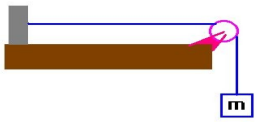
Problems for Physics lab 08

(1) A string has a mass of 1 kg and a length of 1000 m. The string is tied between two trees and has a tension of 100N. Find the frequencies of the modes of oscillation of the system.

(2) A string has a mass of 1 kg and a length of 10 m. The string is tied to a massless ring which can slide freely along a frictionless rod and the string is fixed to a tree on the other end. The string has a tension of 50N. Find the frequencies of the modes of oscillation of the system.

A wire has a mass of 0.01 kg and a total length of 1.3 m. 0.3 m of the wire hangs over a pulley as shown and is attached to a 20 kg mass while the other end of the wire is attached to a grey block. Find the lowest 5 modes of oscillation in this system.



(4) Cowboy Ryan is continuing on his road trip and he decided to head out West! Right before passing through the mountains of western Wyoming, he decided to camp out in the grange overnight. During the night, with the campfire built, he pulled out his trusty 6 string guitar and thought of an interesting problem because he had been gone from my physics class for so long. Suppose that each of the strings on his guitar had the same mass, but the tension on each string was twice the tension on the previous string. Find the ratio of the lowest lying modes of oscillation on his guitar. If the lowest tension on the strings was 100N, and the length of each of the strings was 0.75m, and the mass of each string was 0.001kg, find the lowest frequencies of each of the strings.

(5) An sinusoidal oscillator produces an amplitude of 0.05 m. The oscillator is attached to a string with a mass per unit length of 0.01 kg/m. How much power must the oscillator supply to the system if it is to operate at 60Hz under a tension of 50N?

(6) A wire is 5000 m long and has a total mass of 1 kg. The wire is under a tension of 30N. The wire is attached between two large trees. How long will it take for pulse which is an “upward” pluck to travel there and back and what will the returning pulse look like?Also , after completion start on (1).

(7) Suppose a wire has a mass per unit length of 1kg/m. What is the speed of propagation that would exist if this wire were hung between two poles and was under a tension of 100 N? How long would it take for a pulse to travel between two telephone poles (holding this wire) which were 40 m apart?Also, after completion, start on (2).