Sound Waves

Usually we hear sound transmitted through the air. Air is full of atoms and molecules which transmit the sound wave. Sound cannot pass through vacuum. This was discovered in 1654 by Otto Von Guericke. If an electric bell is placed in a sealed glass jar and the air is pumped out, the sound of the bell becomes feebler and becomes almost inaudible when the limit of exhaustion is reached. The reason why absolute silence is not attained, is that some sound is transmitted by vibration.

In air, sound is propagated in the form of compressions and rarefactions of the air i.e., longitudinal waves.

Sound waves may be transmitted by solids. An approaching train may be heard by placing your ear next to a rail, or the internal vibrations of an engine transmitted to the outside by the engine case.

Liquids also transmit sound. This can be shown by clapping two pieces of stone or metal against each other under water, when the sound of the clapping can be heard above the water. In 1654, Otto Von Guericke found that fish were attracted by the sound of a ringing bell underwater and therefore, concluded that sound could travel through water as well as air.

Sound waves can undergo reflection, refraction, interference and diffraction, but not polarization – a property of transverse waves.

The phenomenon of echoes is due to reflection of sound waves. The rolling of thunder is largely due to successive reflections from the clouds and land surfaces. For appreciable reflection of a wave from any surface, the surface area should be fairly large in comparison to the wavelength of the waves incident on it. Consequently, larger surfaces are required for complete reflection of sound waves. Sound waves being larger than light waves, do not require the reflecting surface to be smooth. For this reason, a brick wall, a wooden board and a row of trees serve as reflectors of sound waves. The reflection of ultrasonic sound pulses in water is the principle behind 'Sonar'.

Refraction of sound waves in the atmosphere occurs when sound waves travel through regions of varying air density. The density of a gas is inversely

proportional to its temperature. Thus, if there is a temperature variation in the air, sound waves are refracted as they pass through the layer boundaries.