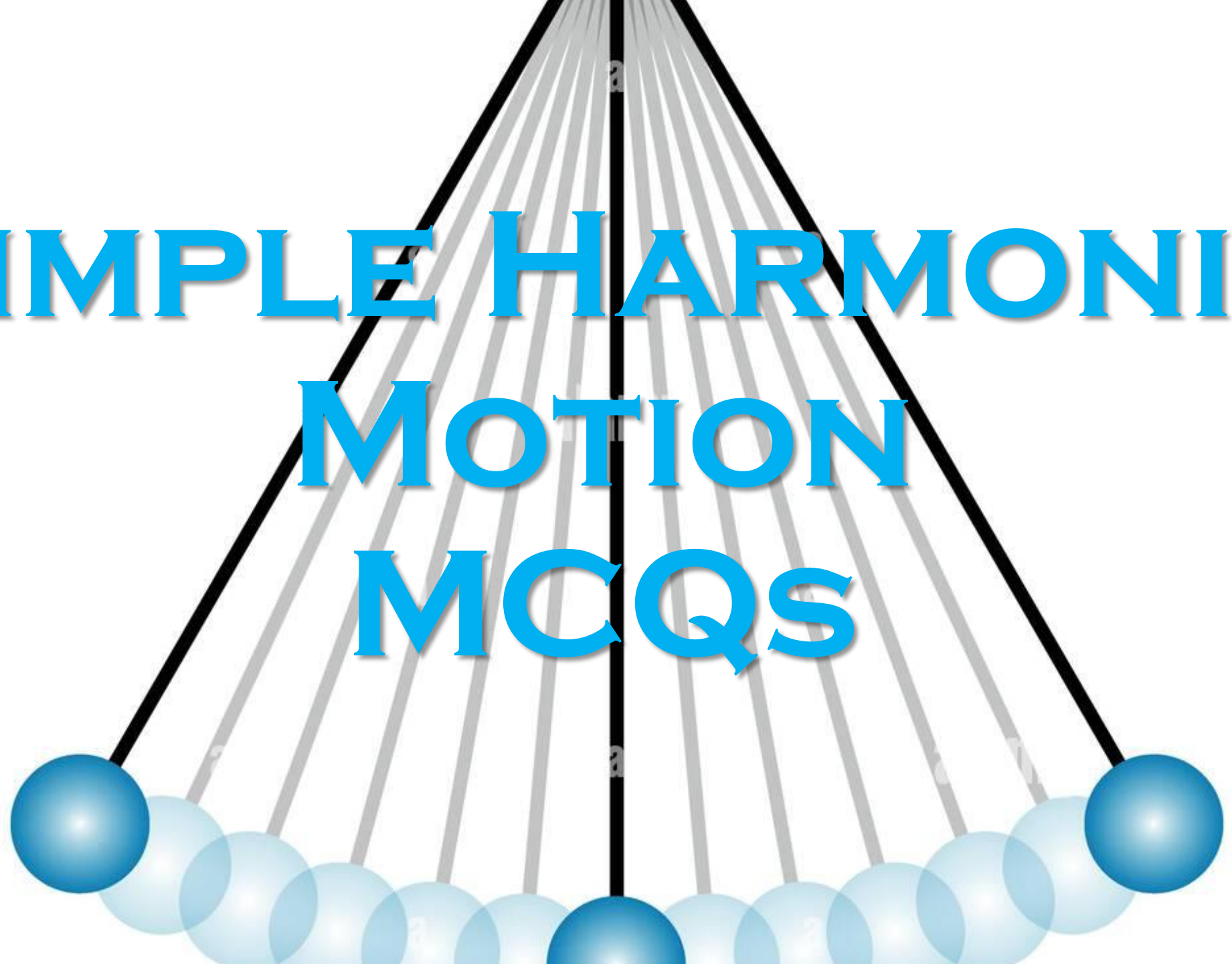
Simple Harmonic Motion MCQs



1. A body executing linear SHM has a velocity of 3m/s when its displacement is 4cm and a velocity of 4m/s when its displacement is 3cm. The amplitude of oscillation is:

a. 5cm b. 7.5cm c. 10cm d. 12.5cm

2. The graph plotted between acceleration and displacement in SHM will be a,

A. Straight Line
B. Parabolic
C. Hyperbolic
D. Elliptical

Remember:

