PHYSICS

BOOKS - NCERT PHYSICS (HINGLISH)

OSCILLATIONS

Multiple Choice Questions Mcqs

1. The displacement of a particle is represented by the equation

$y = 3\cos\left(\frac{\pi}{4} - 2\omega t\right).$

The motion of the particle is

A. simple harmonic with period $2\pi / \omega$

B. simple harmonic with period π / ω

C. periodic but not simple harmonic

D. non-period

Answer:

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2. The displacement of a particle is repersented by the equation $y = \sin^3 \omega t$. The motion is

A. non-periodic

B. periodic but not simple harmonic

C. simple harmonic with period $2\pi / \omega$

D. simple harmonic with period π / ω

Answer: B

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3. The relation between acceleration and displacement of four partical are given below Which, one of the particle is exempting simple harmonic motion ?

A. $a_x = +2x$

B. $a_x = +2x^2$

C. $a_x = -2x^2$

D. $a_x = -2x$

Answer: D

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4. Motion of an oscillating liquid column in a U-tube is

A. periodic but not simple harmonic

B. non-periodic

C. simple harmonic and time period is independent of the density of the liquid

D. simple harmonic and time period is directly proprotional to the density of

the liquid

Answer: C

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5. A particle is acted simultaneously by mutally perpendicular simple harmonic motion $x = a\cos\omega t$ and $y = a\sin\omega t$. The trajectory of motion of the particle will be

A. an ellipes

B. a parabola

C. a circle

D. a straight line

Answer: C

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6. The displacement of a particle varies with time according to the relation $y = a\sin\omega t + bcoas\omega t.$

A. The motion is oscillatory but not SHM

B. The motion is SHM with amplitude a+b

C. The motion is SHM with amplitude $a^2 + b^2$

D. The motion is SHM with amplitude $\sqrt{a^2 + b^2}$

Answer:

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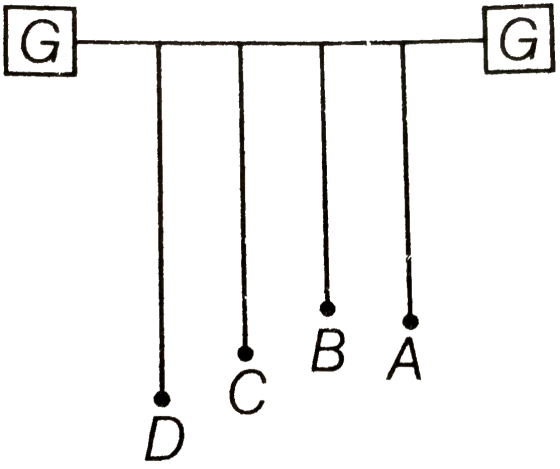
7. Four pendulums A, B, C and D are suspended from the same



elastic support as shown in figure. A and C are of the same length, while B is smaller than A and D is larger than A. If A is given a transverse displacement,

A. will vibrate with maximum amplitude

B. C will vibrate with maximum amplitude

C. B will vibrate with maximum amplitude

D. All the four will oscillate with equal amplitude

Answer:

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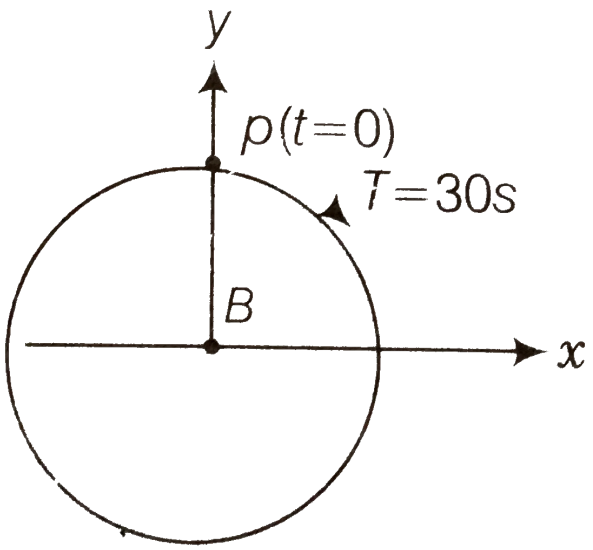
8. Figure shows the circular motion of a particle. The radius of the circle, the period, same of revolution and the initial position are indicated on the figure. The simple harmonic motion of the x-projection of the radius vector the rotating particle P is



A. $x(t) = B\sin\left(\frac{2\pi t}{30}\right)$

B. $x(t) = B\cos\left(\frac{\pi t}{15}\right)$

C. $x(t) = B\sin\left(\frac{\pi t}{15} + \frac{\pi}{2}\right)$

D. $x(t) = B\cos\left(\frac{\pi t}{15} + \frac{\pi}{2}\right)$

Answer:

