Roll No. of Candidate

Name of Candidate

STARS ENTRY TEST SYSTEM-2021
(MDCAT)

Test Code: P-3 (WAVES)

Time Allowed: 50 min

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PHYSICS

1. When sound waves enter from air into water, then
   A) λ increases
   B) Speed decreases
   C) Frequency increases
   D) All of them

2. The periodic wave in the diagram below has a frequency 40 Hz.
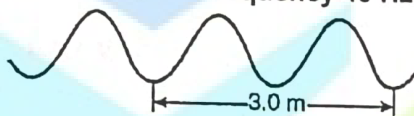
   What is the wave speed?
   A) 120 m/s
   B) 27 m/s
   C) 13 m/s
   D) 60 m/s

3. At what temperature the speed of sound in air will be 1.5 times its value at 27°C in air?
   A) 102°C
   B) 1350°C
   C) 675°C
   D) 402°C

4. A small piece of cork in a ripple tank oscillates us and down as ripples pass it. If the ripples travelling at 0.3 m/s, have a wavelength of 1.5π cm and the cork vibrates with an amplitude of 5mm, then the maximum velocity of the cork will be
   A) 20 cm/s
   B) 20 m/s
   C) 0.02 cm/s
   D) 200 m/s

5. What kind of waves are electromagnetic waves?
   A) Longitudinal waves
   B) Mechanical waves
   C) Transverse waves
   D) sound waves

6. A particle is oscillating according to the equation $x = 7 \cos 0.5\pi t$, where 't' is in second The point moves from the position of equilibrium to maximum displacement in time
   A) 4.0 s
   B) 1.0 s
   C) 2.0 s
   D) 0.5 s

7. Speed of sound at STP is 332 m/sec.) The speed at 2 atm pressure at same temp is
   A) 332m/sec
   B) 340m/sec
   C) 328 m/sec
   D) 350 m/sec

8. The phase of a particle executing simple harmonic motion is $\pi/2$ when it has
   A) Maximum acceleration
   B) Maximum displacement
   C) Maximum velocity
   D) both A) and B.

9. The diagram shows a pulse moving to the right in a rope. "A" is a point on the rope.
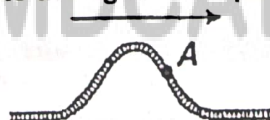
   Which arrow best shows the direction of movement of point "A" at this instant?

   A) ↗   B) →   C) ↑   D) ↓

10. A particle is moving in a circle with uniform speed The motion of the particle is
    A) Periodic and simple harmonic
    B) Periodic but not simple harmonic
    C) A periodic
    D) Both A and B

11. A mass spring system is executing S.H.M. If its amplitude is 4 m and periodic ...... the maximum velocity (m/s) of the particle will be
A) π
B) 2π
C) $2\pi^2$
D) 4π

12. What is the wavelength of the longitudinal wave shown in the diagram below? Assume the dark parts to be wave compressions.

1.0 m
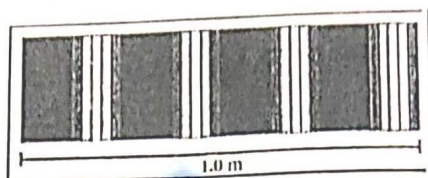
A) 1.00 m
B) 0.50 m
C) 0.75 m
D) 0.25 m

13. Velocity of sound in a gas is proportional to:
A) square root of isothermal elasticity
B) square root of adiabatic elasticity
C) adiabatic elasticity
D) isothermal elasticity

14. A big explosion on the moon cannot be heard on the earth because:
A) The explosion produced high frequency sound waves which are inaudible
B) Sound waves require a material medium for propagation
C) Sound waves are absorbed in the atmosphere of moon
D) Sound waves are absorbed in earth's atmosphere

15. What is the amplitude and wavelength of the wave shown below?

1.5 m
0.20 m
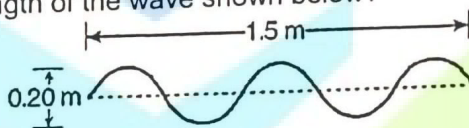
A) amplitude= 0.20 m, wavelength = 0.60 m
B) amplitude= 0.10 m, wavelength = 0.30 m
C) amplitude= 0.20 m, wavelength = 0.30 m
D) amplitude= 0.10 m, wavelength = 0.60 m

