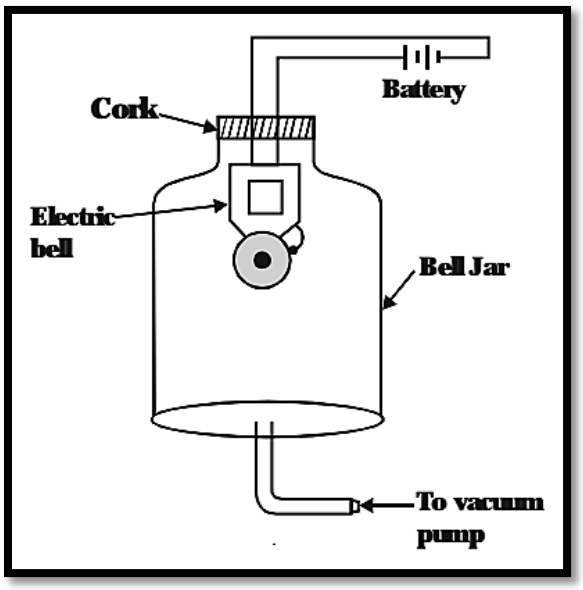
SOUND

SOUND NATURE & SPEED

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.

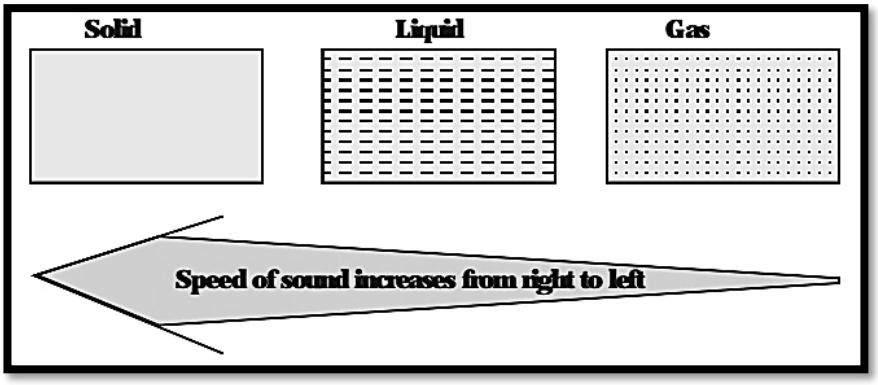
Put an electric bell inside a closed Bell jar connected with a vacuum pump. Initially, air from the jar is not taken out. Connect the electric bell with a battery (Figure). It rings and the sound produced is heard by us.

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.

SPEED OF SOUND

Sound waves travel at different speeds in different substances. The speed of sound varies, depending on factors such as temperature, nature of material, physical state of the substance, etc. For example, the speed of sound in air at 20°C is about 340 m/s, but drops to about 330 m/s 0°C. Sound travels fastest in solids and slowest in gases. Sound does not travel in vacuum.

Speed of sound in solids is greater than the speed of sound in liquids and the speed of sound in liquids is greater than the speed of sound in gases.



SPEED OF SOUND IN VARIOUS MEDIA

Gases	
Air (0°C)	331
Air (20°C)	343
Oxygen (0°C)	317
Helium (0°C)	972
Hydrogen (0°C)	1286
Liquids	
Water (25°C)	1493
Sea water (25°C)	1533

Methylalcohol(25°C)	1143
Blood (37°C)	1570
Solids	
Aluminium (20ºC)	5100
Coppe r (20ºC)	3560
Iron (20ºC)	5130
Vulcanized rubbe r	54
Glass (20ºC)	5170
Granite (20ºC)	6000