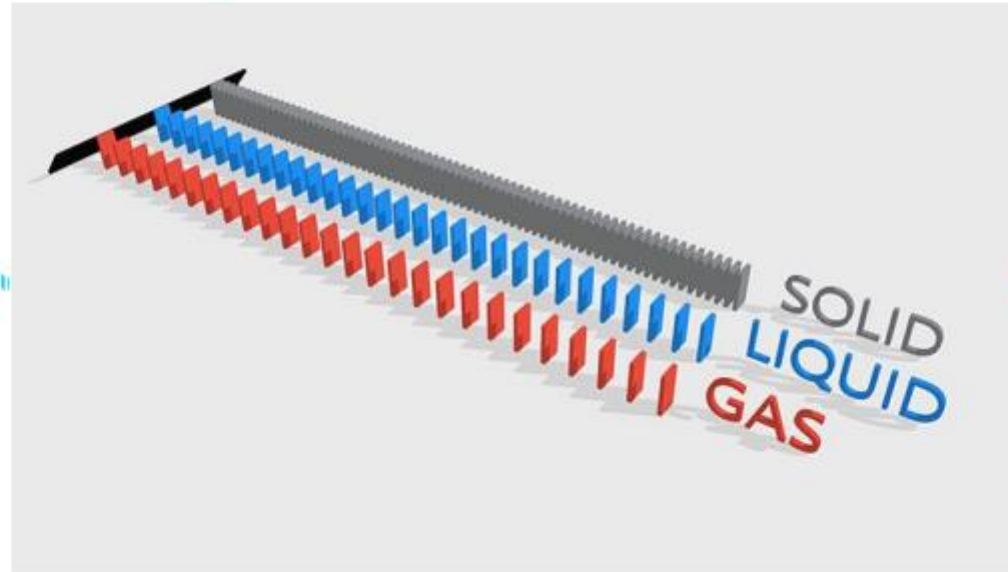


Chapter

Speed of sound

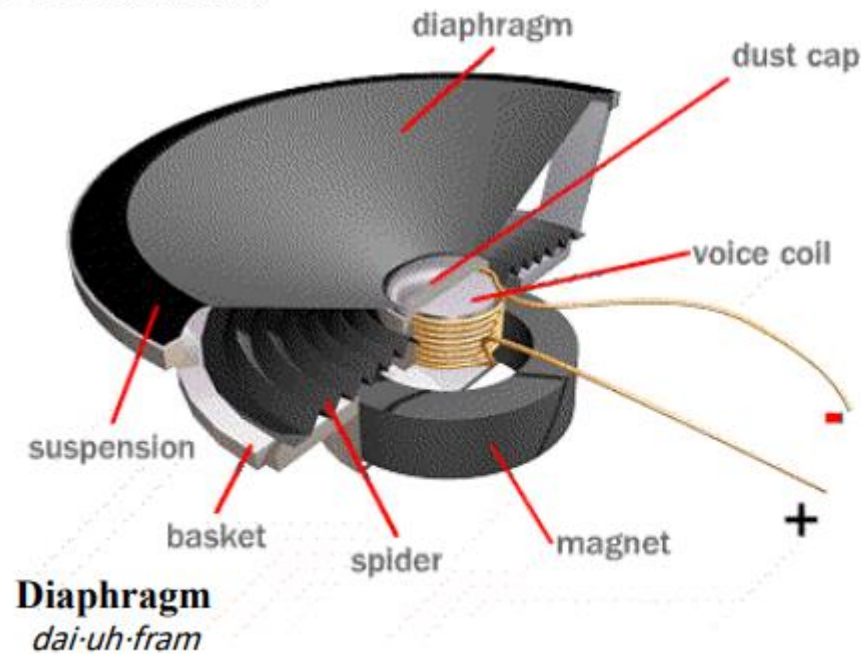


1) Origin of Sound:

The sound waves are generated by a sound source, such as the vibrating diaphragm of a stereo speaker. The sound source creates vibrations in the surrounding medium. As the source continues to vibrate the medium, the vibrations propagate away from the source at the speed of sound, thus forming the sound wave.