16. A source emits a sound of frequency of 400 Hz, but the listener hears it to be 390 Hz. Then
A) The listener is moving towards the source
B) The source is moving towards the listener
C) The listener is moving away from the source
D) The listener has a defective ear

17. Which of the following is / are essential for a system executing simple harmonic motion?
A) Restoring force
B) Frictionless
C) Inertia
D) All of these

18. A particle is executing SHM, its Acceleration at the mean position will be
A) Infinity
B) Equal to the magnitude of velocity
C) Maximum
D) Zero

19. The phase difference between two points separated by 1m in a wave of frequency 120 Hz is 90°. The wave velocity is
A) 280 m/s
B) 480 m/s
C) 180 m/s
D) 380 m/s

20. A travelling wave passes a point of observation. At this point, the time interval between successive crests is 0.2 seconds and
A) The wavelength is 5 m
B) The velocity of propagation is 5 m/s
C) The frequency is 5 Hz
D) The wavelength is 0.2 m

21. Stationary waves of frequency 300 Hz are formed in a medium in which the velocity of sound is 1200 metre/sec. The distance between a node and the neighbouring antinode is
A) 1 m
B) 3 m
C) 2 m
D) 4 m

22. Energy is not carried by which of the following waves
A) Stationary
B) Transverse
C) Progressive
D) Electromagnetic

23. Standing waves are produced in a 10 m long stretched string. If the string vibrates in 5 segments and the wave velocity is 20 m/s, the frequency is
A) 2 Hz
B) 5 Hz
C) 4 Hz
D) 10 H

24. The velocity of waves in a string fixed at both ends is 2 m/s. The string forms standing waves with nodes 5.0 cm apart. The frequency of vibration of the string in Hz is
A) 40
B) 20
C) 30
D) 10

Under similar conditions of temperature and pressure sound travels:
A) Slower in moist air than in dry air
B) Faster in moist air than in dry air
C) With the same speed in moist as well as in dry air
D) Sometime slower and sometimes faster

6. If vibrations of a string are to be increased by a factor of two, then tension in the string must be made
A) Half
B) Four times
C) Twice
D) Eight times

27. A closed pipe and an open pipe have their first overtones identical in frequency. Their lengths are in the ratio
A) 1: 2
B) 3: 4
C) 2: 3
D) 4: 5

28. Which of the following properties of a wave does not change with a change in medium?
A) Frequency
B) Wave length
C) velocity
D) amplitude

29. Speed of sound in vacuum at a temp of 0^0C is:
A) 332 m/s
B) 340 m/s
C) 333 m/s
D) zero

30. The fundamental note produced by a closed organ pipe is of frequency f. The fundamental note produced by an open organ pipe of same length will be of frequency
A) f/2
B) 2 f
C) f
D) 4 f

31. If the distant star is receding from Earth then it will give:
A) Blue shift
B) No Doppler shift
C) Red shift
D) More of there

32. The diagram shows a long rope fixed at one end The other end is moved up and down, setting up a stationary wave.
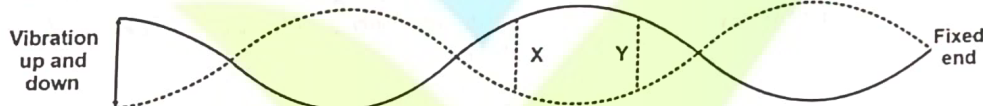
What is the phase difference between the oscillations at X and Y?

