Ordinary Thinking

Objective Questions

Wave Nature and Interference of Light

1. By corpuscular theory of light, the phenomenon which can be explained is
(1) Refraction (2) Interference
(3) Diffraction (4) Polarisation

2. According to corpuscular theory of light, the different colours of light are due to
(1) Different electromagnetic waves
(2) Different force of attraction among the corpuscles
(3) Different size of the corpuscles
(4) None of the above

3. Huygen's conception of secondary waves **[CPMT 1975]**
(1) Allow us to find the focal length of a thick lens
(2) Is a geometrical method to find a wavefront
(3) Is used to determine the velocity of light
(4) Is used to explain polarisation

4. The idea of the quantum nature of light has emerged in an attempt to explain **[CPMT 1990]**
(1) Interference
(2) Diffraction
(3) Radiation spectrum of a black body
(4) Polarisation

5. Two coherent sources of light can be obtained by **[MH CET 2001]**
(1) Two different lamps
(2) Two different lamps but of the same power
(3) Two different lamps of same power and having the same colour
(4) None of the above

6. By Huygen's wave theory of light, we cannot explain the phenomenon of **[CPMT 1989; AFMC 1993, 99; MP PET 1995, 2003; RPMT 2003; BCECE 2003; Pb PMT 2004]**
(1) Interference (2) Diffraction
(3) Photoelectric effect (4) Polarisation

7. The phenomenon of interference is shown by **[MNR 1994; MP PMT 1997; AIIMS 1999, 2000; JIPMER 2000; UPSEAT 1994, 2000]**
(1) Longitudinal mechanical waves only
(2) Transverse mechanical waves only
(3) Electromagnetic waves only
(4) All the above types of waves

8. Two coherent monochromatic light beams of intensities I and $4I$ are superposed. The maximum and minimum possible intensities in the resulting beam are **[IIT-JEE 1988; RPMT 1995; AIIMS 1997; MP PMT 1997; MP PET 1999; BHU 2002; KCET 2000, 05]**
(1) $5I$ and I (2) $5I$ and $3I$
(3) $9I$ and I (4) $9I$ and $3I$

9. Light appears to travel in straight lines since **[RPMT 1997; CPMT 1987, 89, 90, 2001; AIIMS 1998, 2002; KCET 2002; BHU 2002; DCE 2003]**
(1) It is not absorbed by the atmosphere
(2) It is reflected by the atmosphere
(3) Its wavelength is very small
(4) Its velocity is very large

10. The idea of secondary wavelets for the propagation of a wave was first given by **[Orissa PMT 2004]**
(1) Newton (2) Huygen
(3) Maxwell (4) Fresnel

11. By a monochromatic wave, we mean **[AFMC 1995]**
(1) A single ray
(2) A single ray of a single colour
(3) Wave having a single wavelength
(4) Many rays of a single colour

12. The similarity between the sound waves and light waves is **[KCET 1994]**
(1) Both are electromagnetic waves
(2) Both are longitudinal waves
(3) Both have the same speed in a medium
(4) They can produce interference

13. The ratio of intensities of two waves is 9 : 1. They are producing interference. The ratio of

maximum and minimum intensities will be

[MNR 1987
MP PET 1999; AMU (Engg.) 1999; AIIMS 2000]

(1) 10 : 8 (2) 9 : 1
(3) 4 : 1 (4) 2 : 1

14. A wave can transmit ...... from one place to another

[CPMT 1984]

(1) Energy (2) Amplitude
(3) Wavelength (4) Matter

15. If the ratio of intensities of two waves is 1 : 25, then the ratio of their amplitudes will be

[CPMT 1984]

(1) 1 : 25 (2) 5 : 1
(3) 26 : 24 (4) 1 : 5

16. Two identical light sources S_1 and S_2 emit light of same wavelength λ. These light rays will exhibit interference if

[MP PMT 1993]

(1) Their phase differences remain constant
(2) Their phases are distributed randomly
(3) Their light intensities remain constant
(4) Their light intensities change randomly

17. Wave nature of light follows because[MP PMT 1993]

(1) Light rays travel in a straight line
(2) Light exhibits the phenomena of reflection and refraction
(3) Light exhibits the phenomenon of interference
(4) Light causes the phenomenon of photoelectric effect

18. If L is the coherence length and c the velocity of light, the coherent time is

[MP PMT 1996]

(1) cL (2) $\frac{L}{c}$
(3) $\frac{c}{L}$ (4) $\frac{1}{Lc}$

19. If the amplitude ratio of two sources producing interference is 3 : 5, the ratio of intensities at maxima and minima is

[MP PMT 1996]

(1) 25 : 16 (2) 5 : 3
(3) 16 : 1 (4) 25 : 9

20. Colours of thin films result from

[CPMT 1972, 83, 96; RPMT 1997; DCE 2002; AIIMS 2005]

or

On a rainy day, a small oil film on water show brilliant colours. This is due to

[MP PET 2004]

(1) Dispersion of light (2) Interference of light
(3) Absorption of light (4) Scattering of light

21. For constructive interference to take place between two monochromatic light waves of wavelength λ, the path difference should be

[MNR 1992; UPSEAT 2001]

(1) $(2n-1)\frac{\lambda}{4}$ (2) $(2n-1)\frac{\lambda}{2}$
(3) $n\lambda$ (d) $(2n+1)\frac{\lambda}{2}$

22. Two sources of waves are called coherent if

[NCERT 1984; MNR 1995; RPMT 1996, 97; CPMT 1997; UPSEAT 1995, 2000; Orissa JEE 2002; RPET 2003; MP PMT 1996, 2004]

(1) Both have the same amplitude of vibrations
(2) Both produce waves of the same wavelength
(3) Both produce waves of the same wavelength having constant phase difference
(4) Both produce waves having the same velocity

23. Soap bubble appears coloured due to the phenomenon of

[AFMC 1995, 97; RPET 1997; CBSE PMT 1999; Pb PET 2001]

(1) Interference (2) Diffraction
(3) Dispersion (4) Reflection

24. Which of the following statements indicates that light waves are transverse[MP PMT 1995; AFMC 1996]

(1) Light waves can travel in vacuum
(2) Light waves show interference
(3) Light waves can be polarized
(4) Light waves can be diffracted

25. If two light waves having same frequency have intensity ratio 4 : 1 and they interfere, the ratio of maximum to minimum intensity in the pattern will be **[BHU 1995; MP PMT 1995; DPMT 1999; CPMT 2003]**

(1) 9 : 1 (2) 3 : 1
(3) 25 : 9 (4) 16 : 25

26. Evidence for the wave nature of light cannot be obtained from **[MP PET 1996]**

(1) Reflection (2) Doppler effect
(3) Interference (4) Diffraction

27. Two light sources are said to be coherent if they are obtained from **[MP PET 1996]**

(1) Two independent point sources emitting light of the same wavelength
(2) A single point source
(3) A wide source
(4) Two ordinary bulbs emitting light of different wavelengths

28. Wavelength of light of frequency $100 Hz$ **[CBSE PMT 1999]**

(1) $2\times 10^6 m$ (2) $3\times 10^6 m$
(3) $4\times 10^6 m$ (4) $5\times 10^6 m$

29. Two waves having intensity in the ratio 25 : 4 produce interference. The ratio of the maximum to the minimum intensity is **[CPMT 1999]**

(1) 5 : 2 (2) 7 : 3
(3) 49 : 9 (4) 9 : 49

30. Wavefront means **[RPMT 1997, 98]**

(1) All particles in it have same phase
(2) All particles have opposite phase of vibrations
(3) Few particles are in same phase, rest are in opposite phase
(4) None of these

31. Wavefront of a wave has direction with wave motion **[RPMT 1997]**

(1) Parallel (2) Perpendicular
(3) Opposite (4) At an angle of θ

32. Which one of the following phenomena is not explained by Huygen's construction of wavefront **[CBSE PMT 1992]**

(1) Refraction (2) Reflection
(3) Diffraction (4) Origin of spectra

33. Interference was observed in interference chamber when air was present, now the chamber is evacuated and if the same light is used, a careful observer will see **[CBSE PMT 1993; DPMT 2000; BHU 2002]**

(1) No interference
(2) Interference with bright bands
(3) Interference with dark bands
(4) Interference in which width of the fringe will be slightly increased

34. The ratio of intensities of two waves are given by 4 : 1. The ratio of the amplitudes of the two waves is **[CBSE PMT 1993]**

(1) 2 : 1 (2) 1 : 2
(3) 4 : 1 (4) 1 : 4

35. For the sustained interference of light, the necessary condition is that the two sources should **[DPMT 1996; RPMT 1998, 2003]**

(1) Have constant phase difference
(2) Be narrow
(3) Be close to each other
(4) Of same amplitude

36. If the ratio of amplitude of two waves is 4 : 3, then the ratio of maximum and minimum intensity is **[AFMC 1997]**

(1) 16 : 18 (2) 18 : 16
(3) 49 : 1 (4) 94 : 1

37. Which of the following is conserved when light waves interfere **[MNR 1998]**

(1) Intensity (2) Energy
(3) Amplitude (4) Momentum

38. Intensity of light depends upon **[RPMT 1999]**

(1) Velocity (2) Wavelength
(3) Amplitude (4) Frequency

39. Ray diverging from a point source from a wave front that is

[RPET 2000]

(1) Cylindrical (2) Spherical

(3) Plane (4) Cubical

40. Ratio of amplitude of interfering waves is 3 : 4. Now ratio of their intensities will be

[RPET 2000]

(1) $\frac{16}{9}$ (2) 49 : 1

(3) $\frac{9}{16}$ (4) None of these

41. Two coherent sources have intensity in the ratio of $\frac{100}{1}$. Ratio of (intensity) max/(intensity) min is **[RPET 2000]**

(1) $\frac{1}{100}$ (2) $\frac{1}{10}$

(3) $\frac{10}{1}$ (4) $\frac{3}{2}$

42. If two waves represented by $y_1 = 4\sin\omega t$ and $y_2 = 3\sin\left(\omega t + \frac{\pi}{3}\right)$ interfere at a point, the amplitude of the resulting wave will be about

[MP PMT 2000]

(1) 7 (2) 6

(3) 5 (4) 3.5

43. The two waves represented by $y_1 = a\sin(\omega t)$ and $y_2 = b\cos(\omega t)$ have a phase difference of **[MP PMT 2000]**

(1) 0 (2) $\frac{\pi}{2}$

(3) π (4) $\frac{\pi}{4}$

44. In a wave, the path difference corresponding to a phase difference of ϕ is

[MP PET 2000]

(1) $\frac{\pi}{2\lambda}\phi$ (2) $\frac{\pi}{\lambda}\phi$

(3) $\frac{\lambda}{2\pi}\phi$ (4) $\frac{\lambda}{\pi}\phi$

45. Two coherent sources of intensities, I_1 and I_2 produce an interference pattern. The maximum intensity in the interference pattern will be

[UPSEAT 2001; MP PET 2001]

(1) $I_1 + I_2$ (2) $I_1^2 + I_2^2$

(3) $(I_1 + I_2)^2$ (4) $(\sqrt{I_1} + \sqrt{I_2})^2$

46. Newton postulated his corpuscular theory on the basis of

[UPSEAT 2001; KCET 2001]

(1) Newton's rings

(2) Colours of thin films

(3) Rectilinear propagation of light

(4) Dispersion of white light

47. The dual nature of light is exhibited by

[KCET 1999; AIIMS 2001; BHU 2001; MH CET 2003; BCECE 2004]

(1) Photoelectric effect

(2) Refraction and interference

(3) Diffraction and reflection

(4) Diffraction and photoelectric effect

48. Two beams of light having intensities I and $4I$ interfere to produce a fringe pattern on a screen. The phase difference between the beams is $\frac{\pi}{2}$ at point A and π at point B. Then the difference between the resultant intensities at A and B is

[IIT JEE (Screening) 2001]

(1) $2I$ (2) $4I$

(3) $5I$ (4) $7I$

49. Coherent sources are those sources for which

[RPET 2001]

(1) Phase difference remain constant

(2) Frequency remains constant

(3) Both phase difference and frequency remains constant

(4) None of these

50. Wave nature of light is verified by

[RPET 2001]

(1) Interference (2) Photoelectric effect

(3) Reflection (4) Refraction

51. Two waves are represented by the equations $y_1 = a\sin\omega t$ and $y_2 = a\cos\omega t$. The first wave

[MP PMT 2001]

(1) Leads the second by π

(2) Lags the second by π

(3) Leads the second by $\frac{\pi}{2}$

(4) Lags the second by $\frac{\pi}{2}$

52. Light waves producing interference have their amplitudes in the ratio 3 : 2. The intensity ratio of maximum and minimum of interference fringes is **[EAMCET 2001]**

(1) 36 : 1 (2) 9 : 4

(3) 25 : 1 (4) 6 : 4

53. Laser beams are used to measure long distance because **[DCE 2001]**

(1) They are monochromatic

(2) They are highly polarised

(3) They are coherent

(4) They have high degree of parallelism

54. Two coherent sources of different intensities send waves which interfere. The ratio of maximum intensity to the minimum intensity is 25. The intensities of the sources are in the ratio **[UPSEAT 2002]**

(1) 25 : 1 (2) 5 : 1

(3) 9 : 4 (4) 25 : 16

55. The frequency of light ray having the wavelength 3000 Å is **[DPMT 2002]**

(1) 9×10^{13} *cycles/sec* (2) 10^{15} *cycles/sec*

(3) 90 *cycles/sec* (4) 3000 *cycles/sec*

56. Two waves have their amplitudes in the ratio 1 : 9. The maximum and minimum intensities when they interfere are in the ratio **[KCET 2002]**

(1) $\frac{25}{16}$ (2) $\frac{16}{26}$

(3) $\frac{1}{9}$ (4) $\frac{9}{1}$

57. Huygen's principle of secondary wavelets may be used to **[KCET 2002]**

(1) Find the velocity of light in vacuum

(2) Explain the particle behaviour of light

(3) Find the new position of the wavefront

(4) Explain photoelectric effect

58. What is the path difference of destructive interference **[AIIMS 2002]**

(1) $n\lambda$ (2) $n(\lambda + 1)$

(3) $\frac{(n+1)\lambda}{2}$ (4) $\frac{(2n+1)\lambda}{2}$

59. If an interference pattern have maximum and minimum intensities in 36 : 1 ratio then what will be the ratio of amplitudes **[AFMC 2002]**

(1) 5 : 7 (2) 7 : 4

(3) 4 : 7 (4) 7 : 5

60. Intensities of the two waves of light are *I* and 4*I*. The maximum intensity of the resultant wave after superposition is **[MP PET 2002]**

(1) 5 *I* (2) 9 *I*

(3) 16 *I* (4) 25 *I*

61. As a result of interference of two coherent sources of light, energy is **[MP PMT 2002; KCET 2003]**

(1) Increased

(2) Redistributed and the distribution does not vary with time

(3) Decreased

(3) Redistributed and the distribution changes with time

62. To demonstrate the phenomenon of interference, we require two sources which emit radiation **[AIEEE 2003]**

(1) Of the same frequency and having a define phase relationship

(2) Of nearly the same frequency

(3) Of the same frequency

(4) Of different wavelengths

63. When a beam of light is used to determine the position of an object, the maximum accuracy is achieved if the light is **[AIIMS 2003]**

