

SOUND

HUMAN EAR

The human ear

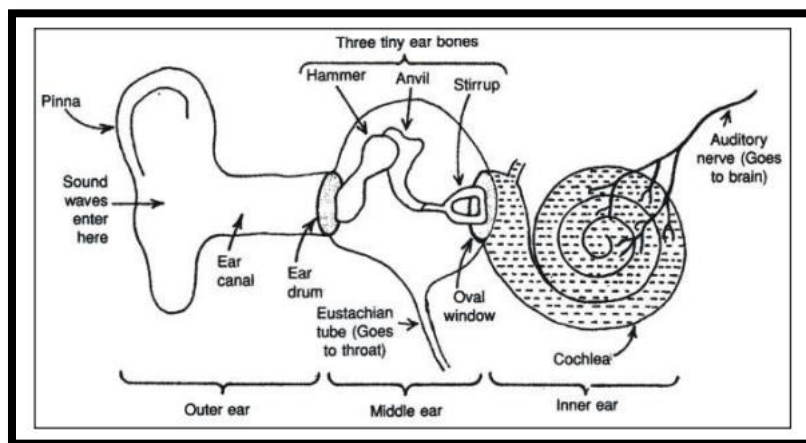
In this article we will learn about the acoustics of hearing. We will see how a human ear converts sound energy into mechanical energy and then to a nerve impulse which is transmitted to the brain.

The human ear consists of (a) the outer ear (pinna), (b) the middle ear, (c) the inner ear. Each part has a specific task to perform. The outer ear, collects the sound and guides it to the middle ear. In the middle ear sound energy is converted into mechanical energy in the form of internal vibrations of the bone structure. These vibrations are then transferred into the inner ear which converts the vibrations into nerve impulses.

The outer ear has an approximately 2 cm long ear canal. Here the sound is collected and amplified. It is in the form of pressure waves with alternate high pressure and low pressure regions.

The middle ear consists of eardrum (tympanic membrane) three tiny inter connected bones-the hammer (malleus), anvil (incus) and stirrup (stapes). The eardrum is a tightly stretched membrane. As the incoming pressure wave from the outer ear strikes, the eardrum starts to vibrate. A compression forces the eardrum inwards whereas a rarefaction forces the eardrum outwards. This means that the eardrum vibrates at the same frequency as that of the sound wave. The eardrum is connected to hammer which in turn is connected to anvil and stirrup. The motion of eardrum will set the hammer, anvil and stirrup into motion at the same frequency as that of eardrum. The three-bone system amplifies the sound further.

The stirrup is connected to the inner ear which consists of cochlea, semicircular canals and the auditory nerve. The vibrations are turned into electrical signals in inner ear which are sent to the brain via the auditory nerve. The brain interprets the sound by the electrical impulses it receives.



Some suggestions to keep the ears healthy are given below:

Never insert any pointed object into the ear. It can damage the eardrum and make a person deaf. Never shout loudly or produce a loud sound into someone's ear.

Never hit anyone hard on his/her ear.