



# **4th Grade Science**

## **Module 2b-3a**

### **Study Guide**

# How to use this study guide:

## General tips:

- Study at the same time each day.
- Make your study time before you do something fun (like watch TV or hang out)
- Have a family member help you follow these steps

## Using your study guide:

1. **Read the section you want to study first.**
  - a. If it's your first time reading this section, highlight or underline phrases that stick out to you as important.
  - b. If you've already read and annotated the section, re-read and write extra notes in the margin about what else you know.
2. **Answer the review questions aligned to this section of the study guide.**
  - a. First, try answering them using your brain – don't peek at the study guide yet. Even if you're not 100% certain the answer is correct, put your best guess.
  - b. Then, check your answers against the study guide and fix the ones you missed.
3. **Create flash cards**
  - a. Put the question or definition on one side.
  - b. Put the answer or word on the other side.
4. **Quiz yourself (or ask a friend/family member to quiz you)**
  - a. Take the whole stack of cards you just made. Read the questions on one side of the note card. Without peeking, guess what the answer is. Put the cards in two piles – got it, not yet
  - b. From the not yet pile, pick up 3 cards. Quiz yourself on these 3 cards (mix up the order each time) until you can get all three answers correct every time.
  - c. Add three more cards to your pile (so now you have six). Quiz yourself on these 6 cards until you can get all 6 answers correct every time (remember to mix up the order of the cards).
  - d. Continue until you've correctly gone through all cards in the deck.

## Other ways you can practice

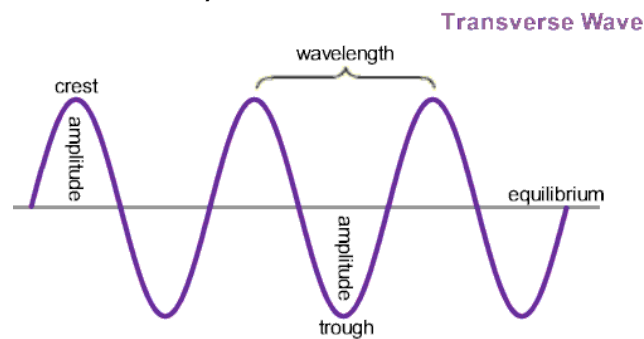
1. **Practicing teaching someone else**
  - a. Ask a family member to read over the section of the study guide you're practicing. Re-tell them the most important information from the study guide. Ask them if there's anything big you got wrong or forgot to mention. Try again.
2. **Watch a video**
  - a. Type the topic or section heading into youtube and watch the videos there!

# Unit 2b–3a Review: Waves, Energy, and Information

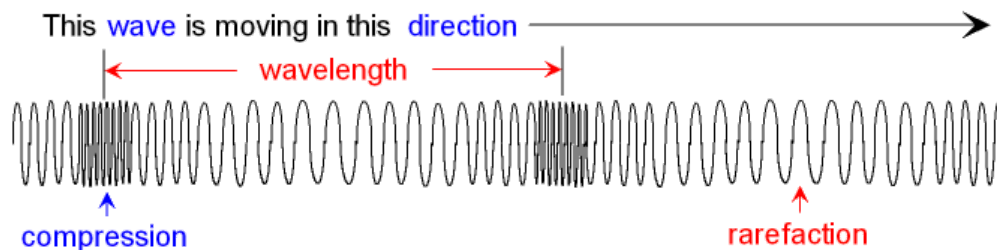
## Section 1: Waves

What is a Wave?

- A wave is a pattern of motion that travels away from a source. A pattern is something that happens over and over again in a repeating pattern.
- Waves move energy, but not matter.
- Waves can take multiple forms, such as disturbing the surface of water, shaking a rope, movement of the Earth, and more.
- Transverse waves move perpendicular (at a right angle) to the motion that caused the wave. This is what water waves look like. If a boat is sitting on the water, the boat would move up and down, but only side to side a little bit.