(1) Polarised (2) Of longer wavelength

(3) Of shorter wavelength (4) Of high intensity

64. If the distance between a point source and screen is doubled, then intensity of light on the screen will become **[RPET 1997; RPMT 1999]**

(1) Four times (2) Double

(3) Half (4) One-fourth

65. Huygen wave theory allows us to know **[AFMC 2004]**

(1) The wavelength of the wave

(2) The velocity of the wave

(3) The amplitude of the wave

(4) The propagation of wave fronts

66. The wave theory of light was given by **[J & K CET 2004; KCET 2005]**

(1) Maxwell (2) Planck

(3) Huygen (4) Young

67. The phase difference between incident wave and reflected wave is 180° when light ray **[RPMT 1998, 2001]**

(1) Enters into glass from air

(2) Enters into air from glass

(3) Enters into glass from diamond

(4) Enters into water from glass

68. Which of the following phenomena can explain quantum nature of light **[RPMT 2001]**

(1) Photoelectric effect (2) Interference

(3) Diffraction (4) Polarisation

69. Which of the following is not a property of light **[AFMC 2005]**

(1) It requires a material medium for propagation

(2) It can travel through vacuum

(3) It involves transportation of energy

(4) It has finite speed

70. What causes changes in the colours of the soap or oil films for the given beam of light **[AFMC 2005]**

(1) Angle of incidence (2) Angle of reflection

(3) Thickness of film (4) None of these

71. Select the right option in the following **[KCET 2005]**

(1) Christian Huygens a contemporary of Newton established the wave theory of light by assuming that light waves were transverse

(2) Maxwell provided the compelling theoretical evidence that light is transverse wave

(3) Thomas Young experimentally proved the wave behaviour of light and Huygens assumption

(4) All the statements give above, correctly answers the question "what is light"

72. Two waves of intensity *I* undergo Interference. The maximum intensity obtained is **[BHU 2005]**

(1) $I/2$ (2) I

(3) $2I$ (4) $4I$

Young's Double Slit Experiment

1. Young's experiment establishes that **[CPMT 1972; MP PET 1994, 98; MP PMT 1998]**

(1) Light consists of waves

(2) Light consists of particles

(3) Light consists of neither particles nor waves

(4) Light consists of both particles and waves

2. In the interference pattern, energy is

(1) Created at the position of maxima

(2) Destroyed at the position of minima

(3) Conserved but is redistributed

(4) None of the above

3. Monochromatic green light of wavelength $5\times10^{-7}\,m$ illuminates a pair of slits 1 *mm* apart. The separation of bright lines on the interference pattern formed on a screen 2 *m* away is **[CPMT 1971; DPMT 1999]**

(1) 0.25 *mm* (2) 0.1 *mm*

(3) 1.0 *mm* (4) 0.01 *mm*

4. In Young's double slit experiment, if the slit widths are in the ratio 1 : 9, then the ratio of the intensity at minima to that at maxima will be **[MP PET 1987]**

(1) 1 (2) 1/9

(3) 1/4 (4) 1/3

5. In Young's double slit interference experiment, the slit separation is made 3 fold. The fringe width becomes **[CPMT 1982, 89]**

(1) 1/3 *times* (2) 1/9 *times*

(3) 3 *times* (4) 9 *times*

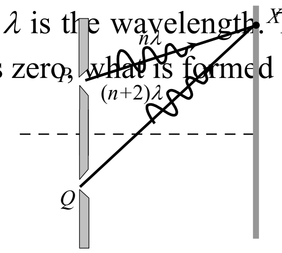
6. In a certain double slit experimental arrangement interference fringes of width 1.0 *mm* each are observed when light of wavelength 5000 Å is used. Keeping the set up unaltered, if the source is replaced by another source of wavelength 6000 Å, the fringe width will be **[CPMT 1988]**

(1) 0.5 *mm* (2) 1.0 *mm*
(3) 1.2 *mm* (4) 1.5 *mm*

7. Two coherent light sources S_1 and S_2 (λ= 6000 Å) are 1*mm* apart from each other. The screen is placed at a distance of 25 *cm* from the sources. The width of the fringes on the screen should be **[CPMT 1990]**

(1) 0.015 *cm* (2) 0.025 *cm*
(3) 0.010 *cm* (4) 0.030 *cm*

8. The figure shows a double slit experiment *P* and *Q* are the slits. The path lengths *PX* and *QX* are $n\lambda$ and $(n+2)\lambda$ respectively, where *n* is a whole number and λ is the wavelength. Taking the central fringe as zero, what is formed at *X*



(1) First bright
(2) First dark
(3) Second bright
(4) Second dark

9. In Young's double slit experiment, if one of the slit is closed fully, then in the interference pattern

(1) A bright slit will be observed, no interference pattern will exist
(2) The bright fringes will become more bright
(3) The bright fringes will become fainter
(4) None of the above

10. In Young's double slit experiment, a glass plate is placed before a slit which absorbs half the intensity of light. Under this case

(1) The brightness of fringes decreases
(2) The fringe width decreases
(3) No fringes will be observed
(4) The bright fringes become fainter and the dark fringes have finite light intensity

11. In Young's experiment, the distance between the slits is reduced to half and the distance between the slit and screen is doubled, then the fringe width

[IIT 1981; MP PMT 1994; RPMT 1997; KCET 2000; CPMT 2003; AMU (Engg.) 2000; DPMT 2003; UPSEAT 2000, 04; Kerala PMT 2004]

(1) Will not change (2) Will become half
(3) Will be doubled (4) Will become four times

12. The maximum intensity of fringes in Young's experiment is *I*. If one of the slit is closed, then the intensity at that place becomes I_o. Which of the following relation is true ?

[NCERT 1982; MP PMT 1994, 99; BHU 1998; RPMT 1996; RPET 1999; AMU (Engg.) 1999]

(a) $I = I_o$
(2) $I = 2I_o$
(3) $I = 4I_o$
(4) There is no relation between *I* and I_o

13. In the Young's double slit experiment, the ratio of intensities of bright and dark fringes is 9. This means that **[IIT 1982]**

(1) The intensities of individual sources are 5 and 4 units respectively
(2) The intensities of individual sources are 4 and 1 units respectively
(3) The ratio of their amplitudes is 3
(4) The ratio of their amplitudes is 2

14. An oil flowing on water seems coloured due to interference. For observing this effect, the approximate thickness of the oil film should be

[DPET 1987; JIPMER 1997; RPMT 2002, 04]

(1) 100 Å (2) 10000 Å
(3) 1 *mm* (4) 1 *cm*

15. The Young's experiment is performed with the lights of blue (λ = 4360 Å) and green colour (λ = 5460 Å), If the distance of the 4th fringe from the centre is *x*, then **[CPMT 1987]**

(1) *x* (Blue) = *x* (Green)(2) *x* (Blue)> *x* (Green)
(3) *x* (Blue) < *x* (Green)(4) $\frac{x(Blue)}{x(Green)} = \frac{5460}{4360}$

16. In the Young's double slit experiment, the spacing between two slits is 0.1 *mm*. If the screen is kept at a distance of 1.0 *m* from the slits and the wavelength of light is 5000 Å, then the fringe width is **[MP PMT 1993; RPET 1996]**

(1) 1.0 *cm* (2) 1.5 *cm*

(3) 0.5 *cm* (4) 2.0 *cm*

17. In Young's double slit experiment, if L is the distance between the slits and the screen upon which interference pattern is observed, x is the average distance between the adjacent fringes and d being the slit separation. The wavelength of light is given by **[MP PET 1993]**

(1) $\frac{xd}{L}$ (2) $\frac{xL}{d}$

(3) $\frac{Ld}{x}$ (4) $\frac{1}{Ldx}$

18. In a Young's double slit experiment, the central point on the screen is **[MP PMT 1996]**

(1) Bright (2) Dark

(3) First bright and then dark (4) First dark and then bright

19. In a 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 4/3 without disturbing the geometrical arrangement, the new fringe width will be **[CBSE PMT 1990]**

(1) 0.30 *mm* (2) 0.40 *mm*

(3) 0.53 *mm* (4) 450 *micron*

20. Young's experiment is performed in air and then performed in water, the fringe width **[CPMT 1990; MP PMT 1994; RPMT 1997; Kerala PMT 2004]**

(1) Will remain same (2) Will decrease

(3) Will increase (4) Will be infinite

21. In double slits experiment, for light of which colour the fringe width will be minimum **[MP PMT 1994]**

(1) Violet (2) Red

(3) Green (4) Yellow

22. In Young's experiment, light of wavelength 4000 Å is used to produce bright fringes of width 0.6 *mm*, at a distance of 2 meters. If the whole apparatus is dipped in a liquid of refractive index 1.5, then fringe width will be **[MP PMT 1994]**

(1) 0.2 *mm* (2) 0.3 *mm*

(3) 0.4 *mm* (4) 1.2 *mm*

23. In Young's double slit experiment, the phase difference between the light waves reaching third bright fringe from the central fringe will be (λ =6000 Å) **[MP PMT 1994]**

(1) Zero (2) 2π

(3) 4π (4) 6π

24. In Young's double slit experiment, if the widths of the slits are in the ratio 4 : 9, the ratio of the intensity at maxima to the intensity at minima will be **[Manipal MEE 1995]**

(1) 169 : 25 (2) 81 : 16

(3) 25 : 1 (4) 9 : 4

25. In Young's double slit experiment when wavelength used is 6000 Å and the screen is 40 *cm* from the slits, the fringes are 0.012 *cm* wide. What is the distance between the slits **[MP PMT 1995; Pb PET 2002]**

(1) 0.024 *cm* (2) 2.4 *cm*

(3) 0.24 *cm* (4) 0.2 *cm*

26. In two separate set - ups of the Young's double slit experiment, fringes of equal width are observed when lights of wavelengths in the ratio 1 : 2 are used. If the ratio of the slit separation in the two cases is 2 : 1, the ratio of the distances between the plane of the slits and the screen in the two set - ups is **[KCET 1996]**

(1) 4 : 1 (2) 1 : 1

(3) 1 : 4 (4) 2 : 1

27. In an interference experiment, the spacing between successive maxima or minima is **[MP PET 1996]**

(1) $\frac{\lambda d}{D}$ (2) $\frac{\lambda D}{d}$

(3) $\frac{dD}{\lambda}$ (d) $\frac{\lambda d}{4D}$

(Where the symbols have their usual meanings)

28. If yellow light in the Young's double slit experiment is replaced by red light, the fringe width will **[MP PMT 1996]**

(1) Decrease

(2) Remain unaffected

(3) Increase

(4) First increase and then decrease

29. In Young's double slit experiment, the fringe width is $1 \times 10^{-4}\,m$ if the distance between the slit and screen is doubled and the distance between the two slit is reduced to half and wavelength is changed from $6.4 \times 10^{7}\,m$ to $4.0 \times 10^{-7}\,m$, the value of new fringe width will be

(1) $0.15 \times 10^{-4}\,m$ (2) $2.0 \times 10^{-4}\,m$

(3) $1.25 \times 10^{-4}\,m$ (4) $2.5 \times 10^{-4}\,m$

30. In Young's experiment, one slit is covered with a blue filter and the other (slit) with a yellow filter. Then the interference pattern **[MP PET 1997]**

(1) Will be blue (2) Will be yellow

(3) Will be green (4) Will not be formed

31. Two sources give interference pattern which is observed on a screen, *D* distance apart from the sources. The fringe width is 2*w*. If the distance *D* is now doubled, the fringe width will **[MP PET 1997]**

(1) Become *w*/2 (2) Remain the same

(3) Become *w* (4) Become 4*w*

32. In double slit experiment, the angular width of the fringes is 0.20° for the sodium light (λ =5890 Å). In order to increase the angular width of the fringes by 10%, the necessary change in the wavelength is **[MP PMT 1997]**

(1) Increase of 589 Å (2) Decrease of 589 Å

(3) Increase of 6479 Å (4) Zero

33. In a biprism experiment, by using light of wavelength 5000 Å, 5 *mm* wide fringes are obtained on a screen 1.0 *m* away from the coherent sources. The separation between the two coherent sources is **[MP PMT/PET 1998]**

(1) 1.0 *mm* (2) 0.1 *mm*

(3) 0.05 *mm* (4) 0.01 *mm*

34. The slits in a Young's double slit experiment have equal widths and the source is placed symmetrically relative to the slits. The intensity at the central fringes is I_0. If one of the slits is closed, the intensity at this point will be **[MP PMT 1999; Orissa JEE 2004; Kerala PET 2005]**

(1) I_0 (2) $I_0 / 4$

(3) $I_0 / 2$ (4) $4I_0$

35. A thin mica sheet of thickness $2 \times 10^{-6}\,m$ and refractive index $(\mu = 1.5)$ is introduced in the path of the first wave. The wavelength of the wave used is 5000 Å. The central bright maximum will shift **[CPMT 1999]**

(1) 2 fringes upward (2) 2 fringes downward

(3) 10 fringes upward (4) None of these

36. In a Young's double slit experiment, the fringe width will remain same, if (*D* = distance between screen and plane of slits, *d* = separation between two slits and λ = wavelength of light used) **[Bihar MEE 1995]**

(1) Both λ and *D* are doubled

(2) Both *d* and *D* are doubled

(3) *D* is doubled but *d* is halved

(4) λ is doubled but *d* is halved

37. In Young's double slit experiment, the slits are 0.5 *mm* apart and interference pattern is observed on a screen placed at a distance of 1.0 *m* from the plane containing the slits. If wavelength of the incident light is 6000 Å, then the separation between the third bright fringe and the central maxima is **[AMU 1995]**

(1) 4.0 *mm* (2) 3.5 *mm*
(3) 3.0 *mm* (4) 2.5 *mm*

38. In Young's double slit experiment, 62 fringes are seen in visible region for sodium light of wavelength 5893 Å. If violet light of wavelength 4358 Å is used in place of sodium light, then number of fringes seen will be **[RPET 1997]**
(1) 54 (2) 64
(3) 74 (4) 84

39. In Young's double slit experiment, angular width of fringes is 0.20^o for sodium light of wavelength 5890 Å. If complete system is dipped in water, then angular width of fringes becomes **[RPET 1997]**
(1) 0.11^o (2) 0.15^o
(3) 0.22^o (4) 0.30^o

40. In Young's double slit experiment, the distance between the slits is 1 *mm* and that between slit and screen is 1 meter and 10th fringe is 5 *mm* away from the central bright fringe, then wavelength of light used will be **[RPMT 1997]**
(1) 5000 Å (2) 6000 Å
(3) 7000 Å (4) 8000 Å

41. In Young's double slit experiment, carried out with light of wavelength λ = 5000 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 **[CBSE PMT 1992; MH CET 2002]**
(1) 1.67 *cm* (2) 1.5 *cm*
(3) 0.5 *cm* (4) 5.0 *cm*

