Physicsaholics

DPP – 2 (SHM)

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Q 1. A particle executing S.H.M of amplitude 4 cm and T = 4 sec. The time taken by it to move from positive extreme position to half the amplitude is -

(a) 1 sec (b) 1/3 sec (c) 2/3 sec (d) $\sqrt{\frac{3}{2}}$sec

Q 2. A particle performing S.H.M. undergoes displacement of A/2 (where A = amplitude of S.H.M.) in one second. At t = 0 the particle was located at either extreme position or mean position. The time period of S.H.M. can be : (consider all possible cases)

(a) 12s (b) 2.4 (c) 6s (d) 1.2s

Q 3. A particle performs SHM in a straight line. In the first second, starting from rest, it travels a distance a and in the next second it travels a distance b in the same direction. The amplitude of the SHM is

(a) a – b (b) $\frac{2a-b}{3}$ (c) $\frac{2a^2}{3a-b}$ (d) None

Q 4. Displacement-time equation of a particle executing SHM is:

$x = A\sin\left(\omega t + \frac{\pi}{6}\right)$.

Time taken by the particle to go directly from $x = -\frac{A}{2}$ to $x = +\frac{A}{2}$ is:

(a) $\frac{\pi}{3\omega}$ (b) $\frac{\pi}{2\omega}$ (c) $\frac{2\pi}{\omega}$ (d) $\frac{\pi}{\omega}$

Q 5. A particle is executing SHM on a straight line. A and B are two points at which its velocity is zero. It passes through a certain point P (AP <BP) at successive intervals of 0.5 s and 1.5 s with a speed of 3 m/s:

(a) the maximum speed of particle is $3\sqrt{2}$ m/s

(b) the maximum speed of particle is $\sqrt{2}$ m/s

(c) the ratio $\frac{AP}{BP}$ is $\frac{\sqrt{2}-1}{\sqrt{2}+1}$

(d) the ratio $\frac{AP}{BP}$ is $\frac{1}{\sqrt{2}}$

Q 6. In simple harmonic motion of a particle maximum kinetic energy is 40 J and maximum potential energy is 60 J.Then:

(a) minimum potential energy will be 20 J

(b) potential energy at half the displacement will be 30 J

(c) kinetic energy at x = A/2 is 30 J . Where A is amplitude.

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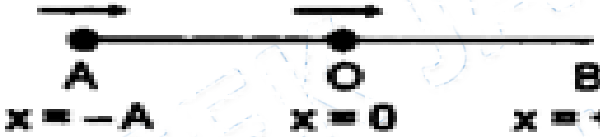
(d) potential energy or kinetic energy at some intermediate position cannot be found from the given data

Q 7. The displacement-time equation of a particle executing SHM is : $x = A \sin(\omega t + \phi)$. At time t =0 position of the particle is x = A/2 and it is moving along negative x-direction. Then the angle ϕ may be:
(a) $\pi/6$ (b) $\pi/3$ (c) $2\pi/3$ (d) $5\pi/6$

Q 8. A linear harmonic oscillation of force constant 2×10^6 N/m and amplitude 0.01 m has a total mechanical energy of 160 joules. Its -
(a) Maximum potential energy is 100 J
(b) Maximum K.E. is 100 J
(c) Maximum P.E. is 40 J
(d) Minimum P.E is zero

Q 9. Two particles undergo SHM along the same line with the same time period (T) and equal amplitudes (A). At a particular instant one particle is at x = - A and the other is at x = 0. They move in the same direction. They will cross each other at:



(a) 4T/3 (b) 3T/8 (c) x = A/2 (d) $x = \frac{A}{\sqrt{2}}$

Q 10. Two Particles A & B are executing SHM along same line about same point with same amplitude but different time periods 3 sec and 6 sec respectively. At t = 0 , A is at –ve extreme and B is at +ve extreme . Find t when they meet first time
(a) 1sec
(b) 2 sec
(c) 3 sec
(d) 4 sec

Q 11. Two Particles A & B are executing SHM along same line about same point with same amplitude 2 meter and same time period 4 sec. Phase difference between A and B is $\pi/3$. maximum separation between them during motion is
(a) 1m
(b) 2m
(c) 1.5 m
(d) None of these

Q 12. Two particles are in SHM on same straight line with amplitude A and 2A and with same angular frequency ω. It is observed that when first particle is at a distance $A/\sqrt{2}$ from origin and going toward mean position, other particle is at extreme position on other side of mean position. Find phase difference between the two particles
(a) 45^o (b) 90^o (c) 135^o (d) 180^o

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Q 13. Two particles are in SHM with same angular frequency and amplitudes A and 2A respectively along same straight line with same mean position. They cross each other at position A/2 distance from mean position while moving in opposite direction. The phase difference between them is :

(a) $\frac{5\pi}{6} - sin^{-1}\left(\frac{1}{4}\right)$ (b) $\frac{\pi}{6} - sin^{-1}\left(\frac{1}{4}\right)$

(c) $\frac{5\pi}{6} - cos^{-1}\left(\frac{1}{4}\right)$ (d) $\frac{\pi}{6} - cos^{-1}\left(\frac{1}{4}\right)$

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Answer Key

Q.1 c	**Q.2 a, b, c, d**	**Q.3 c**	**Q.4 a**	**Q.5 a, c**
Q.6 a, b, c	**Q.7 d**	**Q.8 b**	**Q.9 b, d**	**Q.10 a**
Q.11 b	**Q.12 c**	**Q.13 a**		