PHYSICS

BOOKS - KUMAR PRAKASHAN KENDRA PHYSICS (GUJRATI ENGLISH)

WAVE OPTICS

Section A Questions Answers Try Yourself

1. Name the theories for the propagation of light.

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2. What phenomena of light can be explained on the basis of particle theory of light?

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3. What phenomena of light can be explained on the basis of wave theory of light

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4. According to particle theory of light what is the velocity of light in a dense medium, compared to that in rare medium ?

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5. The speed of light in water is less than the speed of light in air, confirms the assumption of which theory of light?

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6. When can it be assumed that light moves in a straight line

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7. Mention the main difficulty in establishing the wave theory of light.

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8. Write Huygen's principle.

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9. Write Huygen's principle.

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10. Write the limitation of Huygen's principle.

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11. What is the most important point of Huygen's wave theory?

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12. When a wave passes through a given medium, which of following quantities does not depend on the rest ?

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13. What is the effect on the speed and wavelength of light when the light wave refracted from denser medium to rarer medium ?

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14. Write the formula for Doppler shift for light."

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15. What is interference?

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16. What are coherent sources ?

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17. What are incoherent sources?

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18. What is stationary interference ?

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19. Write time-averaged quanity and when is $\frac{1}{2}$ its values ?

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20. Write the condition for constructive interfernce in terms of path difference.

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21. Write the condition of constructive interference in terms of phase difference.

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22. Write the condition of destructive interference in terms of path difference.

Watch Video Solution

23. Write the condition of destructive interference in terms of phase difference.

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24. Tell the frequency of light emitting from sodium lamp.

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25. Write down the condition of constructive interference.

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26. Write down the formula for distance between two consecutive bright fringes or two consecutive dark fringes.

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27. Write the formula for fringe width.

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28. If $\frac{\text{Path difference}}{\text{Wave length}} =$ integer number, what kind Wave length of interference is formed ?

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29. If the path difference of the point on the screen from a coherent source is constant, what is shape of trajectory of the point on the screen ?

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30. Due to which optical phenomenon we do not see the shadow of opaque object clearly ?

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31. Limit of resolution of a telescope and microscope imposing because of which ?

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32. Define diffraction.

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33. Write the condition of n^{th} order maximum in diffraction.

Watch Video Solution

34. Which scientist invented the diffraction ?

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35. Write the difference between the interference pattern and diffraction pattern.

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36. What is the primary purpose of the eye piece telescope ?

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37. How to increase the resolving power telescope ?

Watch Video Solution

38. How to increase the resolving power microscope ?

Watch Video Solution

39. What is Fresnel distance ? Write its formula.

Watch Video Solution

Section A Questions Answers

1. What is visible light ? Write various view on it.

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2. Describe the short history of light.

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3. What was the difficulty in established the wave theory of light and who explained it ?

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4. Explain the wavefront and its types.

Watch Video Solution

5. Wave Optics Explain the use of wavefront to understan wave propagation.

Watch Video Solution

6. Write Huygen's principle and explain it.

Watch Video Solution

7. Explain how to get a new wavefront in time t using Huygen's principle for plane wavefront.

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8. Write the limitation of Huygen's principle.

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9. Derive the laws of refraction from the concept (Huygen's principle) of the wavefront.

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10. Explain plane wave refraction from denser to rarer medium using Huygen's principle.

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11. Explain the reflection of a plane wave using Huygen's principle.

Watch Video Solution

12. Explain refraction of plane wave with a thin prism.

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13. Explain the refraction of a plane wavefront with a thin convex mirror.

Watch Video Solution

14. Explain the reflection of plane wavefront from concave mirror.

Watch Video Solution

15. Write the formula for Doppler shift for light."

Watch Video Solution

16. Write principle of superposition and explain.

Watch Video Solution

17. Explain the superposition principle for static electric forces and write its general equation.

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18. Write down the condition of constructive interference.

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19. Obtain the formula of intensity if the phase difference at a point from two sources is ϕ.

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20. Explain the intensity of the point of superposition of the waves emanating from it by explaining the coherent and incoherent sources.

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21. "If you illuminate two pinholes using two lamps, the interference pattern will not b observed" - Explain.

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22. Explain the Young's experiment, arrangement and experiment to produce interference pattern.

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23. Obtain the formula of path difference at a point on the screen in Young's double slit experiment in term of x, d and D.

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24. Write down the formula for distance between two consecutive bright fringes or two consecutive dark fringes.

Watch Video Solution

25. Discuss the pattern of interference fringes obtained on the screen away from the two point sources.

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26. Describe Young's double slit experiment.

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27. What is diffraction ? Who discovered it? What kind of diffraction phenomenon occurs in waves ?

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28. 'The person standing behind the open door inside the room can hear the voice of this person standing on the other side of the door but they cannot see each other". Give experiment based on the diffraction for this statement.

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29. Explain diffraction by single slit.

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30. In Fraunhoffer diffraction draw the graph of intensity of light on screen versus diffraction angle θ and write the characteristics of it.

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31. Write the difference between the interference pattern and diffraction pattern.

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32. Write the thoughts expressed by Richard Feynman for the difference between interference and diffraction.

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33. Explain by drawing a figure for the pattern of diffraction occurs by two slits.

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34. What happens if we close one slit in a Young's double slit experiment?

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35. Compare and contrast the interference and diffraction.

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36. Obtain the formulas angular width and linear width of central maximum.

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37. Describe the simplest diffraction pattern.

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38. Explain resolving power for optical instruments and explain resolving power of telescopes.

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39. Explain the resolving power of microscope.

Watch Video Solution

40. Explain the confusion with telescope and microscope.

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41. Explain that for a greater distance, the spreading due to diffraction dominates over due to ray optics.

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42. Explain the importance of Fresnel distance.

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43. Explain linearly polarized waves and give it definition.

Watch Video Solution

44. Define unpolarized light and polarized light.

Watch Video Solution

45. Explain the polarization by a thin plastic like sheet.

Watch Video Solution

46. Explain Malus law and write it.

Watch Video Solution

47. What is a polarizer and an analyser ?

Watch Video Solution

48. Show that when the unpolarized light passe through polariser then the intensity emerging light is half that of the intensity the incident light.

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49. Explain Polarisation by scattering.

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50. Explain polarisation of light by reflection and write the Brewster's law and get the formula.

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51. What is a partially polarised light ?

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52. How can a given light be unpolarized, plane polarised and partially plane polarised can be determined ?

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53. What is a partially polarised light ?

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Section B Questions Answers Numericals Numerical From Textual Lllustrations

1. What speed should a galaxy move with respect to us so that the sodium line at 589.0 nm is observed at 589.6 nm ?

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2. (a) When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have the same frequency as the incident frequency. Explain why?

(b) When light travels from a rarer to a denser medium, the speed decreases. Does the reduction in speed imply a reduction in the energy carried by the light wave?

(c) In the wave picture of light, intensity of light is determined by the square of the amplitude of the wave. What determines the intensity of light in the photon picture of light

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3. (a) When monochromatic light is incident on a surface separating two media, the reflected and refracted light both have the same frequency as the incident frequency. Explain why?

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5. Two slits are made one millimetre apart and the screen is placed one metre away. What is the fringe separation when blue-green light of wavelength 500 nm is used ?

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6. Describe Young's double slit experiment.

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7. In Example 10.3, what should the width of each slit be to obtain 10 maxima of the double slit pattern within the central maximum of the single slit pattern?

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8. Assume that light of wavelength 6000Å is coming from a star. What is the limit of resolution of a telescope whose objective has a diameter of 100 inch?

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9. For what distance is ray optics a good approximation when the aperture is 3 mm wide and the wavelength is 500 nm?

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10. Discuss the intensity of transmitted light when a polaroid sheet is rotated between two crossed polaroids?

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11. Unpolarised light is incident on a plane glass surface. What would be the angle of incidence so that the reflected and refracted rays are perpendicular to each other.

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Section B Questions Answers Numericals Numerical From Textual Exercise

1. Monochromatic light of wavelength 589 nm is incident from air on a water surface. What are the wavelength, frequency and speed of (a) reflected, and (b) refracted light? Refractive index of water is 1.33.

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2. What is the shape of the wavefront in each of the following cases:

(a) Light diverging from a point source.

(b) Light emerging out of a convex lens when a point source is placed at its focus.

(c) The portion of the wavefront of light from a distant star intercepted by the Earth.

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(b) Light emerging out of a convex lens when a point source is placed at its focus.

(c) The portion of the wavefront of light from a distant star intercepted by the Earth.

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5. (a) The refractive index of glass is 1.5. What is the speed of light in glass? $\left(\text{Speed of light in vacuum is } 3.0 \times 10^8 ms^{-1}\right)$

(b) Is the speed of light in glass independent of the colour of light? If not, which of the two colours red and violet travels slower in a glass prism?

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6. (a) The refractive index of glass is 1.5. What is the speed of light in glass? (Speed of light in vacuum is $3.0 \times 10^8 ms^{-1}$)

(b) Is the speed of light in glass independent of the colour of light? If not, which of the two colours red and violet travels slower in a glass prism?

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7. A screen is placed 90cm from an object. The image of the object on the screen is formed by a convex lens at two different locations separated by 20cm. Determine the focal length of the lens.

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8. In Young's double-slit experiment using monochromatic light of wavelength λ, the intensity of light at a point on the screen where path difference is λ, is K units. What is the intensity of light at a point where path difference is $\lambda / 3$?

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9. A beam of light consisting of two wavelengths, 650 nm and 520 nm, is used to obtain interference fringes in a Young's double-slit experiment.

(a) Find the distance of the third bright fringe on the screen from the central maximum for wavelength 650 nm.

(b) What is the least distance from the central maximum where the bright fringes due to both the wavelengths coincide?

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10. A beam of light consisting of two wavelengths, 650 nm and 520 nm, is used to obtain interference fringes in a Young's double-slit experiment.

(a) Find the distance of the third bright fringe on the screen from the central maximum for wavelength 650 nm.

(b) What is the least distance from the central maximum where the bright fringes due to both the wavelengths coincide?

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11. In a double-slit experiment the angular width of a fringe is found to be 0.2° on a screen placed 1 m away. The wavelength of light used is 600 nm. What will be the angular width of the fringe if the entire experimental apparatus is immersed in water? Take refractive index of water to be 4/3.

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12. What is the Brewster angle for air to glass transition? (Refractive index of glass = 1.5.)

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13. Light of wavelength $5000 Å$ falls on a plane reflecting surface. What are the wavelength and frequency of the reflected light? For what angle of incidence is the reflected ray normal to the incident ray?

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14. Estimate the distance for which ray optics is good approximation for an aperture of 4 mm and wavelength 400 nm.

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15. The $6563 \text{Å} H\alpha$ line emitted by hydrogen in a star is found to be redshifted by 15Å. Estimate the speed with which the star is receding from the Earth.

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16. Explain how Corpuscular theory predicts the speed of light in a medium, say, water, to be greater than the speed of light in vacuum.

Is the prediction confirmed by experimental determination of the speed of light in water? If not, which alternative picture of light is consistent with experiment?

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17. You have learnt in the text how Huygens' principle leads to the laws of reflection and refraction. Use the same principle to deduce directly that a point object placed in front of a plane mirror produces a virtual image whose distance from the mirror is equal to the object distance from the mirror

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18. Let us list some of the factors, which could possibly influence the speed of wave propagation:

(i) nature of the source.

(ii) direction of propagation.

(iii) motion of the source and/or observer.

(iv) wavelength.

(v) intensity of the wave.

