

FINAL QUESTION PAPER

1. 3. 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) At an angle of 45 degrees to the direction of wave propagation (d) In a circular path
2. 33. Which of the following properties of a wave remains unchanged when it passes from one medium to another? (a) Wavelength (b) Speed (c) Frequency (d) Amplitude
3. 11. The SI unit of intensity of a wave is: (a) Watt per meter (W/m) (b) Joule per second (J/s) (c) Watt per square meter (W/m²) (d) Newton per square meter (N/m²)
4. 71. Two waves are given by $y_1 = A \sin(kx - \omega t)$ and $y_2 = A \cos(kx - \omega t)$. What is the phase difference between these two waves? (a) 0 (b) $\pi/4$ rad (c) $\pi/2$ rad (d) π rad
5. 56. Optical fibers primarily work on the principle of: (a) Reflection (b) Refraction (c) Total Internal Reflection (d) Diffraction
6. 57. The persistence of sound in a large hall due to multiple reflections is known as: (a) Echo (b) Resonance (c) Reverberation (d) Diffraction
7. 87. Which of the following statements about electromagnetic waves is INCORRECT? (a) They do not require a material medium for propagation. (b) They are transverse in nature. (c) Their speed in vacuum is constant for all wavelengths. (d) They are mechanical waves.
8. 47. The speed of light in vacuum is approximately: (a) 3×10^5 m/s (b) 3×10^8 km/s (c) 3×10^8 m/s (d) 3×10^9 m/s
9. 30. A wave is described as having particles oscillating parallel to the direction of energy propagation. This wave is most accurately classified as a: (a) Transverse wave (b) Stationary wave (c) Electromagnetic wave (d) Longitudinal wave
10. 67. If the time period of a wave is T and its angular frequency is ω , which of the following relations is correct? (a) $T = 2\pi \cdot \omega$ (b) $T = \omega / (2\pi)$ (c) $T = 2\pi / \omega$ (d) $T = 1 / \omega$
11. 43. For which of the following applications are ultrasonic waves primarily used? (a) Remote controls for televisions (b) Communication with satellites (c) Sonar and medical imaging (d) Heating food in microwave ovens
12. 12. Which of these is an example of a longitudinal wave? (a) Light waves (b) Water ripples (c) Sound waves in air (d) Waves on a stretched string
13. 115. According to the law of reflection, the angle of incidence is: (a) Greater than the angle of reflection (b) Less than the angle of reflection (c) Equal to the angle of reflection (d) Independent of the angle of reflection
14. 114. Two waves are said to be in phase if their particles at corresponding points: (a) Have the same amplitude but different frequencies (b) Have the same displacement and velocity at the same time (c) Move in opposite directions (d) Have a phase difference of 90 degrees

15. 73. The equation of a wave is given by $y = 0.2 \sin(300t - 1.5x)$, where y and x are in meters and t in seconds. What is the speed of the wave? (a) 200 m/s (b) 1.5 m/s (c) 300 m/s (d) 450 m/s
16. 50. If the refractive index of a medium is 1.5, what is the speed of light in that medium? (Speed of light in vacuum = c) (a) $1.5 c$ (b) $c / 1.5$ (c) c (d) $c - 1.5$
17. 62. The intensity (I) of a wave is directly proportional to which of the following? (a) The amplitude (A) of the wave. (b) The square of the amplitude (A^2) of the wave. (c) The cube of the amplitude (A^3) of the wave. (d) The square root of the amplitude (\sqrt{A}) of the wave.
18. 108. 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) At an angle of 45 degrees to the direction of wave propagation (d) In circles
19. 32. A sound wave travels at a speed of 340 m/s and has a frequency of 680 Hz. What is its wavelength? (a) 0.5 m (b) 2 m (c) 1 m (d) 4 m
20. 13. The phase difference between two points on a progressive wave separated by one full wavelength is: (a) 0 degrees or 0 radians (b) 90 degrees or $\pi/2$ radians (c) 180 degrees or π radians (d) 360 degrees or 2π radians
21. 2. Which of the following is a non-mechanical wave? (a) Sound wave (b) Water wave (c) Light wave (d) Seismic wave
22. 15. Which of the following is NOT a property of electromagnetic waves? (a) They are transverse in nature. (b) They can be polarized. (c) They require a material medium for propagation. (d) They travel at the speed of light in vacuum.
23. 29. When a progressive wave reflects from a denser medium, which of the following typically undergoes a phase change of π radians (180 degrees)? (a) Frequency (b) Wavelength (c) Amplitude (d) Displacement
24. 26. Which of the following is a wave that is both mechanical and transverse? (a) Sound wave in a solid (b) Light wave in vacuum (c) Surface waves on water (d) Ultrasound waves in tissue
25. 20. The phenomenon of polarization is exclusively exhibited by which type of wave? (a) Longitudinal waves (b) Mechanical waves (c) Transverse waves (d) Stationary waves
26. 105. The unit of reverberation time is: (a) Hertz (Hz) (b) Metre (m) (c) Second (s) (d) Decibel (dB)
27. 21. A key characteristic distinguishing a progressive wave from a stationary wave is: (a) Progressive waves have fixed positions of maximum and minimum displacement, while stationary waves do not. (b) Stationary waves transfer energy across the medium, while progressive waves do not. (c) Progressive waves transfer energy through the medium, while stationary waves do not exhibit net energy transfer through the medium. (d) Stationary waves can only be formed in a vacuum, while progressive waves require a medium.
28. 81. Optical fibers work on the principle of: (a) Refraction (b) Reflection (c) Total Internal Reflection (d) Dispersion
29. 27. The maximum displacement of particles of the medium from their mean position during wave propagation is called: (a) Wavelength (b) Frequency (c) Amplitude (d) Phase