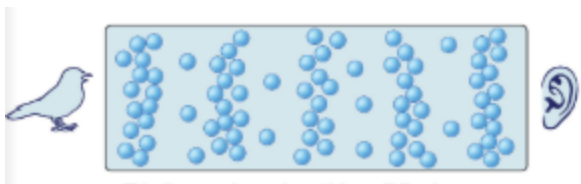
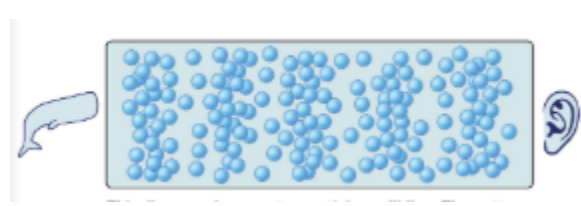
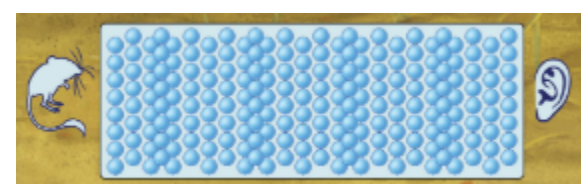


- Longitudinal waves move in the same direction as the motion that caused the wave. (i.e. sound waves)

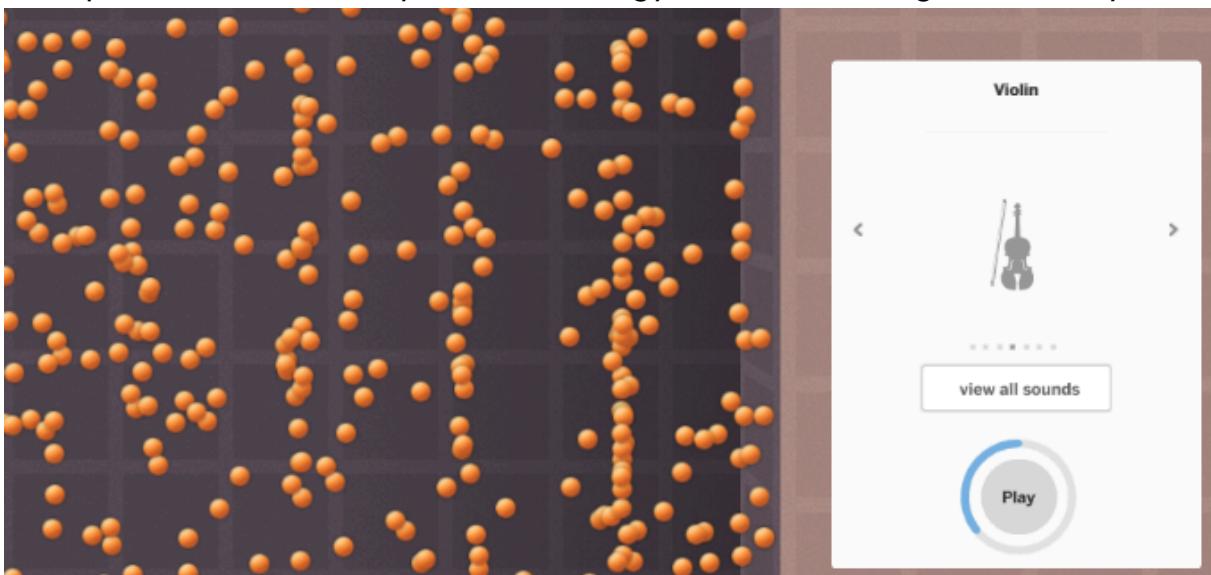


## Section 2: Sound Waves

- Matter is made of particles that are too small to see.
- Sounds can travel through different kinds of materials - solids, liquids, and gases.