On which of these factors, if any, does

(a) the speed of light in vacuum,

(b) the speed of light in a medium (say, glass or water), depend?

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19. For sound waves, the Doppler formula for frequency shift differs slightly between the two situations: (i) source at rest, observer moving, and (ii) source moving, observer at rest. The exact Doppler formulas for the case of light waves in vacuum are, however, strictly identical for these situations. Explain why this should be so. Would you expect the formulas to be strictly identical for the two situations in case of light travelling in a medium?

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20. In double-slit experiment using light of wavelength 600 nm, the angular width of a fringe formed on a distant screen is 0.1°. What is the spacing between the two slits?

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21. Answer the following questions:

(a) In a single slit diffraction experiment, the width of the slit is made double the original width. How does this affect the size and intensity of the central diffraction band?

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22. Answer the following questions:

(b) In what way is diffraction from each slit related to the interference pattern in a double-slit experiment?

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23. Answer the following questions:

(c) When a tiny circular obstacle is placed in the path of light from a distant source, a bright spot is seen at the centre of the shadow of the obstacle. Explain why?

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24. Answer the following questions:

(d) Two students are separated by a 7 m partition wall in a room 10 m high. If both light and sound waves can bend aroundobstacles, how is it that the students are unable to see each other even though they can converse easily.

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25. Answer the following questions:

(e) Ray optics is based on the assumption that light travels in a straight line. Diffraction effects (observed when light propagates through small apertures/slits or around small obstacles) disprove this assumption. Yet the ray optics assumption is so commonly used in understanding location and several other properties of images in optical instruments. What is the justification?

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26. Two towers on top of two hills are 40 km apart. The line joining them passes 50 m above a hill halfway between the towers. What is the longest wavelength of radio waves, which can be sent between the towers without appreciable diffraction effects?

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27. A parallel beam of light of wavelength 500 nm falls on a narrow slit and the resulting diffraction pattern is observed on a screen 1 m away. It is observed that the first minimum is at a distance of 2.5 mm from the centre of the screen. Find the width of the slit.

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28. Answer the following questions:

(a) When a low flying aircraft passes overhead, we sometimes notice a slight shaking of the picture on our Tv screen. Suggest a possible explanation.

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29. Answer the following questions:

(b) As you have learnt in the text, the principle of linear superposition of wave displacement is basic to understanding intensity distributions in diffraction and interference patterns. What is the justification of this principle?

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30. In deriving the single slit diffraction pattern, it was stated that the intensity is zero at angles of $n\lambda/a$. Justify this by suitably dividing the slit to bring out the cancellation.

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Section B Questions Answers Numerical From Darpan Based On Textbook

1. Discuss the pattern of interference fringes obtained on the screen away from the two point sources.

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2. Write the condition of n^{th} order maximum in diffraction.

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3. A small telescope has an objective lens of focal length 140cm and an eyepiece of focal length 5.0cm. What is the magnifying power of the telescope for viewing distant objects when

(a) the telescope is in normal adjustment (i.e., when the final image is at infinity)?

(b) the final image is formed at the least distance of distinct vision (25cm)?

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4. Two waves with wavelength λ have phase difference of 60° at the point of superposition. Find path difference between them.

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5. A ray of light travelling in water is incident on a glass plate immersed in it. When the angle of incident is 51° the reflected ray is totally plane polarized. Find the refractive index of glass. Refractive index of water is 1.33.

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6. In an Young's experiment, the distances between two slits and that between slits and the screen are 0.05 cm and I m respectively.

Find the distance between 3^{rd} bright and 5^{th} dark fringes. Take the wavelength of light equal to 5000Å

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7. In Young's experiment fifth bright fringe produced by light of 4000Å superposes on the fourth bright fringe of an unknown wavelength. Find the unknown wavelength.

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8. In Young's experiment, the distance between two slits is 1 mm and the distance between two consecutive bright fringes is 0.03 cm. Now, on displacing the screen away from the slits by 50 cm, the distance between two consecutive dark fringes is doubled. Find the wavelength of light used.

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9. In Young's double slit experiment, if th distance between two slits is double of the wavelength of light used. Prove that maximum 5 bright fringes will be obtained on the screen.

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10. In the Young's double slit experiment, the slits are 0.4 cm apart and the screen is 100 cm awayIf the wavelength of light used is 5000 Å then the distance between the fourth dark fringe and central bright will be ......

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11. In Fraunhoffer diffraction, the wavelength of light incident on the slit $\frac{d}{2}$ where d is the width of the slit. What will be the number of bright fringes fromed on an infinitely extended screen placed at any distance from the slit ?

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12. A plane polarized light is incident perpendicularly on polaroid. Taking incident light as an axis polaroid is rotated with an

angular speed $\pi rads^{-1}$. If light energy incident in 1s is 4 mJ. How much energy will emerge after one rotation ?

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Section C Ncert Exemplar Solution Multiple Choice Questions Mcqs

1. The perpendicular at a point of contact to the tangent to a circle passes through the centre.

A. For a particular orientation there shall be darkness as observed through the polaroid.

B. The intensity of light as seen through the polaroid shall be independent of the rotation.

C. The intensity of light as seen through the polaroid shall go through a minimum but not zero for two orientations of the polaroid.

D. The intensity of light as seen through the polaroid shall go through a minimum for four orientations of the polaroid.

Answer: C

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2. Consider sunlight incident on a slit of width 10^4Å. The image seen through the slit shall

A. be a fine sharp slit white in colour at the center.

B. a bright slit white at the center diffusing to zero intensities at the edges.

C. a bright slit white at the center diffusing to regions of different colours.

D. only be a diffused slit white in colour.

Answer: A

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3. Consider a ray of light incident from air onto a slab of glass (refractive index n) of width d, at an angle θ. The phase difference between the ray reflected by the top surface of the glass and the bottom surface is

A. $\frac{2\pi nd}{\lambda}\left(1-\frac{\sin^2\theta}{n^2}\right)^{-1/2}+\pi$

B. $\frac{4\pi d}{\lambda}\left(1-\frac{\sin^2\theta}{n^2}\right)^{-1/2}$

C. $\frac{4\pi d}{\lambda}\left(1-\frac{\sin^2\theta}{n^2}\right)^{-1/2}+\frac{\pi}{2}$

D. $\frac{4\pi d}{\lambda}\left(1-\frac{\sin^2\theta}{n^2}\right)^{-1/2}+2\pi$

Answer: A

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4. In a Young's double slit experiment, the source is white light. One of the holes is covered by a red filter and another by a blue filter. In this case

A. there shall be alternate interference patterns of red and blue.

B. there shall be an interference pattern for red distinct from that for blue.

C. there shall be no interference fringes.

D. there shall be an interference pattern for red mixing with one for blue.

Answer: C

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5. Let A(1, 2, -3) and B(-1, -2, 1) are two vectors. Direction cosines of the vector joining the vector in the direction A to is ....

A. There would be no interference pattern on the second screen but it would be lighted.

B. The second screen would be totally dark.

C. There would be a single bright point on the second screen.

D. There would be a regular two slit pattern on the second screen.

Answer: D

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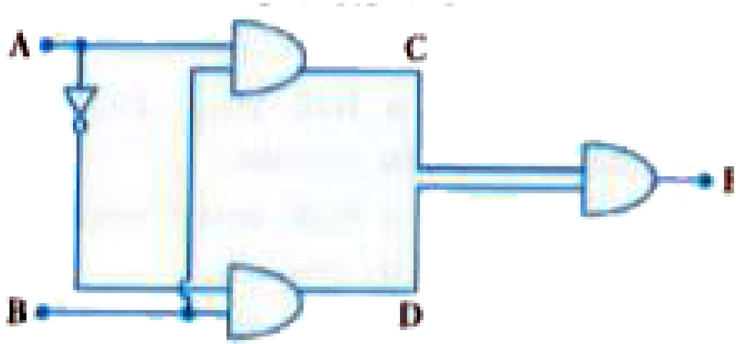
Section C Ncert Exemplar Solution Multiple Choice Questions More Than One Options

1. 

Truth table for the given circuit (See figure) is

A. S_1 and S_2 have the same intensities.

B. S_1 and S_2 have a constant phase difference.

C. S_1 and S_2 have the same phase.

D. S_1 and S_2 have the same wavelength.

Answer: A::B::D

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2. Consider sunlight incident on a pinhole of widht 10^3Å. The image of the pinhole seen on a screen shall be

A. a sharp white ring.

B. different from a geometrical image

C. a diffused central spot, white in colour.

D. diffused coloured region around a sharp central white spot.

Answer: B::D

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3. Consider the diffraction pattern for a small pinhole. As the size of the hole is increased

A. the size decreases.

B. the intensity increases.

C. the size increases.

D. the intensity decreases.

Answer: A::B

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4. For light diverging from a point source

A. the wavefront is spherical.

B. the intensity decreases in proportion to the distance squared.

C. the wavefront is parabolic.

D. the intensity at the wavefront does not depend on the distance.

Answer: A::B

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Section C Ncert Exemplar Solution Very Short Answer Type Questions

1. Is Huygen's principle valid for longitudunal sound waves ?

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2. A long straight wire carries a current of 35 A. What is the magnitude of the field B at a point 20 cm from the wire?

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3. What is the shape of the wavefront on earth for sunlight?

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4. Why is the diffraction of sound waves more evident in daily experience than that of ligh wave ?

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5. The human eye has an approximate angular resolution of $\phi = 5.8 \times 10^4$ rad and a typical photo printer prints a minimum of 300 dpi (dots per inch, 1 inch = 2.54 cm). At what minimal distance z should a printed page be held so that one does not see the individual dots.

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6.

A polaroid (1) is placed in front of a monochromatic source. Another polaroid (II) is placed in front of this polaroid (I) and rotated till no light passes. A third polaroid (III) is now placed in between (I) and (II).

In this case, will light emerge from (II). Explain.

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Section C Ncert Exemplar Solution Short Answer Type Questions

1. Can reflection result in plane polarised light if the light is incident on the interface from the side with higher refractive index ?

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2. For the same objective, find the ratio of the least separation between two points to be distinguished by a microscope for light of

$5000\mathring{A}$ and electrons accelerated through 100 V used as the illuminating substance.

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3. In Young's slit experiment, if the distance between two slits is halved and the distance between the slits and the screen is doubled then the width of fringe will be.....

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Section C Ncert Exemplar Solution Long Answer Type Questions

1. if the intensity of the principal maximum in the single slit Fraunhoffer diffraction pattern, then the intensity when the slit width is double will be .....

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2. What will be the diffraction angle of first order maxima in diffraction obtained due to light of wavelength 55nm and width of slit 0.55 mm ?

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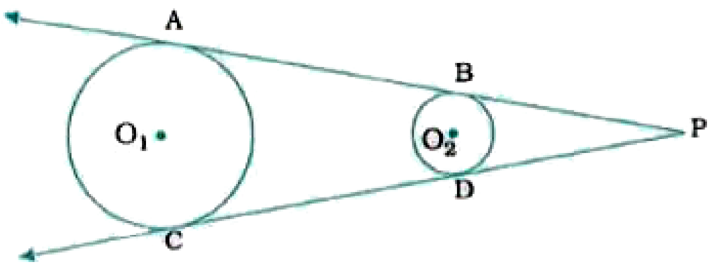
3. As shown in the figure, AB and CD are two common tangents to circles with centres O_1 and O_2 and different radius. Prove that



AB=CD

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4. The optical properties of a medium are governed by the relative permitivity (ε_r) and relative permeability (μ_r). The refractive index is defined as $\sqrt{\mu_r \varepsilon_r} = n$. For ordinary material $\varepsilon_r > 0$ and $\mu_r > 0$ and the positive sign is taken for the square root. In 1964, a Russian scientist V. Veselago postulated the existence of material with $\varepsilon_r < 0 \text{ and } \mu_r < 0$. Since then such 'metamaterials' have been produced in the laboratories and their optical properties studied. For such materials $n = -\sqrt{\mu_r \varepsilon_r}$. As light enters a medium of such refractive index the phases travel away from the direction of propagation.