30. 52. Sound waves in air are best described as: (a) Transverse and electromagnetic. (b) Longitudinal and mechanical. (c) Transverse and mechanical. (d) Longitudinal and electromagnetic.
31. 31. If the periodic time of a wave is 0.02 seconds, what is its frequency? (a) 50 Hz (b) 0.02 Hz (c) 20 Hz (d) 500 Hz
32. 75. Consider two waves with intensities I_1 and I_2 , such that $I_1 = 16 I_2$. If their amplitudes are A_1 and A_2 respectively, what is the ratio A_1/A_2 ? (a) 2 (b) 4 (c) 8 (d) 16
33. 59. Which of the following waves requires a material medium for its propagation? (a) Radio waves (b) X-rays (c) Sound waves (d) Light waves
34. 78. The absolute refractive index of a medium is defined as the ratio of the speed of light in vacuum to the speed of light in that medium. If the speed of light in water is 2.25×10^8 m/s, what is the absolute refractive index of water? (Speed of light in vacuum = 3×10^8 m/s) (a) 1.25 (b) 1.33 (c) 1.50 (d) 1.67
35. 10. If the frequency of a wave is doubled, and its speed remains constant, its wavelength will: (a) Be halved (b) Be doubled (c) Remain unchanged (d) Be quadrupled
36. 16. Which of the following statements accurately describes a mechanical wave? (a) It can propagate through a vacuum. (b) It requires a material medium for its propagation. (c) It always travels at the speed of light in a vacuum. (d) Its energy is always carried by oscillating electric and magnetic fields.
37. 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
38. 83. Which of the following optical instruments commonly uses the principle of Total Internal Reflection? (a) Simple microscope (b) Compound microscope (c) Periscope (d) Prism binocular
39. 92. An echo is distinguished from reverberation primarily by: (a) The frequency of the sound wave. (b) The time delay between the original sound and the reflected sound. (c) The amplitude of the reflected sound. (d) The type of surface from which sound reflects.
40. 49. Ultrasonic waves are commonly used in: (a) Radio broadcasting (b) SONAR systems (c) Optical microscopes (d) X-ray imaging
41. 24. The speed of a mechanical wave in a medium depends primarily on: (a) The amplitude of the wave. (b) The frequency of the wave. (c) The properties of the medium (elasticity and inertia). (d) The wavelength of the wave.
42. 18. In a transverse wave, the particles of the medium oscillate: (a) In the same direction as the wave propagation. (b) Perpendicular to the direction of wave propagation. (c) At an angle of 45 degrees to the direction of wave propagation. (d) In a circular path.
43. 28. Compared to sound waves, electromagnetic waves: (a) Require a medium for propagation. (b) Travel at a slower speed in vacuum. (c) Do not transfer energy. (d) Can be polarized.
44. 41. Total internal reflection occurs when light travels from: (a) A rarer medium to a denser medium. (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 vacuum.

