Honors Physics – Ch 11-12 Practice Problems

1. The largest tigers, and therefore the largest members of the cat family, are the Siberian tigers. Male Siberian tigers are reported to have an average mass of about 389 kg. By contrast, a variety of very small cat that is native to India has an average adult mass of only 1.5 kg. Suppose this small cat is placed on a spring scale, causing the spring to be extended from its equilibrium position by 1.2 mm. How far would the spring be extended if a typical male Siberian tiger were placed on the same scale?

2. The CN Tower in Toronto, Canada, is 533 m tall, making it the world's tallest free-standing structure. Suppose an unusually long bungee cord is attached to the top of the CN Tower. The equilibrium length of the cord is equal to one-third the height of the tower. When a test mass of 70.0 kg is attached, the cord stretches to a length that equals two-thirds of the tower's height. From this information, determine the spring constant of the bungee cord.

3. A simple pendulum with a frequency of 6.4×10^{-2} Hz is as long as the largest known specimen of Pacific giant seaweed. What is this length?

4. Ganymede, the largest of Jupiter's moons, is also the largest satellite in the solar system. Find the acceleration of gravity on Ganymede if a simple pendulum with a length of 1.00 m has a period of 10.5 s.

5. A double coconut can grow for 10 years and have a mass of 20.0 kg. If a 20.0 kg double coconut oscillates on a spring 42.7 times each minute, what is the spring constant of the spring?

6. Suppose a 2662 kg giant seal is placed on a scale and produces a 20.0 cm compression. If the seal and spring system are set into simple harmonic motion, what is the period of the oscillations?

7. Cicadas produce a sound that has a frequency of 123 Hz. What is the wavelength of this sound in the air? The speed of sound in air is 334 m/s.

8. Blue whales are the loudest creatures; they can emit sound waves with an intensity of 3.0×10^{-3} W/m^2. If this intensity is measured 4.0 m from its source, what power is associated with the sound wave?

9. Estimate how far away a cicada can be heard if the lowest audible intensity of the sound it produces is 1.0×10^{-12} W/m^2 and the power of a cicada's sound source is 2.0×10^{-6} W.

10. The unsupported flagpole built for Canada's Expo 86 has a height of 86 m. If a standing wave with a 19th harmonic is produced in an 86 m open pipe, what is its frequency? The speed of sound in air is 334 m/s.

11. The world's largest organ was completed in 1930 in Atlantic City, New Jersey. Its shortest pipe is 4.7 mm long. If one end of this pipe is closed, what is the number of harmonics created by an ultrasound with a wavelength of 3.76 mm?