(i) According to the description above show that if rays of light enter such a medium from air (refractive index = 1) at an angle θ in 2^{nd} quadrant, then the refracted beam is in the 3^{rd} quadrant.

(ii) Prove that Snell's law holds for such a medium.

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5. To ensure almost 100 per cent transmittivity, photographic lenses are often coated with a thin layer of dielectric material. The refractive index of this material is intermediated between that of air and glass (which makes the optical element of the lens). A typically used dielectric film is $MgF_2(n = 1.38)$. What should the thickness of the film be so that at the center of the visible speetrum (5500Å) there is maximum transmission.

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Section D Multiplce Choice Questions Mcqs Mcqs From Darpan Based On Textbook

1. According to particle theory of light what is the velocity of light in a dense medium, compared to that in rare medium ?

A. more in rarer medium and less in denser

B. less in rarer medium and more in denser

C. same in both medium

D. none of these

Answer: B

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2. Light moves in a straight line. Because ......

A. its velocity is very high.

B. it can't absorb in around.

C. its wavelength is too small.

D. it does not reflect from around.

Answer: C

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3. ...... gave the concept of wave theory of propagation of light

A. Newton

B. Maxwell

C. Huygens

D. Descartes

Answer: C

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4. In the wave propagation phenomenon, phase difference of oscillation of two particles having distance à from each other is ......

A. always zero

B. always 2π rad

C. always $\frac{\pi}{2}$ rad

D. non zero

Answer: A

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5. The line perpendicular to wavefront and which represents propagation of wave is ....

A. waveline

B. only straight line

C. ray

D. wave

Answer: C

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6. The most important point of Huygen's wave theory is that ......

A. it is applicable only to mechanical waves

B. it is applicable only to non-mechanical waves.

C. it is applicable to longitudinal waves

D. it is applicable to all types of waves.

Answer: D

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7. Light moves in a straight line. Because ......

A. its velocity is very high

B. it can't absorb in around.

C. its wavelength is too small.

D. it does not reflect from around.

Answer: C

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8. The shape of wave front at large distance is approximately ....

A. plane

B. spherical

C. cylindrical

D. linear

Answer: A

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9. Limitations of Huygen's principle is explained by.....

A. Huygen's and Rayleigh

B. young and Kirchoff

C. Fresnel and Fraunhoffer

D. Malus and Young

Answer: B

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10. Intensity of secondary waves is directly proportional to ......

A. $\sin^2 \theta$

B. $\sin^2\left(\frac{\theta}{2}\right)$

C. $\cos^2 \theta$

D. $\cos^2\left(\frac{\theta}{2}\right)$

Answer: D

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11. Huygen's principle cannot explain .....

A. interference

B. diffraction

C. polarization

D. photo-electric effect

Answer: D

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12. What is the phase difference between consecutive crest and through ?

A. $\frac{\pi}{2}$

B. π

C. 2π

D. zero

Answer: A

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13. Velocity of light in rarer medium is v_1 it passes through denser medium with velocity v_2 incidents at 'i' angle and refracts by 'r angle, then .....

A. $v_1 = v_2$

B. $v_1 > v_2$

C. $v_1 < v_2$

D. none of above.

Answer: B

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14. Light of wavelength 5000 Å incidents on reflecting surface, then for ...... value of incidence angle, reflected and incident ray will be perpendicular.

A. 0°

B. 30°

C. 90°

D. 45°

Answer: D

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15. No. of waves of a certain colour light are 2000 in 1 mm distance in air, then what will be wavelength of light in medium of refractive Index 1.25 ?

A. 1000 Å

B. 2000 Å

C. 3000 Å

D. 4000 Å

Answer: D

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16. A rocket goes away from Earth at speed of $6 \times 10^7 m/s$ and it has blue light in it, what will be the wavelength of light observed by observer at Earth? Wavelength of blue ligth $= 4600 Å$

A. $4600 Å$

B. $5520 Å$

C. 3860Å

D. 3920Å

Answer: B

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17. The wavelength of wave of 5000 Å comir from a star at far distance is experience 5200 A, then what is the velocity ?

A. $1.2 \times 10^7 cm / s$

B. $1.2 \times 10^7 m / s$

C. $1.2 \times 10^7 m / s$

D. $1.2 km / s$

Answer: B

Watch Video Solution

18. Frequency of light changes when source move away from stationary observer, this can b explained by ....

A. doppler effect

B. interference

C. diffraction

D. none of these

Answer: A

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19. The star recedes from the earth at the speed a $100kms^{-1}$ Find the doppler shift of spectrur line $3 \times 10^8 ms^{-1}$ ms having wavelength $5700Å$

A. $0.63Å$

B. $1.90Å$

C. $3.80Å$

D. $5.70Å$

Answer: B

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20. In doppler effect of light, term red shift represents ......

A. decrease in frequency

B. increase in frequency

C. decrease in intensity

D. increase in intensity

Answer: A

Watch Video Solution

21. Speed of light wave of 5000 Å wavelength produced from a star is $1.5 \times 10^6 m / s$, then change in wavelength when it reaches to Earth is ......

A. 25Å

B. zero

C. 100Å

D. 2.5Å

Answer: A

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22. Displacement of two light waves are $e_1 = 4\sin\omega t$ and $e_2 = 3\sin\left(\omega t + \frac{\pi}{2}\right)$. so amplitude of resultant wave = ...

A. 0

B. 1

C. 5

D. 7

Answer: C

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23. Ratio of amplitude of two coherent sources is 5:2. Ratio of intensity of fringes of constructive and destructive interference for stationary interference of these wave is.....

A. $\frac{49}{9}$

B. $\frac{25}{4}$

C. $\frac{3}{7}$

D. $\frac{5}{2}$

Answer: A

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24. Intensity of two sources are different and waves emitting from source experience interference. If ratio of maximum and minimum intensity in interference is 25, intensity of sources is ....

A. $5:1$

B. $9:4$

C. $25:16$

D. $25 : 1$

Answer: B

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25. In Young's experiment ratio of maximum and minimum intensities of fringes is 9: 1. Ratio of amplitude of superposing waves = ...

A. $9 : 1$

B. $3 : 1$

C. $2:1$

D. $1:1$

Answer: C

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26. Write the condition for constructive interfernce in terms of path difference.

A. phase difference = $n\pi$, where n = 0, 1, 2, 3, ...

B. phase difference = $2n\pi$, where n=0,1,2,3,...

C. phase difference = $(2n-1)\pi$ where n = 0, 1,2,3....

D. phase difference = $2n\pi$ where n = 0, 1, 2, 3, ...

Answer: B

Watch Video Solution

27. Write the condition of destructive interference in terms of phase difference.

A. phase difference $= 2n\pi$

B. phase difference $= (2n -)\pi$

C. phase difference $= (2n + 1)\pi$

D. phase difference $= (2n + 1)\frac{\pi}{2}$

Answer: C

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28. Write the condition for constructive interfernce in terms of path difference.

A. path difference $= 2n\lambda$

B. path difference $= \left(n + \frac{1}{2}\right)\lambda$

C. path difference $= n\lambda$

D. path difference $= \left(n - \frac{1}{2}\right)\lambda$

Answer: C

Watch Video Solution

29. Write the condition of destructive interference in terms of path difference.

A. path difference $=n\lambda$

B. path difference $=\left(n+\frac{1}{2}\right)\lambda$

C. path difference $=2n\lambda$

D. path difference $=(2n+1)\lambda$

Answer: B

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30. If distance between source and screen increases by 2%, then intensity obtained at screen will be ....

A. increased by 4%

B. increased by 2%

C. decreased by 2%

D. decreased by 4%

Answer: D

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31. Two electromagnetic waves create (0, 0, 1) Vm and $(-1, 0, 1)Vm^{-1}$ displacement at one point any instance. So resultant intensity at this point will be...... Wm^{-2}

A. $\sqrt{5}$

B. 17

C. 1

D. 5

Answer: D

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32. The maximum intensity obtained due to the superposition of waves of 'n' coherent source having same intensity I_0 is ......

A. nI

B. $\dfrac{I}{n}$

C. $n^2 I$

D. $\dfrac{I}{n^2}$

Answer: C

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33. Interference pattern is formed from two coherent sources of same intensity. If intensit of minima is zero, then what will be th intensity of maxima ?

A. 4I

B. I

C. $4I^2$

D. I^2

Answer: A

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34. In a Young's experiment, the distance between two slits is 0.2 mm. If the wavelength of light used in this experiment is 5000 Å, then the distance of 3rd bright fringes from central maxima will be ......

A. 0.75

B. 0.075

C. 0.0075

D. 0.057

Answer: C

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35. The shape of interference fringe obtained on screen by using monochromatic light in Young's double slit experiment is ......

A. parabolic

B. circular

C. linear

D. hyperbolic

Answer: D

Watch Video Solution

36. Path difference between two waves superposing at one point is 132, so interference at that point will be ...... and ...... order.

A. constructive 13^{th}

B. destructive 13^{th}

C. constructive 7^{th}

D. destructive 7^{th}

Answer: A

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37. In Young's experiment, dark fringe of 5th order is obtained at point P on the screen so path difference at point P on the screen will be

......

A. $\frac{10\lambda}{2}$

B. $\frac{11\lambda}{2}$

C. $\frac{9\lambda}{2}$

D. $\frac{12\lambda}{2}$

Answer: C

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38. In Young's experiment distance between 5^{th} dark fringe and 3rd bright fringe is `x_(5)-x_(3)=......x

A. 2

B. 3

C. $\frac{2}{3}$

D. $\frac{3}{2}$

Answer: D

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39. In double slit experiment, the point on the screen where 3^{rd} order dark fringe from central position is obtained, phase difference between two waves will be .....

A. 3π

B. 4π

C. zero

D. 5π

Answer: D

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40. If path difference between two wave superposing at a point is $\frac{3}{2}\lambda$ interference of ...... type and ...... order will be formed there.

A. destructive, second

B. constructive, second

C. destructive, third

D. constructive, fourth

Answer: A

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41. In Young's experiment distance between two consecutive dark fringes is 2 mm, distance between central maximum and third dark fringe will be ......

A. 3 mm

B. 1.5 mm

C. 2.5 mm

D. 5 mm

Answer: D

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42. If white light is used instead of sodium light in the Young's experiment......

A. all fringes will appear dark.

B. all bright fringes will appear white

C. only the central fringe will be white, all other will look colourful.

D. none of these

Answer: C

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43. only the central fringe will be white, all other will look colourful. - Using B = 10 43) In Young's experiment, yellow light of wavelength 5890 Å is used. The angular width of the fringes is 0.2°. How much do you need to change the wavelength to increase the angular width by 10% ?