45. 76. When light passes from a rarer medium to a denser medium, which of the following quantities decreases?
(a) Frequency (b) Wavelength (c) Speed (d) Both (b) and (c)

46. 103. Sabine's formula for reverberation time (T) is given by: (a) $T = 0.161 * (V / A)$ (b) $T = A / (0.161 * V)$ (c) $T = 0.161 * (A / V)$ (d) $T = V / (0.161 * A)$ Where V is volume and A is total absorption.

47. 90. A ray of light is incident normally on a plane boundary separating two media. The angle of refraction will be: (a) 0 degrees (b) 45 degrees (c) 90 degrees (d) Dependent on the refractive indices of the media.

48. 98. For a distinct echo to be heard by a listener, 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 second (d) 10 seconds

49. 85. When light passes from air into glass, which of the following remains unchanged? (a) Speed (b) Wavelength (c) Frequency (d) Amplitude

50. 106. What type of wave requires a material medium for its propagation? (a) Electromagnetic wave (b) Mechanical wave (c) Light wave (d) Radio wave

51. 72. If the amplitude of a wave is doubled, how many times does its energy density increase? (a) 2 times (b) 4 times (c) 8 times (d) Remains unchanged

52. 61. Which of the following correctly defines the amplitude of a wave? (a) The total distance covered by a particle in one complete oscillation. (b) The maximum displacement of a particle from its mean position. (c) The distance between two consecutive crests or troughs. (d) The number of oscillations per unit time.

53. 70. When a transverse wave reflects from a denser medium (fixed end), what is the phase change experienced by the reflected wave? (a) 0 rad (b) $\pi/2$ rad (c) π rad (d) 2π rad

54. 58. 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

55. 89. A coin at the bottom of a tank of water (refractive index = $4/3$) appears to be at a depth of 12 cm. What is the actual depth of the coin? (a) 9 cm (b) 12 cm (c) 16 cm (d) 20 cm

56. 65. For the wave given by $y(x,t) = 0.05 \sin(200t - 4x)$ in SI units, what is the wavelength of the wave? (a) $\pi/2$ m (b) 2π m (c) 4π m (d) $\pi/4$ m

57. 86. If the refractive index of a medium is 1.5, what is the critical angle for light passing from this medium to air? ($\sin 41.8$ degrees approx $1/1.5$) (a) 30 degrees (b) 41.8 degrees (c) 45 degrees (d) 60 degrees

58. 39. A wave is described by the equation $y(x,t) = A \sin(kx - \omega t)$. The term 'k' represents the: (a) Angular frequency (b) Wave speed (c) Angular wave number (d) Phase constant

59. 36. If the amplitude of a progressive wave is doubled, how does its intensity change? (a) It remains the same. (b) It doubles. (c) It becomes four times. (d) It becomes half.

60. 22. In a stationary wave, the points where the amplitude of oscillation is maximum are called: (a) Nodes (b) Antinodes (c) Crests (d) Troughs

