

## Alternative Assessment

1. A new airport is being built 750 m from your school. The noise level 50 m from planes that will land at the airport is 130 dB. In open spaces, such as the fields between the school and the airport, the level decreases by 20 dB each time the distance increases tenfold. Work in a cooperative group to research the options for keeping the noise level tolerable at the school. How far away would the school have to be moved to make the sound manageable? Research the cost of land near your school. What options are available for soundproofing the school's buildings? How expensive are these options? Have each member in the group present the advantages and disadvantages of such options.
2. Use soft-drink bottles and water to make a musical instrument. Adjust the amount of water in different bottles to create musical notes. Play them as percussion instruments (by tapping the bottles) or as wind instruments (by blowing over the mouths of individual bottles). What media are vibrating in each case? What affects the fundamental frequency? Use a microphone and an oscilloscope to analyze your performance and to demonstrate the effects of tuning your instrument.
3. Interview members of the medical profession to learn about human hearing. What are some types of hearing disabilities? How are hearing disabilities related to disease, age, and occupational or environmental hazards? What procedures and instruments are used to test hearing? How do hearing aids help? What are the limitations of hearing aids? Present your findings to the class.
4. Do research on the types of architectural acoustics that would affect a restaurant. What are some of the acoustics problems in places where many people gather? How do odd-shaped ceilings, decorative panels, draperies, and glass windows affect echo and noise? Find the shortest wavelengths of sounds that should be absorbed, considering that conversation sounds range from 500 to 5000 Hz. Prepare a plan or a model of your school cafeteria, and show what approaches you would use to keep the level of noise to a minimum.
5. Doppler radar systems use the Doppler effect to identify the speed of objects such as aircraft, ships, automobiles, and weather systems. For example, meteorologists use Doppler radar to track the movement of storm systems. Police use Doppler radar to determine whether a motorist is speeding. Doppler radar systems use electromagnetic waves, rather than sound waves. Choose an application of Doppler radar to research. Create a poster showing how the application works.
6. How does a piano produce sound? Why do grand pianos sound different than upright pianos? How are harpsichords and early pianos different from modern pianos? What types of tuning systems were used in the past, and which are used today? Use library and/or Internet sources to answer these questions. If possible, try playing notes on different pianos, and compare the resulting sounds. Create a presentation to share your results with the class.
7. Research the speed of sound in different media (including solids, liquids, and gases), and at different temperatures. Also investigate the concept of *supersonic* speed and find some examples of objects that can move at supersonic speeds. Create a bar chart to compare your results.
8. Bats rely on echolocation to find and track prey. Conduct research to find out how this works. Which species of bats use echolocation? What type of sounds do bats emit? What can a bat learn from reflected sounds, and how do bats process the information? Write a paper with the results of your research.