Jupiter Academy

Subjects : Physics **PRACTICE PAPER 10**

Total Marks : 180

Physics - Section A (MCQ)

1. Two waves having the intensities in the ratio of $9 : 1$ produce interference. The ratio of maximum to the minimum intensity, is equal to

A) $2 : 1$ **B)** $4 : 1$ **C)** $9 : 1$ **D)** $10 : 8$

2. The displacement of a particle is given by $y = 5 \times 10^{-4} \sin(100t - 50x)$, where x is in meter and t in sec, find out the velocity of the wave .... m/sec

A) 5000 **B)** 2 **C)** 0.5 **D)** 300

3. The equation of a transverse wave is given by $y = 10 \sin \pi(0.01x - 2t)$ where x and y are in cm and t is in second. Its frequency is .... $\sec^{-1}$

A) 10 **B)** 2 **C)** 1 **D)** 0.01

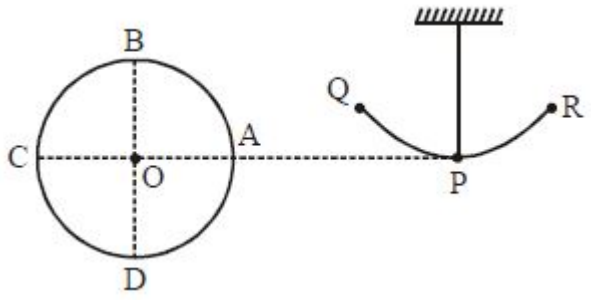
4. Two sound waves of intensity $2\ W/m^2$ and $3\ W/m^2$ meet at a point to produce a resultant intensity $5\ W/m^2$. The phase difference between two waves is .....

A) π **B)** $\frac{\pi}{4}$ **C)** $\frac{\pi}{2}$ **D)** 0

5. The sound intensity level at a point $4\ m$ from the point source is $10\ dB$, then the sound level at a distance $2\ m$ from the same source will be ..... dB

A) 26 **B)** 16 **C)** 23 **D)** 32

6. A sound source is moving on a circular path of radius R with constant angular speed ω in anticlockwise direction and emits a frequency n. An observer performs simple harmonic along the path QPR with time period $T = \frac{2\pi}{\omega}$ as shown in the figure. If at $t = 0$ source is at A and observer is at Q and assume OP is very large as compare to radius R and QP, then



A) Observer will hear maximum frequency at P if source is at B

B) Observer will hear maximum frequency at P if source is at D

C) Observer will hear maximum frequencyat Q if source is at B

D) Observer will hear maximum frequency at Q if source is at D

7. A wave travels uniformly in all directions from a point source in an isotropic medium. The displacement of the medium at any point at a distance r from the source may be represented by (A is a constant representing strength of source)

A) $[A/\sqrt{r}]sin(kr - \omega t)$
B) $[A/r]sin(kr - \omega t)$
C) $[Ar]sin(kr - \omega t)$
D) $[A/r^2]sin(kr - \omega t)$

8. 41 forks are so arranged that each produces 5 beats per sec when sounded with its near fork. If the frequency of last fork is double the frequency of first fork, then the frequencies of the first and last fork are respectively

A) $200, 400$ **B)** $205, 410$
C) $195, 390$ **D)** $100, 200$

9. Regarding speed of sound in gas match the following

(A) Temperature of gas is made 4 times and pressure 2 times	(P) Speed becomes $2\sqrt{2}$ times
(B) Only pressure is made 4 times without change in temperature	(Q) Speed become 2 times
(C) Only temperature is changed to 4 times	(R) Speed remains unchanged
(D) Molecular mass of the gas is made 4 times	(S) Speed becomes half

A) $A - Q,\ B - R,\ C - Q,\ D - S$
B) $A - Q,\ B - S,\ C - Q,\ D - S$
C) $A - S,\ B - R,\ C - Q,\ D - S$
D) $A - Q,\ B - R,\ C - Q,\ D - Q$

10. A sound source is moving towards a stationary observer with $1/10$ of the speed of sound. The ratio of apparent to real frequency is

A) $10/9$ **B)** $11/10$
C) $(11/10)^2$ **D)** $(9/10)^2$

11. In a stationary wave, all particles are

A) At rest at the same time twice in every period of oscillation
B) At rest at the same time only once in every period of oscillation
C) Never at rest at the same time
D) Never at rest at all

12. A transverse harmonic wave on a string is described by $y = 3\sin(36t + 0.018x + \frac{\pi}{4})$ where x and y are in cm and t in s. The least distance between two sucessive crests in the wave is .... m