61. 99. If the reverberation time of a hall is too short, the sound inside the hall would appear: (a) Muffled and unclear. (b) Too loud and sustained. (c) Dry and dull. (d) Having a distinct echo.
62. 40. Which type of wave is an ordinary light wave? (a) Mechanical longitudinal wave (b) Mechanical transverse wave (c) Electromagnetic longitudinal wave (d) Electromagnetic transverse wave
63. 118. For a distinct echo to be heard, the minimum distance between the source of sound and the reflecting surface at 22 degrees Celsius (speed of sound approx 344 m/s) should be approximately: (a) 1.72 m (b) 17.2 m (c) 34.4 m (d) 3.44 m
64. 84. If the refractive index of medium 1 with respect to medium 2 is n_{12} , then the refractive index of medium 2 with respect to medium 1 (n_{21}) is: (a) n_{12} (b) $1/n_{12}$ (c) n_{12}^2 (d) $\sqrt{n_{12}}$
65. 34. 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) Without any definite direction.
66. 23. If the frequency of a wave is doubled and its speed remains constant, its wavelength will: (a) Double (b) Halve (c) Remain unchanged (d) Quadruple
67. 6. Which of the following statements about sound waves is correct? (a) They are electromagnetic waves. (b) They can travel through vacuum. (c) They are longitudinal waves. (d) They are transverse waves in air.
68. 48. Which property is NOT characteristic of a LASER beam? (a) High monochromaticity (b) High divergence (c) High coherence (d) High directionality
69. 51. Total Internal Reflection (TIR) occurs when light travels from: (a) Denser to rarer medium at an angle of incidence less than the critical angle. (b) Rarer to denser medium at an angle of incidence greater than the critical angle. (c) Denser to rarer medium at an angle of incidence greater than the critical angle. (d) Rarer to denser medium at any angle of incidence.
70. 109. The speed of all electromagnetic waves in vacuum is: (a) Dependent on their wavelength (b) Dependent on their frequency (c) Constant for all, approximately 3×10^8 m/s (d) Slower than sound waves
71. 8. When a wave passes from one medium to another, which of the following properties remains unchanged? (a) Wavelength (b) Speed (c) Frequency (d) Amplitude
72. 107. If the frequency of a wave is doubled, and its speed remains constant, what happens to its wavelength? (a) It doubles (b) It becomes half (c) It remains unchanged (d) It quadruples
73. 44. If the frequency of a wave source is 100 Hz, how many waves are produced by the source in one minute? (a) 100 (b) 600 (c) 6000 (d) 1000
74. 1. Which of the following is the primary characteristic of a wave? (a) Transfer of matter (b) Transfer of energy without transfer of matter (c) Transfer of momentum only (d) Transfer of both matter and energy
75. 77. Snell's Law states that for a given pair of media and for light of a given colour, the ratio of sine of angle of incidence to the sine of angle of refraction is a constant. This constant is known as the: (a) Absolute refractive index (b) Relative refractive index (c) Critical angle (d) Dispersion constant

76. 91. What is reverberation? (a) The phenomenon of sound bouncing off a single surface. (b) The persistence of sound in a large enclosure after the source has stopped. (c) The reflection of sound from multiple surfaces in quick succession, creating a distinct repeat. (d) The bending of sound waves around an obstacle.

77. 14. The speed of sound in a medium primarily depends on the medium's: (a) Temperature and density (b) Frequency of the sound (c) Amplitude of the sound (d) Wavelength of the sound

78. 116. 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) Speed of light in one medium to speed of light in another medium (d) Wavelength of light in vacuum to wavelength of light in the medium

79. 19. An example of a longitudinal wave is: (a) Light waves (b) Radio waves (c) Sound waves in air (d) Ocean waves on the surface

80. 66. What is the phase difference between two particles separated by a distance of $\lambda/4$ in a progressive wave? (a) $\pi/4$ rad (b) $\pi/2$ rad (c) π rad (d) 2π rad

81. 117. Reverberation time is the time taken for the sound intensity in a room to fall by a factor of: (a) 100 (b) 1000 (c) 10^6 (d) 10^{-6}

82. 113. The intensity of a wave is directly proportional to the square of its: (a) Wavelength (b) Frequency (c) Amplitude (d) Speed

83. 37. The reciprocal of the periodic time of a wave is known as its: (a) Wavelength (b) Speed (c) Amplitude (d) Frequency

84. 53. The approximate frequency range for human audible sound is: (a) Below 20 Hz (b) Above 20,000 Hz (c) 20 Hz to 20,000 Hz (d) 200 Hz to 2,000 Hz

85. 104. In an empty auditorium, the reverberation time is generally: (a) Longer than when it is full. (b) Shorter than when it is full. (c) The same as when it is full. (d) Dependent only on the sound source.

86. 102. How does an increase in temperature generally affect the speed of sound in air? (a) It decreases the speed of sound. (b) It increases the speed of sound. (c) It has no effect on the speed of sound. (d) It depends on the humidity, not temperature.

87. 9. The time taken by a particle of the medium to complete one oscillation is called the: (a) Wavelength (b) Frequency (c) Speed (d) Period

88. 17. Which of the following is an example of a non-mechanical wave? (a) Sound waves in air (b) Water ripples (c) Seismic P-waves (d) X-rays

89. 5. The maximum displacement of a particle of the medium from its equilibrium position due to a wave is called its: (a) Wavelength (b) Frequency (c) Amplitude (d) Period

90. 100. A person shouts and hears an echo after 2 seconds. If the speed of sound in air is 340 m/s, what is the distance to the reflecting surface? (a) 170 m (b) 340 m (c) 680 m (d) 85 m

