

All sounds are produced by: _____

Types of Sound Waves _____: any sound that can be heard.

Frequencies that the average human ear can hear (_____ Hz to _____ Hz)
(50 Hz - 15,000 Hz at lower volumes)

_____ waves: frequencies less than 20Hz.

Ex. Elephants -elephants communicate through sound waves between 5-15Hz, and the
waves they produce can travel up to 100 miles.

_____ waves: waves with frequencies above 20,000 Hz.

Ex. dogs, bats, and dolphins

_____ refers to objects traveling FASTER than the speed of
sound (i.e. faster than 343 m/s)

As frequency increases, wavelength _____. Therefore, subsonic

waves have _____ wavelengths, while ultrasonic waves have

_____ wavelengths. Ultrasonic waves are used by doctors to
produce images inside the human body. They are able to do this because the
wavelengths of ultrasonic waves are short and are easily reflected off small objects.

_____ is the rate of energy flow through a given area and is
measured in _____ (dB)

Intensity and Frequency determine which sounds are audible.

The softest sounds that can be heard by the human ear occur at the threshold of hearing. The loudest sounds that can be tolerated by the human ear are those at the threshold of pain. Sounds above this can still be heard, but are harmful and painful. Decibels relate the intensity of a sound wave to the intensity at a threshold of hearing. When intensity is multiplied by ten, 10 dB are added. A difference in 10dB also means that the sound is twice as loud.

If we have 100 times more energy in a sound wave, how much louder does it sound?

If we have 100,000 times more energy in a sound wave, how much louder does it sound?

If a 50 dB sound has 1,000 times more energy than a soft sound, what is the decibel rating of the soft sound, and how much softer does it sound?

Intensity to Decibel Levels

Intensity	Decibel	
(W/m ²)	(dB)	
1.0×10^{-12}	0	threshold of hearing
1.0×10^{-9}	30	whisper
1.0×10^{-7}	50	normal conversation
1.0×10^{-4}	80	alarm clock
1.0×10^{-3}	90	Threshold of permanent damage
1.0×10^{-1}	110	car horn
1.0×10^0	120	threshold of pain
1.0×10^3	150	nearby jet

The Human Ear

Outer ear: transfers sound waves to the eardrum

Middle ear: transfers vibrating sound waves from the eardrum to the cochlea

Inner ear: receives vibrations from the middle ear and transfers them into nerve impulses that are interpreted by the brain as sounds at different frequencies.

General Categories of Instruments

Strings

Brass

Woodwinds

No reed

Single reed

Double reed

Multiple reed

Percussion

Electronic