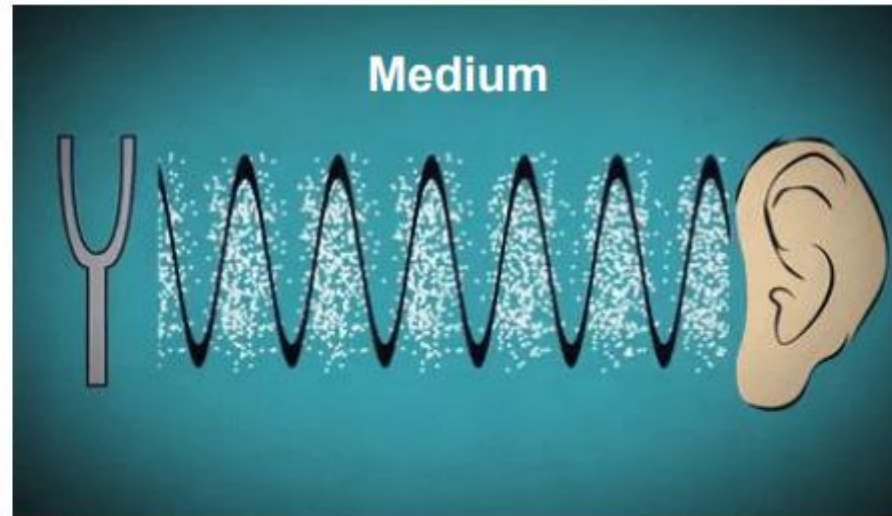
Sound

Vibrations that travel through the air or another medium and can be heard when they reach a person's or animal's ear.



2) Material Medium is a Necessity

Sound needs a material medium for their propagation like **solid, liquid** or **gas** to travel because the **molecules** of solid, liquid and gases carry sound waves from one point to another. Sound cannot progress through the vacuum because the vacuum has no **molecules** which can **vibrate** and **carry** the sound waves.



Sound waves need a for their propagation

Activate Win
Go to Settings to

Types of Acoustics

1.Environmental Noise

Environmental Acoustics is concerned with vibration and noise caused by roadways. Railways, aircraft and general activities that are related to the environment. The main goal of these is to reduce vibration and noise that affects the environment.



2.Musical Acoustics

Musical acoustics is concerned with the study of physics of music i.e., how sounds are used to make music. Areas of study include human voice, musical instruments, and music therapy.



3.Ultrasounds

Ultrasounds are the sounds with a frequency greater than the human audible limit. However, there is no difference in physical properties when compared to normal sound. Ultrasound is used in many fields. Ultrasonic devices are used in measuring distances and in detecting objects. Ultrasound imaging is used in physics.



4.Infrasounds

Infrasounds are the sounds with a frequency of less than 20 Hz. The study of such sounds is called infrasonics. Applications include detection of petrol formation under the earth and the possibility of earthquakes.



5.Vibration and Dynamics

It is the study of how mechanical systems vibrate and interact with their environment. Applications include Vibration control which helps to protect a building from earthquakes and ground vibrations used in railways.



