AP Physics Unit 6 – SHM

Pre-Exam MC

1) A mass m, attached to a horizontal massless spring with spring constant k, is set into simple harmonic motion. Its maximum displacement from its equilibrium position is A. What is the mass's speed as it passes through its equilibrium position?

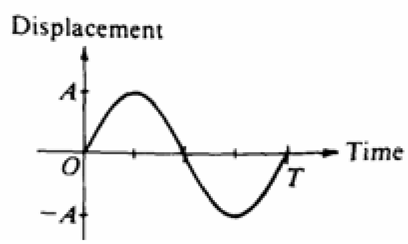
$(A)\ A\sqrt{\frac{k}{m}}\quad (B)\ A\sqrt{\frac{m}{k}}\quad (C)\ \frac{1}{A}\sqrt{\frac{k}{m}}\quad (D)\ \frac{1}{A}\sqrt{\frac{m}{k}}$

2) Which of the following is true for a system consisting of a mass oscillating on the end of an ideal spring?

a) The kinetic and potential energies are equal to each other at all times.
b) The kinetic and potential energies are both constant.
c) The maximum potential energy is achieved when the mass passes through its equilibrium position.
d) The maximum kinetic energy and maximum potential energy are equal, but occur at different times.

3) An object is attached to a spring and oscillates with amplitude A and period T, as represented on the graph. The nature of the velocity v and acceleration a of the object at time T/4 is best represented by which of the following?

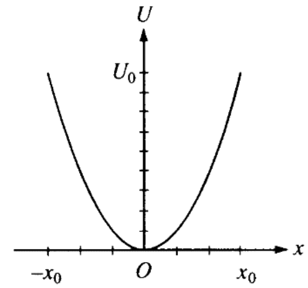
a) $v > 0, a > 0$
b) $v > 0, a < 0$
c) $v > 0, a = 0$
d) $v = 0, a < 0$



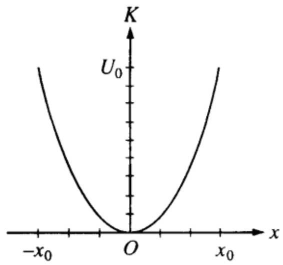
4) When an object oscillating in simple harmonic motion is at its maximum displacement from the equilibrium position. Which of the following is true of the values of its speed and the magnitude of the restoring force?

	Speed	Restoring Force
a)	Zero	Maximum
b)	Zero	Zero
c)	Maximum	½ maximum
d)	Maximum	Zero

5) The graph shown represents the potential energy U as a function of displacement x for an object on the end of a spring moving back and forth with amplitude x_0. Which of the following graphs represents the kinetic energy K of the object as a function of displacement x?



(A)



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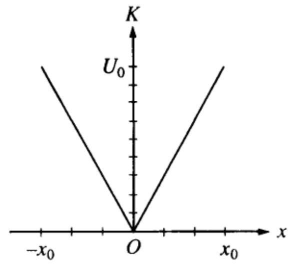
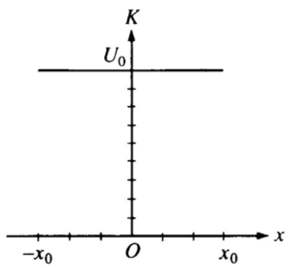
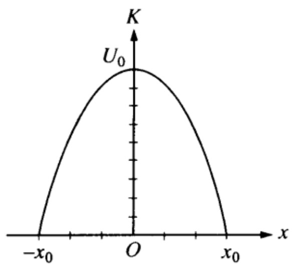


(C)



(D)

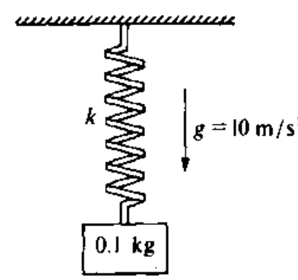


6) A simple pendulum and a mass hanging on a spring both have a period of 1 s when set into small oscillatory motion on Earth. They are taken to Planet X, which has the same diameter as Earth but twice the mass. Which of the following statements is true about the periods of the two objects on Planet X compared to their periods on Earth?

a) Both are shorter.
b) Both are the same.
c) The period of the mass on the spring is shorter; that of the pendulum is the same.
d) The period of the pendulum is shorter; that of the mass on the spring is the same

Questions 7-8

A 0.l -kilogram block is attached to an initially unstretched spring of force constant k = 40 newtons per meter as shown to the right. The block is released from rest at time t = 0.



