Oscillation

Questions on Oscillation, Paper 3

1. Dimensions of force constant are **(MHT-CET-2003)**
   (a) $M^1L^0T^{-2}$ (b) $M^{-1}L^0T^{-2}$
   (c) $M^0L^1T^{-2}$ (d) MLT^{-2}

2. A bar magnet is in oscillatory motion its frequency is 'n' magnetic field induction is $0.4 \times 10^{-5}T$ when the frequency is doubled due to increase the magnetic field induction. The what is increasing value to induction?
   (a) 1.2×10^{-3} B   (b) 1.2×10^{-4}
   (c) 1.2×10^{-5} B   (d) 1.2×10^{-6}

3. 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
   (CPMT 91, NCERT 84)
   (a) $\sqrt{\dfrac{2\pi}{b}}$ (b) $\dfrac{2\pi}{\sqrt{b}}$
   (c) $\dfrac{2\pi}{b}$ (d) $\sqrt{\dfrac{2\pi}{b}}$

4. A force of 6.4N stretches a vertical spring by 0.1 m. the mass that must be suspended from the spring so that it oscillates with a period of $(\pi/4)$ sec is **(Roorkee 88)**
   (a) $\dfrac{\pi}{4}$ kg   (b) $\dfrac{1}{\pi}$ kg
   (c) 1 kg   (d) 10 kg

5. Total energy of a particle executing S.H.M. is proportional to **(MHT CET 2002, CPMT 74)**
   (a) Square of the amplitude of the motion
   (b) Frequency of oscillation
   (c) Velocity in equilibrium position
   (d) Displacement form equilibrium position

6. The length of a pendulum is halved. Its energy will **(MH-CET-2002)**
   (a) Decreased to half
   (b) Increased to 2 times
   (c) Decreased to one fourth
   (d) Increased to 4 times

7. In simple harmonic motion which statement is wrong.
   (MHT-CET-2008)
   (a) A body in S.H.M. its velocity maximum at mean position
   (b) A body in S.H.M. its K.E. less at extreme position
   (c) A body in S.H.M. its acceleration more at extreme position its directions away from mean position
   (d) A body in S.H.M its acceleration less at mean position

8. A simple pendulum is made of a body which is a hollow sphere containing mercury suspended by means of a wire. If a little mercury is drained off, the period of pendulum will **(NCERT 72)**
   (a) Remain unchanged (b) Increase
   (c) Decrease   (d) Become erratic

9. Time period of pendulum is 6.28 sec and amplitude of oscillation is 3 cm. Maximum acceleration of pendulum is **(MHT-CET-2002)**
   (a) 8 cm/s^2 (b) 0.3 cm/s^2
   (c) 3 cm/s^2 (d) 58.2 cm/s^2

10. A body in simple harmonic motion. Its time period is 24 sec. at mean position to 4 sec after its velocity is π m/sec. then find its path length.
    (MHT-CET-2008)
    (a) 48 m   (b) 58 m
    (c) 68 m   (d) 78 m

11. If the length of second's pendulum is increased by 2%, how may seconds it will lose per day? **(CPMT 92)**
    (a) 3427 sec   (b) 3727 sec
    (c) 3927 sec   (d) 864 sec

12. A mass of 1 kg attached to the bottom of a spring ahs a certain frequency of vibration. The following mass has to the added to it in order to reduce the frequency by half (Roorkee 88)
    (a) 1 kg   (b) 3 kg
    (c) 2 kg   (d) 4 kg

13. In S.H.M. path length is 4 cm and maximum acceleration is $2\pi^2$cm/s^2. Time period of motion is **(MHT-CET-2002)**
    (a) 2 s   (b) 4 s
    (c) $\sqrt{2}$ s   (d) 1/2 s

14. A magnet, when suspended in an external magnetic field, has period of oscillation of 4s. when it is cut length wise, and suspended in the same magnetic field, the period of vibration will be **(MHT-CET-2007)**
    (a) $2\sqrt{2}$ s   (b) 2 s
    (c) $4\sqrt{2}$ s   (d) 8 s

15. A body executes S.H.M. with an amplitude A. At what displacement, from the mean position, the kinetic energy of the body is one fourth of its total energy **(CBSE 90)**
    (a) $\dfrac{A}{4}$ (b) $\dfrac{A}{2}$
    (c) $\dfrac{\sqrt{3}}{2} A$ (d) $\sqrt{3A}$

16. M kg weight is suspended from a weightless spring and it has time period T. if now 4M kg weight is suspended from the same spring, the new time period will be
(CPMT 79)
(a) T
(b) 2T
(c) $\dfrac{T}{2}$
(d) 4T

17. The acceleration of particle executing S.H.M. when it is at mean position is **(MHT CET 2002)**
(a) Infinite
(b) Varies
(c) Maximum
(d) Zero

18. A.S.H.M. is represented by
$x = 5\sqrt{2} \,(\sin 2\pi t + \cos^2 \pi t)$. Then amplitude of the S.H.M. is **(MHT CET 2004)**
(a) 10 cm
(b) 20 cm
(c) 5 cm
(d) 50 cm

19. 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 **(MH-CET 2001)**
(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

20. In SHM, graph of which of the following is a straight line? **(MHT-CET2007)**
(a) T.E. against displacement
(b) P.E. against displacement
(c) Acceleration against time
(d) Velocity against displacement

21. The potential energy of a particle in S.H.M. at a distance x from the equilibrium position is
(MH-CET 99)
(a) $\dfrac{1}{2}m\omega^2 x^2$
(b) $\dfrac{1}{2}m\omega^2 a^2$
(c) $\dfrac{1}{2}m\omega^2\left(a^2 - x^2\right)$
(d) Zero

22. The velocity of a particle performing simple harmonic motion, when it passes through its mean position is
(MHT CET 2002)
(a) Infinite
(b) Zero
(c) Minimum
(d) Maximum

23. The time period of a bar magnet in uniform magnetic field $\vec{B}$ is T. It is cut into two halves, by cutting it parallel to its length then the time period of each part in same field is **(MHT-CET-2001)**
(a) $\sqrt{2}\,T$
(b) T
(c) 2T
(d) None of these

24. 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 = **(MHT-CET-2007)**
(a) 9:16
(b) 25:16
(c) 25:9
(d) 19:9

25. The pendulum energy of a particle executing S.H.M. at a distance x from a equilibrium position is proportional to **(Roorkee 92)**
(a) $\sqrt{x}$
(b) x
(c) x^2
(d) x^3

Answers to Oscillation, Paper 3

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