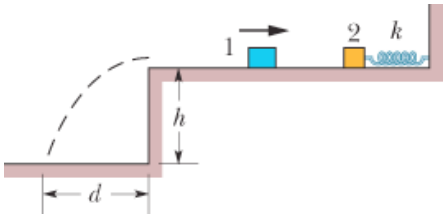
Chapter 15 – Problem Day

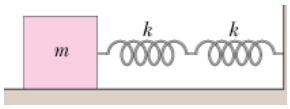
13. In the figure, two identical springs of spring constant 7580 N/m are attached to a block of mass 0.245 kg. What is the frequency of oscillation on the frictionless floor?

14. The figure shows block 1 of mass 0.200 kg sliding to the right over a frictionless elevated surface at a speed of 8.00 m/s. The block undergoes an elastic collision with stationary block 2, which is attached to a spring of spring constant 1208.5 N/m. After the collision, block 2 oscillates in SHM with a period of 0.140 s, and block 1 slides off the opposite end of the elevated surface, landing a distance *d* from the base of that surface after falling height *h* = 4.90 m. What is the value of *d*?



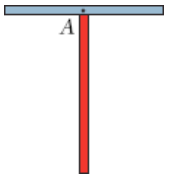
23. Using the same figure from problem 13, two springs are attached to a block that can oscillate over a frictionless floor. If the left spring is removed, the block oscillates at a frequency of 30 Hz. If, instead, the spring on the right is removed, the block oscillates at a frequency of 45 Hz. At what frequency does the block oscillate with both springs attached?

26. In the figure, two springs are joined and connected to a block of mass 0.245 kg that is set oscillating over a frictionless floor. The springs each have spring constant of 6430 N/m. What is the frequency of the oscillations?



40. Suppose that a simple pendulum consists of a small 60.0 g bob at the end of a cord of negligible mass. If the angle θ (in radians) between the cord and the vertical is given by $\theta = 0.08\cos(4.43t + \phi)$ what are (a) the pendulum's length and (b) its maximum kinetic energy?

46. A physical pendulum consists of two meter-long sticks joined together as shown. What is the pendulum's period of oscillation about a pin inserted through point *A* at the center of the horizontal stick?



79. The end point of a spring oscillates with a period of 2.0 s when a block with mass *m* is attached to it. When this mass is increased by 2.0 kg, the period is found to be 3.0 s. Find *m*.

82. A massless spring with spring constant 19 N/m hangs vertically. A body of mass 0.20 kg is attached to its free end and then released. Assume that the spring was unstretched before the body was released. Find (a) how far below the initial position the body descends, and the (b) frequency and (c) amplitude of the resulting SHM.

Chapter 15 Answers

13) 39.6 Hz

14) 4.00 m

23) 54.1 Hz

26) 18.23 Hz

40a) 0.50 m
40b) 9.4×10^{-4} J

46) 1.83 s

79) 1.6 kg

82a) 0.21 m
82b) 1.6 Hz
82c) 0.10 m