7) What is the amplitude, in meters, of the resulting simple harmonic motion of the block?

(A) $\frac{1}{40}m$ (B) $\frac{1}{20}m$ (C) $\frac{1}{4}m$ (D) $\frac{1}{2}m$

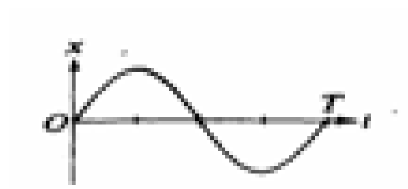
8) What will the resulting period of oscillation be?

(A) $\frac{\pi}{40}s$ (B) $\frac{\pi}{20}s$ (C) $\frac{\pi}{10}s$ (D) $\frac{\pi}{4}s$

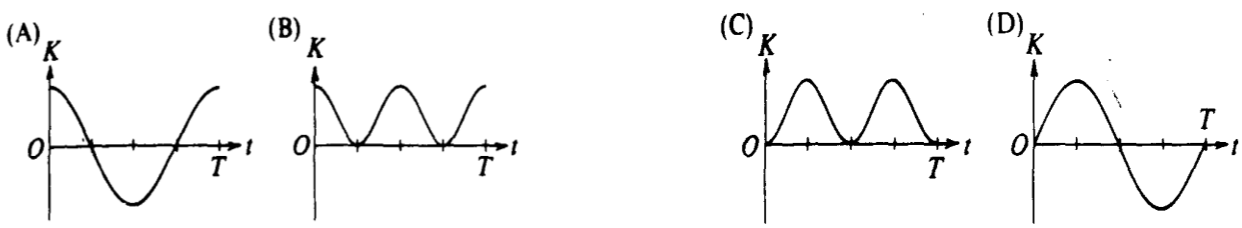
9) A ball is dropped from a height of 10 meters onto a hard surface so that the collision at the surface may be assumed elastic. Under such conditions the motion of the ball is

a) simple harmonic with a period of about 1.4 s
b) simple harmonic with a period of about 2.8 s
c) simple harmonic with an amplitude of 5 m
d) periodic with a period of about 2.8 s but not simple harmonic

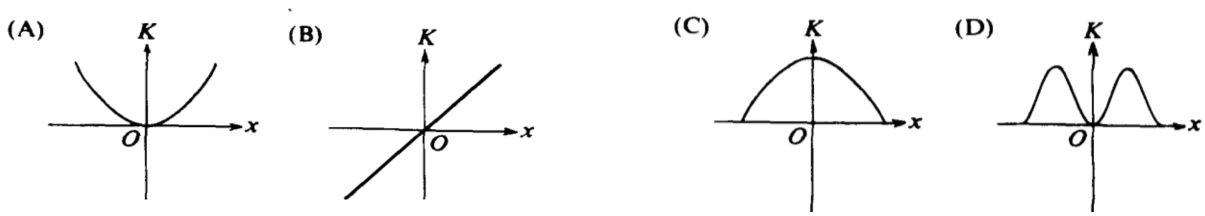
<u>Questions 10-11</u> refer to the graph below of the displacement x versus time t for a particle in simple harmonic motion.



10) Which of the following graphs shows the kinetic energy K of the particle as a function of time t for one cycle of motion?



11) Which of the following graphs shows the kinetic energy K of the particle as a function of its displacement x?



12) A pendulum with a period of 1 s on Earth, where the acceleration due to gravity is g, is taken to another planet, where its period is 2 s. The acceleration due to gravity on the other planet is most nearly

a) g/4
b) g/2
c) 2g
d) 4g