SHM

1. The equation of S.H.M. is $y = a\sin(2\pi nt + \alpha)$, then its phase at time *t* is

(a) $2\pi nt$ (b) α (c) $2\pi nt + \alpha$ (d) $2\pi t$

2. A particle is executing simple harmonic motion with a period of *T seconds* and amplitude *A metre*. The shortest time it takes to reach a point $\frac{A}{\sqrt{2}}m$ from its mean position in seconds is

(a) *T* (b) *T*/4 (c) *T*/8 (d) *T*/16

3. A particle in S.H.M. is described by the displacement function $x(t) = A\cos(\omega t + \theta)$. If the initial $(t = 0)$ position of the particle is 1 *cm* and its initial velocity is $\pi\, cm/s$. The angular frequency of the particle is $\pi\, s^{-1}$, then it's amplitude is

(a) 1 *cm* (b) $\sqrt{2}\, cm$ (c) 2 *cm* (d) 2.5 *cm*

4. If a simple pendulum oscillates with an amplitude of 50 *mm* and time period of 2 *sec*, then its maximum velocity is

(a) 0.10 *m*/*s* (b) 0.15 *m*/*s* (c) 0.8 *m*/*s* (d) 0.16 *m*/*s*

5. When the displacement is half the amplitude, the ratio of potential energy to the total energy is

(a) $\frac{1}{2}$ (b) $\frac{1}{4}$ (c) 1 (d) $\frac{1}{8}$

6. The potential energy of a particle executing S.H.M. is 2.5 *J*, when its displacement is half of amplitude. The total energy of the particle be

(a) 18 *J* (b) 10 *J* (c) 12 *J* (d) 2.5 *J*

7. A sphere of radius *r* is kept on a concave mirror of radius of curvature *R*. The arrangement is kept on a horizontal table (the surface of concave mirror is frictionless and sliding not rolling). If the sphere is displaced from its equilibrium position and left, then it executes S.H.M. The period of oscillation will be

(a) $2\pi\sqrt{\left(\frac{(R-r)1.4}{g}\right)}$ (b) $2\pi\sqrt{\left(\frac{R-r}{g}\right)}$ (c) $2\pi\sqrt{\left(\frac{rR}{g}\right)}$ (d) $2\pi\sqrt{\left(\frac{R}{gr}\right)}$

8. A tunnel has been dug through the centre of the earth and a ball is released in it. It will reach the other end of the tunnel after

(a) 84.6 minutes (b) 42.3 minutes (c) 1 day (d)Will not reach the other end

9. If the length of simple pendulum is increased by 300%, then the time period will be increased by

(a) 100% (b) 200% (c) 300% (d) 400%

10. If the length of second's pendulum is decreased by 2%, how many seconds it will lose per day

(a) 3927 *sec* (b) 3727 *sec* (c) 3427 *sec* (d) 864 *sec*

11. Infinite springs with force constants *k*, 2*k*, 4*k* and 8*k*.... respectively are connected in series. The effective force constant of the spring will be

(a) 2*k* (b) *k* (c) *k*/2 (d) 2048

12. Two springs have spring constants K_A and K_B and $K_A > K_B$. The work required to stretch them by same extension will be

(a) More in spring *A* (b) More in spring *B* (c) Equal in both (d) Nothing can be said

13. The length of a spring is *l* and its force constant is *k*. When a weight *W* is suspended from it, its length increases by *x*. if the spring is cut into two equal parts and put in parallel and the same weight *W* is suspended from them, then the extension will be

(a) 2*x* (b) *x* (c) $\frac{x}{2}$ (d) $\frac{x}{4}$

14. A mass on the end of a spring undergoes simple harmonic motion with a frequency of 0.5 *Hz*. If the attached mass is reduced to one quarter of its value, then the new frequency in *Hz* is

(a) 0.25 (b) 1.0 (c) 2.0 (d) 4.5

15. The amplitude of vibration of a particle is given by $a_m = (a_0)/(a\omega^2 - b\omega + c)$; where a_0, *a*, *b* and *c* are positive. The condition for a single resonant frequency is

(a) $b^2 < 4ac$ (b) $b^2 > 4ac$ (c) $b^2 = 5ac$ (d) $b^2 = 7ac$