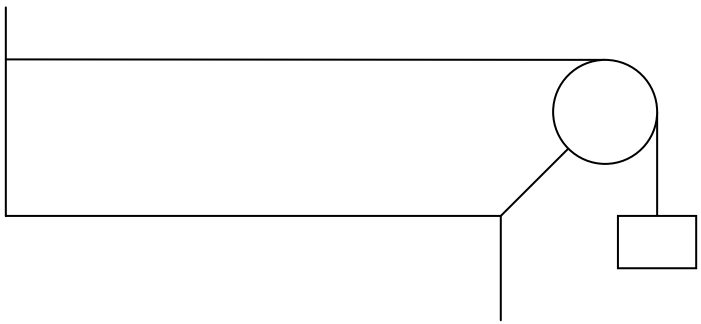
1. In the arrangement shown below, a mass can be hung from a string with mass density of 0.002kg/m that is passed over a light pulley and connected to an oscillator that is oscillating at frequency *f*. The length of the string between point P and the pulley is 2m and when masses of either 16kg or 25kg are hung standing waves are observed. No standing waves are observed for masses between these values.

a. What is the frequency of the oscillator?

b. What is the largest mass for which standing waves could be observed?



2. A string of length L, mass per unit length μ, and tension F_T is vibrating at its fundamental frequency. Describe the effect that each of the following conditions has on the fundamental frequency.

a. The length of the string is doubled with all other factors constant.

b. The mass per unit length is doubled with all other factors constant.

c. The tension is halved with all other factors constant.

3. A copper bar is given a sharp compressive blow at one end. The sound of the blow, traveling through air at 0^oC reaches the opposite end of the bar 6.4 ms later than the sound transmitted through the copper bar. What is the length of the copper bar? (The speed of sound in air at 0^oC is 331 m/s and in copper the speed of sound is 3,560 m/s.)

4. A microwave oven generates sound with an intensity level of 40 dB everywhere just outside of it. What is the intensity of the sound waves emitted by the microwave oven if the threshold intensity is $1x10^{-12}$ J/sm^2?

5. An open pipe has a length of 1 meter and is used in a pipe organ. If the velocity of sound at 20^oC is 343 m/s, what is the frequency of the fundamental sound wave that the pipe can support?