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9. The equation of motion of a particle is $x = a\cos(\alpha t)^2$. The motion is

A. eriodic but not oscillatory

B. periodic and oscillatory

C. oscillatory but not periodic

D. neither periodic nor oscillatory

Answer:

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10. A particle executing SHM has a maximum speed of $30cm/s$ and a maximum acceleration of $60c\frac{m}{s^2}$. The period of oscillation is

A. π sec

B. $\frac{\pi}{2}$ sec

C. 2π sec

D. $\frac{\pi}{t}$ sec

Answer:

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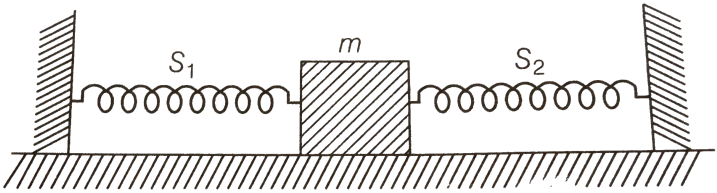
11. When a mass m is connected individually to two springs S_1 and S_2, the oscillation frequencies are v_1 and v_2. If the same mass is

attached to the two springs as shown in figure, the oscillation frequency would be



A. $v_1 + v_2$

B. $\sqrt{v_1^2 + v_2^2}$

C. $\left(\frac{1}{v_1} + \frac{1}{v_2}\right)^{-1}$

D. $\sqrt{v_1^2 - v_2^2}$

Answer: B

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12. The rotation of earth about its axis is

A. periodic motion

B. simple harmonic motion

C. periodic but not simple harmonic motion

D. non-periodic motion

Answer:

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13. Motion of a ball bearing inside a smooth curved bowl, when released from a point slightly above the lower point is

A. simple harmonic motion

B. non-periodic motion

C. periodic motion

D. periodic but not SHM

Answer:

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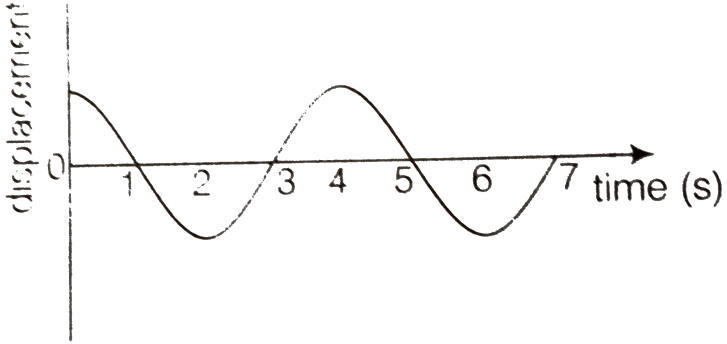
14. Displacement versus time curve for a particle executing SHM is shown in figure. Choose the correct statements.



A. (a) Phase of the oscillator is same at

$t = 0\text{s and t} = 2s$

B. Phase of the oscillator is same at

$t = 2s \quad \text{and} \quad t = 6s$

C. Phase of the oscillator is same at

$t = 1s \text{and } t = 7s$

D. Phase of the oscillator is same at

$t = 1s \text{and } t = 5s$

Answer:

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15. Which of the following statements is/are true for a simple harmonic oscillator ?

A. (a) Force acting is directly porportional to displacement from the mean postion and opposite to it

B. Motion is periodic

C. Acceleration of the oscillator is constant

D. The velocity is periodic

Answer: A:B:D

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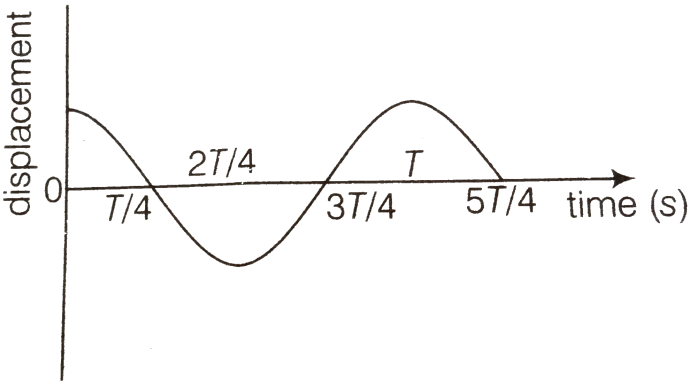
16. The displacement-time graph of a particle executing SHM is shown in figure. Which of the following statement is/are true ?



