Unit 14: Optics

80 MCQs. Correct option in bold. 1 mark each.

1. When a ray of light approaches a smooth polished surface and bounces back, it is called
A. dispersion B. refraction
C. reflection D. diffraction

2. The line perpendicular to the reflecting surface at the point of incidence is called the
A. radius **B. normal**
C. tangent D. principal axis

3. The first law of reflection states that the incident ray, the reflected ray and the normal
A. are parallel B. lie in different planes
C. are perpendicular to each other **D. all lie in the same plane**

4. The second law of reflection states that the angle of incidence
A. is equal to the angle of reflection B. is always 90°
C. is less than the angle of reflection D. is greater than the angle of reflection

5. An incident ray makes an angle of 45° with a plane mirror. The angle of reflection is
A. 90° B. 60° C. 30° **D. 45°**

6. A ray of light strikes a plane mirror at an angle of 47° with the surface. The angle between the incident and reflected rays is
A. 43° B. 47° **C. 86°** D. 94°

7. The image formed by a plane mirror is always
A. real and erect **B. virtual and erect**
C. real and inverted D. virtual and inverted

8. The image formed by a plane mirror is
A. the same size as the object B. half the size
C. smaller than the object D. larger than the object

9. In a plane mirror, the distance of the image from the mirror is
A. half the object distance
B. twice the object distance
C. equal to the distance of the object from the mirror
D. zero

10. A virtual image
A. is always inverted B. can be projected on a screen
C. is formed by actual meeting of rays **D. cannot be projected on a screen**

11. Refraction of light is the change in
A. colour of light
B. direction of light as it passes from one medium to another
C. frequency of light only
D. intensity of light only

12. The speed of light in vacuum is
A. 3×10^8 m/s B. 3×10^5 m/s
C. 3×10^{10} m/s D. 3×10^6 m/s

13. The speed of light in matter is
A. equal to that in vacuum **B. less than that in vacuum**
C. infinite D. greater than that in vacuum

14. Light bends towards the normal when it
A. travels along the normal only B. enters a medium of equal density
C. speeds up on entering a rarer medium **D. slows down on entering a denser medium**

15. Light bends away from the normal when it
A. reflects from a mirror B. enters at 0° incidence
C. speeds up on entering a rarer medium D. slows down on entering a denser medium

16. Refractive index of a medium is defined as
A. speed of light in vacuum divided by speed of light in the medium
B. difference of the two speeds
C. product of the two speeds
D. speed of light in the medium divided by speed in vacuum

17. The formula for refractive index is
A. n = v/c **B. n = c/v** C. n = c − v D. n = cv

18. The refractive index of any medium cannot be
A. equal to 1.5 B. equal to 2
C. less than 1 D. greater than 1

19. The speed of light in diamond (n = 2.419) is about
A. 1.24×10^8 m/s B. 3×10^8 m/s
C. 2.4×10^8 m/s D. 7.3×10^8 m/s

20. The speed of light in a medium of refractive index 1.7 is about
A. 3×10^8 m/s B. 1.7×10^8 m/s
C. 5.1×10^8 m/s **D. 1.76×10^8 m/s**

21. The speed of light in diamond if its refractive index is 2.5 is
A. 1.2×10^8 m/s B. 5.2×10^8 m/s
C. 2.5×10^8 m/s D. 7.5×10^8 m/s

22. Snell's law is expressed as
A. $n_1 \tan\theta_1 = n_2 \tan\theta_2$ B. $n_1 \cos\theta_1 = n_2 \cos\theta_2$
C. $n_1 \sin\theta_1 = n_2 \sin\theta_2$ D. $n_1\,\theta_1 = n_2\,\theta_2$

23. The refractive index of a medium into which light enters from air at 37° and is refracted at 21° is about
A. 2.2 **B. 1.68** C. 1.2 D. 0.6

24. If light enters a medium at right angles to the boundary, the angle of refraction is
A. 90° B. equal to the critical angle
C. 45° **D. 0°**