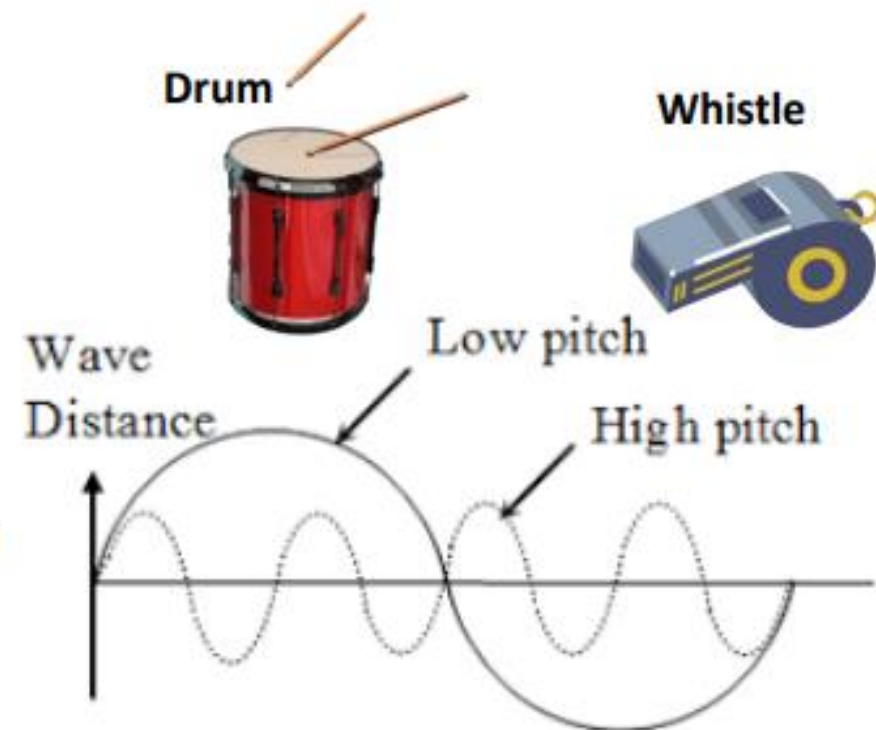
Some properties of sound

(1) **Pitch** : The frequency of a sound wave is what your ear understands as pitch. A higher frequency sound has a higher pitch, and a lower frequency sound has a lower pitch.

(2) **loudness or volume**:

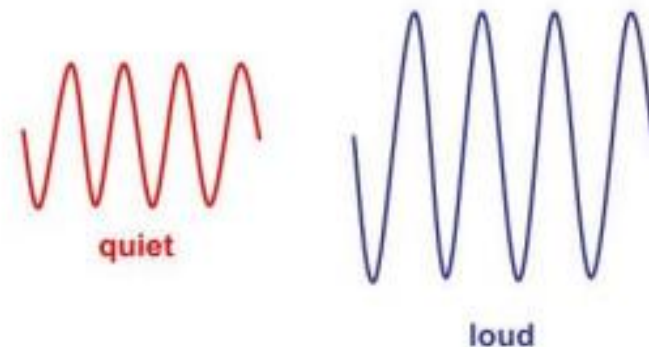
The amplitude of a sound wave determines its loudness or volume. A larger amplitude means a louder sound, and a smaller amplitude means a softer (quite) sound.

Sound volume is measured on a logarithmic scale called the **Decibel Scale**.



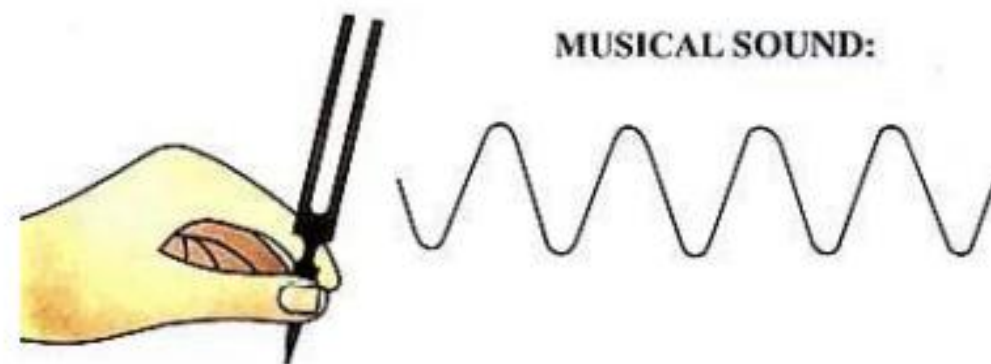
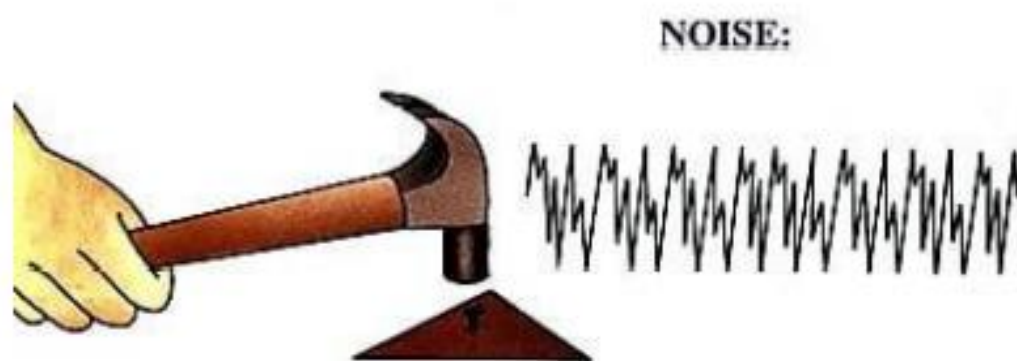
Loudness