42. In a Young's experiment, two coherent sources are placed 0.90 *mm* apart and the fringes are observed one metre away. If it produces the second dark fringe at a distance of 1 *mm* from the central fringe, the wavelength of monochromatic light used would be **[CBSE PMT 1992; KCET 2004]**
(1) $60 \times 10^{-4}\, cm$ (2) $10 \times 10^{-4}\, cm$
(3) $10 \times 10^{-5}\, cm$ (4) $6 \times 10^{-5}\, cm$

43. In Young's double slit experiment, the distance between the two slits is 0.1 *mm* and the wavelength of light used is $4 \times 10^{-7} m$. If the width of the fringe on the screen is 4 *mm*, the distance between screen and slit is **[Bihar CMEET 1995]**
(1) 0.1 *mm* (2) 1 *cm*
(3) 0.1 *cm* (4) 1 *m*

44. In Young's double slit experiment, the distance between sources is 1 *mm* and distance between the screen and source is 1 *m*. If the fringe width on the screen is 0.06 *cm*, then λ = **[CPMT 1996]**
(1) 6000 Å (2) 4000 Å
(3) 1200 Å (4) 2400 Å

45. In Young's double slit experiment, a mica slit of thickness t and refractive index μ is introduced in the ray from the first source S_1. By how much distance the fringes pattern will be displaced **[RPMT 1996, 97; JIPMER 2000; RPMT 2003]**
(1) $\frac{d}{D}(\mu - 1)\, t$ (2) $\frac{D}{d}(\mu - 1)\, t$
(3) $\frac{d}{(\mu - 1)D}$ (4) $\frac{D}{d}(\mu - 1)$

46. In Young's double slit experiment using sodium light (λ = 5898 Å), 92 fringes are seen. If given colour (λ = 5461 Å) is used, how many fringes will be seen **[CPMT 1989; RPET 1996; JIPMER 2001, 02]**
(1) 62 (2) 67
(3) 85 (4) 99

47. If a torch is used in place of monochromatic light in Young's experiment what will happens **[MH CET 1999; KCET 1999]**
(1) Fringe will appear for a moment then it will disappear
(2) Fringes will occur as from monochromatic light
(3) Only bright fringes will appear
(4) No fringes will appear

48. When a thin metal plate is placed in the path of one of the interfering beams of light

(1) Fringe width increases (2) Fringes disappear

(3) Fringes become brighter (4) Fringes becomes blurred

49. In Young's experiment, the distance between slits is 0.28 *mm* and distance between slits and screen is 1.4 *m*. Distance between central bright fringe and third bright fringe is 0.9 *cm*. What is the wavelength of used light

(1) 5000 Å (2) 6000 Å

(3) 7000 Å (4) 9000 Å

50. Two parallel slits 0.6 *mm* apart are illuminated by light source of wavelength 6000 Å. The distance between two consecutive dark fringes on a screen 1 *m* away from the slits is

[JIPMER 1999]

(1) 1 *mm* (2) 0.01 *mm*

(3) 0.1 *m* (4) 10 *m*

51. In young's double slit experiment with a source of light of wavelength 6320Å, the first maxima will occur when

[Roorkee 1999]

(1) Path difference is 9480 Å

(2) Phase difference is 2π radian

(3) Path difference is 6320 Å

(4) Phase difference is π radian

52. If a transparent medium of refractive index μ = 1.5 and thickness $t = 2.5 \times 10^{-5}$ *m* is inserted in front of one of the slits of Young's Double Slit experiment, how much will be the shift in the interference pattern? The distance between the slits is 0.5 *mm* and that between slits and screen is 100 *cm*

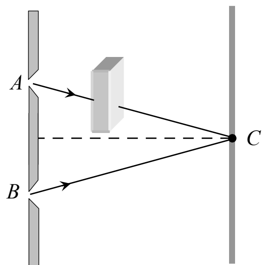
[AIIMS 1999]

(1) 5 *cm* (2) 2.5 *cm*

(3) 0.25 *cm* (4) 0.1 *cm*

53. In Young's experiment, monochromatic light is used to illuminate the two slits *A* and *B*. Interference fringes are observed on a screen placed in front of the slits. Now if a thin glass plate is placed normally in the path of the beam coming from the slit

[UPSEAT 1993, 2000; AIIMS 1999, 2004]



(1) The fringes will disappear

[KCET] 1999] (2) The fringe width will increase

(3) The fringe width will increase

(4) There will be no change in the fringe width but the pattern shifts

54. The fringe width in Young's double slit experiment increases when

[MP PMT 2000]

(1) Wavelength increases

(2) Distance between the slits increases

(3) Distance between the source and screen decreases **[KCET 1999]**

(4) The width of the slits increases

55. In a double slit experiment, instead of taking slits of equal widths, one slit is made twice as wide as the other. Then in the interference pattern **[IIT-JEE (Screening) 2000]**

(1) The intensities of both the maxima and the minima increase

(2) The intensity of maxima increases and the minima has zero intensity

(3) The intensity of maxima decreases and that of the minima increases

(4) The intensity of maxima decreases and the minima has zero intensity

56. Two slits, 4 *mm* apart, are illuminated by light of wavelength 6000 Å. What will be the fringe width on a screen placed 2*m* from the slits

[MP PET 2000]

(1) 0.12 *mm* (2) 0.3 *mm*

(3) 3.0 *mm* (4) 4.0 *mm*

57. In the Young's double slit experiment, for which colour the fringe width is least **[UPSEAT 2001, MP P**

(1) Red (2) Green

(3) Blue (4) Yellow

58. In a Young's double slit experiment, the separation of the two slits is doubled. To keep the same spacing of fringes, the distance *D* of the screen from the slits should be made

[MNR 1998; AMU (Engg.) 2001]

(1) $\frac{D}{2}$ (2) $\frac{D}{\sqrt{2}}$

(3) 2*D* (4) 4*D*

59. Young's double slit experiment is performed with light of wavelength 550 *nm*. The separation between the slits is 1.10 *mm* and screen is placed at distance of 1 *m*. What is the distance between the consecutive bright or dark fringes

[Pb. PMT 2000]

(1) 1.5 *mm* (2) 1.0 *mm*

(3) 0.5 *mm* (4) None of these

60. In Young's experiment, the ratio of maximum to minimum intensities of the fringe system is 4 : 1. The amplitudes of the coherent sources are in the ratio

[RPMT 1996; MP PET 2000; RPET 2001; MP PMT 2001]

(1) 4 : 1 (2) 3 : 1

(3) 2 : 1 (4) 1 : 1

61. An interference pattern was made by using red light. If the red light changes with blue light, the fringes will become

[BHU 2001]

(1) Wider (2) Narrower

(3) Fainter (4) Brighter

62. If a white light is used in Young's double slit experiments then a very large number of coloured fringes can be seen

[KCET 2001]

(1) With first order violet fringes being closer to the central white fringes

(2) First order red fringes being closer to the central white fringes

(3) With a central white fringe

(4) With a central black fringe

63. In a Young's double slit experiment, 12 fringes are observed to be formed in a certain segment of the screen when light of wavelength 600 *nm* is used. If the wavelength of light is changed to 400 *nm*, number of fringes observed in the same segment of the screen is given by **[IIT-JEE (Screening) 2001]**

(1) 12 (2) 18

(3) 24 (4) 30

64. In the Young's double slit experiment with sodium light. The slits are 0.589 *m* a part. The angular separation of the third maximum from the central maximum will be (given $\lambda = 589$ *mm*) **[Pb. PMT 2002]**

(1) $\sin^{-1}(0.33\times10^{8})$ (2) $\sin^{-1}(0.33\times10^{-6})$

(3) $\sin^{-1}(3\times10^{-8})$ (4) $\sin^{-1}(3\times10^{-6})$

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

[RPMT 1999; BHU 2002]

(1) Half (2) Double

(3) One fourth (4) Unchanged

66. In Young's double slit experiment, the central bright fringe can be identified

[KCET 2002]

(1) By using white light instead of monochromatic light

(2) As it is narrower than other bright fringes

(3) As it is wider than other bright fringes

(4) As it has a greater intensity than the other bright fringes

67. In Young's double slit experiment, the wavelength of the light used is doubled and distance between two slits is half of initial distance, the resultant fringe width becomes

[AIEEE 2002]

(1) 2 *times* (2) 3 *times*

(3) 4 *times* (4) 1/2 *times*

68. In a Young's double slit experiment, the source illuminating the slits is changed from blue to violet. The width of the fringes

[KCET 2002]

(1) Increases (2) Decreases

(3) Becomes unequal (4) Remains constant

69. In Young's double slit experiment, the intensity of light coming from the first slit is double the intensity from the second slit. The ratio of the maximum intensity to the minimum intensity on the interference fringe pattern observed is

[KCET 2002]

(1) 34 (2) 40

(3) 25 (4) 38

70. If the sodium light in Young's double slit experiment is replaced by red light, the fringe width will **[MP PMT 2002]**

(1) Decrease

(2) Increase

(3) Remain unaffected

(4) First increase, then decrease

71. In Young's double slit experiment the wavelength of light was changed from 7000 Å to 3500 Å. While doubling the separation between the slits which of the following is not true for this experiment [Orissa JEE 2002]

(1) The width of the fringes changes
(2) The colour of bright fringes changes
(3) The separation between successive bright fringes changes
(4) The separation between successive dark fringes remains unchanged

72. When a thin transparent plate of thickness t and refractive index μ is placed in the path of one of the two interfering waves of light, then the path difference changes by [MP PMT 2002]

(1) $(\mu + 1)t$ (2) $(\mu - 1)t$
(3) $\frac{(\mu+1)}{t}$ (4) $\frac{(\mu-1)}{t}$

73. In Young's double-slit experiment, an interference pattern is obtained on a screen by a light of wavelength 6000 Å, coming from the coherent sources S_1 and S_2. At certain point P on the screen third dark fringe is formed. Then the path difference $S_1P - S_2P$ in microns is [EAMCET 2003]

(1) 0.75 (2) 1.5
(3) 3.0 (4) 4.5

74. In a Young's double slit experiment, the slit separation is 1 *mm* and the screen is 1 *m* from the slit. For a monochromatic light of wavelength 500 *nm*, the distance of 3rd minima from the central maxima is [Orissa JEE 2003]

(1) 0.50 *mm* (2) 1.25 *mm*
(3) 1.50 *mm* (4) 1.75 *mm*

75. In Young's double-slit experiment the fringe width is β. If entire arrangement is placed in a liquid of refractive index n, the fringe width becomes [KCET 2003]

(1) $\frac{\beta}{n+1}$ (2) $n\beta$
(3) $\frac{\beta}{n}$ (4) $\frac{\beta}{n-1}$

76. In an interference experiment, third bright fringe is obtained at a point on the screen with a light of 700 *nm*. What should be the wavelength of the light source in order to obtain 5th bright fringe at the same point [KCET 2003]

(1) 500 *nm* (2) 630 *nm*
(3) 750 *nm* (4) 420 *nm*

77. If the separation between slits in Young's double slit experiment is reduced to $\frac{1}{3}rd$, the fringe width becomes n times. The value of n is [MP PET 2003]

(1) 3 (2) $\frac{1}{3}$
(3) 9 (4) $\frac{1}{9}$

78. A double slit experiment is performed with light of wavelength 500 *nm*. A thin film of thickness 2 μm and refractive index 1.5 is introduced in the path of the upper beam. The location of the central maximum will [AIIMS 2003]

(1) Remain unshifted
(2) Shift downward by nearly two fringes
(3) Shift upward by nearly two fringes
(4) Shift downward by 10 fringes

79. The two slits at a distance of 1 *mm* are illuminated by the light of wavelength $6.5 \times 10^{-7} m$. The interference fringes are observed on a screen placed at a distance of 1*m*. The distance between third dark fringe and fifth bright fringe will be [NCERT 1982; MP PET 1995; BVP 2003]

(1) 0.65 *mm* (2) 1.63 *mm*
(3) 3.25 *mm* (4) 4.88 *mm*

80. In a Young's double-slit experiment the fringe width is 0.2 *mm*. If the wavelength of light used is increased by 10% and the separation between the slits is also increased by 10%, the fringe width will be [MP PMT 2004]

(1) 0.20 *mm* (2) 0.401 *mm*
(3) 0.242 *mm* (4) 0.165 *mm*

81. Two coherent sources of intensity ratio 1 : 4 produce an interference pattern. The fringe visibility will be

[J & K CET 2004]

(1) 1 (2) 0.8

(3) 0.4 (4) 0.6

82. In Young's double slit experiment the amplitudes of two sources are 3*a* and a respectively. The ratio of intensities of bright and dark fringes will be [J & K CET 2004]

(1) 3 : 1 (2) 4 : 1

(3) 2 : 1 (4) 9 : 1

83. In Young's double slit experiment, distance between two sources is 0.1 *mm*. The distance of screen from the sources is 20 *cm*. Wavelength of light used is 5460 Å. Then angular position of the first dark fringe is [DCE 2002]

(1) 0.08° (2) 0.16°

(3) 0.20° (4) 0.313°

84. In a Young's double slit experiment, the slit separation is 0.2 *cm,* the distance between the screen and slit is 1*m*. Wavelength of the light used is 5000 Å. The distance between two consecutive dark fringes (in *mm*) is

[DCE 2004]

(1) 0.25 (2) 0.26

(3) 0.27 (4) 0.28

85. A light of wavelength 5890 Å falls normally on a thin air film. The minimum thickness of the film such that the film appears dark in reflected light [Pb. PMT 2003]

(1) $2.945\times10^{-7}m$ (2) $3.945\times10^{-7}m$

(3) $4.95\times10^{-7}m$ (4) $1.945\times10^{-7}m$

86. In Young's double slit experiment, a minimum is obtained when the phase difference of super imposing waves is

[MH CET 2004]

(1) Zero (2) $(2n-1)\pi$

(3) $n\pi$ (4) $(n+1)\pi$

87. In Fresnel's biprism $(\mu=1.5)$ experiment the distance between source and biprism is 0.3 *m* and that between biprism and screen is 0.7*m* and angle of prism is 1°. The fringe width with light of wavelength 6000 Å will be

[RPMT 2002]

(1) 3 *cm* (2) 0.011 *cm*

(3) 2 *cm* (4) 4 *cm*

88. In Young double slit experiment, when two light waves form third minimum, they have

[RPMT 2003]

(1) Phase difference of 3π (2) Phase difference of $\frac{5\pi}{2}$

(3) Path difference of 3λ (4) Path difference of $\frac{5\lambda}{2}$

89. In Fresnel's biprism experiment, on increasing the prism angle, fringe width will

[RPMT 2003]

(1) Increase

(2) Decrease

(3) Remain unchanged

(4) Depend on the position of object

90. If prism angle $\alpha=1°$, $\mu=1.54$, distance between screen and prism $(b)=0.7\,m$, distance between prism and source $a=0.3\,m$, $\lambda=180\pi\ nm$ then in Fresnal biprism find the value of β (fringe width) [RPMT 2002]

(1) $10^{-4}\,m$ (2) $10^{-3}\,mm$

(3) $10^{-4}\times\pi m$ (4) $\pi\times10^{-3}\,m$

91. If Fresnel's biprism experiment as held in water inspite of air, then what will be the effect on fringe width [RPMT 1997, 98]