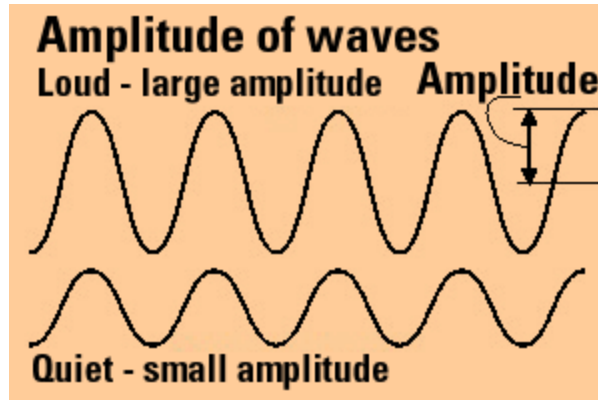
Medium	Particle Diagram
Gas (air)	
Liquid (water)	
Solid (ground)	

- Scientists make models to help them answer questions and visualize things that are difficult to see.
- Sound energy travels as a wave. Energy is transferred through a series of collisions between particles. . The particles of the material it travels through move only a little.
- When particles collide they transfer energy, and that changes how they move.

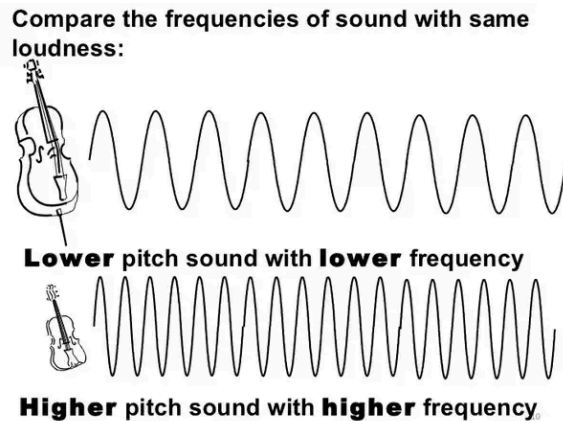


### Section 3: How are Waves Different?

- Amplitude is the height of the wave.
  - The crest is the tallest point of the wave.
  - The trough is the lowest point of the wave.
- The more energy in a wave, the greater the amplitude. The less energy in a wave, the lower the amplitude.

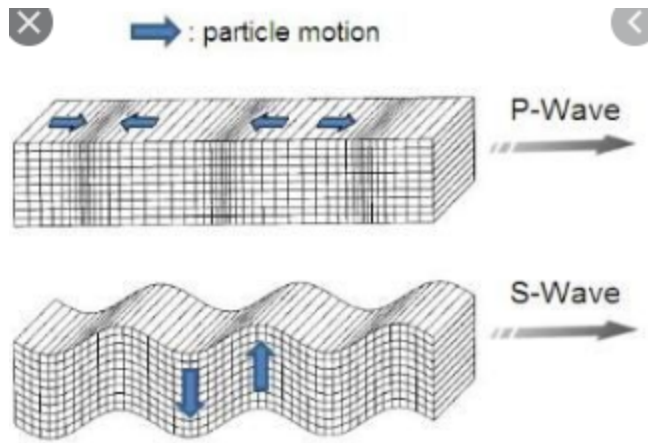


- Wavelength, or frequency, is the distance between the peaks of a waves.
- Short wavelength sounds (higher frequency) have a higher pitch. Long wavelength sounds (low frequency) have a lower pitch.

