Oscillation

Questions on Oscillation, Paper 1

1. 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 **(NCERT 71)**
   (a) 36 m (b) 1 m
   (c) $\frac{1}{36}$ (d) $\frac{1}{6}$m

2. 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 **(CPMT 89)**
   (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) $T = \frac{\pi}{2}\sqrt{\frac{(M+m)}{mgx}}$

3. The displacement of particle performing simple harmonic motion is given by, $x = 8 \sin \omega t + 6 \cos \omega t$, where distance is in cm and time is in second. The amplitude of motion is **(MHT-CET-2005)**
   (a) 10 cm (b) 14 cm
   (c) 2 cm (d) 3.5 cm

4. A simple pendulum is set up in a trolley which moves to the right with an acceleration a on a horizontal plane. Then the thread of the pendulum in the mean position makes an angle θ with the vertical **(CPMT 83)**
   (a) $\tan^{-1}\left(\frac{a}{g}\right)$ in the forward direction
   (b) $\tan^{-1}\left(\frac{a}{g}\right)$ in the backward direction
   (c) $\tan^{-1}\left(\frac{g}{a}\right)$ in the backward direction
   (d) $\tan^{-1}\left(\frac{g}{a}\right)$ in the forward direction

5. 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 **(CBSE 91)**
   (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) $\frac{a^2 - x^2}{x^2}$

6. A particle executes S.H.M. of amplitude A. at what distance from mean position its kinetic energy is equal to its potential energy? **(MHT-CET 99)**
   (a) 0.51 A (b) 0.61 A
   (c) 0.71 A (d) 0.81 A

7. 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 **(MHT-CET-2005)**
   (a) mg tan θ (b) mg sin θ
   (c) – mg sin θ (d) – mg cos θ

8. 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) **(IIT 73)**
   (a) $\frac{1}{\sqrt{2}}$ Second (b) $2 \times \sqrt{2}$ Second
   (c) 2 second (d) $\frac{1}{2}$Second

9. 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 **(CPMT 89)**
   (a) Zero (b) $2\sqrt{3}$ s
   (c) 4 s (d) Infinite

10. The pendulum is acts as second pendulum on earth. Its time on a planet, whose mass and diameter are twice that of earth, is **(MHT-CET-2005)**
    (a) $\sqrt{2}$ s (b) 2 s
    (c) $2\sqrt{2}$ s (d) $1/\sqrt{2}$ s

11. 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 **(CPMT 78)**
    (a) Maximum at extreme position
    (b) Maximum at mean position
    (c) Minimum at mean position
    (d) Same at all positions

12. At a place where g = 980 cm/sec^2. the length of seconds pendulum is about
    (a) 50 cm (b) 100 cm
    (c) 2 cm (d) 2 m

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13. The maximum velocity for particle in SHM is 0.16 m/s and maximum acceleration is 0.64 m/s^2. The amplitude is **(MHT-CET-2004)**
(a) 4×10^{-2} m (b) 4×10^{-1} m
(c) 4×10 m (d) 4×10^{0} m

14. 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? **(NCERT 84)**
(a) 2.5 cm (b) $\sqrt{2}$ cm
(c) 3 cm (d) 2 cm

15. The time period of a spring pendulum is **(CPMT 71)**
(a) $T = 2\pi\sqrt{\frac{m}{k}}$ (b) $T = 2\pi\sqrt{\frac{2k}{m}}$
(c) $T = 2\pi\sqrt{\frac{k}{m}}$ (d) $T = \pi\sqrt{\frac{2m}{k}}$

16. The equation of displacement of particle performing SHM is X = 0.25 sin (200 t). The maximum velocity is **(MHT-CET-2004)**
(a) 100 m/s (b) 200 m/s
(c) 50 m/s (d) 150 m/s

17. A pendulum suspended from the roof of a train has a period T (When the train is at rest). When the train is accelerating with a uniform acceleration 'a', the time period of the pendulum will **(NCERT 80)**
(a) Increase (b) Decrease
(c) Remain unaffected (d) Become infinite

18. A particle executing a vibratory motion while passing through the mean position has **(CPMT 92)**
(a) Maximum P.E. and minimum K.E.
(b) Maximum K.E. and minimum P.E.
(c) P.E. and K.E. both maximum
(d) P.E. and K.E. both minimum

19. The frequency of wave is 0.002 Hz. Its time period is **(MHT-CET-2004)**
(a) 100 s (b) 500 s
(c) 5000 s (d) 50 s

20. A simple pendulum has a period T. it is taken inside a lift moving up with uniform acceleration g/3. now its time period will be **(NCERT 90)**
(a) $\sqrt{2}$ T (b) $\frac{2T}{\sqrt{3}}$
(c) $\frac{\sqrt{3}}{2}$ T (d) $\frac{3T}{\sqrt{2}}$

21. For a magnet of time period T magnetic moment is M, if the magnetic moment becomes one fourth of the initial value, then the time period of oscillation becomes.
(MHT CET 2006)
(a) Half of initial value
(b) One fourth of initial value
(c) Double of initial value
(d) Four time initial value

22. The value of displacement of particle performing SHM, when kinetic energy is (3/4)th of its total energy is **(MHT-CET-2004)**
(a) $x = \pm\frac{A}{2}$ (b) $x = \pm\frac{\sqrt{3A}}{2}$
(c) $x = \pm\frac{A}{4}$ (d) $x = \pm\frac{A}{\sqrt{2}}$

23. The shape of l – T graph of simple pendulum is, **(CPMT-92)**
(a) Curve (b) Parabola
(c) Straight line (d) Hyperbola

24. 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 **(CBSE 91)**
(a) υ ag (b) 3 – a
(c) g + a (d) $\sqrt{g^2 + a^2}$

25. Two equal negative charges –q are fixed at point (0, a) and (0, –a) on the Y-axis A positive charge q is released from rest at point (2a, 0) on the X-axis. The charge Q will **(IIT 83)**
(a) Execute simple harmonic motion about the origin
(b) Move to the origin and remained at rest
(c) Move to infinity
(d) Execute oscillatory motion but not simple harmonic motion

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Answers to Oscillation, Paper 1

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