Name Date

Section 4.1 Summary

Properties of Waves

Textbook pages 134–143

Before You Read

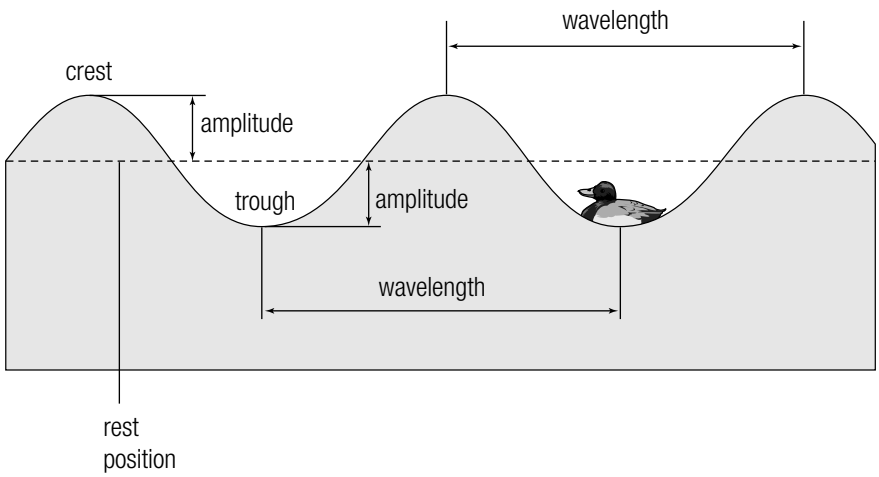
In this section, you will find out about waves, such as water waves, sound waves, and radio waves. On the lines below, list devices you use that make or use waves.

_____

_____

Mark the Text

Identify Details
As you skim the section, use one colour to highlight the text that talks about parts of a wave. Use another colour to highlight other facts about waves.



What are the features of a wave?

A **wave** is a movement that transfers energy through matter or space. Energy is the ability to apply a push or pull on an object. For example, a water wave moves energy through water. A sound wave moves energy through air. A radio wave can move energy through space.

Because you can see water waves, it is helpful to use a water wave to describe waves in general. You cannot see many other kinds of waves, such as sound waves.

A water wave does not carry water along with it. Only the energy carried by the water wave moves forward. A duck moves up and down as a wave passes — it does not move forward.

There are different features of waves that help you describe them. You can see these features labelled on the diagram above. The dotted line represents the rest position of the wave. This is also called the equilibrium position. For a water wave, the rest position of the wave is where the water would be if it were still.

Reading Check

1. What is the rest position of a water wave?

_____

_____

_____

The features of a wave are listed below.

- **crest:** the highest point of a wave
- **trough:** the lowest point of a wave
- **wavelength:** the distance from one point on a wave to the same point on the next wave, such as from crest to crest or from trough to trough. A wave with a long wavelength carries less energy than a wave with a short wavelength.
- **amplitude:** the height of a wave crest from its rest position. Amplitude is also the depth of a wave trough, as measured from its rest position. A wave with a large amplitude carries more energy than a wave with a small amplitude.

How many times does a wave repeat in a period of time?

Another important way to describe a wave is by its frequency. You may have already heard the term frequency used to describe radio stations or music. The **frequency** of a wave is the number of times it repeats in a given period of time. A repetition of a wave is also called an oscillation or vibration. One vibration occurs over one wavelength.

Frequency is measured in hertz. **Hertz** (**Hz**) means cycles per second.

When the wavelength is short, the frequency is high. When the wavelength is long, the frequency is low.

Reading Check

2. How is the frequency of a wave measured?

_____

_____

_____

What are the different types of waves?

You have read that sound travels by sound waves. Sound can travel through air, water, and even solid walls. The matter a wave travels through is called a **medium**. The medium can be a solid, liquid, or gas. For example, the medium of a water wave is water.

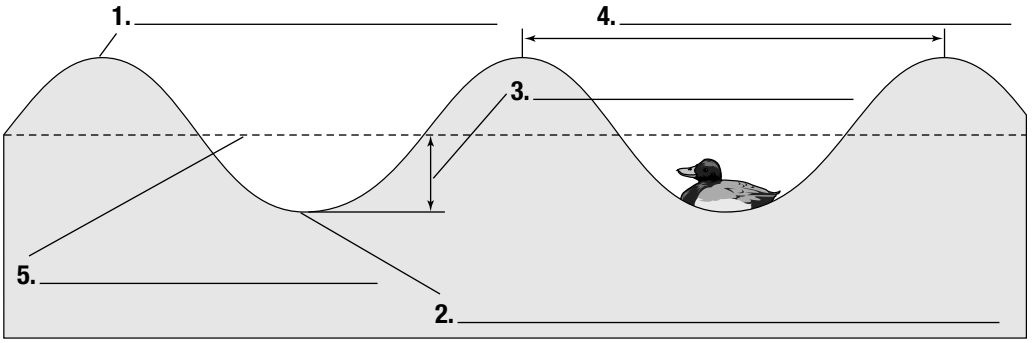
Not all waves need a medium. For example, visible light waves and radio waves can travel through space where there is no matter.

Use with textbook pages 134–136.

Features of a wave

Use the vocabulary words in the box below to label the parts of a wave.

Vocabulary	
amplitude	wavelength
crest	rest position
trough	



On the line beside each term, describe the wave feature.

