Chapter 1-Simple Harmonic Motion

MCQs;

1. The restoring force in SHM is always directed:

- A) Away from mean position
- B) Towards mean position
- C) Perpendicular to displacement
- D) Along the path of motion

Correct: B

2. Which of the following is a condition for SHM?

- A) Constant velocity
- B) Acceleration directly proportional to displacement
- C) Force is zero
- D) Displacement is zero

Correct: B

3. The phase difference between displacement and acceleration in SHM is:

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- A) 90°
- B) 0°

C) 180°

D) 270°

Correct: C

4. A pendulum has maximum acceleration at:

- A) Mean position
- B) Halfway position
- C) Extreme position
- D) At all positions equally

Correct: C

5. The energy in SHM is alternately:

- A) Lost and gained
- B) Potential and thermal
- C) Kinetic and Potential
- D) Stored and radiated

Correct: C

6. If the length of a simple pendulum is doubled, its period becomes: A) Half B) Double C) $\sqrt{2}$ times D) $\sqrt{2}$ times Correct: D

7. What is the frequency of a pendulum that completes 30 oscillations in 60 seconds?

A) 2 Hz

B) 1 Hz

C) 0.5 Hz D) 60 Hz

Correct: B

8. The motion of a child on a swing is an example of:

- A) Uniform motion
- B) Random motion
- C) SHM
- D) Circular motion
- Correct: C

9. The spring constant has unit:

- B) N/m
- C) m/N
- D) Nm²

Correct: B

10. When mass on spring is at equilibrium, the net force is:

- A) MaximumB) ZeroC) Equal to mgD) Equal to kx
- **Correct: B**

11. The speed of wave is the product of:

- A) Wavelength and frequency
- B) Frequency and period
- C) Wavelength and time

D) None Correct: A

- 12. Transverse waves cannot travel through:
- A) Solids
- **B)** Liquids
- C) Gases
- D) Vacuum
- Correct: D

13. In refraction of waves from shallow to deep water, speed:

- A) Decreases
- B) Remains same
- C) Increases
- D) Becomes zero

Correct: C

14. Which property of waves is responsible for sound bending around corners?

- A) Reflection
- B) Refraction
- C) Interference
- D) Diffraction
- **Correct: D**

15. Electromagnetic waves do not require:

- A) Air
- B) Medium
- C) Vacuum
- D) Wavelength
- **Correct: B**

16. The frequency of oscillation of a spring depends on:

- A) Length of spring
- B) Amplitude of motion
- C) Mass attached and spring constant
- D) Temperature
- **Correct: C**

17. If the mass of a pendulum bob increases, the time period will:

- A) Increase
- B) Decrease
- C) Remain same
- D) Become zero

Correct: C

18. Displacement in SHM is maximum at:

- A) Mean positionB) Quarter way
- C) Halfway
- D) Extreme position
- Correct: D

19. In SHM, kinetic energy is zero when:

- A) Acceleration is zero
- B) Displacement is zero
- C) At extreme position
- D) Speed is maximum

Correct: C

20. The restoring force in a pendulum is given by:

- A) T B) mg C) mg sinθ D) mg cosθ Correct: C
- 21. Time period of SHM is independent of:
 A) Displacement
 B) Mass
 C) Spring constant
 D) Gravity
 Correct: A

22. Which motion is not SHM?

- A) Swinging pendulum
- B) Oscillating spring
- C) Moving car

D) Vibrating string Correct: C

23. What happens to frequency if time period is doubled?

A) Doubled
B) Halved
C) Becomes 1/4
D) Becomes 2
Correct: B

24. When a pendulum swings, at mean position:

- A) Kinetic energy is maximum
- B) Potential energy is maximum
- C) Both are zero
- D) Acceleration is maximum
- **Correct: A**

25. Which factor affects the time period of a simple pendulum?

- A) Mass of bob
- B) Length of string
- C) Material of bob
- D) Amplitude
- Correct: B

26. The acceleration in SHM is always directed:

- A) Away from mean position
- B) Opposite to displacement
- C) Along the path of motion
- D) In the direction of velocity

Correct: B

27. The maximum restoring force in SHM acts at:

- A) Mean position
- B) Extreme position
- C) Half displacement
- D) Quarter displacement

