



! Answers: "Acoustic Knowledge" - English 2

UdK Berlin
Sengpiel
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F + A

1. What is the period T of a tone of $f = 1000$ Hz?
The period of an oscillation of 1000 Hz is $T = 1 / f = 1/1000 = 0.001$ s = **1 ms**.
2. What is a so-called "frequency-independent phase shift of $\Delta \varphi = 180^\circ$ " in one channel?
This is the reverse polarity or the phase opposition. (Out of polarity or out of phase) - actually this is really no phase shift, but thoughtlessly often called this way.
3. What is the difference of a RMS value of a sinusoidal signal and the maximum value (peak)?
The RMS = Root Mean Square is $(1/2) \times \sqrt{2} = 0.7071$ times the peak value. Or vice versa: the peak value (peak) is $\sqrt{2} = 1,414$ times larger than the RMS value.
4. What is the definition of the RMS value?
The RMS value is a measure of the energy of a signal. The effective value V_{rms} (the usual notation is V without the index "rms") is the value of the DC voltage, which has the same effect as the corresponding square of the alternating voltage. The RMS value of AC is the same value that would have a DC value, so it has the same effect building the heat. Mathematically, the RMS value is the integral over the square of the sinusoidal voltage or sinusoidal current during one period. It is the time averaging of the rectified signal or the absolute area under the amplitude of a vibration or the integral over the time interval of an oscillation.
5. How does the RMS value of a square wave (1:1 timing) differ from its peak value?
It doesn't differ at all, because in this square wave signal the RMS value is as large as the peak value.
6. Which of these values (RMS or peak value) is usually meant when we speak in the acoustics of the sound pressure and the particle velocity?
Even without a specific reference in the acoustics we mean **always the RMS value** of the sound pressure and the RMS value of the particle velocity.
7. What is the wavelength λ of the frequency $f = 1000$ Hz for the speed of sound $c = 343$ m/s at 20°C ?
At 1000 Hz, the wavelength $\lambda = c / f = 343/1000 = 0.343$ m = **34.3 cm**.
8. What is the minimum time difference Δt that is required for a 1 kHz sine wave to achieve a complete extinction when mixing signals with the same level?
It needs the opposite phase of $T/2$. So $\Delta t = 1 / (2 \times f) = 1/2000 = 0,0005$ s = **0.5 ms**.
9. In a living room, the longest side is 6 m long. At what frequency f_0 lies the lowest resonance frequency of the room?
It occurs at **half the wavelength** - that is at $\lambda_0/2 = 6$ m; so $\lambda = 12$ m. $f_0 = c / \lambda = 343/12 =$ **28.6 Hz**.
10. What is the sound radiation of lower frequencies than the lowest resonance frequency of the room?
From a room dimension which is smaller than the corresponding wavelength, we use the so-called **pressure chamber model**; the tones are emitted only by compression and expansion of the medium air that can be perceived. The claim that low frequencies are not reproducible in small spaces, is not correct.
11. Will Tonmeisters (art and music) have to do in their daily work with the concepts learned in training, such as: loudness (volume) in "phons", or "tonheit" in "mel"? Do you know of practical applications?
Tonmeisters (Music and technology) will never have to do in their professional practice with these quantities. The unit phon is dying - no one has noticed that..
12. What number of the overtones is the fourth harmonic?
The fourth harmonic is the **third (!) overtone**. The fundamental is the first harmonic or also the first partial tone - but the "zeroth" overtone
13. Which harmonic distortions sound musically enjoyable, the even or the odd harmonics?
The even harmonics k_2 (octave), k_4 (double octave), k_6 (octave + fifth), give a musically enjoyable sound, where k_1 is the fundamental wave. See "Distortion of valves (tubes)".
14. Is the density of the harmonics (Teiltondichte) bigger with large (low sounding) instruments or bigger with small (high sounding) instruments? (With justification).
At **large, low-sounding instruments**, of a family of instruments, such as the saxophones, there are much more audible partials which produce a rattling sound, and that's because the density of the harmonics (Teiltondichte) is greater.