

## Chapter 12 Sound

1. Be able to state the approximate speed of sound in air in both meters per second and feet per second and list the variables upon which it does and does not depend.
2. Be able to use the graphical output from our speed of sound experiment to figure out the measured value of the speed of sound.
3. Be able to state how many seconds it takes sound to travel a mile, to the nearest second.
4. Be able to account for the lack of sound in the vacuum of space.
5. Be able to state the approximate frequency range of normal human hearing and to name sound that is too low in frequency to hear and sound that is too high in frequency to hear.
6. Be able to identify our sense of pitch as being directly related to frequency.
7. Be able to describe how wavelength and frequency are related for sound waves in air.
8. Be able to describe what kind of wave sound is.
9. Be able to use  $v = f\lambda$  for sound waves.
10. Be able to describe what the “intensity” of sound is in terms of its units.
11. Given the intensity of a sound, be able to calculate its sound level in decibels.
12. Given the sound level of a sound in decibels, be able to calculate its intensity.
13. Be able to state the factor that the intensity of sound changes for every change in sound level of 10dB.
14. Be able to state how much a doubling of the intensity of a source of sound will raise the perceived sound level in dB.
15. Be able to calculate how a given change in distance from a sound source affects the intensity of the sound.
16. Be able to describe what “fundamental frequency” means and to give examples.
17. Be able to describe what “harmonics” are and to give examples.
18. Be able to sketch a standing wave diagram for each of the first three harmonics that can exist on a stringed instrument’s string.
19. Be able to sketch a standing wave diagram for each of the first three harmonics that can exist in air columns whether the columns have two open ends or an open end and a closed end.
20. Be able to explain why even harmonics do not exist in columns of air with one end open and one end closed or on strings with one end free and the other end fixed.
21. Be able to describe how the standing wave diagram for a column of air is related to the motion of air in that column.

22. Be able to determine the wavelength of a wave by inspection of a standing wave pattern of known length.
23. Be able to use the beat frequency produced by two sound sources to determine their frequency difference.
24. Be able to predict the beat frequency produced by two sound sources given their frequencies.
25. Be able to calculate the wavelength and frequency of sound received by a stationary observer when a sound source is moving either toward or away from the observer.
26. Be able to describe how the speed of sound in air is affected by the motion of its source and to use our Doppler relationship to solve for observed frequencies from moving sources.
27. Be able to describe what a shockwave is.
28. Be able to use the angle between a shock front and the direction of travel of the sound source to determine the ratio of the speed of the source to the speed of the wave.
29. Be able to describe why we can distinguish a trumpet from a flute even when both play the same note.
30. Be able to describe things that you have observed that illustrate something we have dealt with in this chapter.