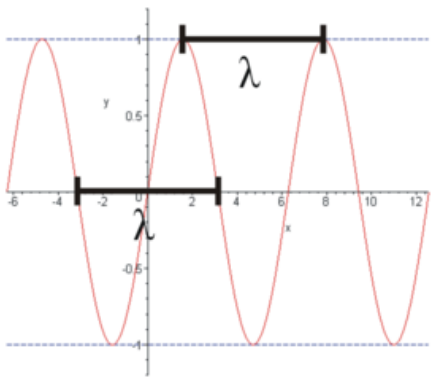
Sound waves:

It is a type of wave that is transmitted by mechanical vibrations in a material medium, such as air, water, or solid objects. Sound waves are characterized by the increase and decrease in pressure of a physical medium, and they move in a wave form through the medium.

Sound waves are measured in a unit called hertz (Hz) which refers to the number of times a complete cycle of a wave is repeated in one second. The frequencies of sound waves audible to humans typically range between 20 Hz and 20,000 Hz. Here are some basic concepts and important properties of sound waves:

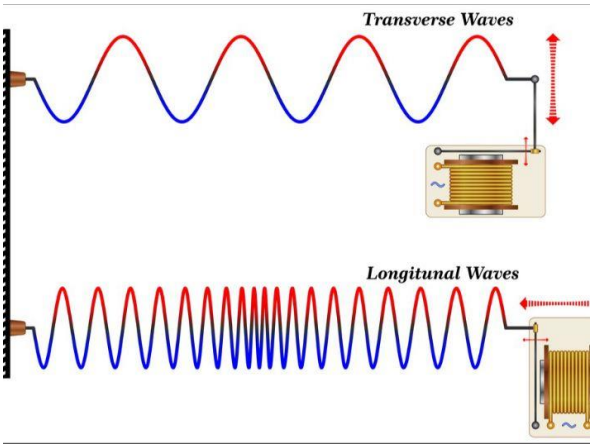
1. Frequency: Refers to the number of times a wave cycle repeats per unit time. Frequency is measured in hertz (Hz). High frequency means a louder, more intense sound, while low frequency means a lower, more intense sound.
2. Intensity: refers to the strength of the sound wave and is measured in decibels (dB). The stronger the wave, the stronger the sound we hear.
3. Wavelength: refers to the distance between two successive points in the wave at which the complete cycle is repeated. Wavelength is measured in meters (m) or fractions thereof.
4. Speed: refers to the speed of propagation of a sound wave in a specific medium, and it varies according to the type of material through which the sound passes. In dry air at room temperature, the speed is about 343 meters per second.



Sound waves are divided into two types:

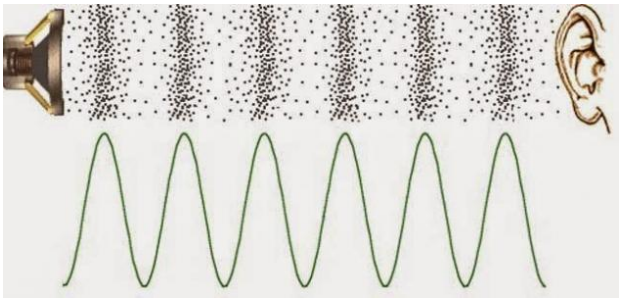
1.Longitudinal waves

2. Transverse waves



Longitudinal waves spread in gaseous media, plasma, and liquids, and physicists call them pressure waves. These waves consist of a number of successive layers that rise above each other, and the pressure and layers in them begin to rise little by little and decrease again sequentially as well. As for transverse waves, they spread throughout the media.

The solid is in the form of successive waves that are perpendicular to the direction of



Characteristics of sound waves:

There are many characteristics of sound waves, including:

1. Vibratory movement, which is the effect of sound on the particles of the medium in which it spreads and thus their disturbance and vibration.

2. The speed of sound. The speed of sound varies according to the medium in which its sound waves propagate. Temperatures also affect this. The speed of sound in a solid medium is higher than its speed in a liquid medium and in a gaseous medium.