- Displacement - Acceleration: Straight line:: DAS
- Time - Displacement: sinusoidal line/ curve:: TDS
- Displacement-Velocity: Elliptical :: DVE

3. The differential equation of SHM is given by $\frac{d^2y}{dt^2} + 100y = 0$, The frequency of motion is,

A. 1

B. 10

C. $\frac{10}{2\pi}$

D. $\frac{100}{2\pi}$

4. The phase difference between displacement and velocity of a particle executing SHM is,

A. $\frac{\pi}{2}$

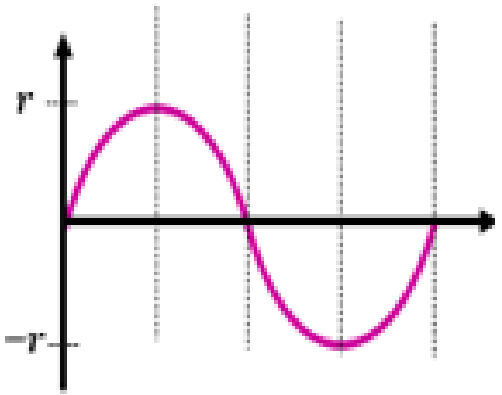
B. π

C. 2π

D. 3π

✓ Displacement Equation:

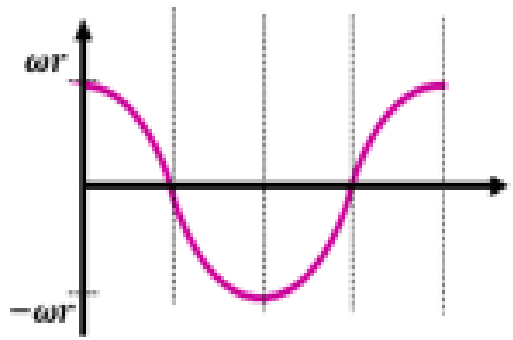
$y = rsin\omega t$



✓ Velocity Equation:

$v = \omega r cos\omega t$

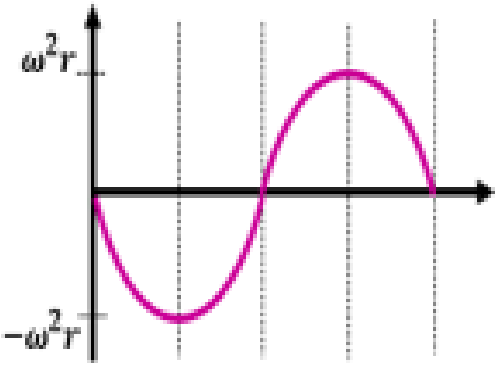
$v = \omega r sin(\omega t + \frac{\pi}{2})$



✓ Acceleration Equation:

$a = -\omega^2 r sin\omega t$

$a = \omega^2 r sin(\omega t + \pi)$



5. The phase difference between displacement and acceleration of a particle executing SHM is,

A. $\frac{\pi}{2}$
B. π
C. 2π
D. 3π

6. A particle undergoes SHM having time period T. What is the time taken by it to move from mean position to half of the amplitudes? [NEB 2080]

A. $\frac{T}{2}$

B. $\frac{T}{3}$

C. $\frac{T}{6}$

D. $\frac{T}{12}$

7. A particle undergoes SHM with time period T. The time taken in completing 5/8 oscillation from mean position is?

A. $\frac{3T}{8}$

B. $\frac{5T}{8}$

C. $\frac{5T}{12}$

D. $\frac{7T}{12}$

8. A particle undergoes SHM with time period T. The time taken in completing 3/8 oscillation from mean position is?

A. $\frac{3T}{8}$

B. $\frac{5T}{8}$

C. $\frac{5T}{12}$

D. $\frac{7T}{12}$

9. A particle vibrating simple harmonically with an amplitude a. The displacement of the particle when its energy is half kinetic and half potential is,

A. $\frac{a}{2}$

B. $\frac{a}{\sqrt{2}}$

C. $\frac{a}{4}$

D. $zero$

10. If the kinetic energy of a body executing SHM is $\frac{1}{3}$ of the potential energy, the displacement of the body is x % of the amplitude, x must be (nearly) [MOE 2009)

