

Tutorial Quiz-5

PHYS 101 : Week of October 15, 2007

Two problems to be done during the first hour on the black board and two to be handed in for marking

For the problems to be marked each problem is worth 10 points

A student may discuss the problems with other students but may not copy from others.

Problem 14.37

A 1.0 kg block oscillates on a spring with spring constant 20N/m. At $t = 0$ s the block is 20 cm to the right of the equilibrium position and moving to the left at a speed of 100 cm/s. Determine the period of oscillation and draw a graph of position versus time.

Problem 14.38

An object in SHM oscillates with a period of 4.0 s and amplitude of 10 cm. How long does the object take to move from $x = 0.0$ cm to $x = 6.0$ cm?

Problem 14.43

A 100 g ball attached to a spring with spring constant 2.5 N/m oscillates horizontally on a frictionless table. Its velocity is 20cm/s when $x = -5.0$ cm.

- What is the amplitude of oscillations?
- What is the ball's maximum acceleration?
- What is the ball's position when the acceleration is maximum?
- What is the speed of the ball when $x = 3.0$ cm?

Problem 14.50

A spring with spring constant k is suspended vertically from a support and a mass m is attached. The mass is held at the point where the spring is not stretched. Then the mass is released and begins to oscillate. The lowest point in the oscillation is 20 cm below the point where the mass was released. What is the oscillation frequency?

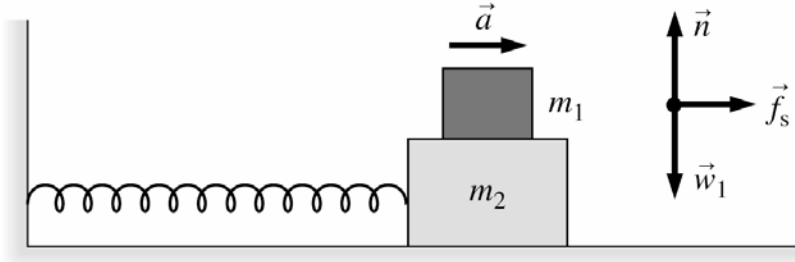
. Problem 14.53

A compact car has a mass of 1200 kg. Assume that the car has one spring on each wheel, that the springs are identical, and that the mass is equally distributed over the four springs.

- What is the spring constant of each spring if the empty car bounces up and down 2.0 times each second?
- What will be the car's oscillation frequency while carrying four 70 kg passengers?

Problem 14.54

Figure P14.54 shows a 1.0 kg mass riding on top of a 5.0 kg mass as it oscillates on a frictionless surface. The spring constant is 50 N/m and the coefficient of static friction between the two blocks is 0.50. What is the maximum oscillation amplitude for which the upper block does not slip?



Problem 14.58

Astronauts on the first trip to Mars take along a pendulum that has a period on earth of 1.50 s. The period on Mars turns out to be 2.45 s. What is the Martian acceleration due to gravity?

Problem 14.62

A 200 g block attached to a horizontal spring is oscillating with an amplitude of 2.0 cm and a frequency of 2.0 Hz. Just as it passes through the equilibrium point, moving to the right, a sharp blow directed to the left exerts a 20 N force for 1.0 ms. What are the new (a) frequency and (b) amplitude?

Problem 14.71

An oscillator with a mass of 500 g and a period of 0.50 s has an amplitude that decreases by 2.0% during each complete oscillation.

- (a) If the initial amplitude is 10 cm, what will be the amplitude after 25 oscillations?
- (b) At what time will the energy be reduced to 60% of its initial value?