4) A block attached to the lower end of a vertical spring oscillates up and down. If the spring obeys Hooke's law, the period of oscillation depends on which of the following?

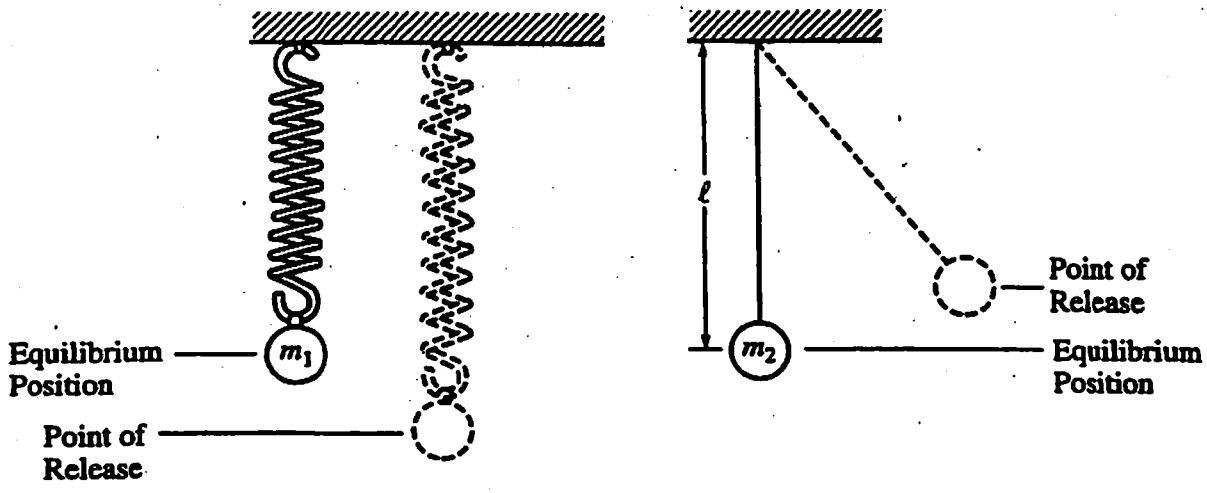
I. Mass of the block
II. Amplitude of the oscillation
III. Force constant of the spring

(A) I only
(B) II only
(C) III only
(D) I and II
(E) I and III

5) 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) Both are longer.
(D) The period of the mass on the spring is shorter; that of the pendulum is the same.
(E) The period of the pendulum is shorter; that of the mass on the spring is the same.

Questions 6-7



A sphere of mass m_1, which is attached to a spring, is displaced downward from its equilibrium position as shown above left and released from rest. A sphere of mass m_2, which is suspended from a string of length ℓ, is displaced to the right as shown above right and released from rest so that it swings as a simple pendulum with small amplitude. Assume that both spheres undergo simple harmonic motion

6. Which of the following is true for both spheres?

(A) The maximum kinetic energy is attained as the sphere passes through its equilibrium position.
(B) The maximum kinetic energy is attained as the sphere reaches its point of release.
(C) The minimum gravitational potential energy is attained as the sphere passes through its equilibrium position.
(D) The maximum gravitational potential energy is attained when the sphere reaches its point of release.
(E) The maximum total energy is attained only as the sphere passes through its equilibrium position.

7. If both spheres have the same period of oscillation, which of the following is an expression for the spring constant?

(A) $\frac{\ell}{m_1 g}$

(B) $\frac{g}{m_2 \ell}$

(C) $\frac{m_1 \ell}{g}$

(D) $\frac{m_2 g}{\ell}$

(E) $\frac{m_1 g}{\ell}$

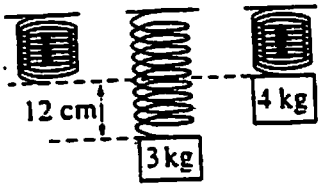
SHM – Pg. 1

1) An ideal spring obeys Hooke's law, $F = -kx$. A mass of 0.50 kilogram hung vertically from this spring stretches the spring 0.075 meter. The value of the force constant for the spring is most nearly

(A) 0.33 N/m
(B) 0.66 N/m
(C) 6.6 N/m
(D) 33 N/m
(E) 66 N/m

2) 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)	$\frac{1}{2}$ maximum	$\frac{1}{2}$ maximum
(D)	Maximum	$\frac{1}{2}$ maximum
(E)	Maximum	Zero



3) A block of mass 3.0 kg is hung from a spring, causing it to stretch 12 cm at equilibrium, as shown above. The 3.0 kg block is then replaced by a 4.0 kg block, and the new block is released from the position shown above, at which the spring is unstretched. How far will the 4.0 kg block fall before its direction is reversed?

(A) 9 cm
(B) 18 cm
(C) 24 cm
(D) 32 cm
(E) 48 cm