91. 94. The absorption coefficient of a material is a measure of: (a) How much sound energy is reflected by the material. (b) How much sound energy is transmitted through the material. (c) How much sound energy is absorbed by the material. (d) How much sound energy is refracted by the material.
92. 120. Which of the following is a characteristic property of LASER light? (a) It is polychromatic (b) It is highly divergent (c) It is incoherent (d) It is highly monochromatic
93. 88. A major advantage of optical fibers over metallic cables for data transmission is: (a) Lower bandwidth (b) Higher signal loss (c) Immunity to electromagnetic interference (d) Higher power consumption
94. 55. The intensity of a wave is directly proportional to the: (a) Amplitude (b) Square of the amplitude (c) Wavelength (d) Frequency
95. 54. For a wave propagating through a medium, which of the following expressions correctly relates its speed (v), frequency (f), and wavelength (λ)? (a) $v = f \times \lambda$ (b) $f = v + \lambda$ (c) $\lambda = v - f$ (d) $v = f / \lambda$
96. 42. The phenomenon of echo is a direct consequence of: (a) Refraction of sound (b) Reflection of sound (c) Diffraction of sound (d) Interference of sound
97. 38. Which of the following is a characteristic of longitudinal waves only? (a) They can be polarized. (b) They require a medium for propagation. (c) They exhibit compressions and rarefactions. (d) They can travel through vacuum.
98. 4. The product of frequency (f) and wavelength (λ) of a wave gives its: (a) Amplitude (b) Period (c) Speed (d) Intensity
99. 25. The frequency of a wave is determined by: (a) The medium through which it travels. (b) The amplitude of the wave. (c) The source that generates the wave. (d) The speed of the wave.
100. 82. An optical fiber consists of a central core and an outer cladding. For efficient light transmission, the refractive index of the core must be: (a) Greater than the refractive index of the cladding. (b) Less than the refractive index of the cladding. (c) Equal to the refractive index of the cladding. (d) Independent of the refractive index of the cladding.
101. 46. Which of the following statements is true regarding electromagnetic waves and sound waves? (a) Both are longitudinal waves. (b) Both can travel through a vacuum. (c) Electromagnetic waves are transverse, while sound waves are longitudinal. (d) Sound waves are transverse, while electromagnetic waves are longitudinal.
102. 119. The principle behind the working of an optical fiber is: (a) Refraction (b) Diffraction (c) Total Internal Reflection (d) Interference
103. 112. Which of the following describes an ultrasonic wave? (a) Sound wave with frequency below 20 Hz (b) Sound wave with frequency between 20 Hz and 20,000 Hz (c) Sound wave with frequency above 20,000 Hz (d) Electromagnetic wave used for imaging
104. 79. Total Internal Reflection occurs when light 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 greater than the critical angle. (c) A rarer medium to a denser medium, and the angle of incidence is less than the critical angle. (d) A denser medium to a rarer medium, and the angle of incidence is less than the critical angle.

