INDIAN SCHOOL MUSCAT

DEPARTMENT OF PHYSICS

STUDY MATERIAL FOR NEET AND JEE EXAMS

OSCILLATIONS AND WAVES

1.	The angular velocity and the amplitude of a simple pendulum is 'ω' and 'a' respectively. At a displacement x from the mean position its kinetic energy is T and potential energy is V, then the ratio of T to V is (a) $\frac{x^2\omega^2}{a^2 - x^2\omega^2}$ (b) $\frac{x^2}{(a^2 - x^2)}$ (c) $\frac{a^2 - x^2\omega^2}{x^2\omega^2}$ (d) $\frac{a^2 - x^2}{x^2}$
2.	A second's pendulum is placed in space laboratory orbiting around the earth at a height 3R from earth's surface where R is earth's radius. The time period of the pendulum will be (a) Zero (b) $2\sqrt{3}$ s (c) 4 s (d) Infinite
3.	The maximum velocity for particle in SHM is 0.16 m/s and maximum acceleration is 0.64 m/s^2. The amplitude is (a) 4×10^{-2} m (b) 4×10^{-1} m (c) 4×10 m (d) 4×10^{0} m
4.	The length of second's pendulum on the surface of earth is 1 m. the length of same pendulum on the surface of moon, where acceleration due to gravity is (1/6)th of the g on the surface of earth is (a) 36 m (b) 1 m (c) $\frac{1}{36}$ (d) $\frac{1}{6}$ m
5.	A particle is vibrating in S.H.M. with an amplitude of 4 cm. at what displacement from the equilibrium position is its energy half potential and half kinetic? (a) 2.5 cm (b) $\sqrt{2}$ cm (c) 3 cm (d) 2 cm
6.	The frequency of wave is 0.002 Hz. Its time period is (a) 100 s (b) 500 s (c) 5000 s (d) 50 s
7.	The mass and diameter of a planet are twice those of earth. the period of oscillation of pendulum on this planet will be (if it is a second's pendulum on earth) (a) $\frac{1}{\sqrt{2}}$ Second (b) $2 \times \sqrt{2}$ Second

	(c) 2 second	(d) $\frac{1}{2}$ Second	
8.	A simple pendulum is suspended from the roof of a trolley which moves in a horizontal direction with an acceleration 'a' then the time period is given $T = 2\pi\sqrt{\frac{l}{g}}$, where g is equal to (a) υ ag (b) 3 – a (c) g + a (d) $\sqrt{g^2 + a^2}$		
9.	A mass M is suspended from a light spring. If the additional mass m is added, it displaces the spring by a distance x. now the combined mass will oscillate on the spring with time period equals to (a) $T = 2\pi\sqrt{\frac{mg}{x(M+m)}}$ (b) $T = 2\pi\sqrt{\frac{x(M+m)}{mg}}$ (c) $T = \frac{\pi}{2}\sqrt{\frac{mg}{x(M+m)}}$ (d) $T = \frac{\pi}{2}\sqrt{\frac{(M+m)}{mgx}}$		
10.	A simple pendulum of length l and mass (bob) m is suspended vertically. The string makes an angle θ with the vertical. The restoring force acting on the pendulum, is (a) mg tan θ (b) mg sin θ (c) – mg sin θ (d) – mg cos θ		
11.	The pendulum is acts as second pendulum on earth. Its time on a planet, whose mass and diameter are twice that of earth, is (a) $\sqrt{2}$ s (b) 2 s (c) $2\sqrt{2}$ s (d) 1/ $\sqrt{2}$ s		
12.	If velocity of body is half the maximum velocity. Then what is the distance from the mean position? (a) 2 A (b) $\frac{\sqrt{3}}{2} \times A$ (c) A (d) $\frac{A}{2}$		
13.	The motion of a particle executing simple harmonic motion is given by X = 0.01 sin 100π (t + 0.05), where X is in metres ant t in second. The time period in second is (a) 0.001 (b) 0.02		

	(c) 0.1 (d) 0.2
14.	A simple pendulum performs simple harmonic motion about x = 0 with an amplitude A and time period T. the speed of the pendulum at $x = \frac{A}{2}$ will be (a) $\frac{\pi A\sqrt{3}}{T}$ (b) $\frac{\pi A}{T}$ (c) $\frac{\pi A\sqrt{3}}{2T}$ (d) $\frac{3\pi^2 A}{T}$
15.	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
16.	A linear harmonic oscillator of force constant 2×10^6 N/m and amplitude 0.01 m has a total mechanical energy of 100 J. it's maximum potential energy is (a) 100 J (b) 200 J (c) 150 J (d) 0
17.	The necessary and sufficient condition for S.H.M. is (a) Constant period (b) Constant acceleration (c) Proportionality between restoring force and displacement from equilibrium position in opposite direction (d) None of the above
18.	A particle moves such that its acceleration a is given by a = −bx, where x is the displacement from equilibrium position and b is a constant. The period of oscillation is (a) $\sqrt{\frac{2\pi}{b}}$ (b) $\frac{2\pi}{\sqrt{b}}$ (c) $\frac{2\pi}{b}$ (d) $\sqrt{\frac{2\pi}{b}}$
19.	The period of oscillation of a mass M, having from a spring of force constant k is T. When additional mass m is attached to the spring, the period of oscillation becomes 5T/4. m/M = (a) 9:16 (b) 25:16 (c) 25:9 (d) 19:9

