Topic: Introduction and basics

Section: Multiple Choice Questions

1. Which of the following statements best describes the propagation of a wave?

(a) Particles of the medium move from one point to another along with the energy.

(b) Energy is transferred from one point to another without the net transfer of matter.

(c) Both matter and energy are transferred simultaneously across the medium.

(d) Only the source of the wave undergoes displacement, not the medium particles.

2. Sound waves in air are classified as:

(a) Transverse and electromagnetic waves

(b) Longitudinal and mechanical waves

(c) Transverse and mechanical waves

(d) Longitudinal and non-mechanical waves

3. If the frequency of a wave propagating in a uniform medium doubles, what happens to its wavelength, assuming the wave speed remains constant?

(a) It doubles.

(b) It halves.

(c) It remains unchanged.

(d) It quadruples.

4. Which of the following is NOT an electromagnetic wave?

(a) X-rays

(b) Radio waves

(c) Visible light

(d) Ultrasonic waves

5. When a sound wave travels from a rarer medium to a denser medium and is reflected, what happens to its phase?

(a) It remains unchanged.

(b) It shifts by pi radians.

(c) It shifts by pi/2 radians.

(d) It shifts by 2pi radians.

6. A light ray passes from air (n = 1.00) into glass (n = 1.50). If the angle of incidence is 45 degrees, what is the approximate angle of refraction? (Given: sin 45 = 0.707)

(a) 28.1 degrees

(b) 30.0 degrees

(c) 45.0 degrees

(d) 67.5 degrees

7. For total internal reflection to occur, the light must travel from:

(a) a rarer medium to a denser medium.

(b) a denser medium to a rarer medium.

(c) vacuum to any medium.

(d) any medium to vacuum.

8. The intensity of a wave is directly proportional to the:

(a) Amplitude of the wave.

(b) Square of the amplitude of the wave.

(c) Wavelength of the wave.

(d) Period of the wave.

9. What is the phase difference between two points on a progressive wave separated by a distance equal to half a wavelength?

(a) 0 radians

(b) pi/2 radians

(c) pi radians

(d) 2pi radians

10. Which of the following properties distinguishes LASER light from ordinary light?

(a) Polychromaticity

(b) Low intensity

(c) High divergence

(d) Coherence

11. The phenomenon of "echo" is a direct consequence of:

(a) Refraction of sound waves.

(b) Diffraction of sound waves.

(c) Reflection of sound waves.

(d) Interference of sound waves.

12. In the context of reverberation in a room, the absorption coefficient of a material primarily quantifies its ability to:

(a) reflect sound energy.

(b) transmit sound energy.

(c) absorb sound energy.

(d) scatter sound energy.

13. Which of the following optical devices works on the principle of total internal reflection?

(a) Simple microscope

(b) Compound microscope

(c) Optical fiber

(d) Telescope

14. A stationary wave is formed by the superposition of two waves having:

(a) Different amplitudes and same frequency.

(b) Same amplitude and different frequencies.

(c) Same amplitude and same frequency, travelling in opposite directions.

(d) Same amplitude and same frequency, travelling in the same direction.

15. The time taken for one complete oscillation of a wave is called its:

(a) Frequency

(b) Wavelength

(c) Period

(d) Amplitude

Answers

1. (b)

2. (b)

3. (b)

4. (d)

5. (b)

6. (a)

7. (b)

8. (b)

9. (c)

10. (d)

11. (c)

12. (c)

13. (c)

14. (c)

15. (c)

Topic: Types of waves, (progressive, stationary, mechanical, non-mechanical, transverse, longitudinal)

Section: Multiple Choice Questions

16. Which of the following statements is true for a mechanical wave?

(a) It can travel through a vacuum.

(b) It requires a material medium for propagation.

(c) Its speed is independent of the medium's properties.

(d) It is always a transverse wave.

17. Sound waves in air are examples of:

(a) Transverse and non-mechanical waves.

(b) Longitudinal and mechanical waves.

