Part I

1. A particle executes simple harmonic motion. When the velocity of the particle is a maximum which one of the following gives the correct values of potential energy and acceleration of the particle.

   (a) potential energy is maximum and acceleration is maximum.

   (b) potential energy is maximum and acceleration is zero.

   (c) potential energy is minimum and acceleration is maximum.

   (d) potential energy is minimum and acceleration is zero.

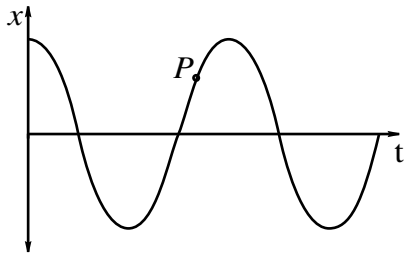
2. A mass vibrates on the end of the spring. The mass is replaced with another mass and the frequency of oscillation doubles. The mass was changed by a factor of

   (a) 1/4 (b) 1/2 (c) 2 (d) 4

3. A mass vibrates on the end of the spring. The mass is replaced with another mass and the frequency of oscillation doubles. The maximum acceleration of the mass

   (a) remains the same. (b) is halved. (c) is doubled. (d) is quadrupled.

4. A particle oscillates on the end of a spring and its position as a function of time is shown below.



   At the moment when the mass is at the point P it has

   (a) positive velocity and positive acceleration

   (b) positive velocity and negative acceleration

   (c) negative velocity and negative acceleration

   (d) negative velocity and positive acceleration

Part II

1. A clock maker wants to design a grandfather clock which keeps time from a 1.0 kg mass which vibrate on the end of a spring.

   (a) What should the spring constant be if the mass is designed to oscillate with a period of 1 second?

   (b) After constructing the clock she notices that on a particularly hot day the clock does not keep the correct time. Explain what might be happening to cause this?

   (c) After careful observation she determines that the clock is losing 1 second every minute. What is the actual period and what is the actual spring constant.

   (d) To compensate for this problem she decides to replace the 1.0 kg mass on the end of the spring with a different one. What should the new mass be?