

**Describe the pathway of sound vibrations from the time a sound is generated to the time the brain registers the sound.**

Sound is originally generated through vibrations. These vibrations push the molecules of the air around and move outward. The molecules then bump into neighboring molecules creating sound waves. Every sound has two main characteristics: pitch and intensity. Pitch is determined by how rapidly the sound waves oscillate each second (frequency). The higher the frequency the higher the pitch and the lower the frequency the lower the pitch. Sound intensity is determined by the amount of energy in the wave (amplitude). The more energy the sound wave has the louder the sound is and the less energy the sound wave has the quieter the sound is.

The sound waves are then funneled and collected by the outer ear. From the outer ear, the sound waves then travel through the auditory canal. Then the sound waves bump up against the ear drum at the end of the auditory canal. The ear drum then vibrates in sync with the sound waves. The vibration of the ear drum also causes the bones of the middle ear (ossicles) to move. This vibration also causes fluid inside the cochlea to vibrate a set of very small hair called sensory hair cells or cilia which are attached to nerve fibers. These hair cells that are attached to nerve fibers can transmit information to the brain. The main nerve that these hair cells are connected to is the vestibulocochlear nerve which is the eighth cranial nerve. The brain uses the information from the hair cells and from the cranial nerve to help distinguish between different types of sounds. We use this process of recognizing sound waves every day without even realizing it. Though the process seems very long, the whole thing happens so fast that we don't even realize what is going on. That is why learning about the scientific process of hearing can help us learn more about ear diseases, deafness and cochlear implants.

This subject is mainly discussed in Chapter 1.3 where the context is cochlear implants. Learning about how sound waves travel through the ear and to the brain can help students understand more about how cochlear implants work. This fits in with the other parts of Chapter 1.3 because it provides the scientific basis for hearing tests and cochlear implants.