Tutorial Quiz-8 **PHYS 101 : Week of November 05, 2007**

Two problems to be done during the first hour on the black board and two to be handed in for marking

For the problems to be marked each problem is worth 10 points
A student may discuss the problems with other students but may not copy from others.

Problem 20.71

The sound intensity 50 m from a wailing tornado siren is 0.10 W/m^2.
a. What is the intensity at 1000 m?
b. The weakest intensity likely to be heard over background noise is $\approx 1\mu$ W/m^2 .Estimate the maximum distance at which the siren can be heard.

Problem 20.73

A bat locates insects by emitting ultrasonic "chirps" and then listening for echoes from the bugs. Suppose a bat chirp has a frequency of 25 kHz. How fast would the bat have to fly, and in what direction, for you to just barely be able to hear the chirp at 20 kHz?

Problem 20.74

A physics professor demonstrates the Doppler effect by tying a 600 Hz sound generator to a 1.0-m-long rope and whirling it around her head in a horizontal circle at 100 rpm. What are the highest and lowest frequencies heard by a student in the classroom?

Problem 20.82

A rope of mass *m* and length *L* hangs from a ceiling.
a. Show that the wave speed on the rope a distance *y* above the lower end is $v = \sqrt{gy}$
b. Show that the time for a pulse to travel the length of the string is $\Delta t = 2\sqrt{L/g}$

Problem 21.36

A string vibrates at its third-harmonic frequency. The amplitude at a point 30 cm from one end is half the maximum amplitude. How long is the string?

Problem 21.37

A string of length *L* vibrates at its fundamental frequency. The amplitude at a point $\frac{L}{4}$ from one end is 2.0 cm. What is the amplitude of each of the traveling waves that form this standing-wave?

Problem 21.38

Two sinusoidal waves with equal wavelengths travel along a string in opposite directions at 3.0 m/s. The time between two successive instants when the antinodes are at maximum height is 0.25 s. What is the wavelength?

Problem 21.40

A violinist places her finger so that the vibrating section of a 1.0 g/m string has a length of 30 cm, then she draws her bow across it. A listener nearby in a $20\,^{0}C$ room hears a note with a wavelength of 40 cm. What is the tension in the string?