Name: _____

AP Physics 1: Simple Harmonic Motion
Energy and Period of Simple Harmonic Motion HW

Conceptual Questions

1. Which of the following statements about a spring-block oscillator in simple harmonic motion about its equilibrium point is false?
   A. The displacement is directly related to the acceleration.
   B. The acceleration and velocity vectors always point in the same direction.
   C. The acceleration vector is always towards the equilibrium point.
   D. The acceleration and displacement vectors always point in opposite directions.

2. A ball is dropped from a height of 10 m onto a hard surface so that the collision at the surface is perfectly elastic. Under such conditions, the motion of the is….
   A. simple harmonic motion with a period of 1.4 s
   B. simple harmonic motion with a period of 2.8 s
   C. simple harmonic motion with an amplitude of 5 m
   D. periodic with a period of 2.8 s but not considered simple harmonic motion
   E. Motion with a constant momentum

Mathematical Questions

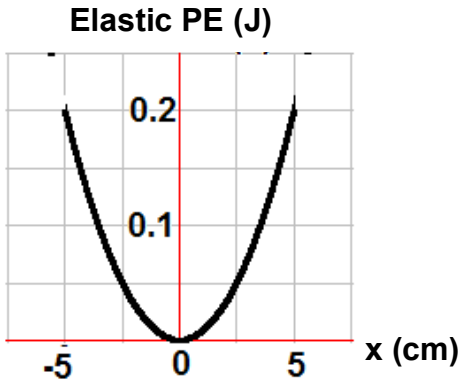
3. As a new twist on target practice, a 25.0 g bullet is shot into a block (m = 0.600 kg) that is attached to a virtually massless horizontal spring (k = 7.70 x 10^3 N/m). The bullet and block are connected after impact and set the spring in motion with an amplitude of 21.5 cm. What must have been the speed of the bullet before the collision?

4. A 0.4 kg object is attached to a horizontal spring undergoes SHM with the total energy of 0.2 J. The potential energy as a function of position presented by the graph provided.
   A. What is the amplitude of oscillations?

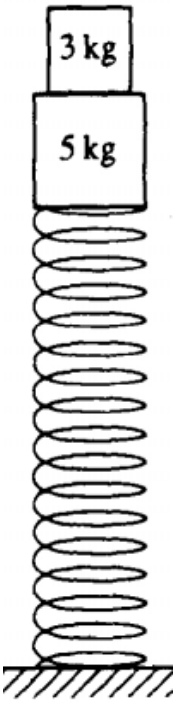
   B. What is the spring constant?

   C. Indicate point or points where the kinetic energy equals the potential energy of the system.

   D. What is the maximum speed of the object?



5. A 5.00 kg block is fastened to an ideal vertical spring that has an unknown spring constant. A 3.00 kg block rests on top of the 5.00 kg block as shown.



   A. When the two blocks are at rest, the spring compresses to its equilibrium position, a distance 20 cm from its original length. Determine the spring constant of the spring.

   The 5.00 kg block is suspended above the unstretched spring by a thin support. The 3.00 kg block is then raised 50.0 cm above the 5.00 kg block and dropped onto it. The two blocks stick together and to the spring following the collision.

   B. What is the combined speed of the blocks after the collision?

   C. What will be the period of the resulting simple harmonic motion?

   D. What will be the frequency of the resulting simple harmonic motion?

   E. What will be the amplitude of the resulting oscillation?

   F. Where will the block attain its maximum speed? Given an explanation for this result.