The loudness of a sound increases with the amplitude of the sound wave.



2: Noise and Music :

- **Noise** corresponds to an irregular vibration of the eardrum produced by some irregular vibration in our surroundings, a jumble of wavelengths and amplitudes.
- White noise is an even mixture of frequencies of sound, all with random phases
- **Music** is the art of sound and has a different character.
- Musical sounds have periodic tones—or musical notes.
- The line that separates music and noise can. Be thin and subjective.



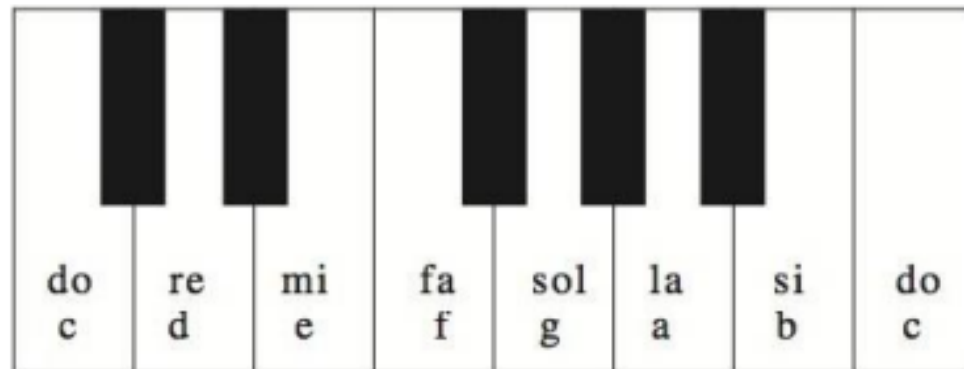
Musical signature and note

1) **A Minor scales:** Is a musical signature symbol start from the **Sol note**, and it called **(The Sol key)** too. It put in the beginning of the musical scale to shows the position of all musical notes.

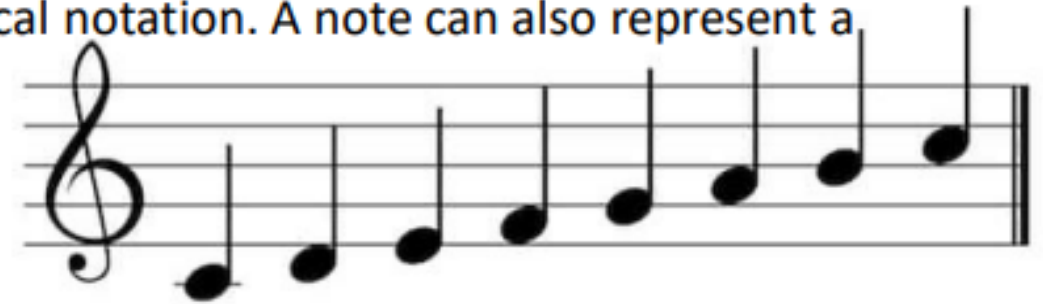


THE KEY OF SOL

In music, a **note** is a symbol denoting a musical sound. Notes can represent the pitch and duration of a sound in musical notation. A note can also represent a pitch class.



