

SOUND

SUMMARY

- ❖ Like heat and light, **sound** is also a form of **energy** which has a characteristic of giving the sensation of hearing.
- ❖ Sound is produced by vibrating bodies. It propagates in air, in the form of **longitudinal** waves that comprise of **compressions** and **rarefactions** unlike the waves on a water surface, which **transverse** in nature.
- ❖ The vibrations of a body cause the surrounding layers of air to vibrate to and fro, which cause these compressions and rarefactions. As sound requires a medium for propagation, it is a **mechanical wave**.

The famous **bell jar experiment** proves this fact.

- ❖ Some of the properties of sound consist of its wavelength, frequency, amplitude and speed.
- ❖ **Wavelength** is the distance between two successive compressions or two successive rarefactions.
- ❖ **Time period** is the time taken by a particle to undergo one compression and the succeeding rarefaction.
- ❖ **Frequency** is the number of vibrations made by a particle in one second, which is generally referred to as **pitch**.
- ❖ The **loudness** of sound depends on the **amplitude** of the vibrating particles. One can differentiate between two sounds by characteristics such as **quality**, pitch and loudness.
- ❖ Like light, sound too undergoes reflection from any hard surface and obeys the same **laws of reflection**, which light obeys, that is **angle of incidence** is equal to the **angle of reflection**, the reflected wave, the incident wave and the normal at the point of incidence lie in the same plane.
- ❖ The reflected sound is referred to as an **echo**. When we produce sound before a reflector, whether we hear the echo or not depends on the speed of the sound in the medium and the **distance** between the source/observer (which is the same in this case) and the reflector. To perceive two sounds they should have a time gap of at least 0.1 second.
- ❖ In a closed enclosure, one can hear multiple sounds (echoes) even after the source of sound stops producing the sound due to multiple reflections at different points on the surfaces of the enclosure. This phenomenon is called **reverberation**.

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- ❖ Reflection of sound is used in various applications like **stethoscope**, **echocardiography**, **sonar** etc, although **ultrasonics** is used for things with a frequency greater than that of the **audible range**.

The sounds whose frequency is less than 20 Hz are **infrasound**, and greater than 20 kHz are **ultrasonics**.

- ❖ The human ear, that helps us hear sound, consists of three parts called the outer ear, middle ear and the inner ear.

The outer ear consists of a **pinna** that helps in capturing the sound; the middle ear comprises of an eardrum and an **auditory canal**, **hammer** and **anvil** that amplify the incident sound; the inner ear consists of an **auditory nerve** that converts the amplified sound into electrical signals and sends it to the brain for perception.

In case of hearing difficulties, one uses hearing aids that consist of a **microphone** and an **amplifier**.