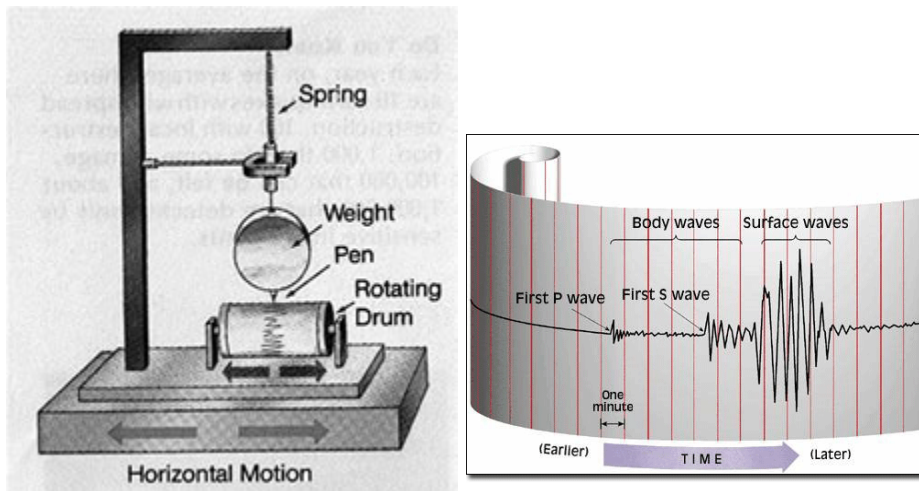


### Section 4: Waves and Natural Hazards

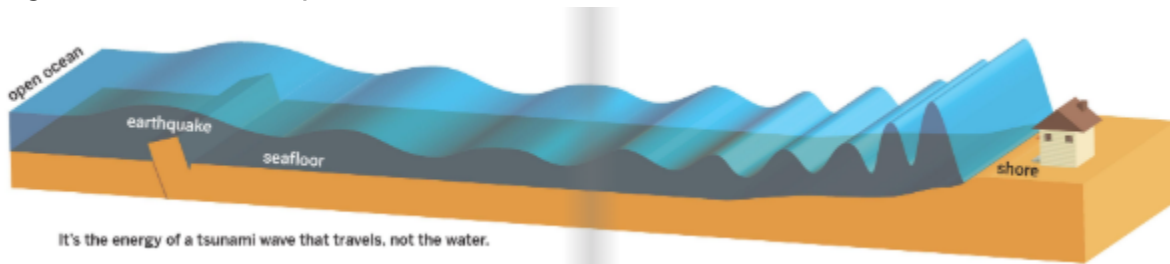
- Earthquakes are caused by plates of the Earth's crust moving against each other, causing a disturbance.
- Earthquakes produce different types of waves.
  - P waves are longitudinal waves. They compress rock and expand rock as they travel through solids, liquids, and gases. They shake the ground in the direction of the plate disturbance.
  - S waves are transverse waves and only travel through solids. They shake the ground perpendicular to the plate disturbance. They do not travel through the liquid core of the Earth.



- Earthquakes can shake at different amplitudes (strengths) and with different amounts of energy.
- Scientists use seismographs to measure earthquake waves.



- Tsunamis are formed when an earthquake happens underwater and causes a wave with a large amount of energy. Scientists warn of possible tsunamis if an underwater earthquake is detected. It is hard to detect actual tsunamis far out as sea since waves do not gain size until they are in shallower water.



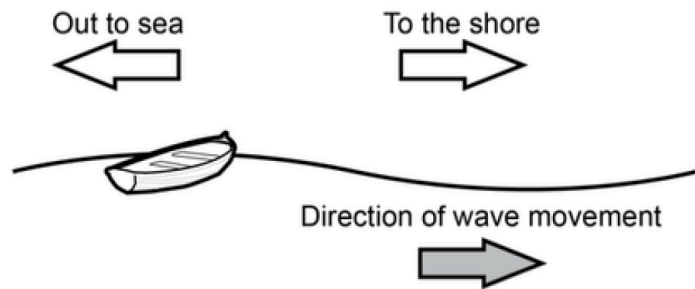
## Module 2b-3a Review Questions:

1. Which of the following would NOT be considered a wave?



2. A boat flows freely on the ocean. Waves, moving as shown in the illustration, pass by the boat. How will the boat move?