A. 33
B. 50
C. 67
D. 87

11. The phase difference between KE and PE of a particle executing SHM is,

A. $\frac{\pi}{2}$
B. π
C. 2π
D. 3π

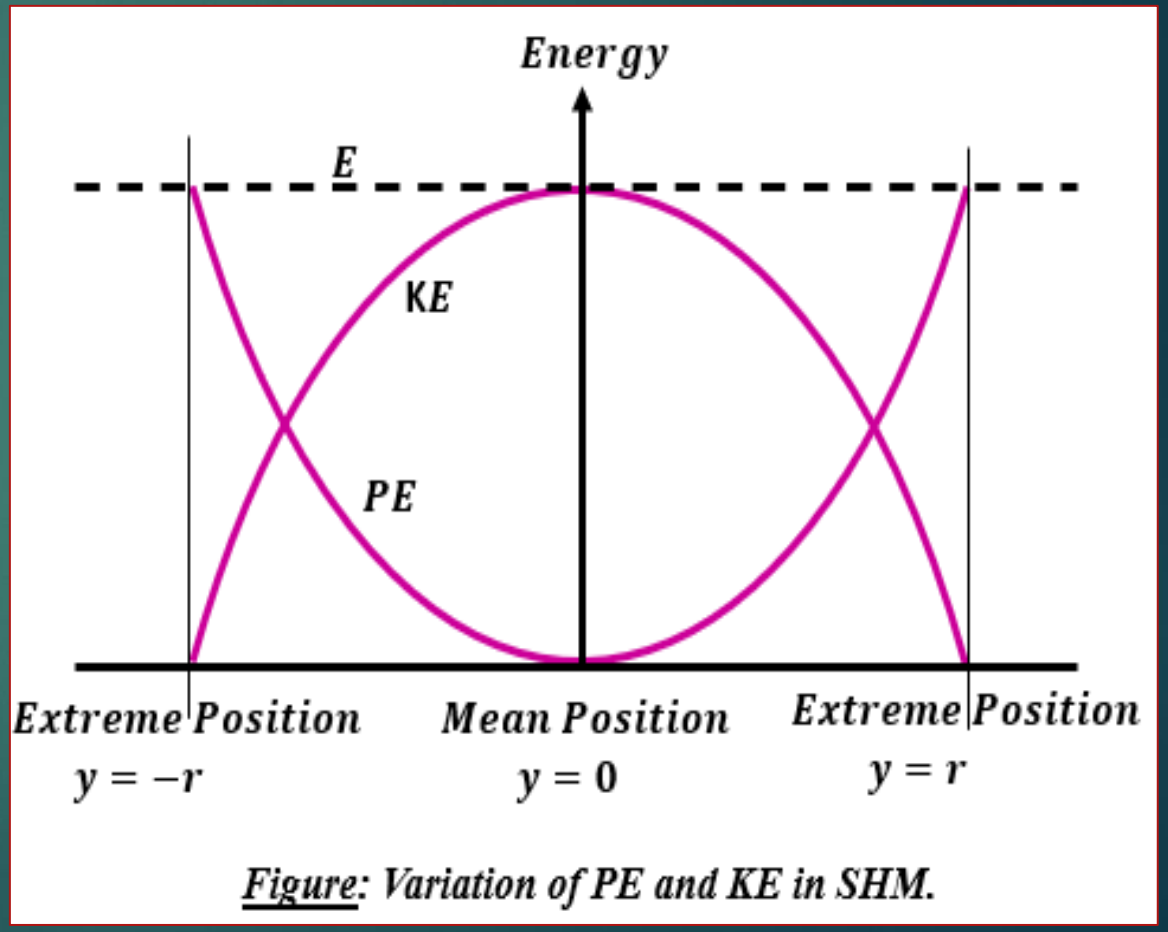


Figure: Variation of PE and KE in SHM.

12. A pendulum clock keeping correct time is taken to high altitudes,

A. It will keep correct time
B. Its length should be decreased to keep correct time
C. Its length should be increased to keep correct time
D. It will not keep correct time even if its length is changed.