(1) Decrease (2) Increase

(3) No effect (4) None of these

92. What is the effect on Fresnel's biprism experiment when the use of white light is made

[RPMT 1998]

(1) Fringe are affected

(2) Diffraction pattern is spread more

(3) Central fringe is white and all are coloured

(4) None of these

93. What happens to the fringe pattern when the Young's double slit experiment is performed in water instead or air then fringe width

[AFMC 2005]

(1) Shrinks (2) Disappear

(3) Unchanged (4) Enlarged

94. In Young's doubled slit experiment, the separation between the slit and the screen increases. The fringe width

[BCECE 2005]

(1) Increases (2) Decreases

(3) Remains unchanged (4) None of these

95. In Young's double slit experiment, the aperture screen distance is 2*m*. The fringe width is 1 *mm*. Light of 600 *nm* is used. If a thin plate of glass (μ = 1.5) of thickness 0.06 *mm* is placed over one of the slits, then there will be a lateral displacement of the fringes by

[BCECE 2005]

(1) 0 *cm* (2) 5 *cm*

(3) 10 *cm* (4) 15 *cm*

96. In which of the following is the interference due to the division of wave front

[UPSEAT 2005]

(1) Young's double slit experiment

(2) Fresnel's biprism experiment

(3) Lloyd's mirror experiment

(4) Demonstration colours of thin film

97. Two slits are separated by a distance of 0.5 *mm* and illuminated with light of $\lambda = 6000$ Å. If the screen is placed 2.5 *m* from the slits. The distance of the third bright image from the centre will be [CPMT 2005]

(1) 1.5 *mm* (2) 3 *mm*

(3) 6 *mm* (4) 9 *mm*

Doppler's Effect of Light

1. The observed wavelength of light coming from a distant galaxy is found to be increased by 0.5% as compared with that coming from a terrestrial source. The galaxy is

[MP PMT 1993, 2003]

(1) Stationary with respect to the earth

(2) Approaching the earth with velocity of light

(3) Receding from the earth with the velocity of light

(4) Receding from the earth with a velocity equal to $1.5 \times 10^6 m/s$

2. A star producing light of wavelength 6000 Å moves away from the earth with a speed of 5 *km/sec*. Due to Doppler effect the shift in wavelength will be $(c = 3 \times 10^8 m/\text{sec})$

[MP PMT 1990]

(1) 0.1 Å (2) 0.05 Å

(3) 0.2 Å (4) 1 Å

3. If the shift of wavelength of light emitted by a star is towards violet, then this shows that star is

[RPET 1996; RPMT 1999]

(1) Stationary

(2) Moving towards earth

(3) Moving away from earth

(4) Information is incomplete

4. Assuming that universe is expanding, if the spectrum of light coming from a star which is going away from earth is tested, then in the wavelength of light

(1) There will be no change

(2) The spectrum will move to infrared region

(3) The spectrum will seems to shift to ultraviolet side

(4) None of the above

5. Doppler's effect in sound in addition to relative velocity between source and observer, also depends while source and observer or both are moving. Doppler effect in light depend only on the relative velocity of source and observer. The reason of this is [MP PET/PMT 1988]

(1) Einstein mass - energy relation

(2) Einstein theory of relativity

(3) Photoelectric effect

(4) None of these

6. A rocket is moving away from the earth at a speed of $6 \times 10^7 m/s$. The rocket has blue light in it. What will be the wavelength of light recorded by an observer on the earth (wavelength of blue light = 4600 Å)

(1) 4600 Å (2) 5520 Å

(3) 3680 Å (4) 3920 Å

7. A spectral line λ = 5000 Å in the light coming from a distant star is observed as a 5200 Å. What will be recession velocity of the star

(1) $1.15 \times 10^7 cm/\sec$ (2) $1.15 \times 10^7 m/\sec$

(3) $1.15 \times 10^7 km/\sec$ (4) 1.15 *km/sec*

8. The apparent wavelength of the light from a star moving away from the earth is 0.01% more than its real wavelength. Then the velocity of star is **[CPMT 1979]**

(1) 60 *km/sec* (2) 15 *km/sec*

(3) 150 *km/sec* (4) 30 *km/sec*

9. A star emits light of 5500 Å wavelength. Its appears blue to an observer on the earth, it means **[DPMT 2002]**

(1) Star is going away from the earth

(2) Star is stationary

(3) Star is coming towards earth

(4) None of the above

10. The velocity of light emitted by a source *S* observed by an observer *O*, who is at rest with respect to *S* is *c*. If the observer moves towards *S* with velocity *v*, the velocity of light as observed will be **[NCERT 1980]**

(1) $c + v$ (2) $c - v$

(3) c (4) $\sqrt{1 - \frac{v^2}{c^2}}$

11. In the context of Doppler effect in light, the term 'red shift' signifies **[MP PET 1994]**

(1) Decrease in frequency

(2) Increase in frequency

(3) Decrease in intensity

(4) Increase in intensity

12. The sun is rotating about its own axis. The spectral lines emitted from the two ends of its equator, for an observer on the earth, will show **[MP PMT 1994]**

(1) Shift towards red end

(2) Shift towards violet end

(3) Shift towards red end by one line and towards violet end by other

(4) No shift

13. A star is moving away from the earth with a velocity of 100 *km/s*. If the velocity of light is $3 \times 10^8 m/s$ then the shift of its spectral line of wavelength 5700 Å due to Doppler's effect will be **[MP PMT 1994]**

(1) 0.63 Å (2) 1.90 Å

(3) 3.80 Å (4) 5.70 Å

14. If a source of light is moving away from a stationary observer, then the frequency of light wave appears to change because of **[AFMC 1995]**

(1) Doppler's effect

(2) Interference

(3) Diffraction

(4) None of these

15. A star emitting radiation at a wavelength of 5000 Å is approaching earth with a velocity of $1.5 \times 10^6 m/s$. The change in wavelength of the radiation as received on the earth, is **[CBSE PMT 1995]**

(1) 25 Å (2) Zero

(3) 100 Å (4) 2.5 Å

16. A star emitting light of wavelength 5896 Å is moving away from the earth with a speed of 3600 *km / sec*. The wavelength of light observed on earth will

[MP PET 1995, 2002]

(1) Decrease by 5825.25 Å

(2) Increase by 5966.75 Å

(3) Decrease by 70.75 Å

(4) Increase by 70.75 Å

($c = 3 \times 10^8 m/sec$ is the speed of light)

17. A star moves away from earth at speed 0.8 *c* while emitting light of frequency $6 \times 10^{14} Hz$. What frequency will be observed on the earth (in units of $10^{14} Hz$) (*c* = speed of light)

[MP PMT 1995]

(1) 0.24 (2) 1.2

(3) 30 (4) 3.3

18. A light source approaches the observer with velocity 0.8 *c*. The doppler shift for the light of wavelength 5500 Å is

[MP PET 1996]

(1) 4400 Å (2) 1833 Å

(3) 3167 Å (4) 7333 Å

19. Light coming from a star is observed to have a wavelength of 3737 Å, while its real wavelength is 3700 Å. The speed of the star relative to the earth is [Speed of light $3 \times 10^8 m/s$]

[MP PET 1997]

(1) $3 \times 10^5 m/s$ (2) $3 \times 10^6 m/s$

(3) $3.7 \times 10^7 m/s$ (4) $3.7 \times 10^6 m/s$

20. In the spectrum of light of a luminous heavenly body the wavelength of a spectral line is measured to be 4747 Å while actual wavelength of the line is 4700 Å. The relative velocity of the heavenly body with respect to earth will be (velocity of light is $3 \times 10^8 m/s$)

[MP PMT/PET 1998]

(1) $3 \times 10^5 m/s$ moving towards the earth

(2) $3 \times 10^5 m/s$ moving away from the earth

(3) $3 \times 10^6 m/s$ moving towards the earth

(4) $3 \times 10^6 m/s$ moving away from the earth

21. The wavelength of light observed on the earth, from a moving star is found to decrease by 0.05%. Relative to the earth the star is

[MP PMT/PET 1998]

(1) Moving away with a velocity of $1.5 \times 10^5 m/s$

(2) Coming closer with a velocity of $1.5 \times 10^5 m/s$

(3) Moving away with a velocity of $1.5 \times 10^4 m/s$

(4) Coming closer with a velocity of $1.5 \times 10^4 m/s$

22. A star is going away from the earth. An observer on the earth will see the wavelength of light coming from the star

[MP PMT 1999]

(1) Decreased

(2) Increased

(3) Neither decreased nor increased

(4) Decreased or increased depending upon the velocity of the star

23. A star is moving towards the earth with a speed of 4.5×10^6 *m/s*. If the true wavelength of a certain line in the spectrum received from the star is 5890 Å, its apparent wavelength will be about [$c = 3 \times 10^8 m/s$] **[MP PMT 1999]**

(1) 5890 Å (2) 5978 Å

(3) 5802 Å (4) 5896 Å

24. Due to Doppler's effect, the shift in wavelength observed is 0.1 Å for a star producing wavelength 6000 Å. Velocity of recession of the star will be

(1) 2.5 *km/s* (4) 10 *km/s*

(3) 5 *km/s* (4) 20 *km/s*

25. A rocket is going away from the earth at a speed of 10^6 *m/s* If the wavelength of the light wave emitted by it be 5700 Å, what will be its Doppler's shift **[RPMT 1996]**

(1) 200 Å (2) 19 Å

(3) 20 Å (4) 0.2 Å

26. A rocket is going away from the earth at a speed 0.2*c*, where *c* = speed of light. It emits a signal of frequency $4\times10^7 Hz$. What will be the frequency observed by an observer on the earth **[RPMT 1996]**

(1) $4\times10^6 Hz$ (2) $3.2\times10^7 Hz$

(3) $3\times10^6 Hz$ (4) $5\times10^7 Hz$

27. If a star is moving towards the earth, then the lines are shifted towards **[AIIMS 1997]**

(1) Red (2) Infrared

(3) Blue (4) Green

28. When the wavelength of light coming from a distant star is measured it is found shifted towards red. Then the conclusion is **[JIPMER 1999]**

(1) The star is approaching the observer

(2) The star recedes away from earth

(3) There is gravitational effect on the light

(4) The star remains stationary

29. A heavenly body is receding from earth such that the fractional change in λ is 1, then its velocity is **[DCE 2000]**

(1) *C* (2) $\frac{3C}{5}$

(3) $\frac{C}{5}$ (4) $\frac{2C}{5}$

30. The 6563 Å line emitted by hydrogen atom in a star is found to be red shifted by 5 Å. The speed with which the star is receding from the earth is **[Pb. PMT 2002]**

(1) 17.29×10^9 *m/s* (2) 4.29×10^7 *m/s*

(3) 3.39×10^5 *m/s* (4) 2.29×10^5 *m/s*

31. Three observers *A*, *B* and *C* measure the speed of light coming from a source to be v_A, v_B and v_C. The observer *A* moves towards the source, the observer *C* moves away from the source with the same speed. The observer *B* stays stationary. the surrounding space is vacuum every where. Then **[KCET 2002]**

(1) $v_A > v_B > v_C$ (2) $v_A < v_B < v_C$

(3) $v_A = v_B = v_C$ (4) $v_A = v_B > v_C$

32. Light from the constellation Virgo is observed to increase in wavelength by 0.4%. With respect to Earth the constellation is **[MP PET 2003]**

(1) Moving away with velocity 1.2×10^6 *m/s*

(2) Coming closer with velocity 1.2×10^6 *m/s*

(3) Moving away with velocity 4×10^6 *m/s*

(4) Coming closer with velocity 4×10^6 *m/s*

33. It is believed that the universe is expanding and hence the distant stars are receding from us. Light from such a star will show **[CPMT 2005]**

(1) Shift in frequency towards longer wavelengths

(2) Shift in frequency towards shorter wavelength

(3) No shift in frequency but a decrease in intensity

(4) A shift in frequency sometimes towards longer and sometimes towards shorter wavelengths

Diffraction of Light

1. A slit of width *a* is illuminated by white light. For red light (λ = 6500 Å), the first minima is obtained at $\theta = 30^o$. Then the value of *a* will be **[MP PMT 1987; CPMT 2002]**

(1) 3250 Å (2) $6.5\times10^{-4} mm$

(3) 1.24 *microns* (4) $2.6\times10^{-4} cm$

2. The light of wavelength 6328 Å is incident on a slit of width 0.2 *mm* perpendicularly, the angular width of central maxima will be **[MP PMT 1987; Pb. PMT 2002]**

(1) 0.36^o (2) 0.18^o

(3) 0.72^o (4) 0.09^o

3. The bending of beam of light around corners of obstacles is called **[NCERT 1990; AFMC 1995; RPET 1997; RPMT 1997; CPMT 1999; JIPMER 2000]**

(1) Reflection (2) Diffraction

(3) Refraction (4) Interference

4. The penetration of light into the region of geometrical shadow is called **[CPMT 1999; JIPMER 2000]**

(1) Polarisation (2) Interference

(3) Diffraction (4) Refraction

5. A slit of size 0.15 *cm* is placed at 2.1 *m* from a screen. On illuminated it by a light of wavelength 5×10^{-5} *cm*. The width of central maxima will be **[RPMT 1999]**

(1) 70 *mm* (2) 0.14 *mm*

(3) 1.4 *mm* (4) 0.14 *cm*

6. A diffraction is obtained by using a beam of red light. What will happen if the red light is replaced by the blue light **[KCET 2000; BHU 2001]**

(1) Bands will narrower and crowd full together

(2) Bands become broader and further apart

(3) No change will take place

(4) Bands disappear

7. What will be the angle of diffracting for the first minimum due to Fraunhoffer diffraction with sources of light of wave length 550 *nm* and slit of width 0.55 *mm* **[Pb. PMT 2001]**

(1) 0.001 *rad* (2) 0.01 *rad*

(3) 1 *rad* (4) 0.1 *rad*

8. Angular width (β) of central maximum of a diffraction pattern on a single slit does not depend upon **[DCE 2000; 01]**

(1) Distance between slit and source

(2) Wavelength of light used

(3) Width of the slit

(4) Frequency of light used

9. A single slit of width 0.20 *mm* is illuminated with light of wavelength 500 *nm*. The observing screen is placed 80 *cm* from the slit. The width of the central bright fringe will be **[AMU (Med.) 2002]**

(1) 1 *mm* (2) 2 *mm*

(3) 4 *mm* (4) 5 *mm*

10. Yellow light is used in single slit diffraction experiment with slit width 0.6 *mm*. If yellow light is replaced by *X*-rays then the pattern will reveal **[IIT-JEE (Screening) 1999; MP PMT 2002; KCET 2003]**

(1) That the central maxima is narrower

(2) No diffraction pattern

(3) More number of fringes

(4) Less number of fringes

11. Which statement is correct for a zone plate and a lens **[RPMT 2002]**

(1) Zone plate has multi focii whereas lens has one

(2) Zone plate has one focus whereas lens has multiple focii

(3) Both are correct

(4) Zone plate has one focus whereas a lens has infinite

12. In Fresnel diffraction, if the distance between the disc and the screen is decreased, the intensity of central bright spot will **[RPMT 2002]**

(1) Increase (2) Decrease

(3) Remain constant (4) None of these

13. A plane wavefront $(\lambda = 6 \times 10^{-7} m)$ falls on a slit $0.4\,mm$ wide. A convex lens of focal length $0.8\,m$ placed behind the slit focusses the light on a screen. What is the linear diameter of second maximum **[RPMT 2001]**

(1) $6\,mm$ (2) $12\,mm$

(3) $3\,mm$ (4) $9\,mm$

14. A zone plate of focal length $60\,cm$, behaves as a convex lens, If wavelength of incident light is $6000\,Å$, then radius of first half period zone will be **[RPMT 2001]**

(1) $36 \times 10^{-8}\,m.$ (2) $6 \times 10^{-8}\,m.$

(3) $\sqrt{6} \times 10^{-8}\,m.$ (4) $6 \times 10^{-4}\,m.$

15. Radius of central zone of circular zone plate is $2.3\,mm.$ Wavelength of incident light is $5893\,Å.$ Source is at a distance of $6\,m.$ Then the distance of first image will be **[RPMT 2001]**

(1) $9\,m$ (2) $12\,m$

(3) $24\,m$ (4) $36\,m$

16. Red light is generally used to observe diffraction pattern from single slit. If blue light is used instead of red light, then diffraction pattern

[RPMT 2001; BCECE 2005; CPMT 2005]

(1) Will be more clear (2) Will contract

(3) Will expanded (4) Will not be visualized

17. In the experiment of diffraction at a single slit, if the slit width is decreased, the width of the central maximum

[KCET 2001]

(1) Increases in both Fresnel and Fraunhofer diffraction

(2) Decreases both in Fresnal and Fraunhofer diffraction

(3) Increases in Fresnel diffraction but decreases in Fraunhofer diffraction

(4) Decreases in Fresnel diffraction but increases is Fraunofer diffraction.