A) 2.5 **B)** 3.5 **C)** 1.5 **D)** 4.5

13. Frequency of tuning fork A is $256\ Hz$. It produces four $beats/sec$. with tuning fork B . When wax is applied at tuning fork B then 6 $beats/sec$. are heard. By reducing little amount of wax $4\ beats/sec$. are heard. Frequency of B is .... Hz

A) 250 **B)** 260 **C)** 252 **D)** 256

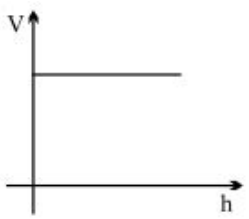
14. Three waves of equal frequency having amplitudes $10\mu m,\ 4\mu m,\ 7\mu m$ arrive at a given point with successive phase difference of $\frac{\pi}{2}$, the amplitude of the resulting wave in μm is given by

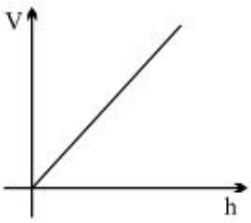
A) 4 **B)** 5 **C)** 6 **D)** 7

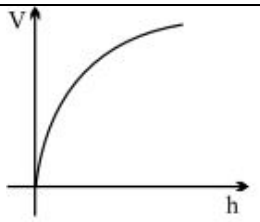
15. A student is performing the experiment of Resonance Column. The diameter of the column tube is $4\ cm$. The frequency of the tuning fork is $512\ Hz$. The air temperature is 38^oC in which the speed of sound is $336\ m/s$. The zero of the meter scale coincides with the top end of the Resonance column tube. When the first resonance occurs, the reading of the water level in the column is ..... cm

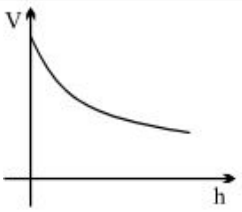
A) 14.0 **B)** 15.2 **C)** 16.4 **D)** 17.6

16. A uniform rope having some mass hanges vertically from a rigid support. A transverse wave pulse is produced at the lower end. The speed (v) of the wave pulse varies with height (h) from the lower end as:

A)


B)


C)


D)


17. The Doppler's effect is applicable for

A) Light waves **B)** Sound waves
C) Space waves **D)** Both (a) and (b)

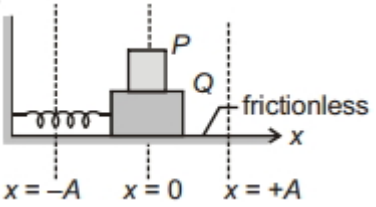
18. A stretched string of length l, fixed at both ends can sustain stationary waves of wavelength λ, given by

A) $\lambda = \frac{n^2}{2l}$ **B)** $\lambda = \frac{l^2}{2n}$
C) $\lambda = \frac{2l}{n}$ **D)** $\lambda = 2l\ n$

19. A tuning fork of frequency $392Hz$, resonates with $50cm$ length of a string under tension (T). If length of the string is decreased by 2%, keeping the tension constant, the number of beats heard when the string and the tuning fork made to vibrate simultaneously is

A) 4 **B)** 6 **C)** 8 **D)** 12

20. In the figure shown, there is friction between the blocks P and Q but the contact between the block Q and lower surface is frictionless. Initially the block Q with block P over it lies at $x = 0$, with spring at its natural length. The block Q is pulled to right and then released. As the spring - blocks system undergoes $S.H.M.$ with amplitude A, the block P tends to slip over Q.P is more likely to slip at

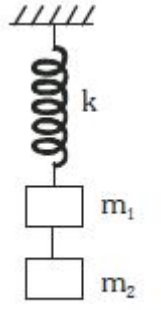


A) $x = 0$ **B)** $x = +A$
C) $x = +\frac{A}{2}$ **D)** $x = +\frac{A}{\sqrt{2}}$

21. The amplitude of a damped oscillator becomes one third in $2\ sec$. If its amplitude after $6\ sec$ is $1/n$ times the original amplitude then the value of n is

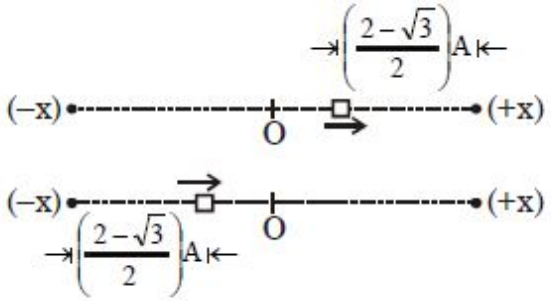
A) 3^2 **B)** $3\sqrt{2}$ **C)** $3\sqrt{3}$ **D)** 3^3

22. Two masses m_1 and m_2 are supended together by a massless spring of constant k. When the masses are in equilibrium, m_1 is removed without disturbing the system; the amplitude of vibration is