A. Increase of 589Å

B. Decreases of 589Å

C. Increase of 6479Å

D. No change have to be made in wavelength.

Answer: A

Watch Video Solution

44. In Young's experiment if mica disc of thickness t and refractive index is placed in the path of one ray coming out of slit, fringes will move ...... distance on the screen

A. $\frac{d}{D}(\mu - 1)t$

B. $\frac{D}{d}(\mu - t)$

C. $\frac{d}{(\mu - 1)D}$

D. $\frac{D}{d}(\mu - 1)\text{t}$

Answer: B

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45. A glass plate of thickness d and refractiv index n is placed on the path of one of the twi coming out of two slits in Young's experiment The minimum thickness of plate for havin zero intensity of central bright fringe should be .... λ is the wavelength of light

A. $(n-1)\frac{\lambda}{2}$

B. $\frac{\lambda}{n-1}$

C. $\frac{\lambda}{2(n-1)}$

D. $(n-1)\lambda$

Answer: C

Watch Video Solution

46. In the Young's double slit experiment, the slits are 0.4 cm apart and the screen is 100 cm awayIf the wavelength of light used is 5000 Å then the distance between the fourth dark fringe and central bright will be ......

A. $4.37 \times 10^{-2} cm$

B. $4.37cm$

C. $4.37 \times 10^{-1}cm$

D. $8.74cm$

Answer: A

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47. 92 fringes are obtained in the definite distance R on screen by Young's double slit experiment using sodium light of $(\lambda = 5898\text{Å})$.

If $(\lambda = 5461\text{Å})$ is used, how many fringes will be obtained in the same distance ?

A. 62

B. 67

C. 85

D. 99

Answer: D

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48. In Young's slit experiment, if the distance between two slits is halved and the distance between the slits and the screen is doubled then the width of fringe will be.....

A. unchanged

B. halved

C. doubled

D. four times

Answer: D

Watch Video Solution

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49. In the Young's experiment, when a plate of thickness λ and refractive index of 1.5 is introduced in path of beam the intensity at the position where central maximum occurred previously remained unchanged. The minimum thickness of glass plate is I

A. 2λ

B. λ

C. $\frac{\lambda}{3}$

D. $\frac{2\lambda}{3}$

Answer: A

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50. In a Young's experiment, the width of one of the two slits is double the other, then interference

A. increases the intensity of bright and dark fringes.

B. The intensity of bright fringes increase and intensity of dark fringes will be zero

C. decreases the intensity of bright fringes and increases the intensity of dark fringes.

D. decreases the intensity of bright fringes and the intensity of dark fringes will be zero.

Answer: A

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51. Young's double slit experiment is made in a liquid. The 10th bright fringe in liquid lies where 6th dark fringe lies in air. The refractive index of liquid is ....

A. 1.2

B. 1.6

C. 1.5

D. 1.8

Answer: D

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52. If the two slits in Young's double slit experiment have width ratio 1:25, then the ratio of the intensity of maxima and minima in the interference pattern will .....

A. PQ

B. W_1W_2

C. W_3W_4

D. xy

Answer: C

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53. The phenomena of light passes through sleet and bends at edges of slit is called ....

A. reflection

B. refraction

C. diffraction

D. polarization

Answer: C

Watch Video Solution

54. ...... found the phenomena of diffraction.

A. Young

B. Huygens

C. Fraunhoffer

D. Grimaldi

Answer: D

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55. Proportion of diffraction by slit ....

A. is directly proportional to

B. is inversely proportional to d.

C. depends on ratio

D. none of these.

Answer: C

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56. If $\frac{\lambda}{a} > 1.$, then amount of diffraction

A. increases

B. decreases

C. doesn't change

D. zero

Answer: A

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57. Condition for maximum diffraction is

A. $\frac{\lambda}{a} = 1$

B. $\frac{\lambda}{a} = 0$

C. $\frac{\lambda}{a} = \infty$

D. $\frac{\lambda}{a} = \frac{1}{2}$

Answer: A

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58. .... can't be explained by ray optics.

A. Reflection

B. Refraction

C. Diffraction

D. Total internal reflection

Answer: C

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59. If diffraction pattern obtained by using violet light instead of patterns obtained by red light, then ...

A. diffraction pattern will disappear.

B. diffraction pattern will look unleashed

C. diffraction pattern remain constant

D. diffraction pattern will narrower.

Answer: D

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60. The central fringe of diffraction pattern obtained by single slit for white light will be

A. black

B. blue

C. red

D. white

Answer: D

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61. Condition for nth minimum in single slit diffraction is ...... where $n = \pm 1, \pm 2, \pm 3, \ldots$

A. $n\lambda = a\sin\theta_n$

B. $alambda = n\sin\theta_n$

C. $\frac{n}{\lambda} = \sin\theta_n$

D. $n\lambda = \frac{\sin\theta_n}{a}$

Answer: A

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62. Condition for n^{th} maximum in single slit diffraction is ..... where n = 1, 2, 3,

A. $a\sin\theta_n = \left(n - \frac{1}{2}\right)\lambda$

B. $a\sin\theta_n = \left(n + \frac{1}{2}\right)\lambda$

C. $\lambda\sin\theta_n = \left(n - \frac{1}{2}\right)a$

D. $\lambda\sin\theta_n = \left(n + \frac{1}{2}\right)a$

Answer: B

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63. Formula of linear width of central maximum in diffraction is ....

A. $\beta = 2\beta_0$

B. $\beta = \frac{\beta_0}{2}$

C. $\beta = \beta_0$

D. not possible

Answer: B

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64. What will be angle of first order maxima obtained by Fraunhoffer diffraction by single slit of width 0.50 mm , using light of wavelength 500 nm

A. 1.5×10^{-3} radian

B. 10.5×10^{-3} radian

C. 1×10^{-3} radian

D. 3×10^{-3} radian

Answer: A

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65. In differation angle of first minima of Fraunhoffer diffraction is $\frac{\pi}{6}$ width of slit d =......

A. λ

B. 2λ

C. $\frac{\lambda}{2}$

D. $\frac{\lambda}{6}$

Answer: B

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66. Which one will be diffracted maximum ?

A. λ rays

B. radiowaves

C. ulraviolet waves

D. infrared waves

Answer: B

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67. For a given slit, ratio of diffraction angle of fringes of first maxima and first minima is......

A. $\frac{1}{2}$

B. $\frac{2}{1}$

C. $\frac{2}{3}$

D. $\frac{3}{2}$

Answer: D

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68. What will be the diffraction angle of first order maxima in diffraction obtained due to light of wavelength 55nm and width of slit 0.55 mm ?

A. 0.0015 radian

B. 0.00015 radian

C. 0.003 radian

D. 0.0010 radian

Answer: B

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69. Frequency of sound wave is 600Hz. This wave Incidens perpendicular to open door of width 0.75m. At which angle is the first minima obtained ? (speed of light in air = $330ms^{-1}$)

A. 20.8

B. 45°

C. 47.2°

D. 83.6°

Answer: C

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70. Monochromatic light of wavelength 5000 A is incident on narrow slit of width 0.001 mm. Now this light is focused on screen placed on focal plane of convex lens. For this interference first minima will be obtained at ...

A. 0°

B. 15°

C. 30°

D. 50°)

Answer: C

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71. Light of 600 nm incidents on an obstacle a it diffracts very less upto 15 m, then find line dimension of obstacle.

A. 3 mm

B. 2 mm

C. 4 mm

D. 5 mm

Answer: A

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72. In Fraunhoffer diffraction, the wavelength incident light perpendicular to slit made double. the distance from the slit to the screen made tripled and if the width of the slit made $\frac{3}{2}$ times then width of central maximum will be.....

A. three times

B. four times

C. doubled

D. half

Answer: B

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73. Four times In Fraunhoffer diffraction by single slit having width d. The perpendicular light of wavelength λ incident on it. The distance between slit and screen is D. If the linear width of central maximum is halve to the width of slit then=.....

A. $\sqrt{\frac{\lambda D}{4}}$

B. $\sqrt{\lambda D}$

C. $\sqrt{4\lambda D}$

D. $(2\lambda D)$

Answer: C

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74. Yellow light is used in single slit diffraction experiment with slit width 0.6 nm. If yellow light is replaced by X-rays then the ......

A. no diffraction pattern will obtained.

B. central maximum obtain wide.

C. central maximum obtain narrow,

D. number of fringes decreases

Answer: A

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75. In telescope, focal length of objective is kept more as ...

A. diameter of lens becomes larger so diffraction becomes less.

B. diameter of lens becomes larger so diffraction becomes more

C. diameter of lens becomes smaller, som

diffraction becomes less.

D. none of above.

Answer: A

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76. Point like object is observed using microscope angle subtended by objective with object is 20° If oil of refractive index 1.4 is kept between object and objective, numerical aperture will be ......

A. 0.24

B. 0.48

C. 2.4

D. 4.8

Answer: A

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77. The limit of resolution of an optical instrument arises an account of ....

A. interference

B. polarisation

C. photoelectric effect

D. diffraction

Answer: D

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78. The angular resolution of a 10 cm diameter telescope at a wavelength of 5000 Å is of the order of .....

A. 10^{6} rad

B. 10^{-6} rad

C. 10^{-4} rad

D. 10^{-2} rad

Answer: B

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79. In telescope, ratio of resolving power due to light of $\lambda. = 4000\text{Å}$ and $\lambda = 6000\text{Å}$ is ......

A. $4:5$

B. $3:2$

C. $2:3$

D. $5:4$

Answer: B

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80. Diameter of lens of telescope is 0.16 m. Wavelength of light is 7500Å, so resolving power of telescope will be ..

A. 1.73×10^5

B. 6.67×10^6

C. 6.67×10^2

D. 6.67×10^4

Answer: A

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81. ...... changes in polarization

A. Frequency

B. Intensity

C. Wavelength

D. Phase

Answer: B

Watch Video Solution

82. In polarisation by reflection of light angle between reflected light and refracted light is

A. π

B. $\frac{\pi}{2}$

C. 2π

D. $\frac{\pi}{4}$

Answer: B

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83. When unpolarised light beam is incident from air into glass (n =1.5) at the polarised angle ....

A. reflected beam is polarised 100 %

B. refracted beam is polarised 50 %

C. reflected beam is unpolarised

D. none of these

Answer: A

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84. If angle of polarisation of transparent medium is 51°, refractive index of medium is ......

A. 0.7771

B. 0.7547

C. 1.2349

D. 1.1504

Answer: C

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85. The angle of incidence at which reflected light totally polarised for reflection from air to glass (refractive index n), is ......

A. $\sin^{-1}(n)$

B. $\sin^{-1}\left(\frac{1}{n}\right)$

C. $\tan^{-1}\left(\frac{1}{n}\right)$

D. $\tan^{-1}(n)$

Answer: D

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86. Refractive index of glass is 1.6 and that water is 1.33. Angle of polarisation for ray light inciding on glass from water is ......

A. $49^{\circ} 48'$

B. $39^{\circ} 12'$

C. $39^{\circ} 44'$

D. $50^{\circ} 16'$

Answer: D

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87. At which angle of incidence light reflected fron glass becomes completely plane polarised i At this angle of incidence angle of refraction is 33.6°

A. 90°

B. 0°

C. 56.4°

D. 46.4°

Answer: C

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88. Velocity of light in air is $3 \times 10^{8} m / s$ and in glass its velocity is $2 \times 10^{8} m / s$ so for glass angle of polarisation is ......

A. 56.50°

B. 56.30°

C. 56.1°

D. 56°

Answer: B

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89. Ray of light is incident on surface of glass plate of absolute refractive index 1.55 at an angle of polarisation angle of refraction = ...

A. $75^{\circ}11'$

B. $32^{\circ}49'$

C. $147^{\circ}49'$

D. 0°

Answer: B

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90. Equation showing relation between angle of polarisation and refractive index is ......

A. $u\sin\theta_p = 1$

B. $u\cot\theta_p = 1$

C. $u\tan\theta_p = 1$

D. $u\cos ec\theta_p = 1$

Answer: B

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91. When ray of light is incident at 58° glass plate, reflected light is completely plane polarised refractive index of glass plate= ......