18. Conditions of diffraction is

[RPET 2001]

(1) $\frac{a}{\lambda} = 1$ (2) $\frac{a}{\lambda} >> 1$

(3) $\frac{a}{\lambda} << 1$ (4) None of these

19. Light of wavelength $589.3\,nm$ is incident normally on the slit of width $0.1\,mm$. What will be the angular width of the central diffraction maximum at a distance of $1\,m$ from the slit

[BHU (Med.) 1999]

(1) $0.68°$ (2) $1.02°$

(3) $0.34°$ (4) None of these

20. The phenomenon of diffraction of light was discovered by

[KCET 2000]

(1) Hygens (2) Newton

(3) Fresnel (4) Grimaldi

21. The radius r of half period zone is proportional to

[RPMT 1998, 2002]

(1) $\sqrt{n}$ (2) $\frac{1}{\sqrt{n}}$

(3) n^2 (4) $\frac{1}{n}$

22. In a diffraction pattern by a wire, on increasing diameter of wire, fringe width

[RPMT 1998]

(1) Decreases

(2) Increases

(3) Remains unchanged

(4) Increasing or decreasing will depend on wavelength

23. What will be the angular width of central maxima in Fraunhoffer diffraction when light of wavelength $6000\,Å$ is used and slit width is $12 \times 10^{-5}\,cm$ **[RPMT 2004]**

(1) 2 *rad* (2) 3 *rad*

(3) 1 *rad* (4) 8 *rad*

24. When a compact disc is illuminated by a source of white light. Coloured 'lanes' are observed. This is due to

[DCE 2003; AIIMS 2004]

(1) Dispersion (2) Diffraction

(3) Interference (4) Refraction

25. The diffraction effect can be observed in **[J & K CET 2004]**

(1) Only sound waves

(2) Only light waves

(3) Only ultrasonic waves

(4) Sound as well as light waves

26. If we observe the single slit Fraunhofer diffraction with wavelength λ and slit width e, the width of the central maxima is 2θ. On decreasing the slit width for the same λ

[UPSEAT 2004]

(1) θ increases

(2) θ remains unchanged

(3) θ decreases

(4) θ increases or decreases depending on the intensity of light

27. When light is incident on a diffraction grating the zero order principal maximum will be

[KCET 2004]

(1) One of the component colours

(2) Absent

(3) Spectrum of the colours

(4) White

28. A beam of light of wavelength 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 the first dark fringes on either side of the central bright fringe is **[IIT-JEE 1994; KCET 2004]**

(1) 1.2 *mm* (2) 1.2 *cm*

(3) 2.4 *cm* (4) 2.4 *mm*

29. In order to see diffraction the thickness of the film is

[J&K CEE 2001]

(1) 100 Å (2) 10,000 Å

(3) 1 *mm* (4) 1 *cm*

30. Diffraction effects are easier to notice in the case of sound waves than in the case of light waves because

[RPET 1978; KCET 1994, 2000]

(1) Sound waves are longitudinal

(2) Sound is perceived by the ear

(3) Sound waves are mechanical waves

(4) Sound waves are of longer wavelength

31. Direction of the first secondary maximum in the Fraunhofer diffraction pattern at a single slit is given by (*a* is the width of the slit)

[KCET 1999]

(1) $a\sin\theta = \frac{\lambda}{2}$ (2) $a\cos\theta = \frac{3\lambda}{2}$

(3) $a\sin\theta = \lambda$ (4) $a\sin\theta = \frac{3\lambda}{2}$

32. A parallel monochromatic beam of light is incident normally on a narrow slit. A diffraction pattern is formed on a screen placed perpendicular to the direction of incident beam. At the first maximum of the diffraction pattern the phase difference between the rays coming from the edges of the slit is

[IIT–JEE 1995, 98]

(1) 0 (2) $\frac{\pi}{2}$

(3) π (4) 2π

33. Diffraction and interference of light suggest

[CPMT 1995; RPMT 1998]

(1) Nature of light is electro-magnetic

(2) Wave nature

(3) Nature is quantum

(4) Nature of light is transverse

34. A light wave is incident normally over a slit of width $24 \times 10^{-5}\, cm$. The angular position of second dark fringe from the central maxima is 30°. What is the wavelength of light

[RPET 1995]

(1) 6000 Å (2) 5000 Å

(3) 3000 Å (4) 1500 Å

35. A parallel beam of monochromatic light of wavelength 5000 Å is incident normally on a single narrow slit of width 0.001 *mm*. The light is focused by a convex lens on a screen placed on the focal plane. The first minimum will be formed for the angle of diffraction equal to

[CBSE PMT 1993]

(1) 0° (2) 15°

(3) 30° (4) 60°

36. The condition for observing Fraunhofer diffraction from a single slit is that the light wavefront incident on the slit should be

[MP PMT 1987]

(1) Spherical (2) Cylindrical

(3) Plane (4) Elliptical

37. To observe diffraction the size of an obstacle

[CPMT 1982]

(1) Should be of the same order as wavelength

(2) Should be much larger than the wavelength

(3) Have no relation to wavelength

(4) Should be exactly $\frac{\lambda}{2}$

38. In the far field diffraction pattern of a single slit under polychromatic illumination, the first minimum with the wavelength λ_1 is found to be coincident with the third maximum at λ_2. So

(1) $3\lambda_1 = 0.3\lambda_2$ (2) $3\lambda_1 = \lambda_2$

(3) $\lambda_1 = 3.5\lambda_2$ (4) $0.3\lambda_1 = 3\lambda_2$

39. Light of wavelength λ = 5000 Å falls normally on a narrow slit. A screen placed at a distance of 1 *m* from the slit and perpendicular to the direction of light. The first minima of the diffraction pattern is situated at 5 *mm* from the centre of central maximum. The width of the slit is

(1) 0.1 *mm* (2) 1.0 *mm*

(3) 0.5 *mm* (4) 0.2 *mm*

40. The width of the n^{th} *HPZ* will be

(1) $\sqrt{nb\lambda}$ (2) $\sqrt{b\lambda}\,[\sqrt{n}-\sqrt{n-1}]$

(3) $(\sqrt{n}-\sqrt{n-1})$ (4) $\frac{\sqrt{b\lambda}}{[\sqrt{n}-\sqrt{n-1}]}$

41. A single slit of width *a* is illuminated by violet light of wavelength 400 *nm* and the width of the diffraction pattern is measured as *y*. When half of the slit width is covered and illuminated by yellow light of wavelength 600 *nm*, the width of the diffraction pattern is **[KCET 2005]**

(1) The pattern vanishes and the width is zero

(2) $y / 3$

(3) $3y$

(4) None of these

Polarization of Light

1. A polariser is used to **[CPMT 1999]**

(1) Reduce intensity of light

(2) Produce polarised light

(3) Increase intensity of light

(4) Produce unpolarised light

2. Light waves can be polarised as they are **[CBSE PMT 1993; KCET 1994; AFMC 1997; J & K CET 2002; CPMT 2005]**

(1) Transverse (2) Of high frequency

(3) Longitudinal (4) Reflected

3. Through which character we can distinguish the light waves from sound waves **[CBSE PMT 1990; RPET 2000, 02]**

(1) Interference (2) Refraction

(3) Polarisation (4) Reflection

4. The angle of polarisation for any medium is 60°, what will be critical angle for this **[UPSEAT 1999]**

(1) $\sin^{-1}\sqrt{3}$ (2) $\tan^{-1}\sqrt{3}$

(3) $\cos^{-1}\sqrt{3}$ (4) $\sin^{-1}\frac{1}{\sqrt{3}}$

5. The angle of incidence at which reflected light is totally polarized for reflection from air to glass (refraction index *n*) is **[AIEEE 2004; UPSEAT 2005]**

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

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

6. Which of following can not be polarised **[Kerala PMT 200**

(1) Radio waves (2) Ultraviolet rays

(3) Infrared rays (d) Ultrasonic waves

7. A polaroid is placed at 45° to an incoming light of intensity I_0. Now the intensity of light passing through polaroid after polarisation would be **[CPMT 1995]**

(1) I_0 (2) $I_0 / 2$

(3) $I_0 / 4$ (4) Zero

8. Plane polarised light is passed through a polaroid. On viewing through the polaroid we find that when the polariod is given one complete rotation about the direction of the light, one of the following is observed **[MNR 1993]**

(1) The intensity of light gradually decreases to zero and remains at zero

(2) The intensity of light gradually increases to a maximum and remains at maximum

(3) There is no change in intensity

(4) The intensity of light is twice maximum and twice zero

9. Out of the following statements which is not correct **[CPMT 1991]**

(1) When unpolarised light passes through a Nicol's prism, the emergent light is elliptically polarised

(2) Nicol's prism works on the principle of double refraction and total internal reflection

(3) Nicol's prism can be used to produce and analyse polarised light

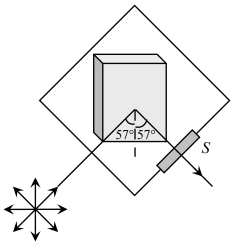
(4) Calcite and Quartz are both doubly refracting crystals

10. A ray of light is incident on the surface of a glass plate at an angle of incidence equal to Brewster's angle ϕ. If μ represents the refractive index of glass with respect to air, then the angle between reflected and refracted rays is **[CPMT 1989]**

(1) $90+\phi$ (2) $\sin^{-1}(\mu\cos\phi)$

(3) 90° (4) $90^o - \sin^{-1}(\sin\phi/\mu)$

11. Figure represents a glass plate placed vertically on a horizontal table with a beam of unpolarised light falling on its surface at the polarising angle of 57° with the normal. The electric vector in the reflected light on screen *S* will vibrate with respect to the plane of incidence in a **[CPMT 1988]**



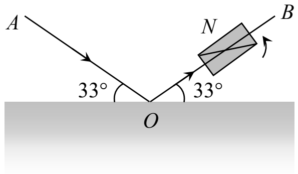
(1) Vertical plane

(2) Horizontal plane

(3) Plane making an angle of 45° with the vertical

(4) Plane making an angle of 57° with the horizontal

12. A beam of light *AO* is incident on a glass slab $(\mu = 1.54)$ in a direction as shown in figure. The reflected ray *OB* is passed through a Nicol prism on viewing through a Nicole prism, we find on rotating the prism that **[CPMT 1986]**



(1) The intensity is reduced down to zero and remains zero

(2) The intensity reduces down some what and rises again

(3) There is no change in intensity

(4) The intensity gradually reduces to zero and then again increases

13. Polarised glass is used in sun glasses because **[CPMT 1981]**

(1) It reduces the light intensity to half an account of polarisation

(2) It is fashionable

(3) It has good colour

(4) It is cheaper

14. In the propagation of electromagnetic waves the angle between the direction of propagation and plane of polarisation is

(1) 0° (2) 45°

(3) 90° (4) 180°

15. The transverse nature of light is shown by **[CPMT 1972, 74, 78; RPMT 1999; AFMC 2001; AIEEE 2002; MP PET 2004; MP PMT 2000, 04; UPSEAT 2005]**

(1) Interference of light (2) Refraction of light

(3) Polarisation of light (4) Dispersion of light

16. A calcite crystal is placed over a dot on a piece of paper and rotated, on seeing through the calcite one will be see **[CPMT 1971]**

(1) One dot

(2) Two stationary dots

(3) Two rotating dots

(4) One dot rotating about the other

17. A light has amplitude *A* and angle between analyser and polariser is 60°. Light is reflected by analyser has amplitude **[UPSEAT 2001]**

(1) $A\sqrt{2}$ (2) $A/\sqrt{2}$

(3) $\sqrt{3}A/2$ (4) $A/2$

18. When light is incident on a doubly refracting crystal, two refracted rays-ordinary ray (*O*-ray) and extra ordinary ray (*E*-ray) are produced. Then **[KCET 2001]**

(1) Both *O*-ray and *E*-ray are polarised perpendicular to the plane of incidence

(2) Both *O*-ray and *E*-ray are polarised in the plane of incidence

(3) *E*-ray is polarised perpendicular to the plane of incidence and *O*-ray in the plane of incidence

(4) *E*-ray is polarised in the plane of incidence and *O*-ray perpendicular to the plane of incidence

19. Light passes successively through two polarimeters tubes each of length 0.29*m*. The first tube contains dextro rotatory solution of concentration $60 kgm^{-3}$ and specific rotation $0.01 rad\ m^2 kg^{-1}$. The second tube contains laevo rotatory solution of concentration $30 kg/m^3$ and specific rotation 0.02 $radm^2 kg^{-1}$. The net rotation produced is **[KCET 2002]**

(1) 15° (2) 0°

(3) 20° (4) 10°

20. V_o and V_E represent the velocities, μ_o and μ_E the refractive indices of ordinary and extraordinary rays for a doubly refracting crystal. Then **[KCET 2002]**

(1) $V_o \geq V_E,\ \mu_o \leq \mu_E$ if the crystal is calcite

(2) $V_o \leq V_E,\ \mu_o \leq \mu_E$ if the crystal is quartz

(3) $V_o \leq V_E,\ \mu_o \geq \mu_E$ if the crystal is calcite

(4) $V_o \geq V_E,\ \mu_o \geq \mu_E$ if the crystal is quartz

21. Polarising angle for water is 53°4'. If light is incident at this angle on the surface of water and reflected, the angle of refraction is **[TNPCEE 2002]**

(1) 53°4' (2) 126°56'

(3) 36°56' (4) 30°4'