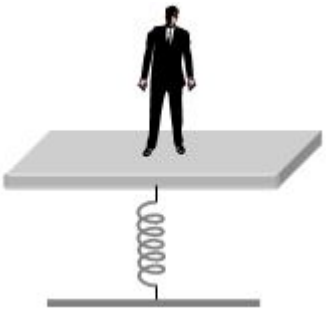
A) $m_1 g/k$ **B)** $m_2 g/k$
C) $\frac{(m_1+m_2)\,g}{k}$ **D)** $\frac{(m_2-m_1)\,g}{k}$

23. Two bodies performing SHM have same amplitude and frequency. Their phases at a certain instant are as shown in the figure. The phase difference between them is



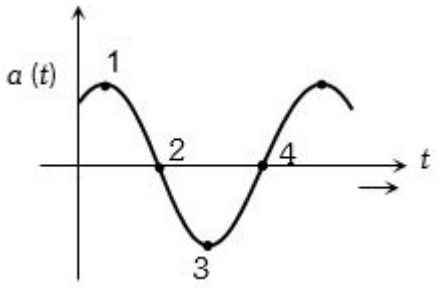
A) $\frac{2\pi}{3}$ **B)** π
C) $\frac{\pi}{3}$ **D)** None of these

24. A man weighing $60\ kg$ stands on the horizontal platform of a spring balance. The platform starts executing simple harmonic motion of amplitude $0.1\ m$ and frequency $\frac{2}{\pi} Hz$. Which of the following statement is correct



A) The spring balance reads the weight of man as $60\ kg$
B) The spring balance reading fluctuates between $60\ kg$. and $70\ kg$
C) The spring balance reading fluctuates between $50\ kg$ and $60\ kg$
D) The spring balance reading fluctuates between $50\ kg$ and $70\ kg$

25. The acceleration a of a particle undergoing $S.H.M.$ is shown in the figure. Which of the labelled points corresponds to the particle being at $-x_{max}$



A) 4 **B)** 3 **C)** 2 **D)** 1

26. The displacement of a particle varies according to the relation $x = 3sin100t + 8cos^2 50t$. Which of the following is $INCORRECT$ about this motion

A) The motion of the particle is $S.H.M.$
B) The amplitude of the $S.H.M.$ of the particle is $5\ units$
C) The amplitude of the resultant $S.H.M.$ is $\sqrt{73}\ units$
D) The maximum displacement of the particle from the origin is $9\ units.$

27. A pendulum is suspended in a lift and its period of oscillation when the lift is stationary is T_0. What must be the acceleration of the lift for the period of oscillation of the pendulum to be $T_0/2$?

A) $2g$ downward **B)** $2g$ upward
C) $3g$ downward **D)** $3g$ upward

28. The displacement of a particle from its mean position (in metre) is given by
$y = 0.2 \sin(10\pi t + 1.5\pi) \cos(10\pi t + 1.5\pi)$
The motion of particle is

A) Periodic but not $S.H.M$
B) Non-periodic
C) Simple harmonic motion with period $0.1\ s$
D) Simple harmonic motion with period $0.2\ s$

29. A U tube of uniform bore of cross-sectional area A has been set up vertically with open ends facing up. Now m gm of a liquid of density d is poured into it. The column of liquid in this tube will oscillate with a period T such that

A) $T = 2\pi\sqrt{\frac{M}{g}}$ **B)** $T = 2\pi\sqrt{\frac{MA}{gd}}$
C) $T = 2\pi\sqrt{\frac{M}{gdA}}$ **D)** $T = 2\pi\sqrt{\frac{M}{2Adg}}$

30. A particle performs SHM with a period T and amplitude a. The mean velocity of the particle over the time interval during which it travels a distance $a/2$ from the extreme position is

A) a/T **B)** $2a/T$ **C)** $3a/T$ **D)** $a/2T$

31. Values of the acceleration A of a particle moving in simple harmonic motion as a function of its displacement x are given in the table below. The period of the motion is

$A(mm\ s^{-2})$	16	8	0	-8	-16
$x\ (mm)$	-4	-2	0	2	4

A) $\frac{1}{\pi}s$ **B)** $\frac{2}{\pi}s$ **C)** $\frac{\pi}{2}s$ **D)** $\pi\, s$

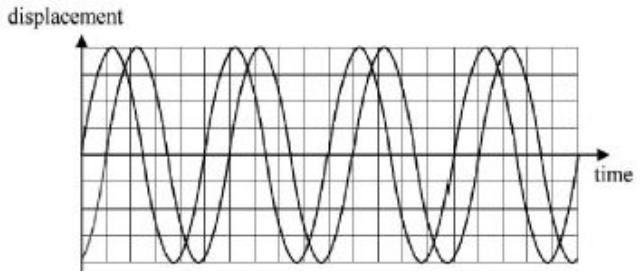
32. For a simple pendulum the graph between L and T will be.

