SOUND

PROPAGATION OF SOUND

Propagation of sound

A vibrating body produces sound. Now we shall study, how the sound travels from one place to another place.

When a body vibrates, then the particles of the medium (say air) around the vibrating body are set into vibrations. The particles of the medium which are very close to the vibrating body are pushed away from the body. These particles of the medium strike against the neighboring particles. Hence the number of particles of the medium in the region where the displaced particles strike against the neighboring particles is large.

This region is known as compression (C). Since pressure is directly proportional to the number of particles, so the compression is a region of high pressure or high density. When the vibrating body moves backward, a region of emptiness known as rarefaction (R) or a region of low pressure or Low density is created. The displaced particles of the medium rebound into the region of low pressure or rarefaction. At the same time, compression is followed outwards. Therefore, when a body vibrates to produce sound, compressions and rarefactions follow one another as the sound waves travel through the' medium away from the vibrating body. When a sound wave travels through a medium, the particles of the medium simply vibrate about their rest positions and they do not move from one place to another place in the medium.

Figure represents the regions of compressions (or high pressures) and o rarefactions (or low pressures) as the sound propagates in the medium.



Sound needs a medium to travel

We have learnt that sound travels from one place to another place when the energy is transferred from one particle to another particle of a medium like air or gas, liquid, solid etc. It means, sound needs a material medium for its propagation. In other words, sound cannot travel through vacuum.



Demonstration to show that sound waves cannot travel through vacuum.

Put an electric bell inside a closed Bell jar connected with a vacuum pump. Initially, air from the jar is not taken out. Connect the electric bell with a battery (Figure). It rings and the sound produced is heard by us. Now start evacuating the air from a Bell jar using a vacuum pump, we will hear less and less sound. i.e. the loudness of the sound decreases. When there is no air in the Bell jar, we do not hear sound. This activity demonstrates that sound waves require material medium (in this case air) for its propagation.