

STEM *Sims*™

# Sound



# Sound

**Do you need an idea for a scientific study?  
Try out one of our ideas or make one of your own.**

**A phrase often used about music is: “Music soothes the savage beast.” While some enjoy certain types of music, others think that same music is just a sound they consider to be noise. Take the following brief quiz to see how much you already know about sound. See the bottom of page 4 to check your answers.**

1. What is the speed of sound in air on a typical day at sea level?
  - a. 333 mph
  - b. 564 mph
  - c. 761 mph
  - d. 995 mph
2. What is the speed of sound in water at a temperature of 70 °F?
  - a. 995 mph
  - b. 1,408 mph
  - c. 2,188 mph
  - d. 3,321 mph
3. What produced the loudest sound in recorded history?
  - a. Philippine’s tidal wave
  - b. Krakatoa volcano
  - c. nuclear bomb
  - d. cheer from the crowd at a Michigan football game
4. Which animal is responsible for the loudest sound ever measured?
  - a. sperm whale
  - b. bull elephant
  - c. Bengal tiger
  - d. howler monkey
5. Which insect is responsible for the loudest sound ever measured?
  - a. African cicada
  - b. honeybee
  - c. desert locust
  - d. katydids



## Making Sound Waves

Water waves and sound waves have some common features but differ on others. In this investigation, you'll use water to visualize sound waves. Get started now with this investigation of sound.

### Materials Required

- 1- large metal frying pan
- 1- metal spoon
- water

### Procedure

1. Make sure to get permission before completing this activity.
2. Fill the frying pan about  $\frac{1}{2}$  way with water.
3. Strike the edge of the frying pan with a metal spoon.
4. Make a dot in the middle of the paper at the intersection of the two folds.
5. Record your observations in Table 1.
6. Again, strike the edge of the frying pan with a metal spoon. Quickly touch the frying pan.
7. Record your observations in Table 1.
8. Hold the frying pan in one of your hands.
9. Strike the edge of the frying pan with a metal spoon.
10. Record your observations in Table 1.

Pan	Observations
On countertop	
On countertop while touching	
Holding in your hand	

### Questions

1. Were any sound waves produced by the pan when struck by the spoon?
  
2. What evidence supports your response to the previous question?
  
3. Explain how holding the pan in your hand did or did not change the results of the experiment.

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## Ultrasound Tools

Most humans can hear sounds that have frequencies between 20 and 20,000 hertz. However, there are sound waves at both higher and lower frequencies that are not detectable by the human ear. Sound above the normal audible limits of human hearing are called ultrasounds. Those below the limit of human hearing are called infrasounds. The upper limits to human hearing are sounds with a frequency of about 20 kHz, while the lower limit is about 20 Hz.

As people age, the upper end of the frequencies heard by most people tend to decrease. That means that many older people cannot hear the same sounds as younger people. Some cell phone companies are creating ring tones that only younger people can hear to avoid having older people be able to detect their children's cell phone usage.

Other companies have developed electronic devices that use a similar technology to keep younger people from loitering in a location. These companies place a high frequency sound generator on street signs. These devices then generate the sound waves that annoy the younger people and get the people to move away from that area to keep them from hanging out on a street corner.

Ultrasound can also be used to incapacitate a person. These weapons direct ultrasonic waves at a person that cause pain and disorientation. Some people exposed to ultrasonic weapons also experience nausea. As of 2021, some police and military forces make use of some of these sonic weapons.

Ultrasound has found many other uses in the modern world. They include using the technology to visualize inside the human body, clean jewelry and lens, kill bacteria and other harmful pathogens, to humidify the indoor air, and even to weld materials that need to be joined. More applications of the ultrasound technology appear on a regular basis.



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Answers will vary. 3) The vibrations of the pan were smaller than before.

Answers: Page 2 Answers: 1) c, 2) d, 3) b, 4) a, 5) a. Page 3 Answers: Making Sound Waves 1) Yes, a tone and waves on the water were formed. 2)

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