22. When a plane polarised light is passed through an analyser and analyser is rotated through 90º, the intensity of the emerging light **[TNPCEE 2002]**

(1) Varies between a maximum and minimum

(2) Becomes zero

(3) Does not vary

(4) Varies between a maximum and zero

23. Consider the following statements *A* to *B* and identify the correct answer

A. Polarised light can be used to study the helical surface of nucleic acids.

B. Optics axis is a direction and not any particular line in the crystal **[EAMCET (Med.) 2003]**

(1) A and B are correct

(2) A and B are wrong

(3) A is correct but B is wrong

(4) A is wrong but B is correct

24. Two Nicols are oriented with their principal planes making an angle of 60°. The percentage of incident unpolarized light which passes through the system is

(1) 50% (2) 100%

(3) 12.5% (4) 37.5%

25. Unpolarized light falls on two polarizing sheets placed one on top of the other. What must be the angle between the characteristic directions of the sheets if the intensity of the final transmitted light is one-third the maximum intensity of the first transmitted beam

(1) 75° (2) 55°

(3) 35° (4) 15°

26. Unpolarized light of intensity $32 Wm^{-2}$ passes through three polarizers such that transmission axes of the first and second polarizer makes and angle 30° with each other and the transmission axis of the last polarizer is crossed with that of the first. The intensity of final emerging light will be

(1) 32 Wm^{-2} (2) 3 Wm^{-2}

(3) 8 Wm^{-2} (4) 4 Wm^{-2}

27. In the visible region of the spectrum the rotation of the place of polarization is given by $\theta = a + \frac{b}{\lambda^2}$. The optical rotation produced by a particular material is found to be 30° *per mm* at $\lambda = 5000$ Å and 50° *per mm* at $\lambda = 4000$Å. The value of constant *a* will be

(1) $+\frac{50°}{9}$ *per mm* (2) $-\frac{50°}{9}$ *per mm*

(3) $+\frac{9°}{50}$ *per mm* (4) $-\frac{9°}{50}$ *per mm*

28. When an unpolarized light of intensity I_0 is incident on a polarizing sheet, the intensity of the light which does not get transmitted is

(1) Zero (2) I_0

(3) $\frac{1}{2} I_0$ (3) $\frac{1}{4} I_0$

29. Refractive index of material is equal to tangent of polarising angle. It is called

(1) Brewster's law (2) Lambert's law
(3) Malus's law (4) Bragg's law

30. In case of linearly polarized light, the magnitude of the electric field vector:
(1) Does not change with time
(2) Varies periodically with time
(3) Increases and decreases linearly with time
(4) Is parallel to the direction of propagation

31. When unpolarised light beam is incident from air onto glass (n = 1.5) at the polarising angle **[KCET 2005]**
(1) Reflected beam is polarised 100 percent
(2) Reflected and refracted beams are partially polarised
(3) The reason for (1) is that almost all the light is reflected
(4) All of the above

32. An optically active compound **[DCE 2005]**
(1) Rotates the plane polarised light
(2) Changing the direction of polarised light
(3) Do not allow plane polarised light to pass through
(4) None of the above

33. When the angle of incidence on a material is 60°, the reflected light is completely polarized. The velocity of the refracted ray inside the material is (in ms^{-1}) **[Kerala PMT 2005]**
(1) 3×10^8 (2) $\left(\frac{3}{\sqrt{2}}\right)\times10^8$
(3) $\sqrt{3}\times10^8$ (4) 0.5×10^8

34. Two polaroids are placed in the path of unpolarized beam of intensity I_0 such that no light is emitted from the second polaroid. If a third polaroid whose polarization axis makes an angle θ with the polarization axis of first polaroid, is placed between these polaroids then the intensity of light emerging from the last polaroid will be **[AIIMS 2005]** **[UPSEAT 2005]**
(1) $\left(\frac{I_0}{8}\right)\sin^2 2\theta$ (2) $\left(\frac{I_0}{4}\right)\sin^2 2\theta$
(3) $\left(\frac{I_0}{2}\right)\cos^4\theta$ (4) $I_0\cos^4\theta$

35. For the study of the helical structure of nucleic acids, the property of electromagnetic radiation generally used is **[EAMCET 2005]**
(1) Reflection (2) Interference
(3) Diffraction (4) Polarization

EM Waves

1. Which of the following statement is wrong **[NCERT 1976]**
(1) Infrared photon has more energy than the photon of visible light
(2) Photographic plates are sensitive to ultraviolet rays
(3) Photographic plates can be made sensitive to infrared rays
(4) Infrared rays are invisible but can cast shadows like visible light rays

2. Pick out the longest wavelength from the following types of radiations **[CBSE PMT 1990]**
(1) Blue light (2) γ-rays
(3) X-rays (4) Red light

3. Wave which cannot travel in vacuum is **[MP PMT 1994]**
(1) X-rays (2) Infrasonic
(3) Ultraviolet (4) Radiowaves

4. Light is an electromagnetic wave. Its speed in vacuum is given by the expression **[CBSE PMT 1993; MP PMT 1994; RPMT 1999; MP PET 2001; Kerala PET 2001; AIIMS 2002]**
(1) $\sqrt{\mu_o\varepsilon_o}$ (2) $\sqrt{\frac{\mu_o}{\varepsilon_o}}$

(3) $\sqrt{\frac{\varepsilon_o}{\mu_o}}$ (4) $\frac{1}{\sqrt{\mu_o\varepsilon_o}}$

5. The range of wavelength of the visible light is **[MP PMT 2000; MP PET 2002]**

(1) 10 Å to 100 Å (2) 4,000 Å to 8,000 Å

(3) 8,000 Å to 10,000 Å (4) 10,000 Å to 15,000 Å

6. Which radiation in sunlight, causes heating effect **[AFMC 2001]**

(1) Ultraviolet (2) Infrared

(3) Visible light (4) All of these

7. Which of the following represents an infrared wavelength **[CPMT 1975; MP PET/PMT 1988]**

(1) 10^{-4} *cm* (2) 10^{-5} *cm*

(3) 10^{-6} *cm* (4) 10^{-7} *cm*

8. The wavelength of light visible to eye is of the order of **[CPMT 1982, 84]**

(1) 10^{-2} *m* (2) 10^{-10} *m*

(3) 1 *m* (4) 6×10^{-7} *m*

9. The speed of electromagnetic wave in vacuum depends upon the source of radiation

(1) Increases as we move from γ-rays to radio waves

(2) Decreases as we move from γ-rays to radio waves

(3) Is same for all of them

(4) None of these

10. Which of the following radiations has the least wavelength **[AIEEE 2003]**

(1) γ-rays (2) β-rays

(3) α-rays (4) X-rays

11. The maximum distance upto which TV transmission from a TV tower of height h can be received is proportional to **[AIIMS 2003]**

(1) $h^{1/2}$ (2) h

(3) $h^{3/2}$ (4) h^2

12. Which of the following are not electromagnetic waves **[AIEEE 2002; CBSE PMT 2003]**

(1) Cosmic rays (2) Gamma rays

(3) β-rays (4) X-rays

13. Ozone is found in **[DPMT 2002]**

(1) Stratosphere (2) Ionosphere

(3) Mesosphere (4) Troposphere

14. The electromagnetic waves travel with a velocity **[J & K CET 2002]**

(1) Equal to velocity of sound

(2) Equal to velocity of light

(3) Less than velocity of light

(4) None of these

15. The ozone layer absorbs **[Kerala PET 2002]**

(1) Infrared radiations (2) Ultraviolet radiations

(3) X-rays (4) γ-rays

16. Electromagnetic radiation of highest frequency is **[Kerala PMT 2004]** **[Kerala PMT 2002]**

(1) Infrared radiations (2) Visible radiation

(3) Radio waves (4) γ-rays

17. Which of the following shows green house effect **[CBSE PMT 2002]**

(1) Ultraviolet rays (2) Infrared rays

(3) X-rays (4) None of these

18. Which of the following waves have the maximum wavelength **[AFMC 2002]**

(1) X-rays (2) I.R. rays

(3) UV rays (4) Radio waves

19. Electromagnetic waves are transverse in nature is evident by **[AIEEE 2002]**

(1) Polarization (2) Interference

(3) Reflection (4) Diffraction

20. If $\vec{E}$ and $\vec{B}$ are the electric and magnetic field vectors of E.M. waves then the direction of propagation of E.M. wave is along the direction of **[CBSE PMT 1992, 2002; DCE 2002, 05]**

(1) $\vec{E}$ (2) $\vec{B}$

(3) $\vec{E}\times\vec{B}$ (4) None of these

21. Biological importance of Ozone layer is **[CBSE PMT 2001]**

(1) It stops ultraviolet rays

(2) Ozone rays reduce green house effect

(3) Ozone layer reflects radio waves

(4) Ozone layer controls O_2/H_2 radio in atmosphere

22. What is ozone hole **[AFMC 2001]**

(1) Hole in the ozone layer

(2) Formation of ozone layer

(3) Thinning of ozone layer in troposphere

(4) Reduction in ozone thickness in stratosphere

23. Which rays are not the portion of electromagnetic spectrum **[Haryana CEET 2000]**

(1) *X*-rays (2) Microwaves

(3) α-rays (4) Radio waves

24. Radio wave diffract around building although light waves do not. The reason is that radio waves **[AMU 2000]**

(1) Travel with speed larger than *c*

(2) Have much larger wavelength than light

(3) Carry news

(4) Are not electromagnetic waves

25. The frequencies of *X*-rays, γ-rays and ultraviolet rays are respectively *a*, *b* and *c*. Then **[CBSE PMT 2000]**

(1) $a < b, b > c$ (2) $a > b, b > c$

(3) $a > b, b < c$ (4) $a < b, b < c$

26. Radio waves and visible light in vacuum have **[KCET 2000]**

(1) Same velocity but different wavelength

(2) Continuous emission spectrum

(3) Band absorption spectrum

(4) Line emission spectrum

27. Energy stored in electromagnetic oscillations is in the form of **[Haryana CEET 2000; AFMC 1994]**

(1) Electrical energy (2) Magnetic energy

(3) Both (1) and (2) (4) None of these

28. Heat radiations propagate with the speed of **[AMU 2000]**

(1) α-rays (2) β-rays

(3) Light waves (4) Sound waves

29. If a source is transmitting electromagnetic wave of frequency $8.2\times10^{6}\,Hz$, then wavelength of the electromagnetic waves transmitted from the source will be **[DPMT 1999]**

(1) 36.6 *m* (2) 40.5 *m*

(3) 42.3 *m* (4) 50.9 *m*

30. In an apparatus, the electric field was found to oscillate with an amplitude of 18 *V*/*m*. The magnitude of the oscillating magnetic field will be **[Pb. PMT 1999]**

(1) $4\times10^{-6}\,T$ (2) $6\times10^{-8}\,T$

(3) $9\times10^{-9}\,T$ (4) $11\times10^{-11}\,T$

31. According to Maxwell's hypothesis, a changing electric field gives rise to **[AIIMS 1998]**

(1) An e.m.f. (2) Electric current

(3) Magnetic field (4) Pressure radiant

32. In an electromagnetic wave, the electric and magnetising fields are $100\,Vm^{-1}$ and $0.265\,Am^{-1}$. The maximum energy flow is **[Pb. PMT 1997, 98]**

(1) $26.5\,W/m^2$ (2) $36.5\,W/m^2$

(3) $46.7\,W/m^2$ (4) $765\,W/m^2$

33. The 21 *cm* radio wave emitted by hydrogen in interstellar space is due to the interaction called the hyperfine interaction is atomic hydrogen.

the energy of the emitted wave is nearly [CBSE PMT 1998]

(1) 10^{-17} *Joule* (2) 1 *Joule*

(3) 7×10^{-8} *Joule* (4) 10^{-24} *Joule*

34. TV waves have a wavelength range of 1-10 *meter*. Their frequency range in *MHz* is [KCET 1998]

(1) 30-300 (2) 3-30

(3) 300-3000 (4) 3-3000

35. Maxwell's equations describe the fundamental laws of [CPMT 1996]

(1) Electricity only (2) Magnetism only

(3) Mechanics only (4) Both (1) and (2)

36. The oscillating electric and magnetic vectors of an electromagnetic wave are oriented along [CBSE PMT 1994]

(1) The same direction but differ in phase by 90°

(2) The same direction and are in phase

(3) Mutually perpendicular directions and are in phase

(4) Mutually perpendicular directions and differ in phase by 90°

37. In which one of the following regions of the electromagnetic spectrum will the vibrational motion of molecules give rise to absorption [SCRA 1994]

(1) Ultraviolet (2) Microwaves

(3) Infrared (4) Radio waves

38. An electromagnetic wave travels along *z*-axis. Which of the following pairs of space and time varying fields would generate such a wave [CBSE PMT 1994]

(1) E_x, B_y (2) E_y, B_x

(3) E_z, B_x (4) E_y, B_z

39. Which of the following rays has the maximum frequency [CBSE PMT 1994]

(1) Gamma rays (2) Blue light

(3) Infrared rays (4) Ultraviolet rays

40. A signal emitted by an antenna from a certain point can be received at another point of the surface in the form of [CPMT 1993]

(1) Sky wave (2) Ground wave

(3) Sea wave (4) Both (1) and (2)

41. Approximate height of ozone layer above the ground is [CBSE PMT 1991]

(1) 60 to 70 *km* (2) 59 *km* to 80 *km*

(3) 70 *km* to 100 *km* (4) 100 *km* to 200 *km*

42. The electromagnetic waves do not transport [Pb. PET 1991]

(1) Energy (2) Charge

(3) Momentum (4) Information

43. A plane electromagnetic wave is incident on a material surface. If the wave delivers momentum *p* and energy *E*, then

(1) $p = 0, E = 0$ (2) $p \neq 0, E \neq 0$

(3) $p \neq 0, E = 0$ (4) $p = 0, E \neq 0$

44. An electromagnetic wave, going through vacuum is described by $E = E_0 \sin(kx - \omega t)$. Which of the following is independent of wavelength

(1) k (2) ω

(3) k/ω (4) $k\omega$

45. An electromagnetic wave going through vacuum is described by $E = E_0 \sin(kx - \omega t)$;

$B = B_0 \sin(kx - \omega t)$. Which of the following equation is true

(1) $E_0 k = B_0 \omega$ (2) $E_0 \omega = B_0 k$

(3) $E_0 B_0 = \omega k$ (4) None of these

46. An *LC* resonant circuit contains a 400 *pF* capacitor and a 100 μH inductor. It is set into oscillation coupled to an antenna. The wavelength of the radiated electromagnetic waves is

(1) 377 *mm* (2) 377 *metre*

(3) 377 *cm* (4) 3.77 *cm*

47. A radio receiver antenna that is 2 *m* long is oriented along the direction of the electromagnetic wave and receives a signal of intensity $5 \times 10^{-16} W/m^2$. The maximum instantaneous potential difference across the two ends of the antenna is

(1) 1.23 μV (2) 1.23 *mV*

(3) 1.23 *V* (4) 12.3 *mV*

48. Television signals broadcast from the moon can be received on the earth while the TV broadcast from Delhi cannot be received at places about 100 *km* distant from Delhi. This is because

