

## Frequency Range of Human Hearing

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Edited by Glenn Elert -- Written by his students

Bibliographic Entry	Result (w/surrounding text)	Standardized Result
Cutnell, John D. and Kenneth W. Johnson. <i>Physics</i> . 4th ed. New York: Wiley, 1998: 466.	"Experiments have shown that a healthy young person hears all sound frequencies from approximately 20 to 20,000 hertz."	20-20,000 Hz
"Ear". <i>Microsoft Encarta Encyclopedia</i> . CD-ROM. 2000.	"The maximum range of human hearing includes sound frequencies from about 15 to about 18,000 waves, or cycles, per second."	15-18,000 Hz
Acoustics. National Physical Laboratory (NPL), 2003.	"The general range of hearing for young people is 20 Hz to 20 kHz."	20-20,000 Hz
"Body, Human." <i>The New Book of Knowledge</i> . New York: Grolier, 1967: 285.	"The human ear can hear vibrations ranging from 15 or 16 a second to 20,000 a second."	15 or 16-20,000 Hz
Caldarelli, David D. and Ruth S. Campanella. Ear. World Book Online Americas Edition. 26 May 2003.	"The full range of human hearing extends from 20 to 20,000 hertz."	20-20,000 Hz

The ear is an amazing body part because it enables humans and animals to hear what goes on around them. Hearing is one of the five senses of the body. The ears help the body to pick up sound waves and vibrations. Sound travels in waves through the air, the ground, and various other substances. Sound cannot be seen, but it can be felt by vibrations.

The number of vibrations that are produced per second is called frequency. Frequency varies for each sound and is measured in hertz. One hertz is equal to one vibration per second. A sound with a low frequency will have a low pitch, such as a human's heartbeat. A sound with a high frequency will have a high pitch, such as a dog whistle. Humans cannot hear sounds of every frequency. The range of hearing for a healthy young person is 20 to 20,000 hertz. The hearing range of humans gets worse with age. People lose the ability to hear sounds of high frequency as they get older. The highest frequency that a normal middle-aged adult can hear is only 12-14 kilohertz. Also, the hearing range for men worsens more quickly than the hearing range for women. This means that women will have the ability to hear notes of higher pitch than men of the same age do.

Christopher D'Ambrose – 2003

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Sebastian Haskel and David Sygoda. <i>Biology, A contemporary Approach</i> . New York: Amsco, 1996.	"The human ear has receptors that can detect sound frequencies ranging from 16 vibrations to 20,000 vibrations per second."	16 - 20,000 Hz
Lerder, Francis C. "The Human Ear." Encarta Encyclopedia Deluxe 2004. CD-ROM.	"The maximum range of human hearing includes sound frequencies from 15 to about 18,000 waves, or cycles, per second."	15 - 18,000 Hz
Peter Hamlin, St. Olaf College. <i>Basic Acoustics for Electronic Musicians</i> . January 1999.	"The human ear can hear frequencies ranging from about 20 cps. to about 20,000 cps (although an individual might have a considerably smaller range)."	20 - 20,000 Hz
Harris, Wayne. <i>Sound and Silence</i> . Termpro. Originally appeared in the March/April 1989 issue of <i>Car Stereo Review</i> magazine.	"The normal range of hearing for a healthy young person is 20 to 20,000 Hz; hearing deteriorates with age and with exposure to unsafe volume levels."	20 - 20,000 Hz
Sense. Wikipedia. 2004.	"Hearing or audition is the sense of sound perception and results from tiny hair fibres in the inner ear detecting the motion of atmospheric particles within (at best) a range of 20 to 20,000 Hz. Sound can also be detected as vibration by tactition. Lower and higher frequencies than can be heard are detected this way only."	20 - 20,000 Hz and higher

What is sound and frequency? Sound is a longitudinal mechanical wave of any frequency. Frequency is the number of cycles, or complete vibration experienced at each point per unit. Frequency is measured in hertz. The hertz, Hz, is the derived SI unit of frequency. The frequency of a sound wave determines its tone and pitch. The frequency range of a young person is about 20 to 20,000 hertz.

The human ear is capable of hearing many of the sounds produced in nature, but certainly not all. Some low frequencies like a heart beat of 1 or 2 Hz can not be heard, just like sonar sounds produced by dolphins which are too high. Any frequency that is below the human range is known as infrasound. It is so low that it may be detected by a creature with big ears, such as an Elephant. In fact, recent research indicates that elephants also communicate with infrasound. Ultrasound, on the other hand, is above the range of the human ear. Bats, whales, porpoises, and dolphins use ultrasound for navigation. Most bats can detect frequencies as high as 100,000 Hz!

Rizwan Choudhary -- 2004