3. Sound intensity, which is the amount of sound energy produced when sound waves impact one square centimeter within the medium as this sound wave passes through it. Physically, the decibel unit is used to measure the amount of sound wave energy.

Classifications of sound waves:

Sound waves are divided into three classifications according to their frequencies, as follows:

1. Audible waves: These are waves whose frequencies range between 20-20,000 Hz, and include all sounds that can be heard by the human ear.

2. Ultrasonic waves: These are the waves whose frequency exceeds 20,000 hertz, which are centered outside the range of human ear sense, and are used in several uses, such as industrial and medical applications.

3. Infrasound waves: These are sound waves whose frequency is less than 20 hertz, meaning that humans cannot hear them or even feel them.

It is not possible for sound waves to be transmitted through a vacuum, as if we put a bell in a glass bell and empty the bell of air, we will not hear the sound of the bell when it rings because the sound does not travel in a vacuum, which means that the sound depends on three things:

1. A vibration source to create sound waves

2. A medium such as air to carry waves

3. A detectable receiver like a human ear.

The speed of sound

Sound waves travel at a constant speed at a speed of 344 meters per second when the room temperature is 22.2 degrees Celsius, and with every rise of one degree Celsius, the speed increases by about 0.6 meters per second.

Air pressure has no effect on the speed of sound, but humidity has a slight effect, as the speed of sound in humid air is somewhat greater than its speed in dry air.

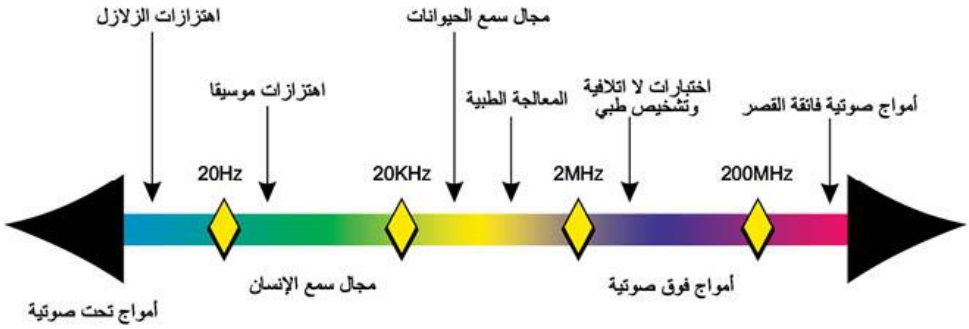
There are many other materials that transmit sound, which are better than air, such as some gases, liquids, and some solid materials such as iron and stone. Sound waves are transmitted in liquids and solids in the same way as they are transmitted in air. Sound also travels faster and farther when using a good sound carrier. .

There are some solid materials that are bad transmitters of sound, such as rubber, cork, cotton, and felt. These materials absorb sound waves instead of transmitting them, which is why these materials are used to isolate sound and stop unwanted noise.

The ability to hear sounds

The human ear cannot hear all frequencies of sound. There are very few people who can hear less than 16 Hz or more than about 20 kHz. Music rarely uses this full range of sound frequencies, with the lowest note having a frequency of 27 Hz and the highest note being over A little less than 4 kHz, and radio stations broadcast frequencies that may reach 15 kHz.

The high frequencies that the human ear cannot hear are called supersonic waves, or ultrasonic waves. The silent dog whistle emits a frequency faster than sound that the dog can hear, unlike the human ear, which cannot. It can cause very high frequencies that range from 100 to 500 kilohertz. Strong physical and chemical interactions that may lead to dust accumulation and the destruction of certain types of bacteria.



Some facts about sound:

1. There is no sound in space because there are no molecules there. Sound cannot travel through space because there are no molecules to travel through. However, here on planet Earth, we have air molecules vibrating in our ears.

2. Sound travels through air slower than through water. In fact, the speed of sound through water is 4.3 times faster than its speed through air. However, sound travels through steel much faster than air and water!