20.	W denotes to the total energy of a particle in linear S.H.M. At a point, equidistant from the mean position and extremity of the path of the particle (a) K.E. of the particle will be w/2 and P.E. will also be w/2 (b) K.E. of the particle will be w/4 and P.E will be w/4 (c) K.E. of the particle will be 3w/4 and P.E. will be w/4 (d) K.E. of the particle will be w/8 and P.E. will be 7w/8
21.	If the length of second's pendulum is increased by 2%, how may seconds it will lose per day? (a) 3427 sec (b) 3727 sec (c) 3927 sec (d) 864 sec
22.	Two springs of constants k_1 and k_2 equal maximum velocities, when executing simple harmonic motion. The ratio of their amplitudes (masses are equal) will be (a) $\frac{k_1}{k_2}$ (b) $\frac{k_2}{k_1}$ (c) $\left(\frac{k_1}{k_2}\right)^{1/2}$ (d) $\left(\frac{k_2}{k_1}\right)^{1/2}$
23.	The maximum velocity of a body in S.H.M. is 0.25 m/s and maximum acceleration is 0.75 m/s^2, the period of S.H.M. is (a) $\left(\frac{\pi}{3}\right)$ second (b) $\left(\frac{\pi}{2}\right)$ second (c) $\left(\frac{2\pi}{3}\right)$ second (d) π second
24.	The maximum velocity and maximum acceleration of a body moving in a simple harmonic oscillator are 2m/s and 4m/s^2 the angular velocity is (a) 1 rad/s (b) 2 rad/s (c) 4 rad/s (d) 5 rad/s
25.	A particle executes S.H.M. with amplitude 0.5 cm and frequency 100 Hz. The maximum speed of particle will be (a) π m/s (b) $5\pi \times 10^{-5}$ m/s (c) 0.5 m/s (d) 100π m/s
26.	A uniform string of length L, mass M is fixed at both ends under tension T. then it can vibrate with frequencies given by n is the formula: (a) $n = \frac{1}{2}\sqrt{\left(\frac{T}{ML}\right)}$

(b) $n = \frac{1}{2}\sqrt{\left(\frac{T}{M}\right)}$

(c) $n = \frac{L}{2}\sqrt{\left(\frac{T}{M}\right)}$

(d) $n = \frac{1}{2}\sqrt{\left(\frac{M}{LT}\right)}$

27. The fundamental frequency of a sting stretched with a weight of 4 kg is 256 Hz. The weight required to produce its octave is

(a) 4 kg wt　　(b) 12 kg wt

(c) 16 kg wt　　(d) 24 kg wt

A stretched wire of 60 cm vibrates with a fundamental note of frequency 256 Hz. If the length of the wire is decreased to 15 cm while the tension in kept constant. The fundamental frequency of the wire will be

(a) 64 Hz　　(b) 256 Hz

(c) 512 Hz　　(d) 1024 Hz

29. An organ pipe P_1 closed at one vibrating in its first harmonic and another pipe P_2 open at both ends vibrating in its third harmonic are in resonance with a given tuning fork. Ratio of the length of P_1that of P_2 is

(a) $\frac{8}{3}$　　(b) $\frac{3}{8}$

(c) $\frac{1}{2}$　　(d) $\frac{1}{3}$

30. In a sonometer wire, the produced waves are

(a) Longitudinal
(b) Transverse, stationary and unpolarised
(c) Transverse, stationary and polarised
(d) Transverse, progressive and polarised

31. A and B are two metal tubes having equal lengths and equal inner diameters. For the tube A, both ends are open while for the tube B, one end is closed. What is the ratio of the fundamental frequencies of A and B?

(a) 1:2　　(b) 2:1　　(c) 1:4　　(d) 4:1

32.	The frequency of fundamental note in a closed pipe (length l, speed of sound ν) is (a) $\frac{\nu}{3l}$ (b) $\frac{\nu}{2l}$ (c) $\frac{3\nu}{4l}$ (d) $\frac{4\nu}{l}$
33.	An air column in a pipe, which is closed at one end, will be in resonance with a vibrating tuning fork of frequency 264 Hz if the length of the column in cm is (a) 31.25 (b) 62.50 (c) 93.75 (d) Both (a) & (c)
34.	The harmonics which are present in a pipe open t one end are (a) Odd harmonics (b) Even harmonics (c) Even as we as odd harmonics (d) None of these
35.	The displacement of a particle executing periodic motion is given by $y = 4\cos^2\left(\frac{1}{2}\right)t \sin(1000t)$. this expression may be considered to be a result of superposition of (a) Two (b) Three (c) Four (d) Five
36.	A stretched string of 1 m length, fixed at both ends, having a mass of 5×10^{-4} kg is under a tension of 20 N. it is plucked at a point situated at 25 cm from one end. The stretched string would vibrate with frequency of (a) 400 Hz (b) 100 Hz (c) 200 Hz (d) 256 Hz
37.	Two wires made up of the same material are of equal lengths but their diameters are in the ratio 1: 2. on stretching each of these two strings by the same tension, the ratio between the fundamental frequencies of these strings is (a) 1: 4 (b) 1: 2 (c) 2: 1 (d) 4: 1

