

Music 170 Homework 1 (due Oct. 2)

1. A 600 kg car goes from 0 km/h to 100 km/h in 17 seconds. What is its acceleration (in m/s^2)? What net force on the car caused this acceleration?
2. A 1.2 kg watermelon is dropped from the roof of a tall building. It takes 2 seconds to reach the ground. What is its velocity immediately before impact? What is its kinetic energy immediately before impact?
3. A spring has a spring constant of K . If the spring is cut in half, what is the spring constant of the two half-length springs?
4. A mass-spring system with two equal masses has two modes of vibration (see textbook fig. 2.7, page 27). The lowest vibrates at 20 Hz. Find the spring constant (as a function of mass) and the frequency of the second mode of vibration.
5. Suppose you have a partially filled bottle (approximately a Helmholtz resonator) whose neck has radius 1 cm and length 2 cm. Blowing over the top of the bottle gives a frequency of 684 Hz. How much liquid would you have to drink so that you get a frequency of 484 Hz?