(1) There is no atmosphere around the moon

(2) Of strong gravity effect on TV signals

(3) TV signals travel straight and cannot follow the curvature of the earth

(4) There is atmosphere around the earth

49. A TV tower has a height of 100 *m*. The average population density around the tower is 1000 per *km*^{2}. The radius of the earth is 6.4×10^6 *m*. the population covered by the tower is

(1) 2×10^6 (2) 3×10^6

(3) 4×10^6 (4) 6×10^6

50. The wavelength 21 *cm* emitted by atomic hydrogen in interstellar space belongs to

(1) Radio waves (2) Infrared waves

(3) Microwaves (4) γ-rays

51. Which scientist experimentally proved the existence of electromagnetic waves **[AFMC 2004]**

(1) Sir J.C. Bose (2) Maxwell

(3) Marconi (4) Hertz

52. An electromagnetic wave of frequency $\nu = 3.0\ MHz$ passes from vacuum into a dielectric medium with permitivity $\varepsilon = 4.0$. Then **[AIEEE 2004]**

(1) Wavelength is doubled and the frequency remains unchanged

(2) Wavelength is doubled and frequency becomes half

(3) Wavelength is halved and frequency remains unchanged

(4) Wavelength and frequency both remain unchanged

53. Frequency of a wave is $6 \times 10^{15} Hz$. The wave is **[Orissa PMT 2004]**

(1) Radiowave (2) Microwave

(3) X-ray (4) None of these

54. The region of the atmosphere above troposphere is known as **[BCECE 2004]**

(1) Lithosphere (2) Uppersphere

(3) Ionosphere (4) Stratosphere

55. Which of the following electromagnetic waves have minimum frequency **[Pb PET 2000]**

(1) Microwaves (2) Audible waves

(3) Ultrasonic waves (4) Radiowaves

56. Which one of the following have minimum wavelength **[Pb PET 2001]**

(1) Ultraviolet rays (2) Cosmic rays

(3) *X*-rays (4) $\gamma -$rays

57. Radiations of intensity $0.5\ W/m^2$ are striking a metal plate. The pressure on the plate is **[DCE 2004]**

(1) $0.166 \times 10^{-8}\ N/m^2$ (2) $0.332 \times 10^{-8}\ N/m^2$

(3) $0.111 \times 10^{-8}\ N/m^2$ (4) $0.083 \times 10^{-8}\ N/m^2$

58. Electromagnetic waves travel in a medium which has relative permeability 1.3 and relative permittivity 2.14. Then the speed of the electromagnetic wave in the medium will be **[MH CET 2003]**

(1) $13.6 \times 10^6\ m/s$ (2) $1.8 \times 10^2\ m/s$

(3) $3.6 \times 10^8\ m/s$ (4) $1.8 \times 10^8\ m/s$

59. The intensity of gamma radiation from a given source is *I*. On passing through 36 *mm* of lead, it is reduced to $\frac{I}{8}$. The thickness of lead which will reduce the intensity to $\frac{I}{2}$ will be

[AIEEE 2005]

(1) 18 *mm* (2) 12 *mm*

(3) 6 *mm* (4) 9 *mm*

60. If λ_v, λ_r and λ_m represent the wavelength of visible light *x*-rays and microwaves respectively, then **[CBSE PMT 2005]**

(1) $\lambda_m > \lambda_x > \lambda_v$ (2) $\lambda_v > \lambda_m > \lambda_y$

(3) $\lambda_m > \lambda_v > \lambda_v$ (4) $\lambda_v > \lambda_x > \lambda_m$

61. For skywave propagation of a 10 *MHz* signal, what should be the minimum electron density in ionosphere

[AFMC 2005]

(1) ~ $1.2 \times 10^{12} m^{-3}$ (2) ~ $10^6 m^{-3}$

(3) ~ $10^{14} m^{-3}$ (4) ~ $10^{22} m^{-3}$

62. The pressure exerted by an electromagnetic wave of intensity *I* (*watts*/*m*^{2}) on a nonreflecting surface is [*c* is the velocity of light] **[AFMC 2005]**

(1) Ic (2) Ic^2

(3) I/c (4) I/c^2

63. Infrared radiation was discovered in 1800 by

[KCET 2005]

(1) William Wollaston (2) William Herschel

(3) Wilhelm Roentgen(4) Thomas Young

64. Which of the following is electromagnetic wave

[BCECE 2005]

(1) *X*-rays and light waves

(2) Cosmic rays and sound waves

(3) Beta rays and sound waves

(4) Alpha rays and sound waves

65. Which one of the following is not electromagnetic in nature

[Kerala PMT 2005]

(1) *X*-rays (2) Gamma rays

(3) Cathode rays (4) Infrared rays

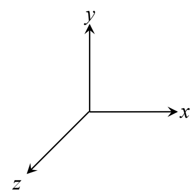
66. Light wave is travelling along y-direction. If the corresponding $\vec{E}$ vector at any time is along the x-axis, the direction of $\vec{B}$ vector at that time is along **[UPSEAT 2005]**

(1) *y*-axis

(2) *x*-axis

(3) + *z*-axis

(4) – *z* axis



67. If *c* is the speed of electromagnetic waves in vacuum, its speed in a medium of dielectric constant *K* and relative permeability μ_r is

[Kerala PET 2005]

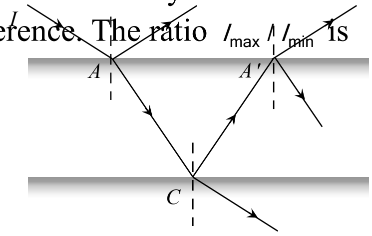
(1) $v = \frac{1}{\sqrt{\mu_r K}}$ (2) $v = c\sqrt{\mu_r K}$

(3) $v = \frac{c}{\sqrt{\mu_r K}}$ (4) $v = \frac{K}{\sqrt{\mu_r C}}$

Critical Thinking

Objective Questions

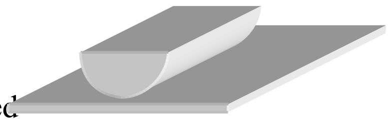
1. A ray of light of intensity *I* is incident on a parallel glass-slab at a point *A* as shown in fig. It undergoes partial reflection and refraction. At each reflection 25% of incident energy is reflected. The rays *AB* and *A'B'* undergo interference. The ratio I_{max}/I_{min} is



(1) 4 : 1 (2) 8 : 1

(3) 7 : 1 (4) 49 : 1

2. A thin slice is cut out of a glass cylinder along a plane parallel to its axis. The slice is placed on a flat glass plate as shown. The observed interference fringes from this combination shall be **[IIT-JEE (Screening)1999]**



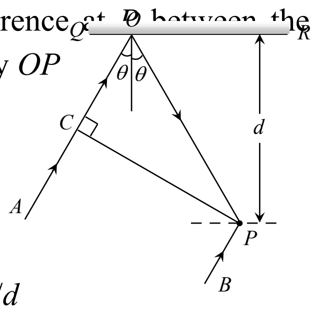
(1) Straight

(2) Circular

(3) Equally spaced

(4) Having fringe spacing which increases as we go outwards

3. In the adjacent diagram, CP represents a wavefront and *AO* & *BP*, the corresponding two rays. Find the condition on θ for constructive interference at P between the ray *BP* and reflected ray *OP* **[IIT-JEE (Screening) 2003]**



(1) $\cos\theta = 3\lambda/2d$

(2) $\cos\theta = \lambda/4d$

(3) $\sec\theta - \cos\theta = \lambda/d$

(4) $\sec\theta - \cos\theta = 4\lambda/d$

4. In Young's double slit experiment, if monochromatic light is replaced by white light **[AIIMS 2001; Kerala PET 2000; KCET 2004]**

(1) All bright fringes become white

(2) All bright fringes have colours between violet and red

(3) Only the central fringe is white, all other fringes are coloured

(4) No fringes are observed

5. In Young's double slit experiment, if the two slits are illuminated with separate sources, no interference pattern is observed because

(1) There will be no constant phase difference between the two waves

(2) The wavelengths are not equal

(3) The amplitudes are not equal

(4) None of the above

6. In Young's double slit experiment, white light is used. The separation between the slits is *b*. The screen is at a distance *d* (*d*>> *b*) from the slits. Some wavelengths are missing exactly in front of one slit. These wavelengths are **[IIT 1984; AIIMS 1995]**

(1) $\lambda = \frac{b^2}{d}$ (2) $\lambda = \frac{2b^2}{d}$

(3) $\lambda = \frac{b^2}{3d}$ (4) $\lambda = \frac{2b^2}{3d}$

7. In a Young's double slit experiment the source *S* and the two slits *A* and *B* are vertical with slit *A* above slit *B*. The fringes are observed on a vertical screen *K*. The optical path length from *S* to *B* is increased very slightly (by introducing a transparent material of higher refractive index) and the optical path length from *S* to *A* is not changed, as a result the fringe system on *K* moves **[NCERT 1984]**

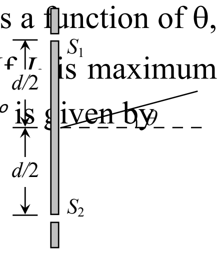
(1) Vertically downwards slightly

(2) Vertically upwards slightly

(3) Horizontally, slightly to the left

(4) Horizontally, slightly to the right

8. In an interference arrangement similar to Young's double slit experiment, the slits S_1 and S_2 are illuminated with coherent microwave sources each of frequency 10^6 *Hz*. The sources are synchronized to have zero phase difference. The slits are separated by distance $d = 150$ *m*. The intensity $I(\theta)$ is measured as a function of θ, where θ is defined as shown. If I_0 is maximum intensity, then $I(\theta)$ for $0 \le \theta \le 90^o$ is given by



(1) $I(\theta) = I_0$ for $\theta = 0^o$

(2) $I(\theta) = I_0 / 2$ for $\theta = 30^o$

(3) $I(\theta) = I_0 / 4$ for $\theta = 90^o$

(4) $I(\theta)$ is constant for all values of θ

9. In the Young's double slit experiment, if the phase difference between the two waves interfering at a point is ϕ, the intensity at that point can be expressed by the expression **[MP PET 1998; MP PMT 2003]**

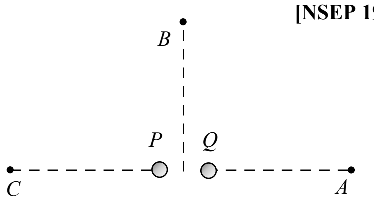
(1) $I = \sqrt{A^2 + B^2 \cos^2 \phi}$ (2) $I = \frac{A}{B}\cos\phi$

(3) $I = A + B\cos\frac{\phi}{2}$ (4) $I = A + B\cos\phi$

Where A and B depend upon the amplitudes of the two waves.

10. Figure here shows P and Q as two equally intense coherent sources emitting radiations of wavelength 20 *m*. The separation PQ is 5.0 *m* and phase of P is ahead of the phase of Q by 90°. A, B and C are three distant points of observation equidistant from the mid-point of PQ. The intensity of radiations at A, B, C will bear the ratio

[NSEP 1994]



(1) 0 : 1 : 4

(2) 4 : 1 : 0

(3) 0 : 1 : 2

(4) 2 : 1 : 0

11. In Young's double slit experiment, the intensity on the screen at a point where path difference is λ is K. What will be the intensity at the point where path difference is $\lambda/4$

[RPET 1996]

(1) $\frac{K}{4}$ (2) $\frac{K}{2}$

(3) K (4) Zero

12. When one of the slits of Young's experiment is covered with a transparent sheet of thickness 4.8 *mm*, the central fringe shifts to a position originally occupied by the 30th bright fringe. What should be the thickness of the sheet if the central fringe has to shift to the position occupied by 20th bright fringe

(1) 3.8 *mm* (2) 1.6 *mm*

(3) 7.6 *mm* (4) 3.2 *mm*

13. In the ideal double-slit experiment, when a glass-plate (refractive index 1.5) of thickness t is introduced in the path of one of the interfering beams (wavelength λ), the intensity at the position where the central maximum occurred previously remains unchanged. The minimum thickness of the glass-plate is

(1) 2λ (2) $\frac{2\lambda}{3}$

(3) $\frac{\lambda}{3}$ (4) λ

14. The time period of rotation of the sun is 25 days and its radius is $7\times10^8 m$. The Doppler shift for the light of wavelength 6000 Å emitted from the surface of the sun will be

(1) 0.04 Å (2) 0.40 Å

(3) 4.00 Å (4) 40.0 Å

15. In hydrogen spectrum the wavelength of H_α line is 656 *nm* whereas in the spectrum of a distant galaxy, H_α line wavelength is 706 *nm*. Estimated speed of the galaxy with respect to earth is **[IIT-JEE 1999; UPSEAT 2003]**

(1) $2\times10^8 m/s$ (2) $2\times10^7 m/s$

(3) $2\times10^6 m/s$ (4) $2\times10^5 m/s$

16. A rocket is going towards moon with a speed v. The astronaut in the rocket sends signals of frequency ν towards the moon and receives them back on reflection from the moon. What will be the frequency of the signal received by the astronaut (Take $v<<c$)

(1) $\frac{c}{c-v}\nu$ (2) $\frac{c}{c-2v}\nu$

(3) $\frac{2v}{c}\nu$ (4) $\frac{2c}{v}\nu$

17. The periodic time of rotation of a certain star is 22 days and its radius is 7 × 10^8 *metres*. If the wavelength of light emitted by its surface be 4320 Å, the Doppler shift will be (1 day = 86400 *sec*) **[MP PET 2001]**

[KCET 2002]

(1) 0.033 Å (2) 0.33 Å

(3) 3.3 Å (4) 33 Å

18. In a two slit experiment with monochromatic light fringes are obtained on a screen placed at some distance from the sits. If the screen is moved by $5\times10^{-2} m$ towards the slits, the change in fringe width is $3\times10^{-5} m$. If separation between the slits is $10^{-3} m$, the wavelength of light used is

[IIT-JEE (Screening) 2002]

[Roorkee 1992]

(1) 6000 Å (2) 5000 Å

(3) 3000 Å (4) 4500 Å

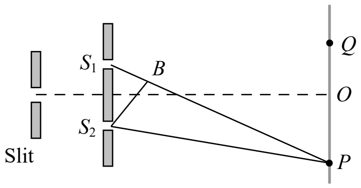
19. In the figure is shown Young's double slit experiment. Q is the position of the first bright fringe on the right side of O. P is the 11th fringe on the other side, as measured from Q. If the wavelength of the light used is $6000\times10^{-10}m$, then S_1B will be equal to

(1) $6\times10^{-6}m$

(2) $6.6\times10^{-6}m$

(3) $3.138\times10^{-7}m$

(4) $3.144\times10^{-7}m$



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

[IIT-JEE 1986; RPMT 2002]

(1) 1 : 2 (2) 2 : 1

(3) 4 : 1 (4) 1 : 1

21. Four light waves are represented by

(i) $y = a_1 \sin\omega t$ (ii) $y = a_2 \sin(\omega t + \phi)$

(iii) $y = a_1 \sin 2\omega t$ (iv) $y = a_2 \sin 2(\omega t + \phi)$

Interference fringes may be observed due to superposition of

(1) (i) and (ii) (2) (i) and (iii)