38.	A tuning fork of frequency 480 Hz is in unison with the first overtone of a pipe closed at one end. What is the fundamental frequency of the closed pipe? (a) 120 Hz (b) 140 Hz (c) 150 Hz (d) 160 Hz
39.	Two linear simple harmonic motions of the same frequency and amplitude are combined and act on a particle are right angles. The resulting motion of the particle will be circular when the phase difference between the two wave is (a) $\frac{\pi}{2}$ (b) $\frac{\pi}{4}$ (c) π (d) Zero
40.	A tuning fork of frequency of 500 c/s is sounded on resonance tube. the first and second resonance are obtained at 17 cm and 50 cm. the velocity of sound in m/sec is (a) 170 (b) 350 (c) 520 (d) 850
41.	As an empty vessel is filled with water, its frequency (a) Increases (b) Decreases (c) Remains the same (d) None of above
42.	Two closed pipe produces 10 beats per second when emitting their fundamental nodes. If their lengths are in the ratio of 25: 26 their fundamental frequency in Hz are (a) 270, 280 (b) 260, 270 (c) 260, 250 (d) 240, 250
43.	In stationary waves (a) Energy is uniformly distributed (b) Energy is minimum at nodes and maximum at antinodes (c) Energy is maximum at nodes and minimum at antinodes

	(d) None of these
44.	Two sound waves of relative intensities 400: 1 show interference. The ratio of intensity at the maxima to minima is close to (a) $\frac{11}{9}$ (b) $\frac{401}{399}$ (c) $\frac{21}{19}$ (d) $\sqrt{\frac{401}{399}}$
45.	The ratio between the amplitudes of two superposing waves is 3: 2. the ratio between the maximum and minimum intensities of the resultant wave will be (a) 9: 4 (b) 25: 1 (c) 13: 5 (d) 5: 1
46.	An open pipe is suddenly closed with the result that, the second overtone on the closed pipe is found to be higher in frequency by 100 Hz, then the first overtone of the original pipe. the fundamental frequency of open pipe will be (a) 100 Hz (b) 300 Hz (c) 150 Hz (d) 200 Hz
47.	The speed of sound in air is 350 meter per second. The fundamental frequency of an open pipe 50 cm long will be (a) 175 Hz (b) 350 Hz (c) 700 Hz (d) 50 Hz
48.	The radius, density and tension of a string A are twice the radius, density and tension of another string B. if the lengths of the string are equal, the ratio of their frequencies of their vibration (i.e. n_A/n_B) (a) 1 (b) 2

	(c) $\frac{1}{2}$ (d) $\frac{1}{4}$
49.	If n_1 is the resonance frequency of a pipe open at both ends and n_2 the resonance frequency of pipe open at one ends only, and both are vibrating in the fundamental mode and the pipes are of the same length, then (a) $n_1 = 2n_2$ (b) $n_1 = n_2$ (c) $2n_1 = n_2$ (d) $3n_2 = 4n_2$
50.	If the end correction of an open organ pipe is 0.8 cm, then the inner radius of the pipe will be (a) $\frac{1}{2}$cm (b) $\frac{1}{3}$cm (c) $\frac{2}{3}$cm (d) $\frac{3}{2}$cm

ANSWER KEY

1.	Answer: (d)	11.	Answer: (c)	21.	Answer: (d)	31.	Answer: (b)	41.	Answer: (a)
2.	Answer: (d)	12.	Answer: (b)	22.	Answer: (d)	32.	Answer: (b)	42.	Answer: (c)
3.	Answer: (a)	13.	Answer: (b)	23.	Answer: (c)	33.	Answer: (d)	43.	Answer: (b)
4.	Answer: (d)	14.	Answer: (c)	24.	Answer: (b)	34.	Answer: (a)	44.	Answer: (a)
5.	Answer: (d)	15	Answer: (c)	25.	Answer: (a)	35.	Answer: (b)	45.	Answer: (b)
6.	Answer: (b)	16.	Answer: (a)	26.	Answer: (a)	36.	Answer: (c)	46.	Answer: (d)
7.	Answer: (b)	17.	Answer: (c)	27.	Answer: (c)	37.	Answer: (c)	47.	Answer: (b)
8.	Answer: (d)	18.	Answer: (b)	28.	Answer: (d)	38.	Answer: (d)	48.	Answer: (c)
9.	Answer: (b)	19.	Answer: (d)	29.	Answer: (b)	39.	Answer: (a)	49.	Answer: (a)
10	Answer: (c)	20.	Answer: (c)	30.	Answer: (c)	40.	Answer: (b)	50.	Answer: (c)