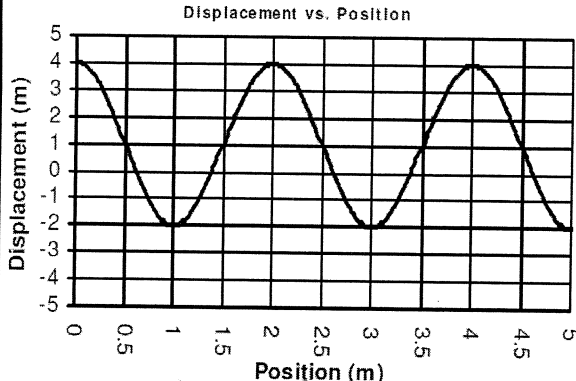


1. Sound **B**
2. Sonic boom **D**
3. Supersonic **A**
4. Ultrasonic **E**
5. Cochlea **C**

- A. Faster than the speed of sound.
- B. A wave caused by alternating high and low pressure.
- C. The organ that detects sound waves.
- D. A pressure wave caused by an object going faster than sound.
- E. A sound higher than humans can hear.

1. Pitch **B**
2. dB **D**
3. Space **A**
4. Loudness **E**
5. v_s **C**

- A. Where there is no sound because of its vacuum.
- B. How we hear changes of frequency of sound.
- C. 340 m/s in air.
- D. How we measure loudness.
- E. The amplitude or strength of a sound.



Use the graph to answer these questions: $\lambda = 2m$

1 cycle is from 1 m to 3 m ; 1/2 cycle is from 0 m to 1 m

Amplitude (A) = 3m Total cycles: 2 1/2

It is a sound wave; find frequency:
 $v = 340 \text{ m/s} = f \cdot \lambda$ $340 \text{ m/s} = f \cdot 2m = 170 \text{ Hz}$

Is this frequency audible to humans (can we hear it)?
 Yes, between 20-20,000 Hz

A wave's velocity is 90 m/sec with a frequency of 6 Hz. What is its wavelength?

$$V = f\lambda \quad \lambda = \frac{V}{f} = \frac{90 \text{ m/s}}{6 \text{ Hz}} = 15 \text{ m}$$

A sound wave has a wavelength of 20 m. Find its frequency.

$$V = 340 \text{ m/s} \quad V = f\lambda$$

$$\lambda = 20 \text{ m} \quad f = \frac{V}{\lambda} = \frac{340 \text{ m/s}}{20 \text{ m}} = 17 \text{ Hz}$$

If a sound wave's frequency is 100 Hz. What is its period?

$$T = \frac{1}{f} = \frac{1}{100 \text{ Hz}} = 0.01 \text{ sec}$$

What is the above wave's wavelength?

$$V = f\lambda$$

$$\lambda = \frac{V}{f} = \frac{340 \text{ m/s}}{100 \text{ Hz}} = 3.4 \text{ m}$$

A railroad crew is repairing a rail. You hear the hammer 0.5 seconds after it is swung. How far away is the crew?

$$v_s = 340 \text{ m/s} \quad v = d/t$$

$$t = 0.5 \text{ sec} \quad d = v \cdot t = 340 \text{ m/s} \cdot 0.5 \text{ sec} = 170 \text{ m}$$

You hear a plane 4 seconds after you see it. Find the distance to the plane.

$$v_s = 340 \text{ m/s} \quad v = d/t$$

$$t = 4 \text{ sec} \quad d = v \cdot t = 340 \text{ m/s} \cdot 4 \text{ sec} = 1360 \text{ m}$$

If a sound is 40 dB loud. Answer how many dB these would be:

- 1) A sound twice as loud: 50 dB
- 2) A sound half as loud: 30 dB

Compared to a 50 dB sound, you would hear a 60 dB as:

twice as loud

Why is space silent?

NO medium for sound to travel through

If I increase the energy I give a sound wave what changes:

loudness

If a wave's fourth harmonic has a frequency of 40 Hz, what is its natural frequency and what is the frequency of H_6 ?

$$H_1 = 10 \text{ Hz}$$

$$H_6 = 60 \text{ Hz}$$

If a wave's fundamental is 6 Hz, what harmonic has a frequency of 48 Hz?

$$H_8$$

Find its period: $T = \frac{1}{f} = \frac{1}{80 \text{ Hz}} = 0.0125 \text{ sec}$

What harmonic is this? H_4
 Could a human hear this frequency? yes
 Mark the nodes and anti-nodes.
 How many wavelengths is it? 2

What is its wavelength? 3m

Find the fundamental frequency:

$$\frac{80 \text{ Hz}}{4} = 20 \text{ Hz}$$

5th harmonic frequency: 100 Hz

Speed of the wave on this string:

$$v = f\lambda = 80 \text{ Hz} \cdot 3 \text{ m} = 240 \text{ m/s}$$

