

Today:	17 Interference 2 nd 1/2	HW4 redo,	HW6
Wed:	Review for Exam 1		HW7
Fri:	Exam 1 (Ch 10, 16, 17)		

- **Diffraction modeled as interference**

17.1 Beats

- **Demo: Two speakers, different frequencies, on oscilloscope and hear**
Quantitative Relation

Ex1: Tuning Tuning your guitar against a hand-held function generator, you count 6 beats in 10 seconds when tuning the open G-string to 196 Hz. What frequencies could the string be playing?

17.2 Transverse Standing Waves (stringed instruments)

Demo: elastic string driven.

- **Definitions**
 - **Resonance:**
 - **Harmonic Series:**
 - **Fundamental:**
 - **Harmonics / overtones:**
- **What determines the allowed frequencies?**
- **Quantitative Relation**

Example2: Say a 1 m long string has a fundamental frequency of 100 Hz. What is the wave speed on the string?

- **Wave speed on String**
- **Application**
- **Musical Note**
- **Standing Waves on 2-D medium: Metal plate modes**

Longitudinal standing waves (Wind instruments)

- **Double Closed – ended cavity**
 - **Wave speed in air**
 - **Allowed Frequencies**
- **Double – Open ended and Single Closed, Single Open ended**

Example3: Say you have an organ pipe with one end open. If its fundamental frequency is 40 Hz (close to the lowest frequency you can hear), how long must it be? Take the speed of sound to be 343 m/s.

Ex4: If you removed the end from this 2.14 m long tube, what would be its new fundamental frequency?

18. In Concept Simulation 17.2 at www.wiley.com/college/cutnell (6th Edition) you can explore the concepts that are important in this problem. A 440.0-Hz tuning fork is sounded together with an out-of-tune guitar string, and a beat of 3 Hz is heard. When the string is tightened, the frequency at which it vibrates increases, and the beat frequency is heard to decrease. What is the original frequency of the guitar string?
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24. A string of length 0.38 m is fixed at both ends. The string is plucked and a standing wave is set up that is vibrating at its second harmonic. The traveling waves that make up the standing wave have a speed of 140 m/s. What is the frequency of vibration?
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38. A tube is open only at one end. A certain harmonic produced by the tube has a frequency of 450 Hz. The next higher harmonic has a frequency of 750 Hz. The speed of sound in air is 343 m/s. (a) What is the integer n that describes the harmonic whose frequency is 450 Hz? (b) What is the length of the tube?