(c) Transverse and mechanical waves.

(d) Longitudinal and non-mechanical waves.

18. In a transverse wave, the particles of the medium oscillate:

(a) Parallel to the direction of wave propagation.

(b) Perpendicular to the direction of wave propagation.

(c) In a circular path.

(d) At an angle of 45 degrees to the direction of propagation.

19. Which of the following is NOT an electromagnetic wave?

(a) X-rays

(b) Gamma rays

(c) Ultrasonic waves

(d) Radio waves

20. A progressive wave transfers:

(a) Matter from one point to another.

(b) Energy without net transfer of matter.

(c) Only momentum, not energy.

(d) Only amplitude, not energy or matter.

21. The speed of an electromagnetic wave in vacuum is given by:

(a) $v = f\lambda$

(b) $c = 1 / \sqrt{\varepsilon_0 \mu_0}$

(c) $c = \lambda / T$

(d) All of the above are correct.

22. The intensity of a wave is directly proportional to:

(a) Its frequency.

(b) Its wavelength.

(c) The square of its amplitude.

(d) Its periodic time.

23. Two points on a progressive wave are separated by a distance of $\lambda/2$. The phase difference between them is:

(a) 0 radians

(b) $\pi/2$ radians

(c) π radians

(d) 2π radians

24. Optical fibers utilize the principle of:

(a) Refraction

(b) Dispersion

(c) Total Internal Reflection

(d) Interference

25. Which characteristic of a wave remains unchanged when it passes from one medium to another?

(a) Wavelength

(b) Speed

(c) Frequency

(d) Amplitude

26. A stationary wave (or standing wave) is characterized by:

(a) Continuous transfer of energy.

(b) Fixed positions of nodes and antinodes.

(c) Particles oscillating with the same amplitude everywhere.

(d) Propagation in only one direction.

27. The phenomenon of 'echo' is a result of:

(a) Refraction of sound

(b) Diffraction of sound

(c) Reflection of sound

(d) Absorption of sound

28. The pitch of a sound wave is primarily determined by its:

(a) Amplitude

(b) Wavelength

(c) Frequency

(d) Speed

29. Which of the following best describes an "ultrasonic wave"?

(a) A sound wave with frequency below the audible range.

(b) An electromagnetic wave used in medical imaging.

(c) A sound wave with frequency above the audible range.

(d) A type of light wave used for communication.

30. In a longitudinal wave, the compressions and rarefactions correspond to regions of:

(a) Maximum and minimum displacement, respectively.

(b) Maximum and minimum pressure, respectively.

(c) Maximum and minimum velocity, respectively.

(d) Constant pressure and displacement.

Answers

16. (b)

17. (b)

18. (b)

19. (c)

20. (b)

21. (d)

22. (c)

23. (c)

24. (c)

25. (c)

26. (b)

27. (c)

28. (c)

29. (c)

30. (b)

Topic: Frequency, wavelength, periodic time and their relations

Section: Multiple Choice Questions

31. Which of the following equations correctly relates the speed (v), frequency (f), and wavelength (lambda) of a wave?

(a) v = f / lambda

(b) v = f * lambda

(c) v = lambda / f

(d) v = f + lambda

32. The periodic time (T) of a wave is inversely proportional to its:

(a) Wavelength

(b) Amplitude

(c) Frequency

(d) Speed

33. In a transverse wave, the particles of the medium oscillate:

(a) Parallel to the direction of wave propagation

(b) Perpendicular to the direction of wave propagation

(c) In circular paths

(d) Randomly

34. Sound waves in air are an example of:

(a) Transverse waves

(b) Electromagnetic waves

(c) Stationary waves

(d) Longitudinal waves

35. The speed of sound is generally highest in:

(a) Gases

(b) Liquids

(c) Solids

(d) Vacuum

36. Which of the following is NOT an electromagnetic wave?

(a) X-rays

(b) Radio waves

(c) Sound waves

(d) Visible light

37. Ultrasonic waves are used for:

(a) Studying the properties of light

(b) Medical imaging (sonography)

