SHM PROBLEMS

1) Calculate the period for a spring whose spring constant is 15 N/m, if the mass on the spring is 1.0 kg.

2) What is the period of a pendulum suspended from the CN tower in Toronto by a string 496 m long?

3) You are designing a pendulum clock. How far must the center of mass of the simple pendulum be located from the pivot point of rotation to give the pendulum a period of 1.0 s?

4) On a particular planet, the period of a 0.50 m pendulum is 1.8 s. What is the acceleration due to gravity on this planet?

5) A spring vibrates with a frequency of 2.20 Hz when a mass of 0.500 kg is hung from it. What will its frequency be if a 1.00 kg mass is hung from it?

6) If a particle undergoes SHM with amplitude 0.15 m, what is the total distance it travels in one period?

7) Calculate the length of a pendulum on earth whose frequency of oscillation is 1.05 Hz.

8) At a certain location in the universe, the frequency of oscillation of a pendulum of length 0.75 m is 0.33 Hz. What would its period be if its length was shortened by 10.0 cm?

9) Concerning a 1000.-kg car with a 65.0-kg driver: If the spring constant of the car's suspension is 54900 N/m, what will be the frequency of oscillation when the car hits a bump?

10) If a pendulum undergoes SHM with an amplitude of 0.15 m, what is the total distance the bob travels in 2 periods?

11) A fish is hung on a scale of spring constant 1040 N/m. If the fish is pulled down and set into oscillation with a period of 0.450 second, what is the mass of the fish?

12) A small fly of mass 0.700 gram is caught in a spider's web. The web vibrates with a frequency of 8.00 Hz. **(a)** What is the value of the effective spring constant for the web? **(b)** At what frequency would you expect the web to vibrate if an insect of mass 0.500 gram were trapped?

13) A spring vibrates with a period of 0.333 s when a mass of 0.500 kg is hung from it. What will be its period if an extra 0.350 kg is hung from it?

14) A pendulum makes 42 vibrations in 50. seconds. What is its period and frequency?

15) What is the period of a simple pendulum 50.0-cm long **(a)** on the earth, and **(b)** when it is in a freely falling elevator?

16) The length of a simple pendulum is 0.450 m, the pendulum bob has a mass of 365 grams, and it is released at an angle of 15° to the vertical. With what frequency does it vibrate?

17) In order to experimentally check the gravitational field strength at a particular location on Mars, an astronaut might set up a pendulum. If she were to use a pendulum 1.00-m in length and observe the pendulum to swing through 20.0 cycles in 63.5 seconds, what would she calculate for 'g'?

ANSWERS:

1) 1.6 s **2) 44.7 s** **3) 0.25 m** **4) 6.1 m/s^2**
5) 1.56 Hz **6) 0.60 m** **7) 0.225 m** **8) 2.8 s**
9) 1.14 Hz **10) 1.2 m** **11) 5.33 kg** **12)** a. **1.77 N/m** b. **9.47 Hz** **13) 0.434 s**
14) T = 1.2 s , *f* = 0.84 Hz **15)** a. **1.42 s** b. **no period** **16) 0.743 Hz** **17) 3.92 m/s^2**