A) 0

B) $\frac{1}{2}\pi$ rad

C) $\frac{1}{4}\pi$ rad

D) $\frac{3}{4}\pi$ rad

3. An observer moves towards a stationary source of sound with a velocity one fifth of the velocity of sound What is the percentage increase in the apparent frequency?
A) Zero
B) 5%
C) 0.5%
D) 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

A) $\vec{E}$

B) $\vec{E} \times \vec{B}$

C) $\vec{B}$

D) None of these

The second overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe L metre long. The length of the open pipe will be
A) L
B) L/4
C) 2 L
D) L/2

The distance between the nearest node and antinode on a stationary wave is
A) λ
B) $\lambda/4$
C) $\lambda/2$
D) 2λ

What is the period of a wave with a frequency of 0.5 Hz?
A) 0.5 s
B) 2 s
C) 1 s
D) 3 s

What is the speed of a sound wave with frequency 2000Hz and wavelength 0.4m?
A) 5×10^3 m/s
B) 2×10^{-4} m/s
C) 3.2×10^2 m/s
D) 8×10^2 m/s

The nature of sound waves in gases is
A) Transverse
B) Stationary
C) Longitudinal
D) Electromagnetic

40. When an observer is approaching a stationary source with a velocity v_o then the apparent change in frequency observed by him will be:

A) $\dfrac{v}{v+v_o}f$

B) $\dfrac{v}{v_o}f$

C) $\left(1+\dfrac{v_o}{v}\right)f$

D) $\dfrac{v_o}{v}f$

41. A wave generator produces 500 pulses in 10 seconds. Find period of pulses it produces

A) 50s

B) $\dfrac{1}{5}$ s

C) $\dfrac{1}{50}$ s

D) $\dfrac{10}{50}$ s

42. The restoring force of SHM is maximum when particle:
A) Displacement is maximum
B) Crossing mean position
C) Half way between them
D) At rest

43. T is a microwave transmitter placed at a fixed distance from a flat reflecting surface S.

A small microwave receiver is moved steadily from T towards S and receives signals of alternate maxima and minima of intensity. The distance between successive maxima is 15 mm. What is the frequency of the microwaves?

A. 1.0×10^7 Hz

B) 1.0×10^{10} Hz

C) 2.0×10^7 Hz

D) 2.0×10^{10} Hz

44. The phase difference between the particles vibrating at two consecutive nodes is:
A) Zero
B) $\pi/2$
C) π
D) 2π

45. The frequency of a certain wave is 500 Hz and its speed is 340 ms^{-1}. What is the phase difference between the motions of two points on the wave 0.17 m apart?

A) $\dfrac{\pi}{4}$ rad

B) $\dfrac{3\pi}{4}$ rad

C) $\dfrac{\pi}{2}$ rad

D) π rad

46. The speed of sound in the direction of wind relative to ground (where v is speed of sound and v_w is speed of wind)
A) v
B) $v + v_w$
C) $v - v_w$
D) $v \pm v_w$

47. An object attached to one end of a spring makes 20 complete oscillations in 10s. Its period is
A) 2 Hz
B) 0.5 Hz
C) 0.50 s
D) 10 s

48. An object attached to one end of a spring makes 20 vibrations in 10 s. Its angular frequency is
A) 0.79 rad/s
B) 6.3 rad/s
C) 12.6 rad/s
D) 2.0 rad/s

49. Frequency f and angular frequency ω are related by:
A) $f = \pi\omega$
B) $f = 2\pi\omega$
C) $f = \omega/\pi$
D) $f = \omega/2\pi$

50. A passenger is sitting in a train which is moving fast. The engine of the train blows a whistle of frequency 'n'. If the apparent frequency of the sound heard by the passenger is 'n'' then
A) n' = n
B) n' < n
C) n' > n
D) n' ≤ n

#	Answer		#	Answer		#	Answer
1	A		21	A		41	C
2	D		22	A		42	A
3	D		23	B		43	B
4	A		24	B		44	C
5	C		25	B		45	C
6	B		26	B		46	B
7	A		27	B		47	C
8	D		28	A		48	C
9	C		29	D		49	D
10	B		30	B		50	A
11	D		31	C		51	—
12	D		32	A		52	—
13	B		33	D		53	—
14	B		34	B		54	—
15	D		35	C		55	—
16	C		36	B		56	—
17	D		37	B		57	—
18	D		38	D		58	—
19	B		39	C		59	—
20	C		40	C		60	—

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