3. The loudest natural sound on Earth is the sound resulting from a volcanic eruption.

4. Dogs have the ability to hear sounds or noises that humans cannot hear because they can hear sounds at a much higher frequency than humans.

5. Music is almost impossible to define, but most people nonetheless describe it as a tangible organization of sounds.

6. Flies are unable to hear any sounds at all!

7. Most white cats with blue eyes are often unable to hear sounds and are usually deaf.

8. Dolphins can hear underwater sounds from a distance of up to 15 miles.

9. Whale sounds are able to travel a huge distance of up to 479 miles through ocean waters, and they also have the ability to communicate with each other over long distances.

10. Most animals use sounds to help them detect dangers and disasters before they happen.

11. Our ears are able to hear distinct and different sounds because the vibrations that enter through them also end up vibrating in our ears.

12. Sound cannot travel through a vacuum because a vacuum is devoid of matter.

13.Acoustics is the scientific study of sound waves.

14. Sound travels at a speed of about 767 miles per hour.

15.Dogs, cats, dolphins and mice can hear ultrasound.

Classification of sound according to frequency

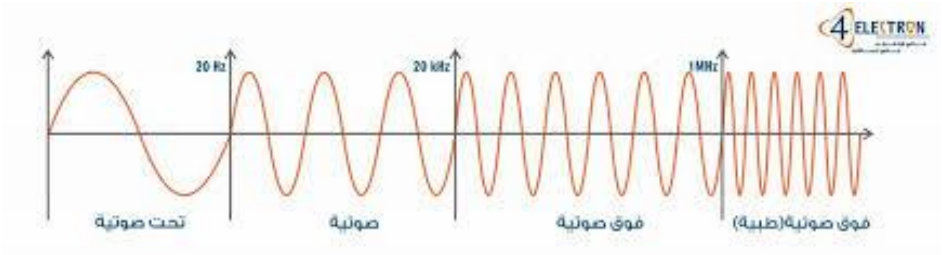
According to frequency, sound is classified into types:

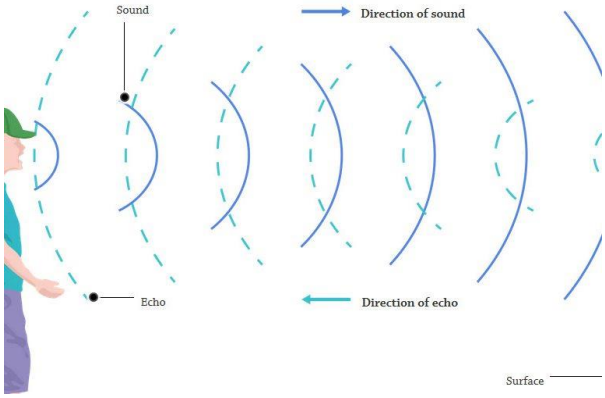
• Infrasonic, which is less than 16 Hz and is inaudible to the human ear as the frequency is very low

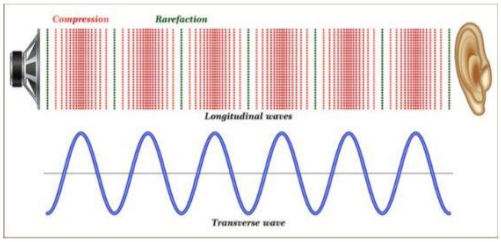
• Hearing range: It extends from 16 Hz to about 20,000 Hz, which are sounds audible to humans.

• Ultrasound, between 20,000 Hz and 1.6 GHz (1.6 billion oscillations per second), which is inaudible to humans, as its frequency is high.

• Ultrasonic, sound waves with a frequency greater than 1 billion Hz (1 billion oscillations/second), which may not propagate.


ELECTRON
20 Hz
20 kHz
1 MHz
تحت صوتية
صوتية
فوق صوتية
فوق صوتية(طبية)


Sound
Direction of sound
Echo
Direction of echo
Surface


Compression
Rarefaction
Longitudinal waves
Transverse wave