13. The time period of a simple pendulum is T remaining at rest inside a lift. Find the time period of the pendulum when the lift starts to move up with an acceleration of g/3

A. T

B. $\frac{T}{2}$

C. $\frac{2T}{5}$

D. $\frac{\sqrt{3}T}{2}$

14. A simple pendulum has a time period T_1 when on earth's surface, and T_2 when taken to a height $'R'$ above the earth surface (where R is the radius of the earth) then the value of $\frac{T_2}{T_1}$ is, [IOM 2014]

A. 4

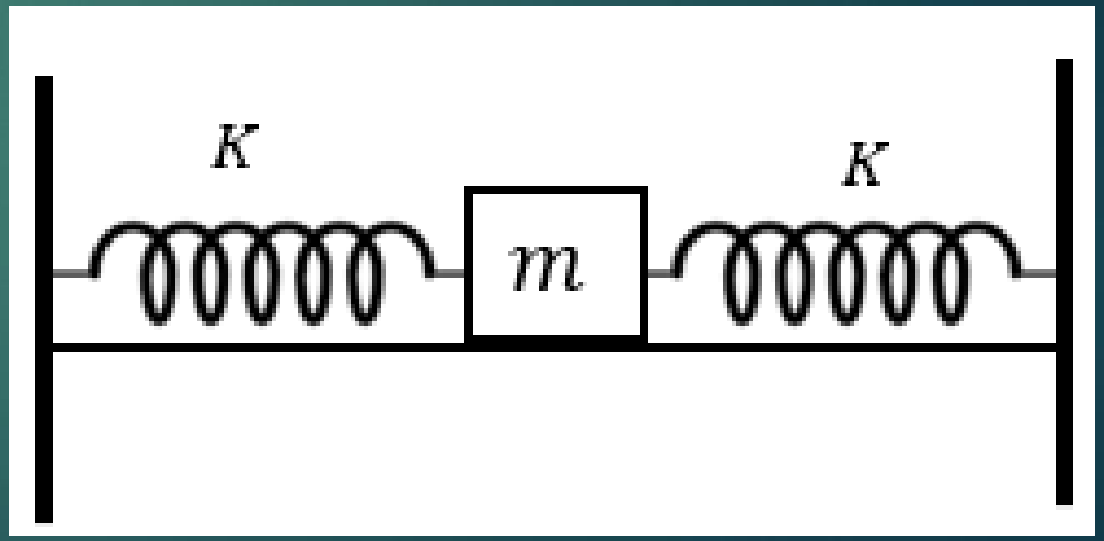
B. **2**

C. $\sqrt{2}$

D. 1

14. Two identical springs are arranged with a block as in figure. The oscillation frequency of the mass is f. If one spring is removed, the frequency of the oscillation will be given by? [NEB 2079]

A. f
B. $\frac{f}{\sqrt{2}}$
C. $\sqrt{2}f$
D. $2f$



15. The length of the second's pendulum on the surface of the earth is 1m. The length of the same pendulum on the surface of the moon, where the acceleration due to gravity is $(\frac{1}{6})^{th}$ of the g on the surface of the earth is,

A. $\frac{1}{36}m$
B. $\frac{1}{6}m$
C. $1m$
D. $36m$

16. A particle executes S.H.M of amplitude A. At what distance from the mean position is its kinetic energy equal to its potential energy?

A. $0.51A$
B. $0.61A$
C. $0.71A$
D. $0.81A$

17. In SHM the kinetic energy is maximum at:

A. At the mean position
B. At the extreme position
C. Nearer to mean position
D. At between extreme and mean position

Note:

- At extreme position velocity is zero, hence kinetic energy is minimum
- At mean position velocity is maximum, hence kinetic energy is maximum

18. A pendulum of mass $20gm$ has amplitude $5cm$ with time period $2sec$. The maximum velocity of bob is:

A. $0.16m/s$
B. $16m/s$
C. $1.6m/s$
D. $160m/s$

19. The maximum velocity of a particle executing SHM with amplitude is $7mm$, is $4.4m/s$. The period of oscillation is:

A. $10s$
B. $100s$
C. $0.1s$
D. $0.01s$

20. The length of simple pendulum is increased by 44%. What is the percentage increased in its period:

A. 5%
B. 10%
C. 20%
D. 44%