Sound

Sound is a wave. By the properties of waves, it needs a source of energy and a medium to travel through.

The source of energy of a sound wave is a vibration.
ex. vibrating string, vocal chord, solid, column of air

The medium a sound wave travels through is air. Since air is a material medium, sound is a mechanical wave (there is no sound in the absence of matter). Sound displaces air particles parallel to the direction of the wave motion, therefore it is a longitudinal wave.

Since sound is a wave it can be characterized by all the properties of waves (velocity, frequency, wavelength, amplitude).

Two of the properties of sound waves are perceived by different sensations in humans:

1. Frequency (f) is responsible for the pitch of a sound. As frequency increases, pitch increases.

   Human range of hearing (audible range) is from **20 – 20 000 Hz**

   Frequencies below the audible range are called infrasonic.

   Frequencies above the audible range are called ultrasonic.

2. Amplitude (A) is responsible for the loudness of a sound. As amplitude increases (more energy), the sound becomes louder.

   Loudness is measured in decibels (dB). dB is the measure of the ratio of the pressure of a given sound to the pressure of the softest sound we can hear, 0 dB. This is known as the threshold of hearing. Every 10 dB increase represents a sound that is 10 times louder.

ex. How much louder is a sound of 80 dB over a sound of 40 dB?

Resonance

Every object has a natural frequency at which it will vibrate or oscillate.

Resonance – the increasing of amplitude due to a periodic force that is at the same frequency as the natural frequency of vibration or oscillation.

Energy is transferred every time the force is applied and the interference is always constructive.

Mechanical resonance must be taken into account when designing certain objects that can come in contact with a source of vibration.

ex. Tacoma Narrows bridge fail