A. The focrce is zero at $t = \dfrac{3T}{4}$

B. The acceleration is maximum at $t = \dfrac{4T}{4}$

C. The velocity is maximum at $t = \dfrac{T}{4}$

D. The PE is equal to KE of oscillation at

$$t = \frac{T}{2}$$

Answer:

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17. A body is performing SHM, then its

A. average total enregy per cycle is equal to

its maximum kinetic energy

B. average kinetic energy per cycle is equal to half of its maximum kinetic energy

C. mean velocity over a complete cycle is equal to $\frac{2}{\pi}$ times of maximum velocity

D. root mean square velocity is $\frac{1}{\sqrt{2}}$ times of its maximum velocity

Answer:

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18. A particle is in linear simple harmonic motion between two points. A and B, 10 cm apart (figure.) take direction from A to B as the positive direction and choose the correct statements.

AO= OB= 5cm

BC=8cm

A. The sing of velocity, acceleration and force on the particle when it is 3 cm

away from A going towards B are positive

B. The sign of velocity of the particle at C going towards B is negative

C. The sign of volocity, acceleration and force on the particle when it is 4 cm away form B going towards A are negative

D. The sign of acceleration and force on the particle when it is at points B is negative

Answer:

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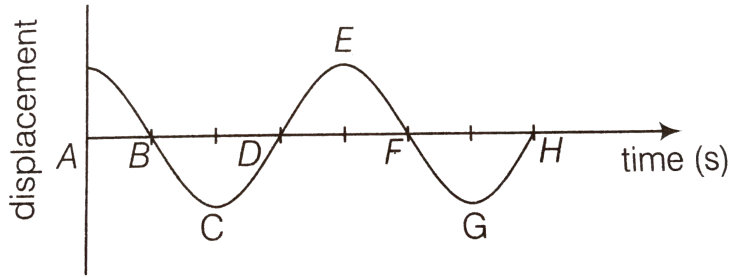
19. Displacement versus time curve for a particle executing SHM is shown in figure. Identify the points marked at which (i) velocity of the oscillator is zero, (ii) speed of the oscillator is maximum.



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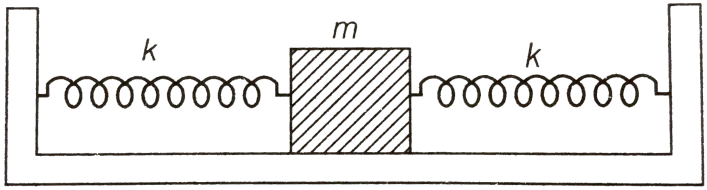
20. Tow identical springs of spring constant k are attached to a block of mass m and to fixed supports as shown in figure. When the mass is displaced from equilibrum position by a distance x towards right, find the restoring force.



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21. What are the two basic characteristics of a simple harmonic motion?

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22. When will the motion of a simple pendulum be simple harmonic?

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23. What is the ration of maximum acceleration to the maximum velocity of a simple harmonic oscillator?

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24. What is the ration between the distance travelled by the oscillator in one time period and amplitude?

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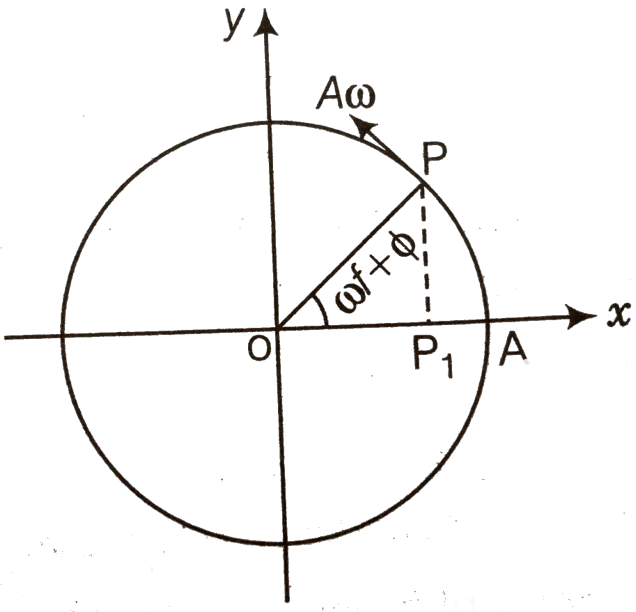
25. In figure, what be the sign of the velocity of the point P', which is the projection of the velocity of the reference particle P.P is moving in a circle of radius R in anti-clockwise direction.



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26. Show that for a particle executing SHM, velocity and dispacement have a phase difference of $\pi / 2$.

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27. Draw a graph to show the variation of PE, KE and total energy of a simple harmonic oscillator with displacement.

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28. The length of a second's pendulum on the surface of earth is 1 m. What will be the length of a second's pendulum on the moon?

