Waves

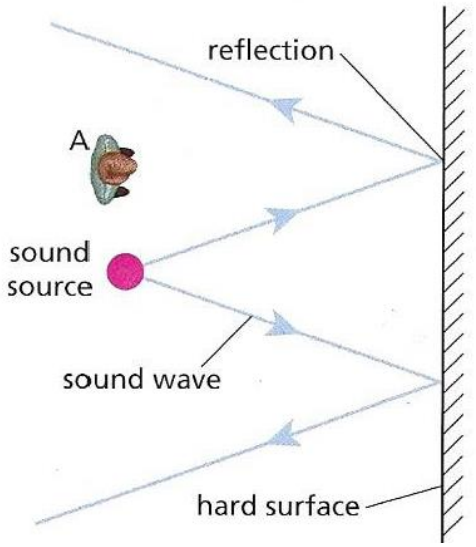
1. Sound

CONCEPT 4

REFLECTION AND ABSORPTION OF SOUND

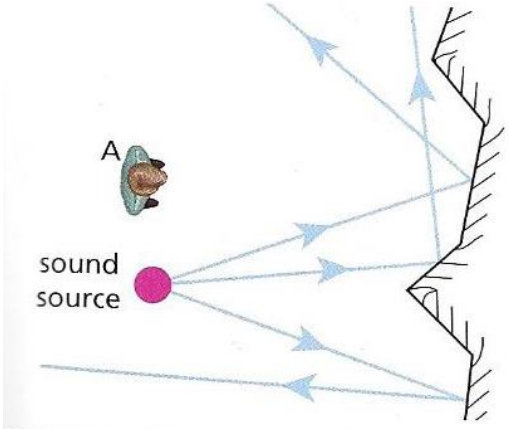
NOTES

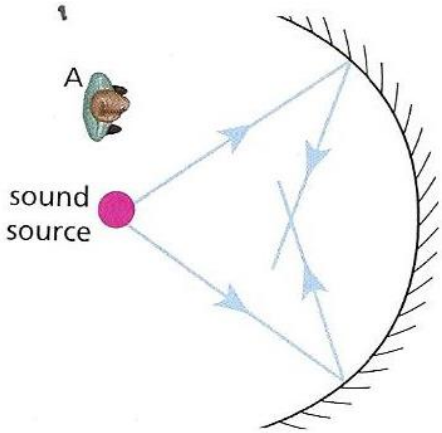
An **echo** is a sound wave that is reflected back to our ears. Hard, flat surfaces reflect sound well and produce strong echoes. Soft surface materials that contain lots of air pockets, like fabric, foam and sponge, are not good at reflecting sound, but absorb it. This process is called **absorption**.



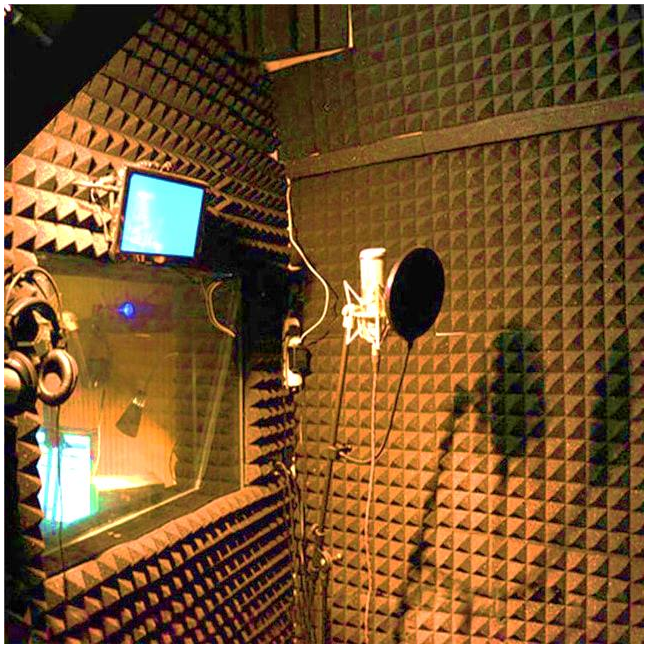
In a concert hall where orchestras play music the seat fabric is designed to absorb sound in the same way as if a person was sitting on it. Concert halls are designed to provide echoes from some surfaces using wood and plaster and to be absorbed by others using foam and fabric.

Some materials can be shaped to reflect sounds in different ways. A jagged surface could reflect sound in many directions away from a source instead of reflecting back to it. A curved surfaces could reflect sound towards a particular point where it may sound louder whereas in other positions it may sound quieter or may not be heard at all.





When sound waves hit soft surface, they are absorbed by the air pockets. The sound waves transfer energy to the air in the pockets so less is reflected. Remember from the previous concept that air is not a good material for sound to travel through. The sound waves become trapped, bouncing around in the air pockets, until all the energy is transferred as heat. Any sound reflected from the surface is therefore much quieter, as the sound waves have much less energy.



These soft materials are useful as **soundproofing**. A vacuum is also a useful in soundproofing. Sheets of glass with a near vacuum between them (very few gas particles) are very effective in stopping sound. This is double glazing and is one way to reduce sound entering a home from a busy road outside.

In outdoor environments, trees, embankments and dense bushes are often used for soundproofing around busy roads (e.g. motorways) or industrial areas.

In a recording studio, acoustic foam is used to line the walls and ceilings. This stops echoes from reflecting into the microphone and ensures that only sound direct from the singer’s mouth is picked up.