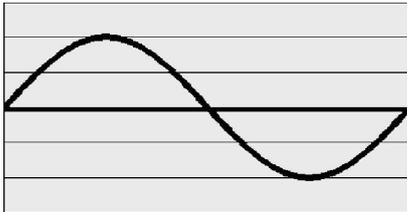
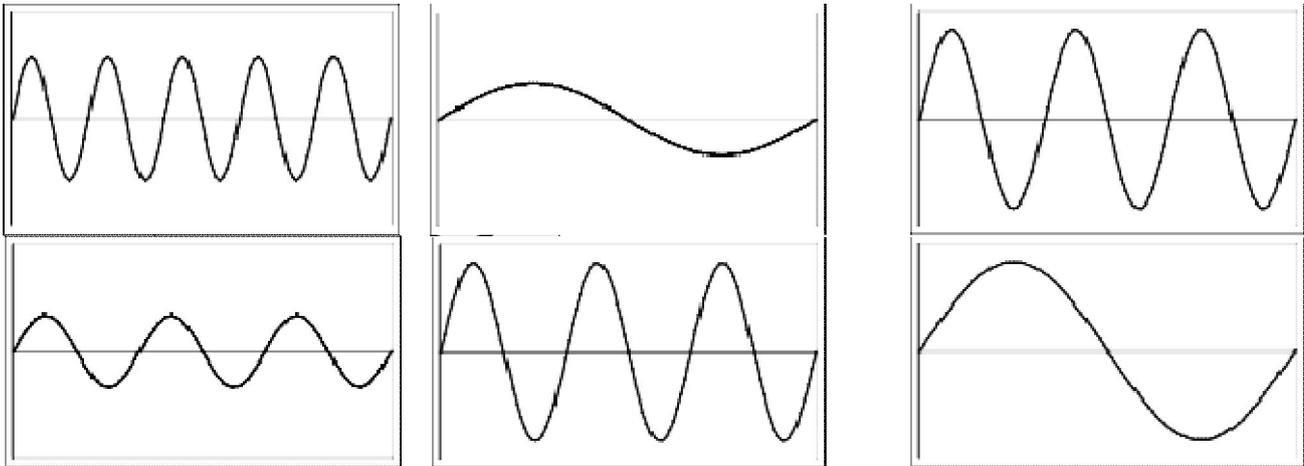


1. What is the top of a wave called?
2. What is the bottom of a wave called?
3. What is frequency?
4. If a wave is traveling at 60 cm/second and has a wavelength of 15 cm, what is the frequency?
5. What does amplitude measure?
6. On the diagram below, indicate with an arrow the distance that represents the wavelength of the wave. With another arrow indicate the distance that represents the amplitude.



7. How many complete waves are there in the diagram above? Is it transverse or longitudinal?
8. What is the difference between a transverse wave and a longitudinal wave?
9. Are sound waves transverse waves or longitudinal waves? Why?
10. You are an astronaut on the moon where there is no air. You and your partner get stuck away from base and find that your radios no longer work. How can you talk to each other? (It is possible.)
11. If you wet your finger and rub it around the rim of a glass it will make the glass ring out with a very distinct sound. How is the glass producing a sound wave?
12. When you are underwater in a quiet swimming pool you can sometimes hear the people at the side of the pool talking (not very loudly, but you can hear them.) Explain how the sound waves get from the talkers to you in the pool. (What is happening at the level of the air and water molecules?)
13. Everyone knows that you can tell how far away a lightning strike is by counting how long it takes until you hear the thunder after seeing the flash.
 - a. If you hear the thunder 10 seconds after the lightning strikes, how far away was the lightning strike? (The thunder is a sound wave in air!)
 - b. How much time would you have to wait for the thunder from a lightning strike that was 1 km away? (Remember to calculate with the right units)\
 - c. How much time would you have to wait for the thunder from a lightning strike that was 1 mile away? (Remember your units.)
14. The eruption of Krakatoa in the 1800s was said to be "heard around the world." Krakatoa is 18,400,000 meters away from Portland. How much sooner would you hear the eruption if you were listening underwater instead of in the air? (Let's go through this step by step)
 - a. How long would it take the sound waves to travel through the air from Krakatoa to Portland?
 - b. How long would it take the sound waves to travel through the water from Krakatoa to Portland?
 - c. How much extra time does the sound wave traveling through air take?

15. If the horn of the train mostly puts out a sound wave with a frequency of 200 waves/second
- What frequency would you hear in the air? What frequency would you hear in the track?
 - What would the wavelength of that sound wave be in air?
 - What would the wavelength of that sound wave be in the track?
16. Label the volume (loud, medium or soft) and the pitch (high, middle or low) for each of the following sound waves.



17. What is the range of human hearing?
18. What do we call sounds that are too high pitched for people to hear?
19. What do we call sounds that are too low pitched for people to hear?
20. On a warm 4th of July night (28 oC) I was watching fireworks. I timed the delay from when I saw the exploding fireworks to when I heard the explosion. On average, it took 2.30 seconds for the sound to reach me. How far away (in kilometers) were the fireworks exploding?
21. The wave below was produced by two students shaking a spring up and down that are standing 6.0 meters apart. A third student measured the oscillations of the wave and determined that it took 5.70 seconds for 10 complete oscillations (vibrations).
- determine the frequency
 - determine the wavelength
 - determine the period
 - determine the speed of the wave on the spring If the students moved farther apart, how would your answers change for the questions above? There are 1.5 complete standing waves on the spring.