(c) Broadcasting radio programs

(d) Heating homes

38. The amplitude of a wave represents:

(a) The total energy carried by the wave

(b) The maximum displacement of particles from their mean position

(c) The distance between two consecutive crests

(d) The number of waves passing a point per second

39. The intensity of a wave is directly proportional to the square of its:

(a) Frequency

(b) Wavelength

(c) Amplitude

(d) Speed

40. The absolute refractive index of a medium is defined as the ratio of:

(a) Speed of light in the medium to speed of light in vacuum

(b) Speed of light in vacuum to speed of light in the medium

(c) Angle of incidence to angle of refraction

(d) Wavelength in vacuum to wavelength in the medium

41. Total Internal Reflection (TIR) can occur when light travels from:

(a) A denser medium to a rarer medium

(b) A rarer medium to a denser medium

(c) Any medium to vacuum

(d) Vacuum to any medium

42. Optical fibers operate on the principle of:

(a) Refraction

(b) Diffraction

(c) Total Internal Reflection

(d) Interference

43. The SI unit of frequency is:

(a) Meter

(b) Second

(c) Hertz

(d) Joule

44. As the temperature of the air increases, the speed of sound in air:

(a) Increases

(b) Decreases

(c) Remains the same

(d) Becomes zero

45. Reverberation time in a hall is reduced by:

(a) Increasing the volume of the hall

(b) Using sound-absorbing materials

(c) Decreasing the number of audience members

(d) Increasing the reflectivity of the walls

Answers

31. (b)

32. (c)

33. (b)

34. (d)

35. (c)

36. (c)

37. (b)

38. (b)

39. (c)

40. (b)

41. (a)

42. (c)

43. (c)

44. (a)

45. (b)

Topic: Properties and applications of electromagnetic waves (ordinary light, LASER) and sound waves (ultrasonic wave, audible wave)

Section: Multiple Choice Questions

46. Which of the following statements correctly distinguishes electromagnetic waves from mechanical waves?

(a) Electromagnetic waves require a medium for propagation, while mechanical waves do not.

(b) Electromagnetic waves are longitudinal, while mechanical waves are transverse.

(c) Electromagnetic waves are transverse and can travel through vacuum, while mechanical waves are longitudinal or transverse and require a medium.

(d) Electromagnetic waves always have a higher frequency than mechanical waves.

47. A characteristic property of LASER light that makes it useful in various applications like surgery and data storage is its:

(a) high speed in a vacuum.

(b) continuous spectrum.

(c) high coherence and monochromaticity.

(d) ability to be easily absorbed by all materials.

48. Ultrasonic waves are widely used in medical imaging (sonography) primarily because they:

(a) have a very long wavelength, allowing deep penetration.

(b) are electromagnetic waves and do not cause ionization.

(c) have high frequencies, allowing for high resolution and directionality.

(d) can travel through a vacuum without significant energy loss.

49. If the frequency of a sound wave is 500 Hz and its wavelength in a medium is 0.6 m, what is the speed of the sound wave in that medium?

(a) 120 m/s

(b) 300 m/s

(c) 833 m/s

(d) 0.0012 m/s

50. Which of the following conditions is essential for total internal reflection to occur?

(a) Light must travel from a denser medium to a rarer medium.

(b) The angle of incidence must be less than the critical angle.

(c) Light must travel from a rarer medium to a denser medium.

(d) The angle of incidence must be exactly 90 degrees.

51. Which of the following pairs correctly identifies the nature of the specified waves?

(a) Sound waves: Transverse; Light waves: Longitudinal

(b) Sound waves: Longitudinal; Light waves: Transverse

(c) Sound waves: Electromagnetic; Light waves: Mechanical

(d) Sound waves: Stationary; Light waves: Progressive

52. The working principle of an optical fiber is based on the phenomenon of:

(a) Reflection

(b) Refraction

(c) Total Internal Reflection

(d) Dispersion

53. The speed of sound in air is primarily affected by its:

(a) frequency.