25. A glass slab dipped in a liquid of the same refractive index shows no boundary because refraction is
A. zero B. infinite
C. maximum D. minimum but not zero

26. The apparent flattening of the Sun at dawn and dusk is due to
A. polarization B. reflection
C. refraction D. dispersion

27. A ray travelling in a medium of index 1.6 enters at 21° into a medium of index 1.7. The angle of refraction is about
A. 24° **B. 19.7°** C. 21° D. 22.3°

28. The angle of incidence in the denser medium for which the angle of refraction is 90° is called the
A. angle of reflection B. Brewster angle
C. angle of deviation **D. critical angle**

29. Total internal reflection occurs when light travels from a
A. denser medium to a rarer medium at an angle greater than the critical angle
B. denser to rarer medium at an angle less than the critical angle
C. rarer medium to a denser medium
D. rarer to denser medium at any angle

30. Total internal reflection can occur only when light travels from
A. a rarer to a denser medium **B. a denser to a rarer medium**
C. air to glass D. air to water

31. The formula for the critical angle is
A. $\tan\theta c = n$ B. $\sin\theta c = n$
C. $\cos\theta c = 1/n$ **D. $\sin\theta c = 1/n$**

32. The critical angle of polystyrene (n = 1.49) surrounded by air is
A. 90° B. 60° **C. 42.2°** D. 32.2°

33. The critical angle for light travelling from a medium of index 1.63 into a medium of index 1.35 is about
A. 35° B. 42° C. 90° **D. 55.9°**

34. When the angle of incidence equals the critical angle, the refracted ray
A. bends towards the normal B. is totally reflected
C. moves along the boundary D. goes into the second medium at 45°

35. The working principle of optical fibres is
A. total internal reflection B. refraction
C. diffraction D. dispersion

36. The mirage on a road in summer is explained by
A. diffraction **B. total internal reflection**
C. polarization D. dispersion

37. An advantage of optical fibres over copper cables is
A. more power consumption B. greater electrical interference
C. lower bandwidth **D. higher bandwidth and faster speed**

38. A converging lens is also called a
A. plane lens B. concave lens
C. convex lens D. diverging lens

39. A converging lens is
A. flat
B. thicker at the centre and thinner at the edges
C. equally thick everywhere
D. thinner at the centre and thicker at the edges

40. The focal length of a converging lens is
A. positive B. infinite C. negative D. zero

41. The focal point of a concave lens is
A. at the optical centre B. at infinity
C. virtual D. real

42. The image formed by a convex lens for an object at infinity is
A. real and enlarged at 2F **B. real, at the focus and highly diminished**
C. virtual and enlarged D. virtual and diminished

43. An object placed beyond 2F of a convex lens forms an image that is
A. virtual and enlarged
B. real and enlarged beyond 2F
C. real and same size
D. real, inverted and smaller, between F and 2F

44. An object placed at 2F of a convex lens forms an image that is
A. real, inverted and the same size at 2F B. formed at infinity
C. virtual and enlarged D. real and smaller

45. An object placed between F and 2F of a convex lens forms an image that is
A. real and smaller B. at infinity
C. real, inverted and larger, beyond 2F D. virtual and enlarged

46. An object placed inside F of a convex lens forms an image that is
A. virtual and diminished **B. virtual, erect and enlarged**
C. real and inverted D. real and diminished

47. The image formed by a diverging lens for an object at infinity is
A. virtual and enlarged B. real and inverted
C. real and enlarged **D. virtual, upright and diminished**

48. Linear magnification is also equal to
A. q/p B. p × q C. p/q D. p − q

49. An object of height 2 cm is placed 6 cm from a lens with magnification 3. The image height is
A. 12 cm B. 18 cm C. 2 cm **D. 6 cm**

50. An object of height 2 cm is placed 6 cm from a lens with magnification 3. The image distance is
A. 18 cm B. 6 cm C. 9 cm D. 2 cm

