

<p>75 min</p>	<p>Learning outcomes:                      1. Sound is a wave, audible frequencies range from 20 Hz to 20000 Hz                      2. Ultrasound applications                      3. Calculating the speed of sound at a given temperature in C°                      4. Human perception of sound                      5. Sound intensity and level, and values for some common sounds                      6. How to calculate sound level given the intensity and vice versa                      7. Sound level and distance                      8. Sound safety</p>	<p><b>Materials</b></p> <ul style="list-style-type: none"> <li>• Bowl, plastic wrap, rice grains, a small drum, an oscilloscope, a microphone, overhead projector, computer</li> </ul>
<p><b>Minds On...</b>                      5 min                      5 min</p>	<p>1. In class demo using a microphone and an oscilloscope, students are challenged/prompted to conclude that sound is a wave.                      2. Question to entire class: what is the meaning of ultrasound, and give example(s) from real life</p>	
<p><b>Action!</b>                      1 min                      4 min                      10 min                      5 min                      5 min                      5 min                      15 min                      5 min                      5 min</p>	<p>1. Explain the meaning of ultra and infra. Relate ultrasound and sound. Both are waves, sound has a frequency that is perceptible by the human ear, whereas the frequency of ultrasound is higher than that.                      2. Show video of ultrasound application at:  <a href="http://www.youtube.com/watch?v=9X6HwEObo4w">http://www.youtube.com/watch?v=9X6HwEObo4w</a>.                      3. Introduce the formula for calculating the speed of sound in air. Students use the formula to calculate the speed of sound given the temperature in C°, and then to calculate the temperature given the speed. Give the right answers for students to check their work.                      4. Show the table of the speed of sound in various media (Table 1, page 395)                      5. In class demo: wrap some plastic wrap on a bowl; place some rice grains on the wrap. Make sound with a small drum close by. The grains will move indicating the wrap moved too. The ear drum works in a similar way. Explain human perception of sound.                      6. Define sound intensity as the amount of sound energy being transferred per unit area; unit W/m<sup>2</sup>. Refer to some values in table 2 page 395. Introduce sound level as a convenient way of identifying loudness.                      7. Introduce formula: <math>L=10\text{Log}(I/I_0)</math>. Teacher models the solution of 2 direct application exercises; one is to calculate level when given an intensity; and the other is to calculate the intensity when given a sound level. Students work in pairs on question 9 on page 397. Successful students will write solutions on the board.                      8. Explain the effect of distance, refer students to table 3 page 396                      9. Explain sound safety, refer students to table 4 page 396</p>	

**Consolidate  
Debrief**

10 min

Students are asked to recall their learning during this class and share it with the class. Teacher assigns homework.

**Home Activity or Further Classroom Consolidation**

**Solve questions: 4, 8, 10, page 397**

**Google the world's quietest room**