105. 95. The SI unit of absorption coefficient is: (a) metre squared (m^2) (b) sabin (c) dimensionless (d) metre (m)
106. 7. Electromagnetic waves travel in vacuum with a speed of approximately: (a) $3 \times 10^8 \text{ m/s}$ (b) $3 \times 10^5 \text{ m/s}$ (c) $3 \times 10^2 \text{ m/s}$ (d) It depends on their frequency.
107. 110. When a light ray passes from an optically rarer medium to an optically denser medium, it: (a) Bends away from the normal (b) Bends towards the normal (c) Does not bend at all (d) Is totally internally reflected
108. 35. The speed of electromagnetic waves in vacuum is given by: (a) $c = 1 / (\mu_0 \epsilon_0)$ (b) $c = \sqrt{(\mu_0 \epsilon_0)}$ (c) $c = 1 / \sqrt{(\mu_0 \epsilon_0)}$ (d) $c = \mu_0 \epsilon_0$
109. 69. A sound wave is described by $y(x,t) = A \sin(kx - \omega t)$. If the displacement amplitude is A and the wave number is k, what is the unit of k? (a) m (b) s (c) rad/m (d) rad/s
110. 101. The primary purpose of using acoustic panels on the walls of a recording studio is to: (a) Increase the reflection of sound. (b) Reduce sound transmission to the outside. (c) Control reverberation and prevent echoes. (d) Amplify the sound within the studio.
111. 60. An electromagnetic wave consists of: (a) Only an electric field oscillating perpendicular to the direction of propagation. (b) Only a magnetic field oscillating perpendicular to the direction of propagation. (c) Mutually perpendicular oscillating electric and magnetic fields, both perpendicular to the direction of propagation. (d) Mutually perpendicular oscillating electric and magnetic fields, both parallel to the direction of propagation.
112. 93. According to Sabine's formula, the reverberation time (T) of a hall is directly proportional to: (a) The total absorbing area of the hall. (b) The absorption coefficient of the materials in the hall. (c) The volume of the hall. (d) The frequency of the sound.
113. 74. If the maximum pressure variation in a sound wave is P_{max} , which quantity is proportional to the square of P_{max} ? (a) Amplitude of displacement (b) Wavelength (c) Intensity (d) Frequency
114. 63. The phase of a wave at a given point and time describes: (a) The maximum displacement of the particle at that instant. (b) The energy carried by the wave at that point. (c) The state of oscillation (position and direction of motion) of the particle at that point and time. (d) The speed at which the wave travels.
115. 97. Which of the following materials typically has a high absorption coefficient for sound? (a) Concrete (b) Polished marble (c) Thick curtains or carpets (d) Glass
116. 96. To reduce the reverberation time in a large auditorium, which of the following measures would be most effective? (a) Increasing the volume of the auditorium. (b) Decreasing the total absorbing area. (c) Replacing hard, reflective surfaces with soft, porous materials. (d) Increasing the intensity of the sound source.
117. 111. 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) Any medium to vacuum (d) Vacuum to any medium
118. 68. If the intensity of a wave at a distance r from a point source is I, what will be its intensity at a distance 2r from the same source, assuming no energy loss? (a) $I/2$ (b) $I/4$ (c) $2I$ (d) $4I$
119. 45. The relationship between angular frequency (ω) and linear frequency (f) is: (a) $\omega = f / (2\pi)$ (b) $\omega = 2\pi f$ (c) $\omega = \pi f$ (d) $\omega = f$

120. 64. A progressive wave is represented by the equation $y(x,t) = 0.05 \sin(200t - 4x)$ in SI units. What is the angular frequency of the wave? (a) 0.05 rad/s (b) 4 rad/s (c) 200 rad/s (d) 50 rad/s

ANSWER KEY

1. (b)
2. (c)
3. (c)
4. (c)
5. (c)
6. (c)
7. (d)
8. (c)
9. (d)
10. (c)
11. (c)
12. (c)
13. (c)
14. (b)
15. (a)
16. (b)
17. (b)
18. (b)
19. (a)
20. (d)
21. (c)
22. (c)
23. (d)
24. (c)
25. (c)
26. (c)
27. (c)

28. (c)

29. (c)

30. (b)

31. (a)

32. (b)

33. (c)

34. (b)

35. (a)

36. (b)

37. (c)

38. (d)

39. (b)

40. (b)

41. (c)

42. (b)

43. (d)

44. (c)

45. (d)

46. (a)

47. (a)

48. (b)

49. (c)

50. (b)

51. (b)

52. (b)

53. (c)

54. (c)

55. (c)

56. (a)

57. (b)

58. (c)

59. (c)

60. (b)

61. (c)

62. (d)

63. (b)

64. (b)

65. (b)

66. (b)

67. (c)

68. (b)

69. (c)

70. (c)

71. (c)

72. (b)

73. (c)

74. (b)

75. (b)

76. (b)

77. (a)

78. (b)

79. (c)

80. (b)

81. (c)

82. (c)

83. (d)

84. (c)

- 85. (a)
- 86. (b)
- 87. (d)
- 88. (d)
- 89. (c)
- 90. (b)
- 91. (c)
- 92. (d)
- 93. (c)
- 94. (b)
- 95. (a)
- 96. (b)
- 97. (c)
- 98. (c)
- 99. (c)
- 100. (a)
- 101. (c)
- 102. (c)
- 103. (c)
- 104. (b)
- 105. (c)
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- 107. (b)
- 108. (c)
- 109. (c)
- 110. (c)
- 111. (c)
- 112. (c)
- 113. (c)

114. (c)

115. (c)

116. (c)

117. (b)

118. (b)

119. (b)

120. (c)