PART OF PIANO KEY



Sound	Do	Re	Mi	Fa	Sol	La	Si	Do
Code	C	D	E	F	G	A	B	C

NAMES OF SOME NOTES

Music Symbols (Rhythm music)



Whole Note

worth four beats



Half Note

worth two beats



Quarter Note

worth one beats



Eighth Note

worth half beats



Sixteenth Note



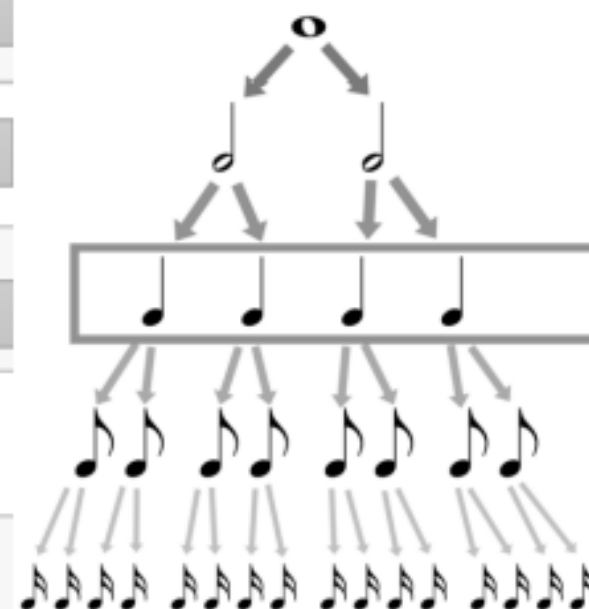
Thirty-second Note



Sixty-fourth Note



One Hundred Twenty-eighth Note



1 whole note = 4 beats

1 half note = 2 beats

1 quarter note = 1 beat

1 eighth note = $\frac{1}{2}$ a beat

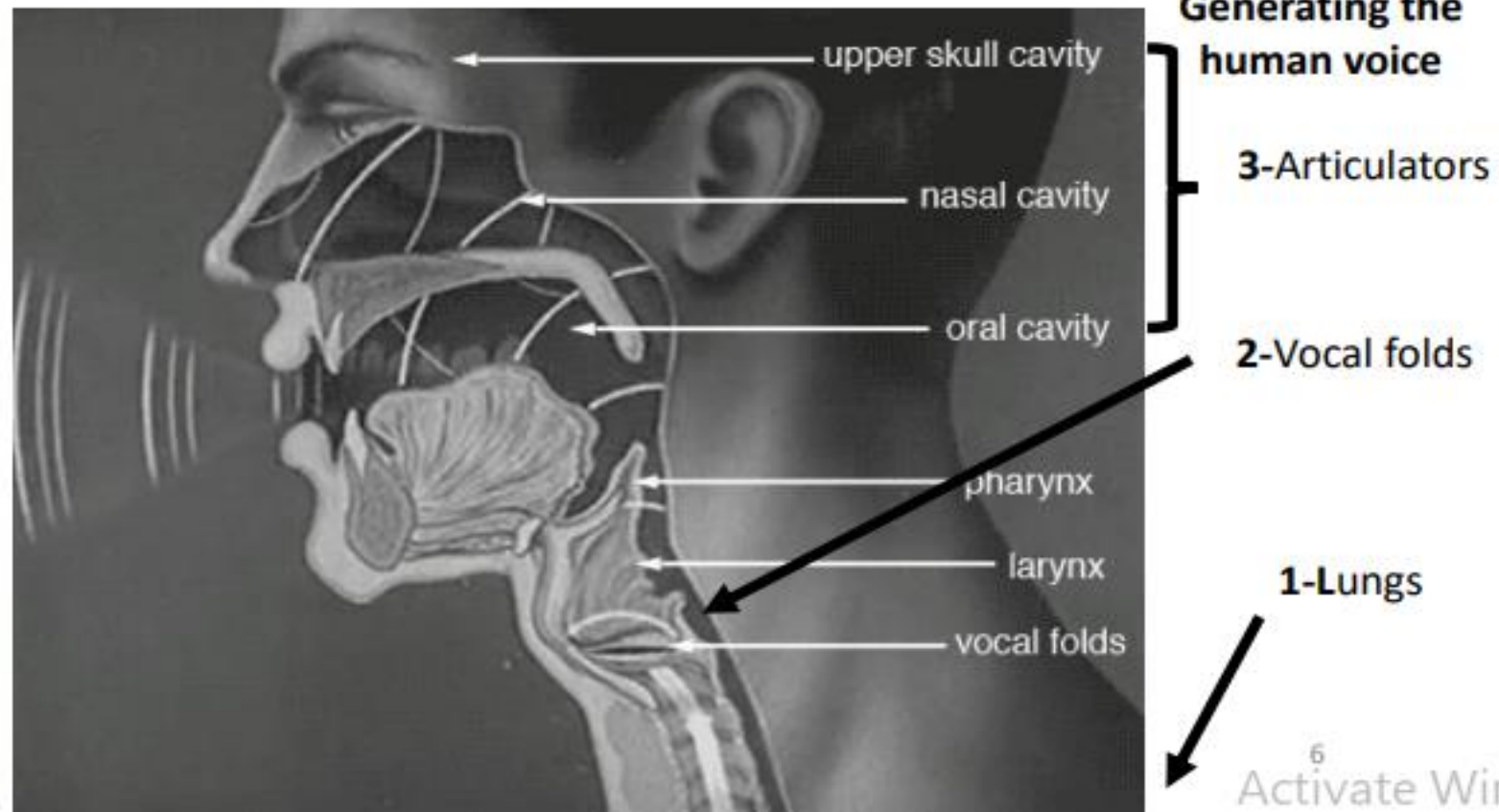
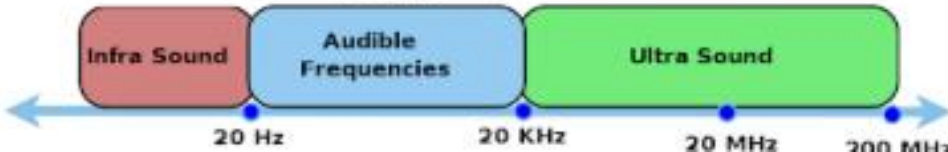
1 sixteenth note = $\frac{1}{4}$ a beat

