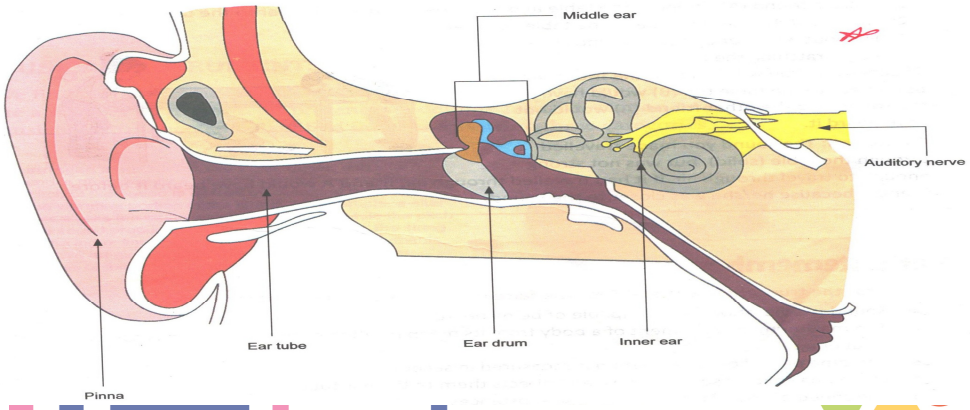
How our ears catch sound: We have just learnt how sound vibrations from a source propagate through the air and reach out ears. Let us now discuss how our ears actually 'hear' these sound vibrations. The ear can be broadly classified into three parts: the outer ear, the middle ear, and the inner ear.

Outer ear: the part of the outer ear that is visible to us is called pinna. The pinna collects sound waves and directs them to the ear tube. At the end of the ear tube is the ear drum (also called tympanum). The ear drum vibrates when sound waves strike it and transmits the sound to the middle ear.

Middle ear: the middle ear is the cavity with three important ear bones. These three bones are placed in such a way that they move when the ear drum vibrate and, therefore, transmit the vibration to the inner ear.



Inner ear: the inner ear is filled with a fluid. When this fluid vibrates, it excites tiny hair in the inner ear. These hairs transform the vibrations into electrical impulses, which are sent to the brain via the auditory nerve. This is how we 'hear' a sound.

A Special Feature Of The Human Ear- Persistence Of Hearing

The human ear has a special feature. This is its property of persistence of hearing. When a given sound reaches the human ear and affects the ear drum, its effect 'stays on' in the ear drum for nearly 1/10th, i.e. 0.1 of a second. This helps us to get a 'feeling of continuity' while hearing one sound after another.

Type Of Sound: Sound can be of different types- soft, loud, pleasure, unpleasant, musical; audible (can be heard), inaudible (cannot be heard), etc. some sounds may fall into more than one category. For instance, the sound produced when an aero plane takes off is both loud and unpleasant.

Audible And Inaudible Sounds:

Sometimes a group of neighborhood dogs start barking on their own, while the residents living in the area are left wondering what provoked the dogs to bark. One possible reason could be that the dogs might have heard some unfamiliar high- pitched sound, which the residents did not hear. Our ears are sensitive only to a certain range of frequencies, 20 Hz to 20,000 Hz. We cannot hear sound waves of frequency below 20Hz and above 20,000 Hz. Dogs have the ability to hear very high- pitched sounds, which we cannot. Sound waves of frequency below 20Hz are called infrasonic waves, and those of frequencies above 20,000 Hz

are called ultrasonic waves. Human beings cannot hear these sound waves. We also cannot hear sound waves if they are too feeble.

Musical Instruments: We find certain sounds pleasant and associate them with music. In a musical sound, there are a number of frequencies present in a definite ratio or relation to each other.
In stringed instruments- like violin, guitar, and sitar, sound is produced by a vibration string. The shrillness or pitch of the sound is altered by changing the length of the vibrating portion of the string.
In wind instruments: like trumpet, flute, and harmonica, sound is produced by the vibrating air column inside the instrument.
In percussion instruments: like table, drums and dholak sound is produced by a vibrating skin or membrane.
Noise: Unpleasant, discomfort-causing sound from any source is called noise. Sustained presence of harmful, unwanted, or annoying noise in the environment is called noise pollution.

Source Of Noise Pollution: Any object that produces a noise is a potential source of noise pollution. Some examples are automobiles, blaring loudspeakers, television and radio (when played at a loud volume), air coolers, and air conditioners.

Harmful Effects Of Noise Pollution: Noise has a jarring effect on us. The effect of noise pollution on people should not be underestimated. Here are some of the harmful effects of noise pollution:

- Irritation and loss of concentration;
- Sleep disturbance and stress (which can lead to high blood pressure);
- Ear damage and loss of hearing (which may result from exposure to a sudden loud noise or from continuous exposure to noise over a period of time).

Measures To Reduce Noise Pollution: Minimizing noise pollution requires a certain degree of discipline from all of us. Some of the measures one should adopt to keep noise pollution under control are given below.

- The use of loudspeakers should be avoided.
- People living in flats (and houses close to each other) should not talk too loudly or play the television/music too loudly so as not to disturb their neighbors.
- While driving, people should avoid playing loud music and using the horn unnecessarily.

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