A. 1.6

B. 1.5

C. 14

D. 1.35

Answer: A

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92. When polaroid is rotated intensity of light increases and decreases but never becomes zero, so we can say that incident light is ....

A. completely plane polarised

B. partially plane polarised

C. unpolarised

D. none of these

Answer: B

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93. Critical angle for a medium is $\sin^{-1}(0.6)$, then polarization angle for this medium is ......

A. $\sin^{-1}(0.8)$

B. $\sin^{-1}(1.5)$

C. $\tan^{-1}(1.6666)$

D. $\tan^{-1}(0.6)$

Answer: C

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94. Ray of light moving in water incidents on glass plate. Reflected light becomes completely plane polarised when incident at 51°, so refractive index of glass will be ...... [Refractive index of water 1.3 and $\tan 51^{\circ} = 1.235$]

A. 1.33

B. 1.805

C. 1.605

D. 1.305

Answer: C

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95. The angle of polarisation for any medium is 60°, what will be the critical angle for this?

A. $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$

B. $\tan^{-1}\sqrt{3}$

C. $\cos^{-}\left(\frac{1}{\sqrt{3}}\right)$

D. $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$

Answer: A

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96. An unpolarised beam of light of intensity l_0 falls on a poloroid. The intensity of the emergent beam is

A. becomes zero and remains zero

B. slightly decrease and slightly increase

C. does not change

D. decrease gradually and becomes zero and then again increases.

Answer: D

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97. The unpolarised light is incident on polarisers placed above the other, so what is the angle between these two polarisers so that the than the intensity of the transmitted light is $\frac{1}{3}$ than the intensity of incident light?

A. 54.7°

B. 35.3°

C. 0°

D. 60°

Answer: B

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98. Ordinary light incident on a glass slab at the polarizing angle suffers a deviation of 22°. The value of angle of refraction is ....

A. 74°

B. 22°

C. 90°

D. 34°

Answer: D

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99. A person finds that the sun rays reflected by the still surface of water in a lake are polarized. If the refractive index of water is 1.327 the sun will be seen at the angle of .... with the horizon

A. 57°

B. 75°

C. 37°

D. 53°

Answer: C

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100. Two nicol prisms are oriented with their principal planes making an angle of 60°. Then ..... % of incident unpolarised light which will pass through the system.

A. 50

B. 100

C. 37.5

D. 12.5

Answer: D

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101. Plane polarized light incidents on tourmaline plate. $\vec{E}$ vectors make 45° with optic axis of plate. Then % difference in magnitudes o initial and final intensities of $\vec{E}$ vectors is ....

A. 0.19

B. 0.92

C. 0.5

D. 0.29

Answer: C

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102. When light incidents on transparent medium at polarization angle, then elements ..... are there in reflected light.

A. Only 15% σ

B. Only 15% π

C. 85% σ and $15\ \%$ π

D. 85% π and $100\ \%$ σ

Answer: A

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103. Ray incidents at 60° and reflected ray gets completely polarized, then speed of refracted light in denser medium is ......

A. $\sqrt{2}$

B. $\sqrt{3} \times 10^8$

C. $\sqrt{3}$

D. $\sqrt{2} \times 10^8$

Answer: B

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104. A system is created by adjusting the five polaroids to touch each other. The polaroid rotates one by one about its axis to 60°. Then intensity of emergent light emitted from the last polaroid will be the ...... part of intensity of incident light.

A. $\dfrac{I_0}{64}$

B. $\dfrac{I_0}{32}$

C. $\dfrac{I_0}{256}$

D. $\dfrac{I_0}{512}$

Answer: D

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105. When unpolarized light incidents on polarizer 3.14 rad/s angular speed and area 3 $\times 10^{-4} m^2$ with energy $3 \cdot 10^{-3} J$, then find energy of polarized light in each rotation

A. $47.1 \times 10^{-4} J$

B. $27.1 \times 10^{-4} J$

C. $37.1 \times 10^{-4} J$

D. $17.1 \times 10^{-4} J$

Answer: A

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106. Two polaroids are in crossed situation and intensity of polarized light is zero. If third polaroid is placed in between such that it makes half angle with optic axis, than angle between two polaroids, then intensity of polarized light will be .... Where I_0 is maximum intensity of incident light.

A. $\frac{I_0}{2}$

B. $\frac{I_0}{4}$

C. I_0

D. $\frac{I_0}{8}$

Answer: D

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107. The critical angular for a particular medium is $\sin^{-1}\left(\frac{3}{5}\right)$, then how much is the angle of polarisation in that medium ?

A. $\sin^{-1}\left(\frac{4}{5}\right)$

B. $\tan^{-1}\left(\frac{5}{3}\right)$

C. $\tan^{-1}\left(\frac{3}{4}\right)$

D. $\tan^{-1}\left(\frac{4}{3}\right)$

Answer: B

Watch Video Solution

108. What speed should a galaxy move with respect to us so that the sodium line at 589.0 nm is observed at 589.6 nm ?

A. $306 \times 10^{-3} m / s$

B. $305 \times 10^3 m / s$

C. $306 \times 10^3 m / s$

D. $306 \times 10^3 k \frac{m}{s}$

Answer: C

Watch Video Solution

109. Two slits are made one millimetre apart and the screen is placed one metre away. What is the fringe separation when blue-green light of wavelength 500 nm is used ?

A. $5 \times 10^{-10} m$

B. $5 \times 10^{-4} m$

C. $5 \times 10^{-6} m$

D. $5 \times 10^{-7} m$

Answer: B

Watch Video Solution

110. Assume that light of wavelength 6000Å is coming from a star. What is the limit of resolution of a telescope whose objective has a diameter of 100 inch?

A. 2.9 rad

B. 2.9×10^{-7} rad

C. 2.9×10^{-5}rad

D. 2.9×10^{-9} rad

Answer: B

Watch Video Solution

111. For what distance is ray optics a good approximation when the aperture is 3 mm wide and the wavelength is 500 nm?

A. 6 m

B. 18 mm

C. 18m

D. 6 mm

Answer: C

Watch Video Solution

112. Unpolarised light is incident on a plane glass surface. What would be the angle of incidence so that the reflected and refracted rays are perpendicular to each other.

A. 33°

B. 57°

C. 24°

D. none of these

Answer: B

Watch Video Solution

113. Monochromatic light of wavelength 589 nm is incident from air on a water surface. What are the wavelength, frequency and speed of (a) reflected, and (b) refracted light? Refractive index of water is 1.33.

A. $5.09 \times 10^{14} Hz$

B. $1.7 \times 10^{-19} Hz$

C. $5.09 \times 10^{17} Hz$

D. $1.7 \times 10^{-14} Hz$

Answer: A

Watch Video Solution

114. Monochromatic light of wavelength 589 nm is incident from air on a water surface. What are the wavelength, frequency and speed of (a) reflected, and (b) refracted light? Refractive index of water is 1.33.

A. 444 nm

B. 226 nm

C. 509 nm

D. 589 nm

Answer: A

Watch Video Solution

115. (a) The refractive index of glass is 1.5. What is the speed of light in glass? (Speed of light in vacuum is $3.0 \times 10^8 ms^{-1}$)

(b) Is the speed of light in glass independent of the colour of light? If not, which of the two colours red and violet travels slower in a glass prism?

A. $5 \times 10^{-9} ms^{-1}$

B. $5 \times 10^{8} m / s$

C. $2 \times 10^{8} m / s$

D. $2 \times 10^{-8} m / s$

Answer: C

Watch Video Solution

116. In a Young's double-slit experiment, the slits are separated by 0.28 mm and the screen is placed 1.4 m away. The distance between the central bright fringe and the fourth bright fringe is measured to be 1.2 cm. Determine the wavelength of light used in the experiment.

A. 4000 Å

B. 5000 Å

C. 6000 Å

D. 7000 Å

Answer: C

Watch Video Solution

117. A beam of light consisting of two wavelengths, 650 nm and 520 nm, is used to obtain interference fringes in a Young's double-slit experiment.

(a) Find the distance of the third bright fringe on the screen from the central maximum for wavelength 650 nm.

(b) What is the least distance from the central maximum where the bright fringes due to both the wavelengths coincide?

A. 7.8 mm

B. 1.95 mm

C. 5.2 mm

D. 1.17 mm

Answer: D

Watch Video Solution

118. In a double-slit experiment the angular width of a fringe is found to be 0.2° on a screen placed 1 m away. The wavelength of light used is 600 nm. What will be the angular width of the fringe if the entire experimental apparatus is immersed in water? Take refractive index of water to be 4/3.

A. 0.27°

B. 0.15°

C. 0.2°

D. 0.21°

Answer: B

Watch Video Solution

119. What is the Brewster angle for air to glass transition? (Refractive index of glass = 1.5.)

A. 53.6°

B. 35.3°

C. 56.3°

D. 36.5°

Answer: C

Watch Video Solution

120. Light of wavelength 5000Å falls on a plane reflecting surface. What are the wavelength and frequency of the reflected light? For what angle of incidence is the reflected ray normal to the incident ray?

A. 90°

B. 45°

C. 135°

D. 60°

Answer: B

Watch Video Solution

121. The $6563\text{Å} H\alpha$ line emitted by hydrogen in a star is found to be redshifted by 15Å. Estimate the speed with which the star is receding from the Earth.

A. $686 \times 10^5 ms^{-1}$

B. $-686 \times 10^5 ms^{-1}$

C. $6.86 \times 10^5 ms^{-1}$

D. $-6.86 \times 10^5 ms^{-1}$

Answer: D

Watch Video Solution

122. In double-slit experiment using light of wavelength 600 nm, the angular width of a fringe formed on a distant screen is 0.1°. What is the spacing between the two slits?

A. $3.44 \times 10^{-4} m$

B. $955 m$

C. $3.44 \times 10^{4} m$

D. $3.44 \times 10^{4} m$

Answer: D

Watch Video Solution

123. Two towers on top of two hills are 40 km apart. The line joining them passes 50 m above a hill halfway between the towers. What is the longest wavelength of radio waves, which can be sent between the towers without appreciable diffraction effects?

A. 125 cm

B. $12.5 cm$

C. $1.25 cm$

D. $0.125 cm$

Answer: B

Watch Video Solution

124. A parallel beam of light of wavelength 500 nm falls on a narrow slit and the resulting diffraction pattern is observed on a screen 1 m away. It is observed that the first minimum is at a distance of 2.5 mm from the centre of the screen. Find the width of the slit.

A. 0.02 mm

B. 0.2 mm

C. 2.0 mm

D. 0.002 m

Answer: B

Watch Video Solution

125. To demonstrate the phenomenon of interference, we require two sources which emit radiation ......

A. of nearly the same frequency.

B. of the same frequency

C. of different wavelength

D. of the same frequency and having a definite phase relationship.

Answer: D

Watch Video Solution

126. The angle of incidence at which reflected light totally polarised for reflection from air to glass (refractive index n), is ......

A. $\sin^{-1}(n)$

B. $\sin^{-1}\left(\frac{1}{n}\right)$

C. $\tan^{-1}\left(\frac{1}{n}\right)$

D. $\tan^{-1}(n)$

Answer: D

Watch Video Solution

127. 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

Answer: C

Watch Video Solution

128. A Young's double slit experiment uses a monochromatic source. The shape of the interference fringes formed on a screen is.....

A. hyperbola

B. circle

C. straight line

D. parabola

Answer: C

Watch Video Solution

129. If unpolarised light of intensity I_0 is incident on the polarising plate, intensity of emerging light will be ......