A) Hyperbola **B)** Parabola
C) A curved line **D)** A straight line

33. A spring having a spring constant 'K' is loaded with a mass 'm'. The spring is cut into two equal parts and one of these is loaded again with the same mass. The new spring constant is

A) $\frac{K}{2}$ **B)** K **C)** $2K$ **D)** K^2

34. The diagram shows two oscillations. What is the phase difference between the oscillations?

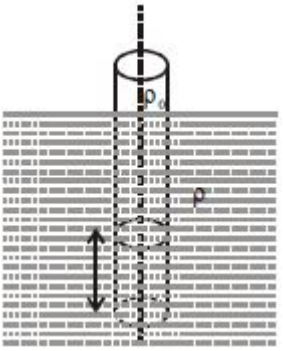


A) $\frac{\pi}{5}rad$ **B)** $\frac{2\pi}{5}rad$
C) $\frac{3\pi}{5}rad$ **D)** $\frac{4\pi}{5}rad$

35. A particle of mass $10\ gm$ moves in a field where potential energy per unit mas is given by expression $v = 8 \times 10^4\ x^2\ erg/gm$. If the total energy of the particle is $8 \times 10^7\ erg$ then the relation between x and time t is

A) $x = 10 \sin(400\,t + \phi)\ cm$
B) $x = \sin(400\,t + \phi)\ m$
C) $x = 10 \sin(40\,t + \phi)\ cm$
D) $x = 100 \sin(4\,t + \phi)\ m\ [\phi = \text{constant}]$

36. A solid cylinder of density ρ_0, cross-section area A and length l floats in a liquid $\rho(>\rho_0)$ with its axis vertical, as shown. If it is slightly displaced downward and released, the time period will be

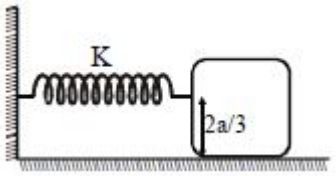


A) $2\pi\sqrt{\frac{l}{g}}$ **B)** $2\pi\sqrt{\frac{\rho_0 l}{\rho g}}$
C) $2\pi\sqrt{\frac{\rho l}{\rho_0 g}}$ **D)** $2\pi\sqrt{\frac{l}{2g}}$

37. The potential energy of a simple harmonic oscillator at mean position is $2\ joules$. If its mean $K.E.$ is $4\ joules$, its total energy will be .... J

A) 7 **B)** 8 **C)** 10 **D)** 11

38. Find maximum amplitude for safe SHM (block does not topple during SHM) of a cubical block of side 'a' on a smooth horizontal floor as shown in figure (spring is massless)



A) $\frac{mg}{3K}$ **B)** $\frac{3mg}{K}$ **C)** $\frac{2mg}{3K}$ **D)** None

39. A particle of mass m is hanging vertically by an ideal spring of force constant K. If the mass is made to oscillate vertically, its total energy is

A) Maximum at extreme position
B) Maximum at mean position
C) Minimum at mean position
D) Same at all position

40. Which of the following statements is not true ? In the case of a simple pendulum for small amplitudes the period of oscillation is

A) Directly proportional to square root of the length of the pendulum
B) Inversely proportional to the square root of the acceleration due to gravity
C) Dependent on the mass, size and material of the bob
D) Independent of the amplitude

41. Which of the following is a necessary and sufficient condition for S.H.M.

A) Constant period
B) Constant acceleration
C) Proportionality between acceleration and displacement from equilibrium position
D) Proportionality between restoring force and displacement from equilibrium position

42. If speed of sound in air in $330\,m/s$ then, find the number of tones present in an open organ pipe of length $1\,m$ whose frequency if ≤ 1000.

A) 2 B) 4 C) 8 D) 6

43. The number of possible natural oscillations of air column in a pipe closed at one end of length $85\ cm$ whose frequencies lie below $1250\ Hz$ are (Velocity of sound $= 340\ ms^{-1}$)

A) 4 B) 5 C) 6 D) 7

44. '$SONAR$' emits which of the following waves

A) Radio waves B) Ultrasonic waves
C) Light waves D) Magnetic waves

45. $Assertion$: For a particle performing SHM, its speed decreases as it goes away from the mean position.
$Reason$: In SHM, the acceleration is always opposite to the velocity of the particle.

A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
C) If the Assertion is correct but Reason is incorrect.
D) If both the Assertion and Reason are incorrect.