(b) wavelength.

(c) amplitude.

(d) temperature and humidity.

54. Reverberation time in a hall is defined as the time taken for the sound intensity to fall to:

(a) one-half of its initial value.

(b) one-tenth of its initial value.

(c) one-millionth of its initial value (or 60 dB drop).

(d) zero after the source stops.

55. For a distinct echo to be heard, the minimum distance between the sound source and the reflecting surface should be approximately (assuming speed of sound in air is 340 m/s):

(a) 1.7 m

(b) 17 m

(c) 34 m

(d) 340 m

56. According to Snell's Law, when a light ray passes from a medium with refractive index n1 to a medium with refractive index n2, and n1 > n2, the ray will:

(a) bend towards the normal.

(b) bend away from the normal.

(c) continue undeviated.

(d) always undergo total internal reflection.

57. The intensity of a wave is directly proportional to the:

(a) amplitude

(b) square of the amplitude

(c) frequency

(d) square of the wavelength

58. Two waves are said to be in phase if their particles at corresponding positions have:

(a) the same amplitude and frequency.

(b) the same displacement and velocity at the same time.

(c) different wavelengths but same speed.

(d) amplitudes that are always equal to zero.

59. Which of the following is NOT an electromagnetic wave?

(a) X-rays

(b) Radio waves

(c) Sound waves

(d) Visible light

60. A progressive wave is characterized by:

(a) the oscillation of particles about their mean positions without transfer of energy.

(b) the transfer of energy without the actual transfer of matter.

(c) stationary nodes and antinodes.

(d) a constant amplitude throughout the medium.

Answers

46. (c)

47. (c)

48. (c)

49. (b)

50. (a)

51. (b)

52. (c)

53. (d)

54. (c)

55. (b)

56. (b)

57. (b)

58. (b)

59. (c)

60. (b)

Topic: Amplitude, intensity, phase and wave equations

Section: Multiple Choice Questions

61. The maximum displacement of particles of the medium from their mean position during wave propagation is called:

(a) Wavelength

(b) Amplitude

(c) Frequency

(d) Period

62. The intensity of a wave is defined as the average power per unit area propagating perpendicular to the direction of energy flow. Its SI unit is:

(a) Joule

(b) Watt per square meter

(c) Pascal

(d) Newton per meter

63. For a progressive wave, the intensity (I) is directly proportional to the:

(a) Square of its amplitude

(b) Amplitude

(c) Square root of its amplitude

(d) Inverse of its amplitude

64. Two waves are represented by y1 = A sin(kx - omega t) and y2 = A sin(kx - omega t + pi/2). The phase difference between these two waves is:

(a) 0

(b) pi/4

(c) pi/2

(d) pi

65. A wave is described by the equation y(x,t) = 0.05 sin(2x - 4t) where x and y are in meters and t is in seconds. The angular frequency of this wave is:

(a) 0.05 rad/s

(b) 2 rad/s

(c) 4 rad/s

(d) 0.5 rad/s

66. From the wave equation y(x,t) = A sin(kx - omega t), the speed of the wave can be calculated as:

(a) k * omega

(b) omega / k

(c) k / omega

(d) A * omega

67. When a sound wave travels from air into water, which of the following properties remains unchanged?

(a) Speed

(b) Wavelength

(c) Amplitude

(d) Frequency

68. The phase change of a reflected wave when a wave in a string reflects from a rigid wall (fixed end) is:

(a) 0

(b) pi/2

(c) pi

(d) 2pi

69. If the path difference between two coherent waves is lambda/2 (where lambda is the wavelength), the corresponding phase difference is:

(a) 0

(b) pi/2

(c) pi

(d) 2pi

70. The equation y = 5 sin(3x + 6t) represents a wave travelling in the:

(a) Positive x-direction

(b) Negative x-direction

(c) Positive y-direction

(d) Negative y-direction

71. A sound wave has an intensity of 1.0 x 10^-6 W/m^2. If its amplitude is doubled, the new intensity will be:

(a) 1.0 x 10^-6 W/m^2

(b) 2.0 x 10^-6 W/m^2

(c) 4.0 x 10^-6 W/m^2

(d) 0.5 x 10^-6 W/m^2

72. For a spherical wave emanating from a point source, the intensity of the wave at a distance r from the source is proportional to:

(a) r

(b) r^2

(c) 1/r

(d) 1/r^2

73. Which of the following describes a transverse wave?

(a) The particles of the medium oscillate parallel to the direction of wave propagation.

(b) The particles of the medium oscillate perpendicular to the direction of wave propagation.

(c) The wave requires a medium for its propagation.

(d) It is also known as a pressure wave.

74. The wavelength of a wave is 50 cm and its frequency is 20 Hz. The speed of the wave is:

(a) 10 m/s

(b) 0.1 m/s

(c) 1000 m/s

(d) 100 m/s

75. An electromagnetic wave propagating in vacuum has a frequency of 6 x 10^14 Hz. Its wavelength is approximately: (Speed of light c = 3 x 10^8 m/s)

(a) 5 x 10^-7 m

(b) 2 x 10^6 m

(c) 1.8 x 10^23 m

(d) 5 x 10^6 m

Answers

61. (b)

62. (b)

63. (a)

64. (c)

65. (c)

66. (b)

67. (d)

68. (c)

69. (c)

70. (b)

71. (c)

72. (d)

73. (b)

74. (a)

75. (a)

Topic: Reflection, refraction, Snell's law, absolute refractive index, relative refractive index, total internal reflection, critical angle, optical fiber (construction, properties and applications)

76. When a light ray travels from one transparent medium to another, it changes its direction. This phenomenon is known as:

(a) Reflection

(b) Refraction

(c) Diffraction

(d) Polarization

77. According to Snell's Law, if i is the angle of incidence and r is the angle of refraction, and n1 and n2 are the refractive indices of the first and second media respectively, then:

(a) n1 sin r = n2 sin i

(b) n1 sin i = n2 sin r

(c) n1 / sin i = n2 / sin r

(d) sin i / sin r = n1 / n2

78. The absolute refractive index of a medium is defined as the ratio of the speed of light in:

(a) Vacuum to the speed of light in the medium

(b) The medium to the speed of light in vacuum

(c) Air to the speed of light in the medium

(d) The medium to the speed of light in air

79. If the refractive index of water with respect to air is 1.33, what does this value represent?

(a) The absolute refractive index of air

(b) The relative refractive index of water with respect to air

(c) The absolute refractive index of water

(d) The relative refractive index of air with respect to water

80. The critical angle for a pair of media is the angle of incidence in the denser medium for which the angle of refraction in the rarer medium is:

(a) 0 degrees

(b) 45 degrees

(c) 90 degrees

(d) 180 degrees

81. Total Internal Reflection (TIR) occurs when a light ray travels from:

(a) A rarer medium to a denser medium, and the angle of incidence is greater than the critical angle.

(b) A denser medium to a rarer medium, and the angle of incidence is less than the critical angle.

(c) A denser medium to a rarer medium, and the angle of incidence is greater than the critical angle.

(d) Any medium to any other medium, as long as the angle of incidence is 90 degrees.

