

The Nature of Sound Waves

Read from **Lesson 1** of the **Sound and Music** chapter at **The Physics Classroom**:

- <http://www.physicsclassroom.com/Class/sound/u1111a.html>
- <http://www.physicsclassroom.com/Class/sound/u1111b.html>
- <http://www.physicsclassroom.com/Class/sound/u1111c.html>

MOP Connection: Sound and Music: sublevel 1

TRUE or FALSE: Identify the following statements as being either true (T) or false (F).

T or F?

- _____ 1. Sound waves are longitudinal waves.
- _____ 2. As the teacher talks, students hear the voice because particles of air move from the mouth of the teacher to the ear of the student.
- _____ 3. Sound waves are mechanical waves.
- _____ 4. All sound waves are produced by a vibrating object.
- _____ 5. A sound wave does not consist of crests and troughs.

6. Mac is talking to Kate. The dot at A represents a particle of air. Describe the motion that this particle must undergo in order for Kate to hear Mac. Then show the motion by placing arrows on the diagram.



7. Tosh is holding one end of a slinky; the opposite end is attached to a wall. Tosh wishes to produce a longitudinal wave in the slinky. Describe how Tosh must move his hand in order to produce a longitudinal wave. Then place arrows on the diagram to show the way in which Tosh must move his hand.



8. A sound wave is moving through air. The diagram below represents a snapshot of the air particles at a given instant in time. Several regions are labeled with a letter. Use the letters to identify the compressions and rarefactions.



Compressions: _____ Rarefactions: _____

9. A science fiction film depicts inhabitants of one spaceship (in outer space) hear the sound of a nearby spaceship as it zooms past at high speeds. Critique the physics of this film.

Properties of Sound Waves

Read from **Lesson 2** of the **Sound and Music** chapter at **The Physics Classroom**:

<http://www.physicsclassroom.com/Class/sound/u1112a.html>

<http://www.physicsclassroom.com/Class/sound/u1112b.html>

<http://www.physicsclassroom.com/Class/sound/u1112c.html>

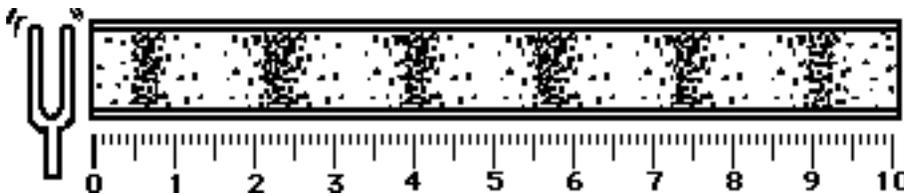
MOP Connection: Sound and Music: sublevel 2

Review:

Match the following wave quantities to the *mini-definition*. Place the letter in the blank.

- A. Frequency B. Period C. Speed D. Wavelength E. Amplitude

- _____ 1. **How fast** the wave moves through the medium.
- _____ 2. **How long** the wave is.
- _____ 3. **How often** the particles vibrate about their fixed position.
- _____ 4. **How much time** it takes the particles to complete a vibrational cycle.
- _____ 5. **How far** the particles vibrate away from their resting position.
6. A sound wave with its characteristic pattern of compressions and rarefactions is shown below. A centimeter ruler is included below the pattern. The wavelength of this sound wave is _____ cm.



7. The pitch of a sound is directly related to the _____ of the sound wave.
 a. frequency b. wavelength c. speed d. amplitude
8. High pitched sounds have relatively large _____ and small _____.
 a. period, wavelength b. speed, period
 c. frequency, wavelength d. period, frequency
 e. amplitude, wavelength f. amplitude, speed
9. As the frequency of a sound increases, the wavelength _____ and the period _____.
 a. increases, decreases b. decreases, increases
 c. increases, increases d. decreases, decreases
10. A sound wave is described as being 384 waves/s. This quantity describes the wave's _____.
 a. frequency b. period c. speed d. wavelength
11. The speed of a sound wave depends upon the _____.
 a. frequency of the wave b. wavelength of the wave
 c. amplitude of the wave d. properties of the medium through which it moves
12. If a person yells (as opposed to whispering), then it will cause _____.
 a. air molecules to vibrate more frequently
 b. the sound wave to travel faster
 c. air molecules to vibrate with greater amplitude
13. If a person yells (as opposed to whispering), then it will cause _____.
 a. the pitch of the sound to be higher
 b. the speed of the sound to be faster
 c. the loudness of the sound to be louder