A. zero

B. I_0

C. $\frac{1}{2}I_0$

D. $\frac{1}{4}I_0$

Answer: A

Watch Video Solution

130. On screen there are two bright points at a distance 1 mm. These points are observed by the person whose eye is having diameter 3 mm from which maximum distance this person can observe them resolved ?

A. 6 m

B. 3 m

C. 5 m

D. 1 m

Answer: C

Watch Video Solution

131. if the intensity of the principal maximum in the single slit Fraunhoffer diffraction pattern, then the intensity when the slit width is double will be .....

A. I_0

B. $\frac{I_0}{2}$

C. $2I_0$

D. $4I_0$

Answer: A

Watch Video Solution

132. In a Young's double slit experiment the intensity at a point where the path difference is $\frac{\lambda}{6}$(λ being the wavelength of the light used) is I. If I_0 denotes the maximum intensity then $\frac{I}{I_0} = \dots$

A. $\frac{1}{\sqrt{2}}$

B. $\frac{\sqrt{3}}{2}$

C. $\frac{1}{2}$

D. $\frac{3}{4}$

Answer: D

Watch Video Solution

133. A mixture of light consisting of wavelength 590 nm and an unknown wavelength, illuminates Young's double slit and gives rise to two overlapping interface patterns on the screen. The central maximum of both light coincide. Further it is observed that the third bright fringe of known light coincides with the 4^{th} bright fringe of the unknown light. From this data, the wavelength of the unknown light is

A. 393.4 nm

B. 885.0 nm

C. $442.5nm$

D. $776.8nm$

Answer: C

Watch Video Solution

134. At two points P and Q on a screen in Young's double slit experiment, waves from slits S_1 and S_2 have a path difference of O and $\frac{\lambda}{4}$ respectively. The ratio of intensities at P and Q will be ......

A. $3:2$

B. $2:1$

C. $\sqrt{3}:1$

D. $4:1$

Answer: B

Watch Video Solution

135. In Young's double slit experiment, the two slits act as coherent sources of waves of equal amplitude A and wavelength λ. In another experiment with the same arrangement the two slits are made to act as incoherent sources of wave of same amplitude and wavelength. If the intensity at the middle point of the screen in the first case is I, and in the second case is I_2 then the ratio $\frac{I_1}{I_2}$ is ....

A. 4

B. 2

C. 1

D. 0.5

Answer: B

Watch Video Solution

136. In Young's double slit experiment, one of the slit is wider than other, so that the amplitude of the light from one slit is double of that from other slit. If I_m be the maximum intensity the resultant intensity I when they interface at phase difference ϕ is given by ....

A. $\frac{I_m}{9}(4+5\cos\phi)$

B. $\frac{I_m}{3}\left(1+2\frac{\cos^2(\phi)}{2}\right)$

C. $\frac{I_m}{5}\left(1+4\frac{\cos^2(\phi)}{2}\right.$

D. $\frac{I_m}{9}\left(1+8\cos^2\left(\frac{\phi}{2}\right)\right)$

Answer: D

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137. A beam of unpolarised light of intensity is passed through a polaroid A and then through another polaroid B which is oriented so that its principal plane makes an angle of 45° relative to that of A. The intensity of the emergent light

A. $\frac{I_0}{8}$

B. I_0

C. $\frac{I_0}{2}$

D. $\frac{I_0}{4}$

Answer: D

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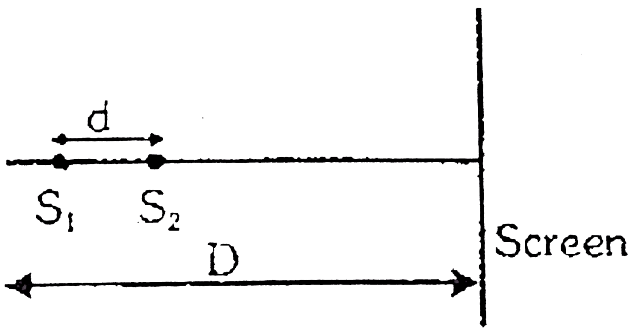
138. 

Two coherent point sources S_1 and S_2 are separated by a small distance 'd' as shown. The fringes obtained on the screen will be:

A. concentric circle

B. points

C. straight lines

D. semicircles

Answer: A

Watch Video Solution

139. Two beams, A and B of plane polarised light with mutually perpendicular plane of polarisation are seen through a polaroid.

From the position when the beam A has maximum intensity (and beam B has zero intensity) a rotation of polaroid through 30° makes the two beams appear equally bright. If the initial intensities of the two beams are I_A and I_B respectively, then $\frac{I_A}{I_B} = \dots.$

A. $\frac{3}{2}$

B. 1

C. $\frac{1}{3}$

D. 3

Answer: C

Watch Video Solution

140. The box of a pin hole camera of length L has a hole of radius a. It is assumed that when the hole is illuminated by a parallel beam of light of wavelength λ the speed of the spot (obtained on the opposite wall of the camera) is the sum of its geometrical spread and the spread due to diffraction. The spot would then have its minimum size (say b_{min}) when .....

A. $\alpha = \frac{\lambda^2}{L}$ and $b_{\text{min}} = \left(\frac{2\lambda^2}{L}\right)$

B. $a = \sqrt{\lambda L}$ and $b_{\min} = \left(\frac{2\lambda^2}{L}\right)$

C. $a = \sqrt{\lambda L}$ and $b_{\min} = \sqrt{4\lambda L}$

D. $\alpha = \frac{\lambda^2}{L}$ and $b_{\min} = \sqrt{4\lambda L}$

Answer: C

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141. In a Young's double slit experiment, slits are separated by 0.5 mm and the screen is placed 150 cm away. A beam of light consisting of two wavelengths 650 nm and 520 nm is used tc obtain interference fringes on the screen. The least distance from the common central maximum to the point where the bright fringes due to both the wavelengths coincide is.....

A. $9.75mm$

B. 15.6 mm

C. 1.56 mm

D. 7.8 mm

Answer: D

Watch Video Solution

142. An observer is moving with half the speed of light towards a stationary microwave source emitting waves at frequency 10 GHz. What is the frequency of the microwave measured by the observer ? (Speed of light $= 3 \times 10^8 ms^{-1}$)

A. 17.3 GHz

B. 15.3 GHz

C. 10.1 GHz

D. 12.1 GHz

Answer: A

Watch Video Solution

143. Unpolarized light of intensity I passes through an ideal polarizer A. Another identical polarizer B is placed behind A. The intensity of light beyond B is found to be $\frac{1}{2}$. Now another identical polarizer C is placed between A and

B. The intensity beyond B is now found to be $\frac{1}{8}$. The angle between polarizer A and C is ......

A. 0°

B. 30°

C. 45°

D. 60°

Answer: D

Watch Video Solution

144. The angular width of the central maximum in a single slit diffraction pattern is 60°. The width of the slit is $1 \mu m$ The slit is illuminated by monochromatic plane waves. If another slit of same width is made near it. Young's fringes can be observed on a screen placed at a distance 50 cm from the slits. If the observed fringe width is 1 cm, what is slit separation distance ? (i.e. distance between the centres of each slit)

A. $25 \mu m$

B. $50\mu m$

C. $75\mu m$

D. $100\mu m$

Answer: A

Watch Video Solution

145. Consider a Young's double slit experiment as shown in figure. What should be the slit separation d in terms of wavelength such that the first minima occurs directly in front of the slit (S_1) ?

A. $\dfrac{\lambda}{2\left(\sqrt{5}-2\right)}$

B. $\dfrac{\lambda}{\left(\sqrt{5}-2\right)}$

C. $\dfrac{\lambda}{2\left(5-\sqrt{2}\right)}$

D. $\dfrac{\lambda}{2\left(5-\sqrt{2}\right)}$

Answer: A

Watch Video Solution

146. A polarizer analyzer set is adjusted such that the intensity of ligth coming out of the analyzer is just 10% of the original intensity. Assuming that the polarizer analyzer set does not asorb any light, the angle by which the analyzer needs to be rotated further to reduce the output intensity to be zero is

A. 60°

B. 45°

C. 18.4°

D. 71.6°

Answer: C

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147. Visible light of wavelength $6000 \times 10^{-8} cm$ fall normally on a single slit and produces diffraction pattern. It is found that the second diffraction minima is at 60° from the centre maxima. If the first minima is produced at θ is close to

A. 20°

B. 25°

C. 30°

D. 45°

Answer: B

Watch Video Solution

148. In a Young's double slit experiment, the separation between the slits is 0.15 mm. In the experiment, a source of light of wavelength 589 nm is used and the interference pattern is observed on a screen kept 1.5 m away. The separation between the successive bright fringes on the screen is

A. 5.9 mm

B. 3.9 mm

C. 1.9 mm

D. 2.3 mm

Answer: A

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149. Which of the following phenomenon is not common for light and sound ?

A. Interference

B. Diffraction

C. Refraction

D. Polarisation

Answer: D

Watch Video Solution

150. Interference is possible in ....

A. light waves only

B. sound waves only

C. both light and sound waves.

D. neither light nor sound waves.

Answer: C

Watch Video Solution

151. In Young's double slit experiment is performed with blue and with green light of wavelengths 4360 Å and 5460 A respectively. If x is the distance of 4^{th} maxima from the central one, then.....

A. x (blue) = x (green)

B. x(blue) $>$ x (green)

C. x (blue) $<$ x (green)

D. $\frac{x(\text{blue})}{x(\text{green})} = \frac{5460}{4360}$

Answer: C

Watch Video Solution

152. In Young's double slit experiment, the fringe width is found to be 0.4 mm. If the whole apparatus is immersed in water of refractive index , without disturbing the geometrical arrangement, the new fringe width will be .....

A. 0.3 mm

B. 0.4 mm

C. 0.53 mm

D. $450\mu m$

Answer: A

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153. Ratio of intensities of two waves are given by 4:1. Then ratio of the amplitudes of the two waves is

A. $2:1$

B. $1:2$

C. $4:1$

D. $1:4$

Answer: A

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154. Which of following phenomenon is not to explained by Huygen's construction of wavefront?

A. Refraction

B. Reflection

C. Diffraction

D. Spectra

Answer: D

Watch Video Solution

155. In Young's experiment, two coherent sources are placed 0.9 mm apart and fringe are observed one meter away. If it produces second dark fringe at a distance of 1 mm from central fringe, the wavelength of monochromatic light used would ......

A. $60 \times 10^{-4} cm$

B. $10 \times 10^{-4} cm$

C. $10 \times 10^{-5} cm$

D. $6 \times 10^{-5} cm$

Answer: D

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156. In Young's double slit experiment, carried out with light of wavelength $\lambda = 5000 \text{Å}$ the distance between the slits is 0.2 mm and the screen is at 200 cm from the slits. The central maximum is at x = 0. The third maximum (taking the central maximum as zeroth maximum) will be at x equal to ......

A. $1.67 cm$

B. $1.5 cm$

C. $0.5 cm$

D. $5.0cm$

Answer: B

Watch Video Solution

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

A. fringe width will decrease

B. fringe width will increase.

C. fringe width will remain unchanged

D. fringes will becomes less intense

Answer: A

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158. Interference was observed in interference chamber where air was present, now the chamber is evacuated and if the same light is used, a careful observer will see ......

