

How fast is the Speed of Sound?

Air at room temperature (20°C) :	344 m/sec	Copper:	3,100 m/ sec
Air at 0°C :	332 m/sec	Gold:	3,240 m/sec
Fresh water:	1,490 m/sec	Brick:	3,650 m/sec
Salt water:	1,530 m/sec	Hard wood:	4,000 m/sec
Lead:	1,210 m/sec	Glass:	4,540 m/sec
Plastic:	1,800 m/sec	Iron:	5,000 m/sec
Silver:	2,680 m/sec	Steel:	5,200 m/sec

Use the information in the chart to answer questions 1 and 2 .

1. How could you increase the speed of sound in a substance? Explain your answer.

2. Generally, the speed of sound increases as you go from a gas, to a liquid, and then to a solid . Based on what you know of the structure of matter, come up with a logical explanation for why this is so.

The normal range of human hearing is from 20 Hz to 20,000 Hz.
The human voice ranges from 250 to 2,500 in normal speech

Infrasonic: Sound frequencies below the range of human hearing.

Ultrasonic: Sound frequencies above the range of human hearing.

Loudness and The Decibel Scale (see chart page 510)

The more intense a sound wave the louder it is.

The lowest sound humans can hear is 0 db.

Sounds above 85 db can damage your hearing.

Sounds of 140 db or more cause instant damage.

For every increase of 10 units on the decibel scale, the sound intensity increases by a factor of 10 .

For example, a sound of 10 db is 10 times more intense than a sound of 0 db.

A sound of 20 db is 100 times more intense than a sound of 0 db, and a sound of 30 db is 1,000 times more intense than a sound of 0 db.

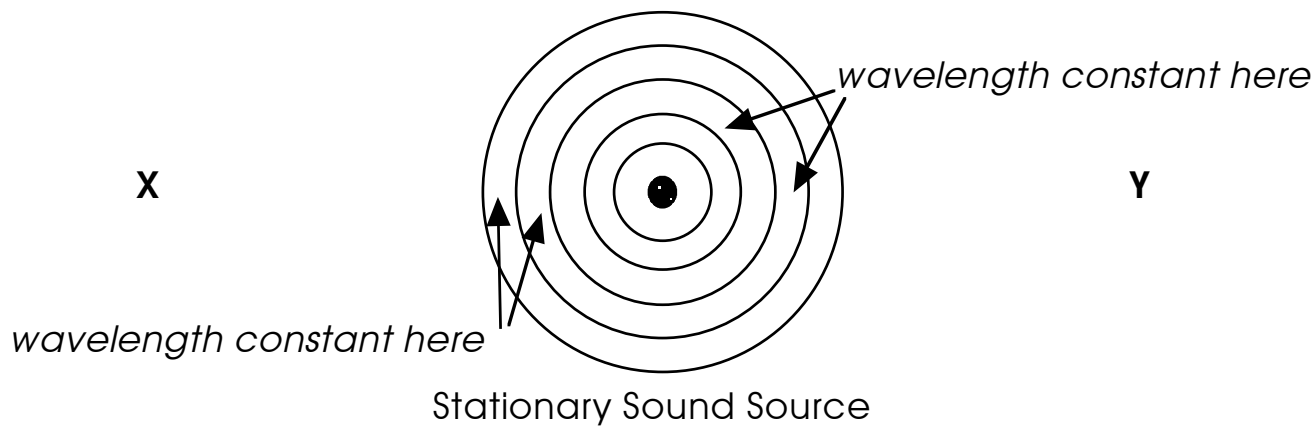
A sound of 70 db is 10 times more intense than a sound of 60 db.

The Doppler Effect (Teacher Demo)

This occurs if there is relative motion between the sound source and the listener.(either the listener or the source is moving) As the distance between the source and listener increases, pitch decreases and vice versa .

Doppler Effect -Continued

The group of circles below, represents sound waves emanating from a stationary source. Each sound wave is an equal distance from the other waves, producing a constant wavelength and frequency. This sound appears to have a constant pitch as we hear it. The "X" and "Y" represent two observers that hear the sound. They both hear the sound as being the same.



In this second example, we see what happens when the source of the sound is moving relative to an observer. The sound source is getting closer to the observer "X" at the left. As a result, the source of the sound is catching up with the sound waves just made. This causes the waves to 'pile up' on top of each other, and decreases the distance between waves, making the wavelength shorter in front of the moving source. This increases the pitch and the frequency of the sound for observer "X".

However, the sound waves behind the source, 'lag behind' the moving source. This lengthens the distance between waves, making the wavelength longer as the source moves away from previously created sound waves and from observer "Y". This lowers both the pitch and frequency for observer "Y".

