Sound Waves

All right, welcome to today's lesson on sound waves. Sound waves are longitudinal mechanical waves, meaning that they must come from the vibration of a gas, liquid, or solid. Or in other words, they must happen through a medium. And for sound waves, there are actually a series of compressions and rarefactions that disturb the medium.

So sound waves, in particular, are actually spherical, and they radiate out from the point source, which you can see right here. And they actually have a wavelength equal to the distance between these two circles here.

The speed of sound depends on temperature. The warmer the air, the faster the speed travels or the faster the wave travels. At 20 degrees Celsius, which is about room temperature, the speed of sound is 343 meters per second. Now, this is very important because when you do your math problems, you're going to have to know that off the top of your head, so this number right here, 343 meters per second.

Supersonic is a term used to tell us that a speed is faster than the speed of sound or a wave is faster than the speed of sound. The term mach is used to designate how much faster a wave is than the speed of sound. So if you hear mach 1, that's one times the speed of sound, mach two, two times the speed of sound, and so forth.

And subsonic means that we have a wave that is slower than the speed of sound. So in other words, it's slower than the speed of sound in that particular medium. Pitch is a term used to describe how high or low humans perceive a sound to be. So the real big thing here is that this is a human perception.

The pitch of a music note is related to its frequency. In other words, when you are determining a high pitch or a low pitch, you're actually determining the wave's frequency. So a high-pitched sound, like that from a violin, has a high frequency of vibration. And a low-pitched sound, like that from a tuba, has a low frequency of vibration.

Once again, we can look at music notes, and we can determine their frequency. So the middle C has a low frequency. And then we kind of see the musical scale here, C, D, E, F, G, A, B. And then we actually see C again, because any time that you have a doubled frequency, like 262 and-- or doubling 262, which makes 524, that's actually what we call an octave. And it's a higher note.

The human range of hearing, the average person can hear sounds from range ranging from 20 hertz to 20,000 hertz. Other animals can actually hear a little bit higher than that, like dolphins and dogs and so forth. Ultrasonic would be something that dogs could hear, which is above the human range.

And ultrasound imaging, which is actually used in the medical field, is done using sound waves with a frequency much greater than 20,000 hertz. That's why we actually don't hear it when it's happening. And then infrasonic is below the human hearing range.