Correct: B

28. In a spring-mass system, the force is proportional to:

- A) Velocity
- B) Acceleration
- C) Displacement from mean position
- D) Mass of spring
- **Correct: C**

29. The velocity of a body in SHM is zero at:

- A) Mean position
- B) Halfway from mean
- C) Extreme position
- D) Nowhere

Correct: C

30. When does the body in SHM have maximum kinetic energy?

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- A) At mean position
- B) At maximum displacement
- C) Midway
- D) At rest

Correct: A

31. Which one is a characteristic of SHM?

- A) Constant speed
- B) Acceleration proportional to velocity
- C) Constant amplitude
- D) Force proportional to displacement

Correct: D

32. The unit of angular frequency is:
A) rad/s
B) Hz
C) m/s²
D) N
Correct: A

33. A graph of displacement vs time in SHM gives:

- A) Straight line
- B) Circular arc

C) Sine or cosine wave D) Exponential curve Correct: C

34. The time period of a mass-spring system is independent of:
A) Mass of body
B) Spring constant
C) Amplitude
D) Length of spring

- Correct: C
- 35. In SHM, total energy remains:
 A) Zero
 B) Constant
 C) Increasing
 D) Decreasing
 Correct: B

36. When is potential energy maximum in SHM?

A) Mean position
B) Zero displacement
C) Extreme position
D) Halfway

Correct: C

Correct: C

37. Time period of SHM is the time to complete:

- A) Half oscillation
- B) One oscillation
- C) Two oscillations
- D) One second
- Correct: B

38. Which formula represents time period of simple pendulum?

A) T = $2\pi\sqrt{(I/g)}$ B) T = $\sqrt{(g/I)}$ C) T = $2\pi\sqrt{(g/I)}$ D) T = $2\pi\sqrt{(I)}$ Correct: A

39. If the spring constant is increased, the time period:

- A) Increases
- B) Decreases
- C) Remains same
- D) Becomes infinite
- **Correct: B**

40. The restoring force for a pendulum is given by:

- A) T B) mg sinθ
- C) kx

D) mv²/r

Correct: B

41. Which wave property changes when light enters a different medium?

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- A) Frequency
- B) Wavelength
- C) Amplitude
- D) Phase
- Correct: B

42. Speed of wave =

A) Time × Frequency
B) Wavelength × Frequency
C) Frequency / Wavelength
D) Wavelength / Time
Correct: B

43. Diffraction increases when:

A) Opening is wide
B) Wavelength is small
C) Opening is small
D) None
Correct: C

44. In transverse waves, particles move:

A) Parallel to wave direction

- B) Perpendicular to wave direction
 C) Randomly
 D) Circular
 Correct: B
- 45. The energy carried by a wave depends on:
- A) Speed
- B) Frequency
- C) Amplitude
- D) Wavelength
- Correct: C

46. Which type of waves require a medium for propagation?

- A) Light waves
- B) X-rays
- C) Sound waves
- D) Gamma rays
- Correct: C

47. In transverse waves, particles of the medium move:

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- A) Parallel to wave direction
- B) Perpendicular to wave direction
- C) Randomly
- D) Opposite to wave motion
- **Correct: B**

48. In longitudinal waves, particles of the medium move:

- A) Perpendicular to wave direction
- B) At 45° to wave direction
- C) Parallel to wave direction
- D) Circular

Correct: C

49. Which one is a transverse wave?

- A) Sound
- B) Water wave
- C) Compression in spring
- D) Longitudinal wave

Correct: B

50. A ripple tank is best used to study: A) SHM B) Nuclear motion C) Wave behavior D) Magnetism Correct: C

51. When water waves pass from deep to shallow water, their speed:

- A) Increases
- B) Decreases
- C) Remains same
- D) Becomes zero
- Correct: B

52. When a wave strikes a surface and bounces back, the process is:

- A) Refraction
- B) Reflection
- C) Diffraction
- D) Interference

Correct: B

53. The bending of waves around the edges of obstacles is called:

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- A) Reflection
- B) Refraction
- C) Diffraction
- D) Dispersion
- Correct: C

