

Exam #2 Study Sheet

2013

Physics 1320

Music & Physics

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IMPORTANT: Review Term Sheets:

Harmonic series

Musical Ratios/Intervals: 5th, 4th, Major/Minor 3rd, 2nd

Middle C=C₄, and US conventions

Inverse square law

Chorus effect

Formant region.

Subjective tones: Difference tones.

Loudness difference Limen:

Frequency difference Limen:

Pitch vs. loudness

implied fundamental

phon: Loudness level

sones: Loudness

sound intensity level: dB

intensity level: W/m²

Masking

Critical Band:

Scales: {P,J,M,E}

time-domain/frequency-domain graphs

human ear

Pythagorean / Just (de Caus) /Meantone (1/4 comma)/Equal Temperament

A speaker outputs 100 W/m² at a distance of 1m. Compute the intensity at a distance of 10m.

Understand the dB scale, and be able to add SIL. intensity (I) in Watts per squared meter, intensity level (IL) in dB ($10 \log I_1/I_2$), intensity ratio, sound pressure level, threshold of audibility, Fletcher-Munson curves, equal loudness contours, loudness level (LL) in phons, threshold of feeling (pain), loudness (L) in sones, sound level meter, dB(A), OSHA standard

Understand units. Recall the 3 fundamental units, and be able to reduce terms to basic units.

Example: which of the following do not have units of acceleration.

Use the basic formula: $d = s t$, or equivalently: $x = v t$. Example, sound travels x distance in t seconds. Find v .

Perform problems from lab. Example: Which of the following do not have 4 significant figures. Example: Galileo measures a wave covers a round trip of 20 miles in 30 seconds, and 40 miles in 50 seconds. Find the reaction time of his assistant, and the true speed of the wave.

Examine a graph of a wave and determine amplitude, phase, period, frequency, etc.

Given K and M , compute the f for a mass on a spring.

Given g and L , , compute the f for a mass on a string.

Two tones sound together. Compute the average frequency, and the beat frequency.

For both an open and closed organ pipe, sketch the first 5 resonances. Find the frequency and wavelength in terms of the length of the pipe, and the speed of sound.

Understand and know how to use the inverse square law Know about wave properties:

Reflection, Refraction, Interference, Diffraction, Doppler effect.

VARIOUS TERMS:

Length, time, mass, speed, velocity, area, acceleration, volume, force, work, pressure, power, vector, momentum, equilibrium,

vibration - oscillation, periodic motion, period, T , cycle, frequency, f , Hz, simple harmonic motion, SHM, amplitude, displacement, restoring force, momentum, phase, sine curve, pure tone, sinusoid, fundamental frequency, mass - stiffness, natural frequencies, damping, driving force, $f = 1/T$, $T = 1/f$, envelope, wave history, time domain/frequency domain graphs,

medium, propagation, compression, expansion (rarefaction), density, elasticity, longitudinal wave, transverse wave, tension, displacement-time, pressure-time curves, pressure/displacement phase relationship (90 degrees), wavelength, speed of sound, reflection, refraction, diffraction, phase, constructive interference, destructive interference, beats ($f_b = f_1 - f_2$), Doppler effect, efficiency, intensity, inverse square law,

standing wave, node, antinode, vibratory modes, harmonics, partials, overtones, open tube function (open pipe), stopped (closed) tube function (stopped pipe), conical pipe function, resonance, sympathetic vibration, Helmholtz resonator