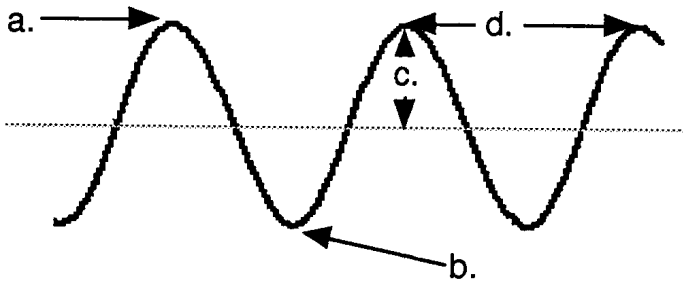
- a. Up and down
- b. Closer to shore
- c. Farther out to sea
- d. Along the line of the shore



3. Label each part of the wave by writing the name of the part on the lines below.

Be sure your answer includes:

- The correct part next to the correct letter
- All words spelled correctly
- The words: amplitude, crest, wavelength, and trough



a. \_\_\_\_\_

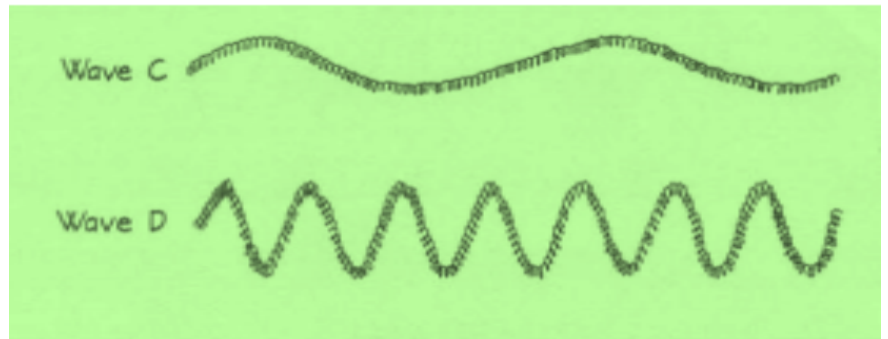
b. \_\_\_\_\_

c. \_\_\_\_\_

d. \_\_\_\_\_

4. Which wave has a longer wavelength?

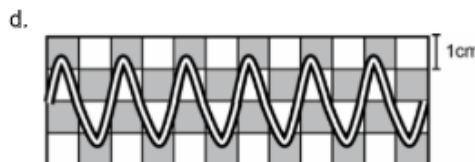
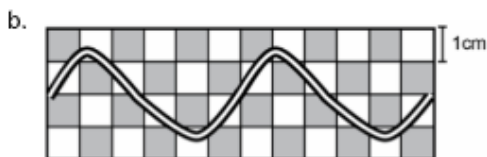
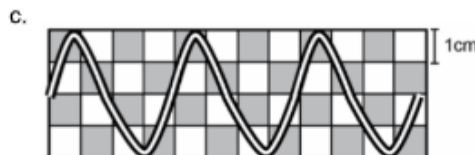
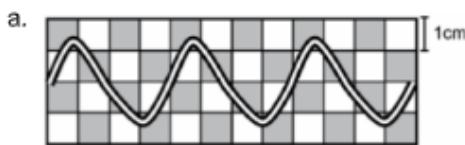
- a. They both have the same wavelength.
- b. Wave C
- c. It is impossible to tell.
- d. Wave D