(3) (ii) and (iv) (4) (iii) and (iv)

22. In Young's double slit experiment the y-coordinates of central maxima and 10th maxima are 2 cm and 5 cm respectively. When the YDSE apparatus is immersed in a liquid of refractive index 1.5 the corresponding y-coordinates will be

(1) 2 cm, 7.5 cm

(2) 3 cm, 6 cm

(3) 2 cm, 4 cm

(4) 4/3 cm, 10/3 cm

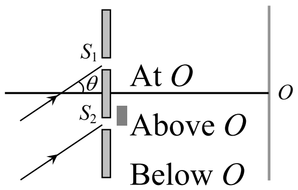
[CPMT 1986, 92]

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

(1) $\frac{I_0}{2}$ (2) $\frac{3}{4}I_0$

(3) I_0 (4) $\frac{I_0}{4}$

24. A monochromatic beam of light falls on YDSE apparatus at some angle (say θ) as shown in figure. A thin sheet of glass is inserted in front of the lower slit S_2. The central bright fringe (path difference = 0) will be obtained



(1) At O

(2) Above O

(3) Below O

(4) Anywhere depending on angle θ, thickness of plate t and refractive index of glass μ

25. In Young's double slit experiment how many maximas can be obtained on a screen (including the central maximum) on both sides of the central fringe if $\lambda = 2000$ Å and $d = 7000$ Å

(1) 12 (2) 7

(3) 18 (4) 4

26. In a Young's double slit experiment, the slits are 2 mm apart and are illuminated with a mixture of two wavelength $\lambda_0 = 750 nm$ and $\lambda = 900 nm$. The minimum distance from the common central bright fringe on a screen 2m from the slits where a bright fringe from one interference pattern coincides with a bright fringe from the other is

(1) 1.5 *mm* (2) 3 *mm*

(3) 4.5 *mm* (4) 6 *mm*

27. A flake of glass (refractive index 1.5) is placed over one of the openings of a double slit apparatus. The interference pattern displaces itself through seven successive maxima towards the side where the flake is placed. if wavelength of the diffracted light is $\lambda = 600 nm$, then the thickness of the flake is

(1) 2100 *nm* (2) 4200 *nm*

(3) 8400 *nm* (4) None of these

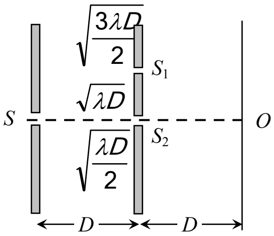
28. Two ideal slits S_1 and S_2 are at a distance d apart, and illuminated by light of wavelength λ passing through an ideal source slit S placed on the line through S_2 as shown. The distance between the planes of slits and the source slit is D. A screen is held at a distance D from the plane of the slits. The minimum value of d for which there is darkness at O is

(1) $\sqrt{\frac{3\lambda D}{2}}$

(2) $\sqrt{\lambda D}$

(3) $\sqrt{\frac{\lambda D}{2}}$

(4) $\sqrt{3\lambda D}$



29. In a double slit arrangement fringes are produced using light of wavelength 4800 $Å$. One slit is covered by a thin plate of glass of refractive index 1.4 and the other with another glass plate of same thickness but of refractive index 1.7. By doing so the central bright shifts to original fifth bright fringe from centre. Thickness of glass plate is

(1) 8 μm (2) 6 μm

(3) 4 μm (4) 10 μm

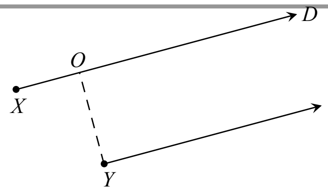
30. Two point sources X and Y emit waves of same frequency and speed but Y lags in phase behind X by $2\pi l$ radian. If there is a maximum in direction D the distance XO using n as an integer is given by

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

(2) $\lambda(n+l)$

(3) $\frac{\lambda}{2}(n+l)$

(4) $\lambda(n-l)$



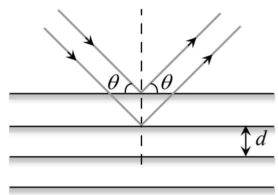
31. A beam with wavelength λ falls on a stack of partially reflecting planes with separation d. The angle θ that the beam should make with the planes so that the beams reflected from successive planes may interfere constructively is (where n =1, 2, ……)

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

(2) $\tan^{-1}\left(\frac{n\lambda}{d}\right)$

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

(4) $\cos^{-1}\left(\frac{n\lambda}{2d}\right)$



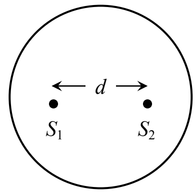
32. Two coherent sources separated by distance d are radiating in phase having wavelength λ. A detector moves in a big circle around the two sources in the plane of the two sources. The angular position of n = 4 interference maxima is given as

(1) $\sin^{-1}\frac{n\lambda}{d}$

(2) $\cos^{-1}\frac{4\lambda}{d}$

(3) $\tan^{-1}\frac{d}{4\lambda}$

(4) $\cos^{-1}\frac{\lambda}{4d}$



33. Two coherent sources S_1 and S_2 are separated by a distance four times the wavelength λ of the source. The sources lie along y axis whereas a detector moves along + x axis. Leaving the origin and far off points the number of points where maxima are observed is

(1) 2 (2) 3

(3) 4 (4) 5

34. A circular disc is placed in front of a narrow source. When the point of observation is at a distance of 1 *meter* from the disc, then the disc covers first HPZ. The intensity at this point is

I_0. The intensity at a point distance 25 *cm* from the disc will be

(1) $I_1 = 0.531 I_0$ (2) $I_1 = 0.053 I_0$

(3) $I_1 = 53 I_0$ (4) $I_1 = 5.03 I_0$

35. A wavefront presents one, two and three HPZ at points *A*, *B* and *C* respectively. If the ratio of consecutive amplitudes of HPZ is 4 : 3, then the ratio of resultant intensities at these point will be

(1) 169 : 16 : 256 (2) 256 : 16 : 169

(3) 256 : 16 : 196 (4) 256 : 196 : 16

36. A circular disc is placed in front of a narrow source. When the point of observation is 2 *m* from the disc, then it covers first HPZ. The intensity at this point is *I*. When the point of observation is 25 *cm* from the disc then intensity will be

(1) $\left(\frac{R_6}{R_2}\right)^2 I$ (2) $\left(\frac{R_7}{R_2}\right)^2 I$

(3) $\left(\frac{R_8}{R_2}\right)^2 I$ (4) $\left(\frac{R_9}{R_2}\right)^2 I$

37. In a single slit diffraction of light of wavelength λ by a slit of width *e*, the size of the central maximum on a screen at a distance *b* is

(1) $2b\lambda + e$ (2) $\frac{2b\lambda}{e}$

(3) $\frac{2b\lambda}{e} + e$ (4) $\frac{2b\lambda}{e} - e$

38. Angular width of central maxima in the Fraunhoffer diffraction pattern of a slit is measured. The slit is illuminated by light of wavelength 6000 Å. When the slit is illuminated by light of another wavelength, the angular width decreases by 30%. The wavelength of this light will be

(1) 6000 Å (2) 4200 Å

(3) 3000 Å (4) 1800 Å

39. In a single slit diffraction experiment first minimum for red light (660 *nm*) coincides with first maximum of some other wavelength λ'. The value of λ' is

(1) 4400 Å (2) 6600 Å

(3) 2000 Å (4) 3500 Å

40. The ratio of intensities of consecutive maxima in the diffraction pattern due to a single slit is

(1) 1 : 4 : 9 (2) 1 : 2 : 3

(3) $1 : \frac{4}{9\pi^2} : \frac{4}{25\pi^2}$ (4) $1 : \frac{1}{\pi^2} : \frac{9}{\pi^2}$

41. Light is incident normally on a diffraction grating through which the first order diffraction is seen at 32°. The second order diffraction will be seen at

(1) 48°

(2) 64°

(3) 80°

(4) There is no second order diffraction in this case

42. White light may be considered to be a mixture of waves with λ ranging between 3900 Å and 7800 Å. An oil film of thickness 10,000 Å is examined normally by reflected light. If μ = 1.4, then the film appears bright for

(1) 4308 Å, 5091 Å, 6222 Å

(2) 4000 Å, 5091 Å, 5600 Å

(3) 4667 Å, 6222 Å, 7000 Å

(4) 4000 Å, 4667 Å, 5600 Å, 7000Å

43. Among the two interfering monochromatic sources *A* and *B*; *A* is ahead of *B* in phase by 66°. If the observation be taken from point *P*, such that $PB - PA = \lambda/4$. Then the phase difference between the waves from *A* and *B* reaching *P* is

(1) 156° (2) 140°

(3) 136° (4) 126°

44. The ratio of the intensity at the centre of a bright fringe to the intensity at a point one-quarter of the distance between two fringe from the centre is

(1) 2 (2) 1/2

(3) 4 (4) 16

45. A parallel plate capacitor of plate separation 2 *mm* is connected in an electric circuit having source voltage 400 *V*. if the plate area is 60

cm^2, then the value of displacement current for 10^{-6} sec will be

(1) 1.062 *amp* (2) 1.062×10^{-2} *amp*

(3) 1.062×10^{-3} *amp* (4) 1.062×10^{-4} *amp*

46. A long straight wire of resistance *R*, radius *a* and length *l* carries a constant current *I*. The Poynting vector for the wire will be

(1) $\frac{IR}{2\pi al}$ (2) $\frac{IR^2}{al}$

(3) $\frac{I^2R}{al}$ (4) $\frac{I^2R}{2\pi al}$

47. In an electromagnetic wave, the amplitude of electric field is 1 *V/m*. the frequency of wave is $5\times10^{14}\,Hz$. The wave is propagating along *z*-axis. The average energy density of electric field, in *Joule/m*^{3}, will be

(1) 1.1×10^{-11} (2) 2.2×10^{-12}

(3) 3.3×10^{-13} (4) 4.4×10^{-14}

48. A laser beam can be focussed on an area equal to the square of its wavelength *A He-Ne* laser radiates energy at the rate of 1*mW* and its wavelength is 632.8 *nm*. The intensity of focussed beam will be

(1) $1.5\times10^{13}\,W/m^2$ (2) $2.5\times10^{9}\,W/m^2$

(3) $3.5\times10^{17}\,W/m^2$ (4) None of these

49. A lamp emits monochromatic green light uniformly in all directions. The lamp is 3% efficient in converting electrical power to electromagnetic waves and consumes 100*W* of power. The amplitude of the electric field associated with the electromagnetic radiation at a distance of 10*m* from the lamp will be

(1) 1.34 *V/m* (2) 2.68 *V/m*

(3) 5.36 *V/m* (4) 9.37 *V/m*

50. A point source of electromagnetic radiation has an average power output of 800 *W*. The maximum value of electric field at a distance 4.0 *m* from the source is

(1) 64.7 *V/m* (2) 57.8 *V/m*

(3) 56.72 *V/m* (4) 54.77 *V/m*

51. A wave is propagating in a medium of electric dielectric constant 2 and relative magnetic permeability 50. The wave impedance of such a medium is

(1) 5 Ω (2) 376.6 Ω

(3) 1883 Ω (4) 3776 Ω

52. A plane electromagnetic wave of wave intensity 6 *W/m*^{2} strikes a small mirror area 40 *cm*^{2}, held perpendicular to the approaching wave. The momentum transferred by the wave to the mirror each second will be

(1) $6.4\times10^{-7}\,kg-m/s^2$ (2) $4.8\times10^{-8}\,kg-m/s^2$

(3) $3.2\times10^{-9}\,kg-m/s^2$ (4) $1.6\times10^{-10}\,kg-m/s^2$

53. Specific rotation of sugar solution is 0.01 SI units. 200 kgm^{-3} of impure sugar solution is taken in a polarimeter tube of length 0.25*m* and an optical rotation of 0.4*rad* is observed. The percentage of purity of sugar is the sample is **[KCET 2004]**

(1) 80% (2) 89%

(3) 11% (4) 20%

54. A 20 *cm* length of a certain solution causes right-handed rotation of 38°. A 30*cm* length of another solution causes left-handed rotation of 24°. The optical rotation caused by 30*cm* length of a mixture of the above solutions in the volume ratio 1 : 2 is **[KCET 2001]**

(1) Left handed rotation of 14°

(2) Right handed rotation of 14°

(3) Left handed rotation of 3°

(4) Right handed rotation of 3°

55. A beam of natural light falls on a system of 6 polaroids, which are arranged in succession such that each polaroid is turned through 30° with respect to the preceding one. The percentage of incident intensity that passes through the system will be

(1) 100% (2) 50%
(3) 30% (4) 12%

56. A beam of plane polarized light falls normally on a polarizer of cross sectional area $3 \times 10^{-4} m^2$. Flux of energy of incident ray in 10^{-3} *W*. The polarizer rotates with an angular frequency of 31.4 *rad/sec*. The energy of light passing through the polarizer per revolution will be

(1) 10^{-4} *Joule* (2) 10^{-3} *Joule*
(3) 10^{-2} *Joule* (4) 10^{-1} *Joule*

57. In a YDSE bi-chromatic light of wavelengths 400 *nm* and 560 *nm* are used. The distance between the slits is 0.1 *mm* and the distance between the plane of the slits and the screen is 1*m*. The minimum distance between two successive regions of complete darkness is **[IIT JEE (Screening) 2004]**

(1) 4 *mm* (2) 5.6 *mm*
(3) 14 *mm* (4) 28 *mm*

58. The maximum number of possible interference maxima for slit-separation equal to twice the wavelength in Young's double-slit experiment is **[AIEEE 2004]**

(1) Infinite (2) Five
(3) Three (4) Zero

59. The *k* line of singly ionised calcium has a wavelength of 393.3 *nm* as measured on earth. In the spectrum of one of the observed galaxies, this spectral line is located at 401.8 *nm*. The speed with which the galaxy is moving away from us, will be **[Pb. PET 2003]**

(1) 6480 *km/s* (2) 3240 *km/s*
(3) 4240 *km/sec* (4) None of these

60. A Young's double slit experiment uses a monochromatic source. The shape of the interference fringes formed on a screen is **[AIEEE 2005]**

(1) Straight line (2) Parabola
(3) Hyperbola (4) Circle

61. If I_0 is the intensity of the principal maximum in the single slit diffraction pattern, then what will be its intensity when the slit width is doubled **[AIEEE 2005]**

(1) I_0 (2) $\frac{I_0}{2}$
(3) $2I_0$ (4) $4I_0$

62. In Young's double slit experiment intensity at a point is (1/4) of the maximum intensity. Angular position of this point is **[IIT-JEE (Screening) 2005]**

(1) $\sin^{-1}(\lambda/d)$ (2) $\sin^{-1}(\lambda/2d)$
(3) $\sin^{-1}(\lambda/3d)$ (4) $\sin^{-1}(\lambda/4d)$

63. A beam of electron is used in an *YDSE* experiment. The slit width is d. When the velocity of electron is increased, then **[IIT-JEE (Screening) 2005]**

(1) No interference is observed
(2) Fringe width increases
(3) Fringe width decreases
(4) Fringe width remains same