51. An object of height 3 cm at a distance of 5 cm is placed from a lens with magnification 3. The image height and distance are
A. 9 cm and 1.7 cm B. 1 cm and 1.7 cm
C. 9 cm and 15 cm D. 15 cm and 9 cm

52. An object is placed at 10 cm from a convex lens of focal length 5 cm. The linear magnification is
A. 2 **B. 1** C. 0.5 D. 3

53. A real image
A. can be caught on a screen
B. is formed by imaginary intersection of rays
C. cannot be caught on a screen
D. is always erect

54. A real image is always
A. virtual B. erect **C. inverted** D. smaller

55. A magnifying glass uses a
A. prism B. concave lens
C. plane mirror **D. convex lens**

56. To use a magnifying glass, the object must be placed
A. at infinity **B. closer than the focal point**
C. beyond 2F D. at 2F

57. A magnifying glass forms an image that is
A. enlarged, inverted and real B. diminished and virtual
C. diminished and real **D. enlarged, erect and virtual**

58. The splitting of white light into seven colours by a prism is called
A. dispersion B. total internal reflection
C. diffraction D. reflection

59. In a prism, the colour that bends the most is
A. red B. yellow **C. violet** D. green

60. A camera forms on the film or CCD an image that is
A. virtual and erect **B. real and inverted**
C. virtual and inverted D. real and erect

61. The number of colours in the visible spectrum is
A. eight B. five **C. seven** D. six

62. The seven colours of the visible spectrum in order from red are
A. red, yellow, orange, green, blue, violet, indigo
B. red, orange, yellow, green, blue, indigo, violet
C. red, orange, yellow, blue, green, indigo, violet
D. violet, indigo, blue, green, yellow, orange, red

63. Ibn al-Haytham is known as the
A. father of chemistry B. father of algebra
C. father of astronomy **D. father of optics**

64. Red light has the
A. longest wavelength and lowest frequency
B. longest wavelength and highest frequency
C. shortest wavelength and lowest frequency
D. shortest wavelength and highest frequency

65. Violet light has the
A. longest wavelength and highest frequency
B. longest wavelength and lowest frequency
C. shortest wavelength and highest frequency
D. shortest wavelength and lowest frequency

66. The visible spectrum lies in the wavelength range of about
A. 500 to 700 nm **B. 400 to 750 nm**
C. 700 to 900 nm D. 400 to 850 nm

67. In the human eye, the image is formed on the
A. retina B. iris C. cornea D. pupil

68. In the human eye, the image formed on the retina is
A. virtual and erect B. virtual and inverted
C. real and erect **D. real and inverted**

69. The near point of the eye is at
A. 250 cm B. 2.5 cm **C. 25 cm** D. 2.5 m

70. Rods are used for
A. colour vision B. sharpness only
C. focusing **D. night vision**

71. Cones are used for
A. colour vision B. night vision
C. hearing D. balance

72. Short-sightedness (myopia) is the condition in which a person sees
A. no colours
B. near objects clearly but distant objects blurry
C. distant objects clearly but near objects blurry
D. all objects clearly

73. In myopia, the image forms
A. on the cornea B. behind the retina
C. on the retina **D. in front of the retina**

74. Myopia is corrected using a
A. concave lens B. plane glass
C. prism D. convex lens

75. Long-sightedness (hypermetropia) is the condition in which a person sees
A. near objects clearly but distant objects blurry
B. everything blurry
C. distant objects clearly but near objects blurry
D. no colours

76. In hypermetropia, the image forms
A. on the lens **B. behind the retina**
C. in front of the retina D. on the retina

77. Hypermetropia is corrected using a
A. concave lens B. plane glass
C. prism **D. convex lens**

78. Gravitational lensing occurs because massive objects
A. scatter sound **B. curve space-time and bend light**
C. reflect light D. absorb all light

79. Einstein rings are seen due to
A. gravitational lensing B. acoustic lensing
C. diffraction D. refraction in glass

80. Acoustic lenses are used to

A. reflect heat
B. focus light
C. focus or diverge sound waves
D. produce electricity