5. When comparing two waves, which statement is true about the wave with the greatest wavelength?

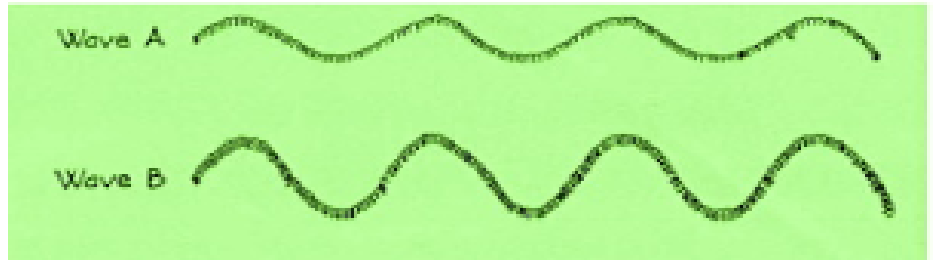
- a. The one with the greatest wavelength has the greatest height.
- b. The one with the greatest wavelength has the greatest speed.
- c. The one with the greatest wavelength has the most space between crests.
- d. The one with the greatest wavelength traveled the longest distance.

6. Which wave has the greatest amplitude?

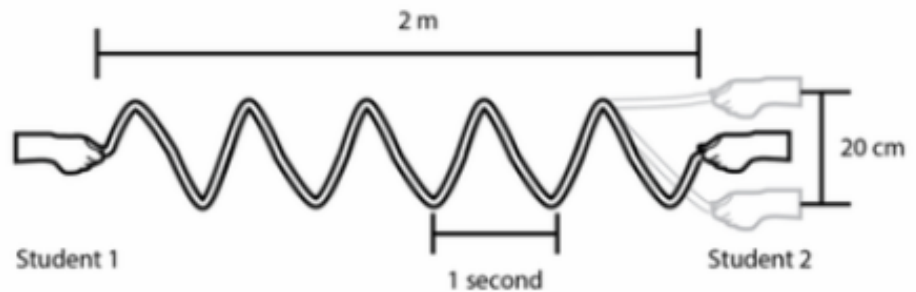


7. Which wave form produces a louder sound?

- a. Wave A
- b. Wave B
- c. They have the same volume
- d. It is impossible to tell which one is louder



Students are modeling waves with a rope in their 4th grade science class. Two students hold two ends of a rope. Student 1's hand is still, while Student 2 moves the other end up and down at a constant rate.



8. **Part A:** How could the students create a wave with a longer wavelength?

- a. Replace the rope with a longer one
- b. Student 2 should move the rope a shorter distance up and down, but at the same speed
- c. Student 2 should move the end of the rope more quickly
- d. Student 2 should move the end of the rope more slowly

9. **Part B:** How could the students increase the amplitude of the wave?

- a. Student 1 should move the end of the rope more quickly
- b. Student 2 should move the end of the rope a greater distance up and down
- c. Student 2 and Student 1 should move further apart
- d. They should replace the rope with a longer one

10. Below is a diagram showing the path of a tsunami that started with an earthquake in Alaska. **Draw an arrow on the map from the source of the tsunami to Hawaii.**



11. What is TRUE of the tsunami wave?

- A. The water around the location of the earthquake in Alaska will travel outward from the source, eventually reaching Hawaii.
- B. The energy from the earthquake in Alaska will travel outward from the source, eventually reaching Hawaii.
- C. The boats around the location of the earthquake in Alaska will be destroyed and all the fishermen will move to Hawaii.
- D. The sea animals and plants around the location of the earthquake in Alaska will not be disturbed and will relocate to Hawaii.