54. Which of the following remains unchanged during refraction?

- A) Speed
- B) Wavelength
- C) Frequency
- D) Direction
- Correct: C

55. When wave enters new medium at an angle and changes direction, this is: A) Reflection

B) RefractionC) DiffractionD) EchoCorrect: B

56. Wave speed is calculated using: A) $v = T \times f$ B) $v = f / \lambda$ C) $v = f \times \lambda$ D) $v = \lambda / f$

Correct: C

57. Which of the following is not a mechanical wave?

- A) Water wave
- B) Sound wave
- C) Radio wave
- D) Seismic wave
- Correct: C

58. When two waves meet and reinforce or cancel each other, it's called:

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- A) Reflection
- B) Refraction
- C) Interference
- D) Diffraction
- Correct: C

59. Which factor does not affect wave speed in a medium?

- A) Medium's properties
- B) Frequency
- C) Temperature (for gases)
- D) Wavelength

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Correct: D
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60. In ripple tank, the evidence of diffraction is most clear when:

- A) Wavelength > slit width
- B) Wavelength < slit width
- C) Slit is wide
- D) Surface is rough

Correct: A

61. The unit of wavelength is: A) m/s B) s C) m D) Hz Correct: C

62. Which of the following quantities is a vector?

A) Speed

B) Frequency

C) Velocity

D) Wavelength

Correct: C

63. What is the speed of a wave having frequency 10 Hz and wavelength 3 m?

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A) 3 m/s

B) 13 m/s

C) 30 m/s

D) 300 m/s

Correct: C

64. Which of the following is not a wave property?

A) Diffraction

- B) Reflection
- C) Refraction
- D) Boiling
- **Correct: D**

65. Which wave phenomenon proves that waves carry energy without transferring matter?
A) Reflection
B) Refraction
C) Diffraction
D) All of the above
Correct: D

66. If 100 waves pass in 5s, frequency is:

A) 5 Hz B) 10 Hz C) 20 Hz D) 25 Hz Correct: B

67. A 30 Hz wave travels 60 cm in 0.5s. What is its speed?

A) 90 cm/s
B) 120 cm/s
C) 150 cm/s
D) 180 cm/s
Correct: C

68. If wavelength is 4m and frequency is 2Hz, speed is:

- A) 1 m/s
- B) 2 m/s
- C) 6 m/s
- D) 8 m/s
- Correct: D

69. When sound reflects, it creates: A) Refraction

- A) RefractionB) EchoC) InterferenceD) Doppler
- Correct: B

70. In a ripple tank, when waves move from deep to shallow water, speed:

- A) Increases
- B) Remains same
- C) Decreases
- D) Becomes zero
- Correct: C

71. Which wave property remains unchanged during refraction?

- A) Speed
- B) Wavelength
- C) Frequency
- D) Direction

Correct: C

72. What happens to diffraction if the gap is made narrower?

- A) Decreases
- B) Increases
- C) Remains same
- D) Vanishes
- **Correct: B**

73. The energy in SHM is conserved by transforming between:

- A) Light and heat
- B) KE and PE
- C) Work and friction
- D) Force and momentum

Correct: B

74. In SHM, maximum restoring force occurs at:

- A) Mean position
- B) Quarter position
- C) Extreme position
- D) Zero position

Correct: C S O C H IS A CHL O B Y M A

75. A 5 Hz vibrator produces waves with wavelength 2 cm. The wave speed is:

- A) 2.5 cm/s
- B) 10 cm/s
- C) 0.4 cm/s
- D) 7 cm/s
- **Correct: B**

76. Which one is not a property of waves demonstrated in a ripple tank?

- A) Reflection
- **B)** Refraction
- C) Diffraction
- D) Fusion
- **Correct: D**

77. During SHM, the object has maximum speed at:

A) Extreme point
B) Mean point
C) Start point
D) All positions
Correct: B

78. The relation between wave speed, frequency, and wavelength is: A) $v = \lambda/f$ B) $v = f/\lambda$ C) $v = f\lambda$ D) $v = 1/\lambda f$ Correct: C

79. If wavelength is 5 cm and speed is 25 cm/s, frequency is: A) 2 Hz B) 5 Hz C) 10 Hz D) 25 Hz Correct: C

80. The SI unit of wave speed is: A) m/s

A) m/s B) Hz C) N D) kg **Correct: A**