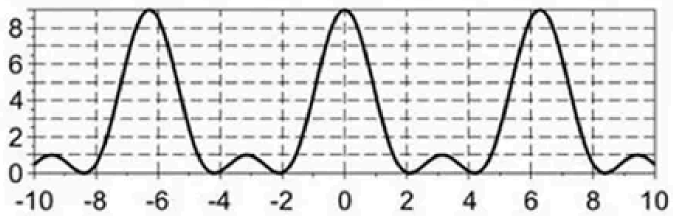


The intensity (in arbitrary units) pattern of fringes obtained on a screen kept at distance $D\,(D \gg a)$ along the z - axis is best represented by

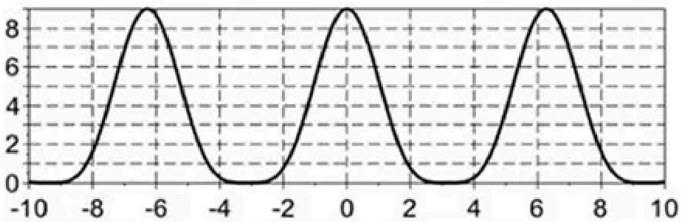
1.



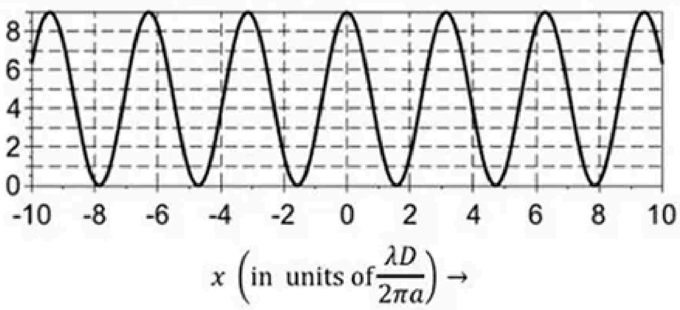
2.



3.



4.



Answer Key

15 questions . Subject and topic for quick revision

Q. No	Subject	Topic	Answer
Q1	Optics	Interference and diffraction	**1**
Q2	Optics	Interference and diffraction	**1**
Q3	Optics	Interference and diffraction	**2**
Q4	Optics	Interference and diffraction	**2**
Q5	Optics	Interference and diffraction	**3**
Q6	Optics	Interference and diffraction	**4**
Q7	Optics	Interference and diffraction	**2**
Q8	Optics	Interference and diffraction	**1**
Q9	Optics	Interference and diffraction	**3**
Q10	Optics	Interference and diffraction	**1**
Q11	Optics	Interference and diffraction	**1**
Q12	Optics	Interference and diffraction	**2**
Q13	Optics	Interference and diffraction	**2**
Q14	Optics	Interference and diffraction	**3**
Q15	Optics	Interference and diffraction	**2**

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