3) Voice and Hearing

a) Human voice

Human voice originates from the vibrations of the vocal chords and the sound from the musical instruments is due to the vibrations of the air columns. In some cases, the vibrating frequency of the source may be so very small or so very large that it is not audible to the human ear. The audible frequency ranges from 20 Hz to 20 kHz. The frequency below 20 Hz is called **Infrasonic** and the frequency above 20 kHz is called **Ultrasonic**.

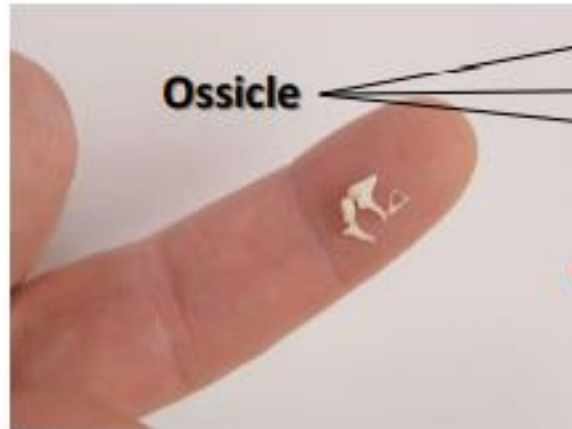
Human vocal cords



b) Hearing sound

Sounds travel as waves and pass through the canal of the **external ear**. The waves cause the ear drum to vibrate (The ear drum separates the external ear from the middle ear.) The vibrations of the ear drum cause the 3 small bones in the **middle ear** to transfer the energy of sound vibrations to the fluids of the **inner ear**. Vibrations in this fluid stimulate the delicate nerve hair cell fibers as impulses or signals. The hearing nerve then transmits these signals to the brain where they are interpreted as understandable sound.

1. Ear Canal
2. Eardrum
- 3-5 Ossicles (hammer or Malleus, anvil or incus, stirrup or stapes)
6. Oval window
7. Eustachian Tube (canal leading to the nose)
8. Cochlea
9. Auditory Nerve



1. بیستنه جوگه
2. تاپنه پهرده
3. دهزگا
4. چاهگوش
5. ناوزهنگ
6. کونی هیلکاهی
7. جوگه ی نوسناکی
8. لولپینج
9. بیستنه دهمار