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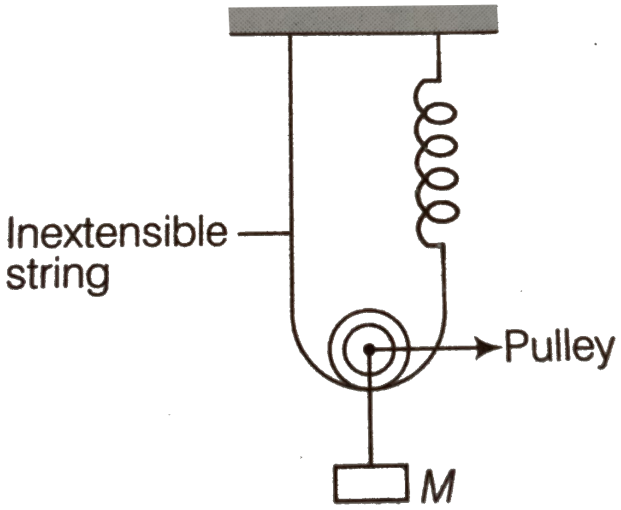
29. Find the time period of mass M when displaced from its equilibrium position and

then released for the system shown in figure.



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30. Show that the motion of a particle represented by $y = \sin \omega t - \cos \omega t$ is simple harmonic with a period of $2\pi / \omega$.

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31. Find the displacement of a simple harmonic oscillator at which its PE is half of the maximum energy of the oscillator.

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32. A body of mass m is situated in potential field $U(x) = U_o(1 - \cos \propto x)$ when, U_o and $\propto$ are constants. Find the time period of small oscillations.

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33. A mass of 2kg is attached to the spring of spring constant $50Nm^{-1}$. The block is pulled to a distance of 5 cm from its equilibrium position at $x = 0$ on a horizontal frictionless surface from rest at t=0. Write the expression for its displacement at anytime t.

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34. Consider a pair of identical pendulums, which oscillate with equal amplitude independently such that when one pendulum is at its exatreme position making an angle of 2° to the right with the vertrcal, the other pendulum makes an angle of 1° to the left of the vertical. What is the left of the vertical. What is the phase difference between the pendulums?

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35. A person normally weighing 50 kg stands on a massless platform which oscillates up and down harmonically at a frequency of $2.0s^{-1}$ and an amplitude 5.0 cm. A weighing machine on the platform gives the persons wieght against time.

(a) Will there be any change in weight of the body, during the oscillation?

(b) If answer to part (a) is yes, what will be the maximum and minimum reading in the machine and at which position?

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36. A body of mass m is attached ot one end of a massless spring which is suspended vertically form a fixed point. The mass is held in hand, so that the spring is neither stretched nor compressed. The lowest position attained by the mass during oscillation is 4 cm below the point, where it was held in hand.

(a) What is the amplitude of oscillation?

(b) Find the frequency of oscillation?

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37. A cylindrical log of wood of height h and area of cross-section A floats in water. It is pressed and then released. Show that lon would execute SHM with a time period. $T = 2\pi\sqrt{\frac{m}{Apg}}$ where, m is mass of the body and p is density of the liquid.

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38. One end of a V-tube containing mercury is connected ot a suction pump and the other end to atmosphere. The two arms of the tube

are inclined to horizontal at an angle of 45° each. A small pressure difference is created between two columns when the suction pump is removed. Will Neglect capillary and viscous forces. Find the time period of oscillation.

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39. A tunnel is dug through the centre of the earth. Shwo that a body of mass m when dropped form rest from one end of the tunnel will execute simple harmonic motion.

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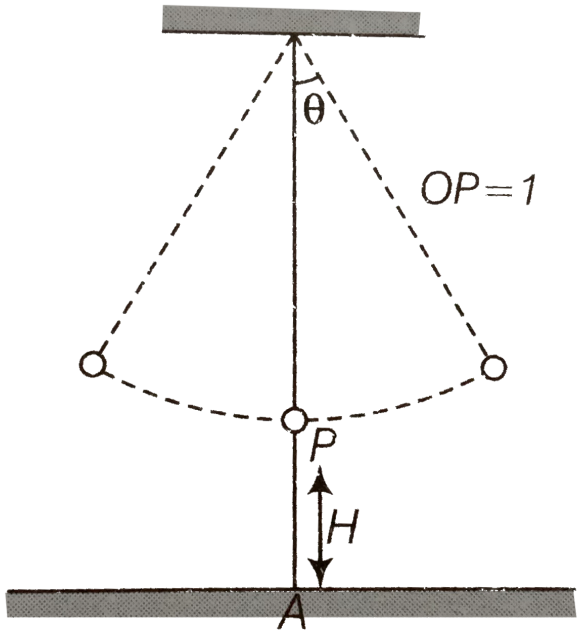
40. A simple pendulum of time period 1s and length l is hung from a fixed support at 0. Such that the bob is at a distance H vertically above A on the ground (figure) the amplitude is θ_0 the string snaps at $0 = \theta_0/2$. Find the time taken by the bob to hit the ground. Also find distance from A where bob hits the ground. Assume θ_0 to be small, so that

$\sin\theta_0 \approx \theta_0$ and $\cos\theta_0 \approx 1$.



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