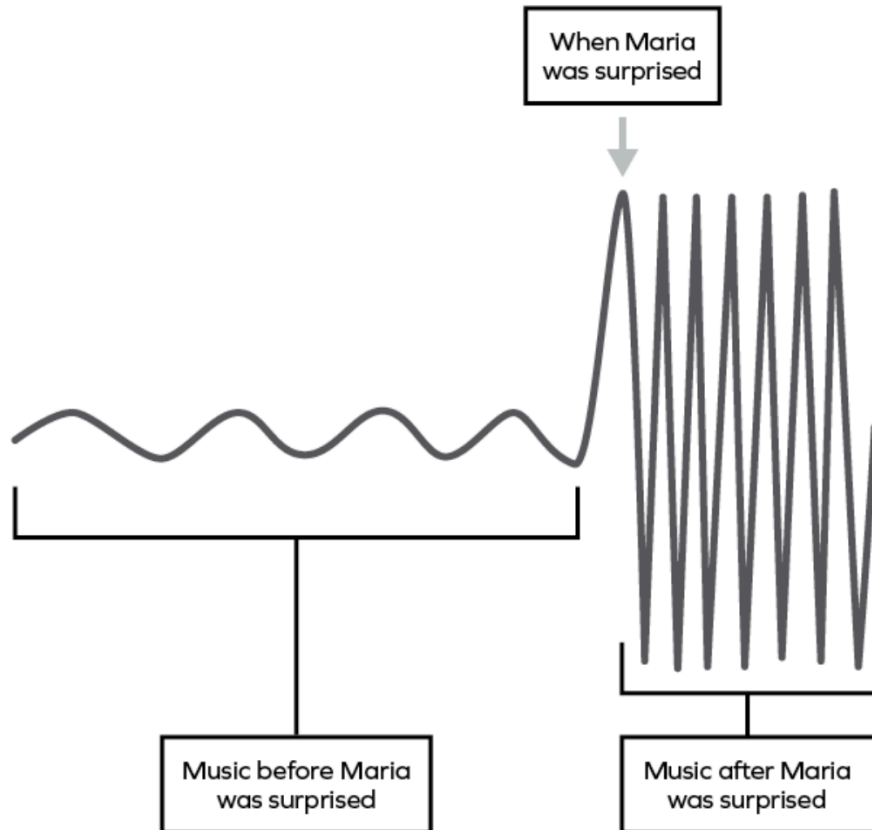
12. Scientists predict an earthquake will occur in the middle of the ocean. Why is it important to warn the nearest coastal town, even if it is over 300 miles away from where the earthquake occurs?

- A. An earthquake in the ocean can cause the ground to crack open in the coastal town.
- B. An earthquake in the ocean affects the water cycle and can cause rains to fall in the coastal town.
- C. An earthquake in the ocean can cause new islands to form, which may collide with the coastal town.
- D. An earthquake in the ocean can cause large waves that could flood the coastal town even 300 miles away.

**Use the following information to help you answer questions .**

Maria was working on homework quietly in her living room. Her brother was playing music on his computer on the other side of the room. Suddenly something about the music changed and surprised Maria. Maria was so surprised by the change in the music that she jumped!

The sound from the computer looked like this:



13. Based on the diagram, what changed about the music?

- A. The song changed.
- B. The amplitude of the sound wave increased.
- C. The wavelength of the sound wave increased.
- D. The amplitude of the sound wave decreased.

## **Unit 2b-3a Vocabulary:**

1. Medium: the substance or material that carries the wave
2. Source: where a wave form starts
3. Crest: the highest point of a wave
4. Trough: the lowest point of a wave
5. Amplitude: the height of a wave
6. Wavelength: the distance between the same 2 points in a wave (i.e. crest to crest)
7. Transverse Wave: a wave that moves perpendicular to the direction of the disturbance that caused the wave
8. Longitudinal Wave: a wave that moves in the same direction as the disturbance that caused the wave
9. Frequency: the number of times a wave passes in a certain amount of time
10. Wave: a pattern of motion caused by a disturbance
11. Pattern: an event that repeats
12. Earthquake: a sudden and violent shaking of the ground caused by movement of the Earth's crust
13. Seismograph: A machine scientists use to measure earthquake waves
14. Energy – the ability to make something observable happen; light, sound, heat, electrical, and motion are some types of energy
15. Motion – the change in position of an object
16. Position – the location of an object
17. Speed – how fast or slow an object moves
18. Pattern – an event that repeats itself
19. Predict – make a guess about what might happen
20. Collision – a forceful impact when energy is transferred from one object to another
21. Effect – the result of an action