A. no interference

B. interference with brighter bands

C. interference with dark bands.

D. interference with larger width.

Answer: D

Watch Video Solution

159. Aparallel beam of monochromatic light of wavelength 4000Å is incident normally on a single narrow slit of width 0.0008 mm. The light is focused by a a convex lens on a screen placed in focal plane. The first minimum will be formed for the angle of diffraction equal to

A. 0°

B. 15°

C. 30°

D. 50°

Answer: C

Watch Video Solution

160. 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. $12.5cm$

B. 12 cm

C. 13 cm

D. 14 cm

Answer: B

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161. Colours appear on a thin soap film and soap bubbles due to the phenomenon of ......

A. refraction

B. dispersion

C. interference

D. diffraction

Answer: C

Watch Video Solution

162. Distance between two points on paper is They are observed such that view line observer is perpendicular to them. Diameter lens of an eye of an observer is 2 mm. Fo which minimum value of d both points will h observed ?

A. $1.25cm$

B. $12.5cm$

C. $1.25cm$

D. $2.5mm$

Answer: B

Watch Video Solution

163. In Young's double slit experiment if width of the slit is made $\frac{1}{3}$ th times width of fringe becomes n times then n ......

A. 3

B. $\frac{1}{3}$

C. 9

D. $\frac{1}{9}$

Answer: A

Watch Video Solution

164. If waves of light having intensity I_1 and I_2 passes through any region in the same time in the same direction, what will be sum of maximum and minimum intensity ?

A. $I_1 + I_2$

B. $\left(\sqrt{I_1} + \sqrt{I_2}\right)^2$

C. $\left(\sqrt{I_1} - \sqrt{I_2}\right)^2$

D. $2(I_1 + I_2)$

Answer: D

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165. In Young's double slit experiment, the slit are 2 mm apart and are illuminated by photons of two wavelengths $\lambda = 12000\text{Å}$ and $\lambda_2 = 10000\text{Å}$. At what minimum distance from the common central bright fringe on the screen 2 m from the slit will a bright fringe from one interference pattern coincide with a bright fringe from the other?

A. 4 mm

B. 3 m

C. 8 mm

D. 6 mm

Answer: D

Watch Video Solution

166. A parallel beam of fast moving electrons is incident normally on a narrow slit. A fluorescent screen is placed at a large distance from the slit. If the speed of the electron is increased which of the following statements is correct?

A. The angular width of the central maximum will decrease

B. The angular width of the central maximum will decrease

C. Diffraction pattern is not observed on the screen in the case of electrons.

D. The angular width of the central maximum of diffraction pattern will increases

Answer: A

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167. 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. 1.2mm

C. 2.4 cm

D. 2.4 mm

Answer: D

Watch Video Solution

168. In the Young's double slit experiment, the intensity of light at a point on the screen where the path difference is λ is K. (K being the wavelength of light used). The intensity at 2 a point where the path difference is $\frac{\lambda}{4}$ will be.....

A. K

B. $\frac{K}{4}$

C. $\frac{K}{2}$

D. zero

Answer: C

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169. If the focal length of objective lens is increased then magnifying power of ......

A. microscope will increase but that of telescope decrease.

B. microscope and telescope both will increase

C. microscope and telescope both will decrease

D. microscope will decrease but that of telescope increase

Answer: D

Watch Video Solution

170. For a parallel beam of monochromatic light wavelength λ diffraction is produced by single slit whose width 'a' is of the order of th wavelength of the light. If 'D' is the distance the screen from the slit, the width of th central maxima will be ......

A. $\frac{2D\lambda}{a}$

B. $\frac{D\lambda}{a}$

C. $\frac{Da}{\lambda}$

D. $\frac{2Da}{\lambda}$

Answer: A

Watch Video Solution

171. In a double slit experiments, the two slits are 1 mm apart and the screen is placed in away. A monochromatic light of wavelength 500 nm is used. What will be the width of each slit for obtaining ten maxima of double sli within the central maxima of single sli

pattern?

A. 0.2 mm

B. 0.1 mm

C. 0.5 mm

D. 0.02 mm

Answer: A

Watch Video Solution

172. At the first minimum adjacent to the central maximum of a single slit differation pattern the phase difference between the Huygen's wavelet from the edge of the slit and the wavelet from the mid point of the slit is......

A. $\frac{\pi}{8}$ rad

B. $\frac{\pi}{4}$ rad

C. $\frac{\pi}{2}$ rad

D. π rad

Answer: D

Watch Video Solution

173. If the two slits in Young's double slit experiment have width ratio 1:25, then the ratio of the intensity of maxima and minima in the interference pattern will .....

A. $\frac{4}{9}$

B. $\frac{9}{4}$

C. $\frac{121}{49}$

D. $\frac{49}{121}$

Answer: B

Watch Video Solution

174. The intensity at the maximum in a Young's double slit experiment is I_0. Distance between two slits is $d = 5\lambda$ where λ is the wavelength of light used in the experiment. What will be the intensity in front of one of the slits on the screen placed at a distance $D = 10d$?

A. $\frac{I_0}{4}$

B. $\frac{3}{4}I_0$

C. $\frac{I_0}{2}$

D. I_0

Answer: C

Watch Video Solution

175. In a diffraction pattern due to a single slit of width a, the first minimum is observed at an angle 30° when light of wavelength 5000 Å is incident on the slit. The first secondary maximum is observed at an angle of ...

A. $\sin^{-1}\left(\frac{2}{3}\right)$

B. $\sin^{-1}\left(\frac{1}{2}\right)$

C. $\sin^{-1}\left(\frac{3}{4}\right)$

D. $\sin^{-1}\left(\frac{1}{4}\right)$

Answer: C

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176. The interference patterns is obtained with two coherent light sources of intensity ratio n. I the interference pattern, the ratio $(I_{\max} - I_{\min})(I_{\max} + I_{\min})$ will be......

A. $\dfrac{\sqrt{n}}{(n+1)^2}$

B. $\dfrac{2\sqrt{n}}{(n+1)^2}$

C. $\dfrac{\sqrt{n}}{n+1^2}$

D. $\dfrac{2\sqrt{n}}{n+1^2}$

Answer: D

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177. A linear aperture whose width is 0.02 em is placed immediately in front of a lens of focal length 60 cm. The aperture is illuminated normally by a parallel beam of wavelength $5 \times 10^{-5} cm$. The distance of the first dark band of the differation pattern from the centre of the screen is ....

A. 0.20 cm

B. $0.15 cm$

C. $0.10cm$

D. $0.25cm$

Answer: B

Watch Video Solution

178. Two coherent sources of intensity ratio a interfere. The value of $\frac{I_{\max} - I_{\min}}{I_{\max} + I_{\min}}$ is ....

A. $2\sqrt{\frac{\alpha}{1+\alpha}}$

B. $\frac{2\sqrt{\alpha}}{1+\alpha}$

C. $\dfrac{1+\alpha}{2\sqrt{\alpha}}$

D. $\dfrac{1-\alpha}{1+\alpha}$

Answer: B

Watch Video Solution

179. A parallel beam of light of wavelength λ is incident normally on a single slit of width d. Diffraction bands are obtained on a screen placed at a distance D from the slit. The second dark band from the central bright band will be at a distance given by ....

A. $\frac{2\lambda D}{d}$

B. $\lambda d D$

C. $\frac{\lambda D}{2d}$

D. $\frac{2\lambda d}{D}$

Answer: A

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180. Unpolarised light is incident from air on a plane surface of a material of refractive index u! At a particular angle of incidence μ it is found that the reflected and refracted rays are perpendicular to each other. Which of the following options is correct for this situation ?

A. $I = \tan^{-1}\left(\frac{1}{\mu}\right)$

B. Reflected light is polarised with its electric vector parallel to the plane of incidence.

C. $i = \sin^{-1}\left(\frac{1}{\mu}\right)$

D. Reflected light is polarised with its electric vector perpendicular to the plane of incidence.

Answer: D

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181. In Young's double slit experiment the separation d between the slits is λ mm, the wavelength of the light used is 5896 Å and distance D between the screen and slits is 100 cm. It is found that the angular width of the fringes is 0.20°. To increase the fringe angular width to 0.21° (with same λ. and D) the separation between the slits needs to change to .....

A. 1.7 mm

B. 1.8 mm

C. 2.1 mm

D. 1.9 mm

Answer: D

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182. An astronomical refracting telescope will have large angular magnification and high angular resolution when it has an objective lens of ......

A. small focal length and small diameter

B. small focal length and large diameter.

C. large focal length and large diameter.

D. large focal length and small diameter.

Answer: C

Watch Video Solution

183. In a double slit experiment, when light of wavelength 400 nm was used, the angular width of the first minima formed on a screen placed i m away was found to be 0.2°. What will be the angular width of the first minima if the entire experimental apparatus is immersed in water $(u_{\text{water}} = 4/3)$

A. 0.1°

B. 0.266°

C. 0.15°

D. 0.05°

Answer: C

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184. Two waves of intensities 1 and 41 superpose, then the maximum and minimum intensities are ...... and ...... respectively.

A. 5I,3I

B. 9I, I

C. 9I, 3I

D. 5I, I

Answer: B

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185. Light appears to travel in a straight line because....

A. it is not absorbed by surrounding

B. it is reflected by surrounding.

C. its wavelength is very smal

D. its velocity is very large

Answer: C

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186. Interference phenomenon appears in ......

A. only transverse waves

B. only longitudinal waves.

C. only electromagnetic waves.

D. all types of waves.

Answer: D

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187. When a transparent medium of refractive index 1.5 and thickness of 2.5×10^{-5} m is introduced in front of a slit in Young's experiment, how much shift of interference fringes will occur ?

$(d = 0.4mm \text{ and } D = 100cm)$

A. 5 cm

B. 2.5 cm

C. $0.25cm$

D. $0.1cm$

Answer: B

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188. Ratio of intensities of two waves is 9:1. If these two are superimposed, what is the ratio of maximum and minimum intensities?

A. $10 : 8$

B. $9 : 1$

C. $4 : 1$

D. $2 : 1$

Answer: C

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189. The path difference for destructive interference is.....

A. $n\lambda$

B. $\dfrac{(n+1)\lambda}{2}$

C. $n(\lambda+1)$

D. $\dfrac{(2n+1)\lambda}{2}$

Answer: D

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190. The golden colour found in sea oyster is due to....

A. diffraction

B. polarisation

C. scattering

D. reflection

Answer: B

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191. When a beam of light is used determine the position of an object, the maximum accuracy is achieved if the light is .....

A. polarised

B. of longer wavelength

C. of shorter wavelength

D. of high intensity

Answer: C

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192. A double slit experiment is performed with light of wavelength 500 nm. A thin film of thickness $2 \mu m$ and refractive index 1.5 is introduced in the path of the upper beam. The location of the central maximum will ......

A. remain unshifted.

B. shift downward by nearly two fringes.

C. shift upward by nearly two fringes.

D. shift downward by 10 fringes

Answer: C

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193. In case of linearly polarised light, the magnitude of the electric field vector ....

A. does not change with time.

B. varies periodically with time

C. increases and decreases linearly with time

D. is parallel to the direction of propagation.

Answer: B

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194. A stone thrown into still water creates a circular wave pattern moving radially outwards. If r is the distance measured from the centre of the pattern, the amplitude of the wave varies as .....

A. $r^{\frac{-1}{2}}$

B. r^{-1}

C. r^{-2}

D. $r^{-\frac{3}{2}}$

Answer: B

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195. When exposed to sunlight, thin films of oil on water often exhibit brilliant colours due to the phenomenon of .....

A. interference

B. diffraction

C. dispersion

D. polarisation

Answer: A

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196. Which properties are independent of each other for waves propagating in the medium ?