82. The sparkling of a diamond is a spectacular example of which optical phenomenon?

(a) Reflection

(b) Refraction

(c) Total Internal Reflection

(d) Dispersion

83. The working principle of an optical fiber is based on:

(a) Refraction

(b) Total Internal Reflection

(c) Dispersion

(d) Diffraction

84. An optical fiber consists of a central core and an outer cladding. For the phenomenon of Total Internal Reflection to occur inside the fiber, the refractive index of the core must be:

(a) Equal to the refractive index of the cladding

(b) Greater than the refractive index of the cladding

(c) Less than the refractive index of the cladding

(d) Independent of the refractive index of the cladding

85. Which of the following is a key advantage of optical fibers for data transmission over traditional copper cables?

(a) Lower bandwidth

(b) Higher signal loss

(c) Immunity to electromagnetic interference

(d) Requires more power for signal transmission

86. When a light ray enters a denser medium from a rarer medium, which of the following properties remains unchanged?

(a) Wavelength

(b) Speed

(c) Frequency

(d) Direction

87. If the critical angle for a medium is 30 degrees when light travels from this medium to air, what is the absolute refractive index of the medium? (Given: sin 30 degrees = 0.5)

(a) 0.5

(b) 1.0

(c) 2.0

(d) 1.5

88. Light bends when it passes from one medium to another because there is a change in its:

(a) Amplitude

(b) Frequency

(c) Speed

(d) Color

89. The phenomenon of mirage observed in deserts is due to:

(a) Reflection of light

(b) Scattering of light

(c) Total Internal Reflection

(d) Dispersion of light

90. The relative refractive index of medium 2 with respect to medium 1 (n21) is given by:

(a) n1 / n2

(b) n2 / n1

(c) (n1 + n2) / 2

(d) n1 * n2

Answers

76. (b)

77. (b)

78. (a)

79. (b)

80. (c)

81. (c)

82. (c)

83. (b)

84. (b)

85. (c)

86. (c)

87. (c)

88. (c)

89. (c)

90. (b)

Topic: Reverberation, Reverberation time, Sabine's formula, echo, absorption coefficient

Section: Multiple Choice Questions

91. Which phenomenon describes the persistence of sound in a closed enclosure due to multiple reflections?

(a) Echo

(b) Diffraction

(c) Reverberation

(d) Refraction

92. The time taken for the intensity of sound in a room to fall to one millionth (10^-6) of its initial value after the source has stopped is known as:

(a) Echo time

(b) Periodic time

(c) Reverberation time

(d) Absorption time

93. Sabine's formula for reverberation time (T) is given by:

(a) T = k(V/A)

(b) T = k(A/V)

(c) T = k(V * A)

(d) T = k(V^2 / A)

(where V is volume, A is total absorption, and k is a constant)

94. What is the SI unit of reverberation time?

(a) Metre

(b) Second

(c) Hertz

(d) Decibel

95. For a distinct echo to be heard, the minimum time interval between the original sound and the reflected sound should be approximately:

(a) 0.01 seconds

(b) 0.1 seconds

(c) 1.0 seconds

(d) 10.0 seconds

96. If the speed of sound in air is 340 m/s, what is the minimum distance required from a reflecting surface to hear a distinct echo?

(a) 1.7 m

(b) 17 m

(c) 34 m

(d) 340 m

97. The absorption coefficient of a material quantifies its ability to:

(a) Reflect sound waves

(b) Transmit light waves

(c) Absorb sound energy

(d) Generate sound waves

98. A perfect sound absorber would have an absorption coefficient of:

(a) 0

(b) 0.5

(c) 1

(d) Infinity

99. In an auditorium, excessive reverberation can make speech:

(a) Clearer and louder

(b) Indistinct and muffled

(c) Higher in pitch

(d) Lower in pitch

100. Which of the following materials would have a relatively high sound absorption coefficient?

(a) Polished marble

(b) Thick curtains

(c) Concrete wall

(d) Metallic sheet

101. To reduce the reverberation time in a large hall, one should:

(a) Increase the volume of the hall

(b) Use highly reflective materials

(c) Add sound-absorbing materials

(d) Decrease the number of sound sources

102. Reverberation differs from an echo primarily in:

(a) The frequency of the reflected sound

(b) The number of reflections and the time interval between them

(c) The medium through which sound travels

(d) The amplitude of the original sound wave

103. In Sabine's formula, the term 'A' represents:

(a) Area of the room

(b) Total absorption of the room

(c) Amplitude of sound

(d) Acoustic impedance

104. Which of the following is an ideal reverberation time for a concert hall designed for orchestral music?

(a) 0.5 seconds

(b) 1.5 - 2.5 seconds

(c) 4.0 - 5.0 seconds

(d) 0.1 seconds

105. If the volume of a hall is doubled while the total sound absorption remains constant, the reverberation time will:

(a) Be halved

(b) Remain the same

(c) Be doubled

(d) Increase fourfold

Answers

91. (c)