A. Velocity

B. Wavelength

C. Frequency

D. All these depend on each other

Answer: C

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197. In Young's double slit experiment, the distance between two slits is made three times then the fringe width will become ......

A. 9 times

B. $\frac{1}{9}$ times

C. 3 times

D. $\frac{1}{3}$ times

Answer: D

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198. Light is incident normally on a diffracting grating through which the first diffraction is seen at 32°. In this case the second ordei diffraction will be ......

A. 80°

B. 64°

C. 48°

D. there is no second order diffraction

Answer: D

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199. Which out of following cannot produce two coherent sources ?

A. Lloyd's mirror

B. Fresnel biprism

C. Young's double slit

D. Prism

Answer: D

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200. In Young's double slit experiment, the two slits act as coherent sources of equal amplitude 'a' and of wavelength λ. In another experiment with the same setup the two slits are sources of equal amplitude 'a' and wavelength λ but are incoherent. The ratio of intensities of light at the mid point of the screen in the first case to that in the second case is ....

A. $2:1$

B. $1:2$

C. $3:4$

D. $4:3$

Answer: A

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201. In an interference the intensity of two interfering waves are I and 4I respectively. They produce intensity at two point A and B with phase angle of $\frac{\pi}{2}$ and π it respectively. Then differation in between them is ......

A. I

B. 2I

C. 4I

D. 5I

Answer: C

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202. In a single slit diffraction with $\lambda = 500$ nm and a lens of diameter 0.1 mm then width of central maxima, obtain on screen at a distance of l m will be ......

A. 5 mm

B. 1 mm

C. 10 mm

D. 2.5 mm

Answer: C

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203. A: Particle theory fails to explain the velocity of light in air and water.

R: According to particle theory, light in a dense medium is moving faster than in rare medium.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion.

C. Assertion is true but the reason is false.

D. Both assertion and reason are false

Answer: A

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204. A: It is not possible to have an interference between sound waves produce from two violins.

R: The phase difference for two waves in interference must be constant.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion.

C. Assertion is true but the reason is false.

D. Both assertion and reason are false

Answer: A

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205. A: The obstacle must be in the order of $10^{-7}m$ to see the differation of light.

R: The wavelength of visible light is in the order of $10^{-7}m$.

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion.

C. Assertion is true but the reason is false.

D. Both assertion and reason are false

Answer: A

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206. A: To increase resolving power of a telescope, the diameter of objective should be large.

R: Resolving power of a telescope is given by $\frac{D}{1.22\lambda}$

A. Both assertion and reason are true and the reason is correct explanation of the assertion.

B. Both assertion and reason are true but reason is not correct explanation of the assertion.

C. Assertion is true but the reason is false.

D. Both assertion and reason are false

Answer: A

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207. What changes during the polarisation of light?

A. Frequency

B. Wavelength

C. Phase

D. Intensity

Answer: D

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208. If light of intensity Io is incident at an angle 45° with optical axis of polaroid, so intensity of emerging light is......

A. I_0

B. $0.5I_0$

C. $0.25I_0$

D. zero

Answer: B

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209. What should be wavelength of light to get 5^{th} bright fringe at a point where 3rd bright fringe is obtained using wavelength 700 nm in Young's experiment?

A. 420 nm

B. 500 nm

C. 750 nm

D. 630 nm

Answer: A

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210. The polarisation of light proved that light is composed of ......

A. longitudinal waves

B. transverse waves

C. streamline waves

D. rays without waves

Answer: A

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211. The limit of resolution of an optical instrument arises an account of ....

A. interference

B. polarisation

C. diffraction

D. reflection

Answer: C

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212. Ray of light moving in water incidents on glass plate. Reflected light becomes completely plane polarised when incident at 51°, so refractive index of glass will be ...... [Refractive index of water 1.3 and $\tan 51^\circ = 1.235$]

A. 1.33

B. 1.805

C. 1.605

D. 1.305

Answer: C

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213. The diameter of telescope lens is 0.61 m, the A wavelength of light is 5000 Å, then resolving power of telescope will be ......

A. 2×10^4

B. 2×10^2

C. 2×10^6

D. 10^6

Answer: D

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214. In Young's experiment distance between twe slits is 0.28 mm and distance between the slit and the screen is 1.4 m. If distance between central bright fringe and third bright fringe is 0.9 cm wavelength of light used in Young's experiment is .....

A. 6000Å

B. 5000Å

C. 4000Å

D. 3000Å

Answer: A

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215. Which of the following can not be polarised?

A. Ultrasonic waves

B. Radio wave

C. Ultraviolet Waves

D. X-rays

Answer: A

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216. 100π phase difference = ... path difference.

A. 50λ

B. 100λ

C. 10λ

D. 25λ

Answer: A

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217. What will be angle of first order maxima obtained by Fraunhoffer diffraction by single slit of width 0.50 mm , using light of wavelength 500 nm

A. 1.5×10^{-4} radian

B. 1.5×10^{-3} radian

C. 1×10^{-3} radian

D. 3×10^{-3} radian

Answer: D

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218. The width of fringes ...... as the Young's double slit experiment moves from air to water

A. becomes infinite

B. decreases

C. increacses

D. does not change

Answer: B

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219. What is the angle between the plane of polarisation and the direction of propagation of beam of plane polarised light ?

A. 0°

B. 45°

C. 180°

D. 90°

Answer: A

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220. In Young's double slit experiment, the intensity at a point P on the screen is half the maximum intensity in the interference pattern. If the wavelength of light used is λ and d is the distance between the slits, the angular separation between point P and the centre of the screen is ......

A. $\sin^{-1}\left(\frac{\lambda}{d}\right)$

B. $\sin^{-1}\left(\frac{\lambda}{2d}\right)$

C. $\sin^{-1}\left(\frac{\lambda}{4d}\right)$

D. $\sin^{-1}\left(\frac{\lambda}{3d}\right)$

Answer: C

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221. In a two tourmalines experiment, the polariser and analyser are crossed with each other. At what angle should the analyser be rotated so that 25% of light passes through analyser ?

A. 60°

B. 90°

C. 30°

D. 45°

Answer: C

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222. In a arrangement of Young experiment the central fringe of interference pattern produced by light of wavelength 6000 Å so the central fringe is superposing to 4th order dark fringe, after a glass plate of refractive index 1.5 is introduced. The thickness of the glass plate would be ......

A. $6 \times 10^{-6} m$

B. $4.5 \times 10^{-6} m$

C. $4.2 \times 10^{-6} m$

D. $4.8 \times 10^{-6} m$

Answer: C

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223. Two beams of light of intensity I_1, and I_2interfere to give an interference pattern. If the ratio of maximum intensity to that of minimum intensity is $\frac{16}{4}$ then $I_1 : I_2 =$ ....

A. $1:9$

B. $4:1$

C. $1:4$

D. $9:1$

Answer: D

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224. In Young's double slit experiment if the width of 4^{th} bright fringe is 2×10^{-2}cm, then the width of 6th bright fringe will be ......

A. 3×10^{-2}

B. 10^{-2}

C. 2×10^{-2}

D. 1.5×10^{-2}

Answer: C

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225. The diameter of the pupil of human eye is 2.5 mm. Assuming the wavelength of light used is 5000 Å. What must be the minimum distance between two point like objects to be seen clearly if they are at a distance of 5 m from the eye ?

A. $1.22 \times 10^{-3} m$

B. $1.34 \times 10^{-3} m$

C. $1.5 \times 10^{-3} m$

D. $1.6 \times 10^{-3} m$

Answer: A

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226. Unpolarised light falls first on polarizer Pan then on analyzer A. If the intensity o transmitted light from the analyzer is $\frac{1}{8}$ th the incident unpolarized light what will be th

angle between optic axis of P and A?

A. 45°

B. 30°

C. 0°

D. 60°

Answer: D

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227. A plane polarized light is incident normally on a tourmaline plate. Its $\overrightarrow{E}$ vectors make an angle of 60° with the optic axis of the plate. Find the percentage difference between initial and final intensities.

A. 0.25

B. 0.75

C. 0.5

D. 0.9

Answer: B

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228. Light of wavelength λ is incident on slit of width d. The resulting diffraction pattern is observed on a screen placed at distance D. The linear width of central maximum is equal to width of the slit then D = ...

A. $\frac{d^2}{2\lambda}$

B. $\frac{d}{\lambda}$

C. $\frac{2\lambda^2}{d}$

D. $\frac{2\lambda}{d}$

Answer: A

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229. If the wavelength of light is 4000 A, then the number of waves in 1 mm length will be ......

A. 25

B. 250

C. 2500

D. 25000

Answer: C

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230. Velocity of electromagnetic wave having wavelength 5000 Å in medium of refractive index 2 is .....

A. 2×10^8

B. 1.5×10^8

C. 3×10^8

D. 1.5×10^9

Answer: B

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231. A diffraction pattern is formed by blue light, if blue light is replaced by yellow light, then ......

A. the maxima and minima are broadened and become distinct.

B. the maxima and minima are narrow and more crowded.

C. the pattern does not change.

D. diffraction pattern disappears

Answer: A

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232. In Fraunhoffer diffraction by a single slit, the width of the slit is 0.01 cm. If the wavelength of the light incident normally on the slit is 5000 Å the angular distance of second maxima from the mid line of central maxima is ...... rad.

A. 0.125

B. 0.15

C. 0.015

D. 0.0125

Answer: D

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233. In Young's double slit experiment if the distance between two slits is equal to the wavelength of used light. Then the maximum number of bright fringes obtained on the screen will be ......

A. 2

B. 5

C. 7

D. infinite

Answer: A

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234. If the wavelength of light used is 6000 Å. The angular resolution of telescope of objective lens having diameter 10 cm is ...... Rad

A. 6.10×10^{-6}

B. 7.32×10^{-6}

C. 6.55×10^{-6}

D. 7.52×10^{-6}

Answer: B

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235. Match the terms in column I with those in column II

	Column I		Column II
(a)	Compound epithelium	(i)	Alimentary canal
(b)	Compound eye	(ii)	Cockroach
(c)	Septal nephridia	(iii)	Skin
(d)	Open circulatory system	(iv)	Mosaic vision
(e)	Typhlosole	(v)	Earthworm
(f)	Osteocytes	(vi)	Phallomere
(g)	Genitalia	(vii)	Bone

A. $I \rightarrow P, ii \rightarrow s, iii \rightarrow R, iv \rightarrow Q$

B. $I \rightarrow P, ii \rightarrow R, iii \rightarrow s, iv \rightarrow Q$

C. $I \rightarrow Q, ii \rightarrow s, iii \rightarrow R, iv \rightarrow P$

D. $I \rightarrow r, ii \rightarrow q, iii \rightarrow s, iv \rightarrow P$

Answer: B

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236. Which of the following is wrong for interference fringes?

A. Fringes are due to limited portion of wave front

B. All bright fringes are equally bright.

C. Distance between two consecutive fringes is constant.

D. Fringes are due to the use of coherent sources.

Answer: A

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237. A ray of light travelling in impure water is incident on a glass plate immersed in it. Wher the angle of incidence is 51°, the reflected ray i totally plane polarised. Given that refractiv index of impure water is 1.4. The refractive index of glass should be ......

A. 1.64

B. 1.34

C. `1.53

D. 1.73

Answer: D

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238. In a Young double slit experiment, the width of the source slit is increased then......

A. instead of interference, diffraction appears

B. fringe pattern gets more and more sharp

C. angular distance between fringes increased.

D. fringe pattern gets less and less sharp.

Answer: D

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239. V_{radial} is considered.......when the source moves away from the observer.

A. negative

B. positive

C. infinite

D. positive

Answer: B

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