92. (c)

93. (a)

94. (b)

95. (b)

96. (b)

97. (c)

98. (c)

99. (b)

100. (b)

101. (c)

102. (b)

103. (b)

104. (b)

105. (c)

Topic: Summary (quick revision)

Section: Multiple Choice Questions

106. Which of the following statements is true for a mechanical wave?

(a) It can travel through vacuum.

(b) It requires a material medium for its propagation.

(c) It is always a transverse wave.

(d) Its speed is independent of the medium.

107. If the frequency of a wave is 50 Hz and its wavelength is 2 meters, what is its speed?

(a) 25 m/s

(b) 50 m/s

(c) 100 m/s

(d) 0.04 m/s

108. Which of the following is NOT a characteristic property of electromagnetic waves?

(a) They are transverse waves.

(b) They travel at the speed of light in vacuum.

(c) They can be polarized.

(d) They require a material medium for propagation.

109. In a longitudinal wave, the particles of the medium oscillate:

(a) perpendicular to the direction of wave propagation.

(b) parallel to the direction of wave propagation.

(c) in circular paths.

(d) randomly in all directions.

110. The speed of sound in air primarily depends on:

(a) its frequency.

(b) its amplitude.

(c) temperature and humidity.

(d) its wavelength.

111. According to the law of reflection, the angle of incidence is always equal to the angle of:

(a) refraction.

(b) deviation.

(c) reflection.

(d) critical angle.

112. When a ray of light passes from an optically denser medium to a rarer medium, it:

(a) bends towards the normal.

(b) bends away from the normal.

(c) passes undeviated.

(d) undergoes total internal reflection only.

113. Total Internal Reflection occurs when light travels from:

(a) a rarer medium to a denser medium.

(b) a denser medium to a rarer medium.

(c) air to water.

(d) vacuum to air.

114. The critical angle for a pair of media is defined as the angle of incidence in the denser medium for which the angle of refraction in the rarer medium is:

(a) 0 degrees.

(b) 45 degrees.

(c) 90 degrees.

(d) 180 degrees.

115. Optical fibers transmit light on the principle of:

(a) refraction.

(b) dispersion.

(c) total internal reflection.

(d) interference.

116. Sabine's formula relates reverberation time (T) to the volume of the hall (V) and the total absorption (A) as:

(a) $T = k A / V$

(b) $T = k V / A$

(c) $T = k (V + A)$

(d) $T = k (V - A)$

(Where k is a constant)

117. An echo is heard when:

(a) sound waves are continuously generated.

(b) sound waves reflect off a surface and return to the listener after a noticeable delay.

(c) sound waves pass through different media.

(d) sound waves diffract around an obstacle.

118. Which of the following is a primary characteristic of LASER light?

(a) It is polychromatic.

(b) It is incoherent.

(c) It is highly divergent.

(d) It is highly monochromatic.

119. Ultrasonic waves are commonly used in:

(a) radio communication.

(b) medical imaging (e.g., sonography).

(c) astronomical observations.

(d) generating electricity.

120. The intensity of a wave is directly proportional to the square of its:

(a) frequency.

(b) wavelength.

(c) amplitude.

(d) speed.

Answers

106. (b)

107. (c)

108. (d)

109. (b)

110. (c)

111. (c)

112. (b)

113. (b)

114. (c)

115. (c)

116. (b)

117. (b)

118. (d)

119. (b)

120. (c)