6. amplitude _____

_____

7. crest _____

_____

8. trough _____

_____

9. wavelength _____

_____

10. rest position _____

_____

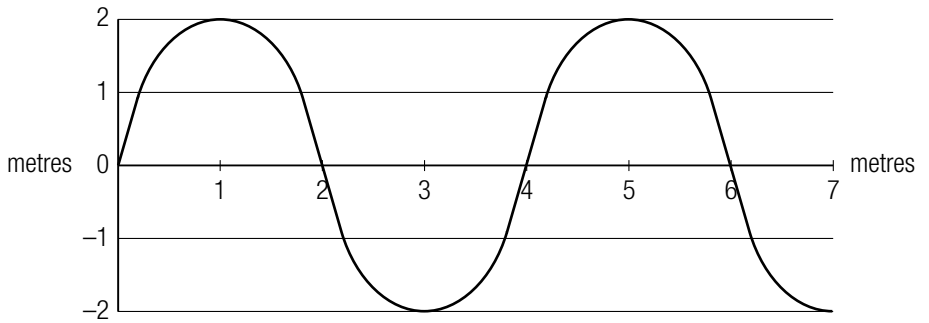
Use with textbook pages 134–138.

Characteristics of waves

Use the information in the graphs to answer the questions.

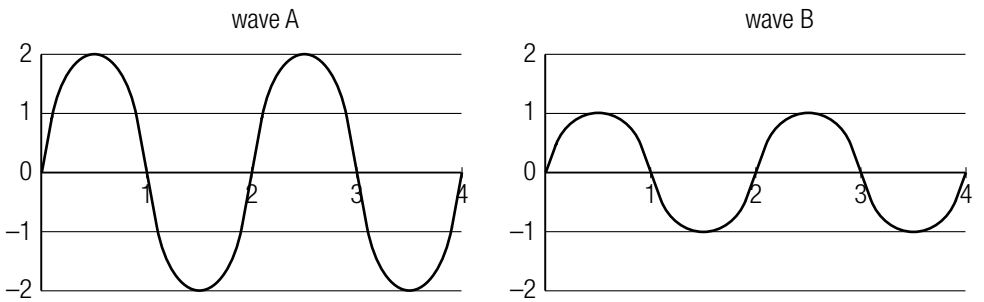
1. How long is the wavelength of the wave below? _____

2. How large is the amplitude of the wave below? _____



3. Which wave below has the smaller amplitude, A or B? _____

4. Which wave carries more energy, A or B? _____

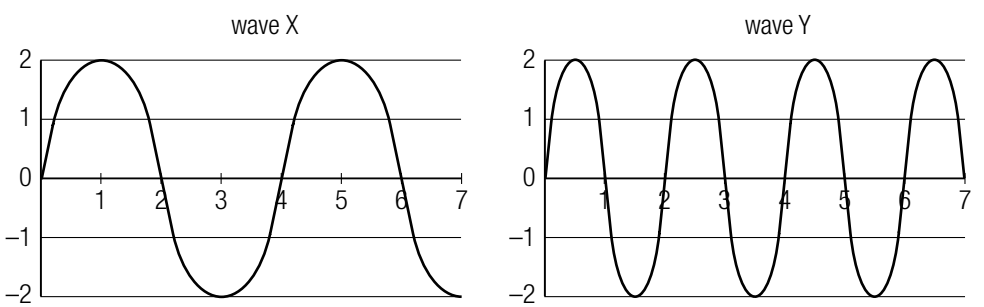


5. What is the same for waves X and Y below: amplitude, wavelength, or frequency?

_____

6. Which wave has a greater frequency, X or Y? _____

7. Which wave has a longer wavelength, X or Y? _____



Use with textbook pages 134–138.

True or false?

Read the statements given below. If the statement is true, write "T" on the line in front of the sentence. If it is false, write "F," and then rewrite the statement so it is true.

1. _____ Waves transfer matter forward.

_____

2. _____ Energy is the capacity to apply a push or pull to an object.

_____

_____

3. _____ A trough is the highest point in a wave.

_____

4. _____ The wavelength is the distance from crest to trough.

_____

5. _____ The amplitude of a wave is the height of a wave crest or the depth of a wave trough from the rest position.

_____

_____

6. _____ The larger the amplitude, the less energy is transported by the wave.

_____

_____

7. _____ Amplitude is the number of motions that occur in a given time.

_____

_____

8. _____ Frequency is measured in units called hertz.

_____

9. _____ The wavelength of a wave increases as frequency increases.

_____

_____

Use with textbook pages 134–138.

Properties of waves

Match each Term on the left with the best Descriptor on the right. Each Descriptor may be used only once.	
Term	**Descriptor**
1. _____ crest **2.** _____ trough **3.** _____ amplitude **4.** _____ frequency **5.** _____ wavelength	**A.** height of crest from rest position **B.** a movement that carries energy through matter or space **C.** the lowest point of a wave **D.** trough to trough **E.** the highest point of a wave **F.** vibrations per second

Circle the letter of the best answer.

6. What happens when the amplitude of a wave becomes smaller?

A. the frequency increases

B. the wavelength decreases

C. the height of the crests increases

D. the amount of energy that the wave carries decreases

7. Which of the following is **not** a way to measure wavelength?

A. the distance from crest to crest

B. the distance from trough to trough

C. the distance from the top of a crest to the bottom of a trough

D. the distance covered by one complete crest plus one complete trough

8. Which of the following statements is true?

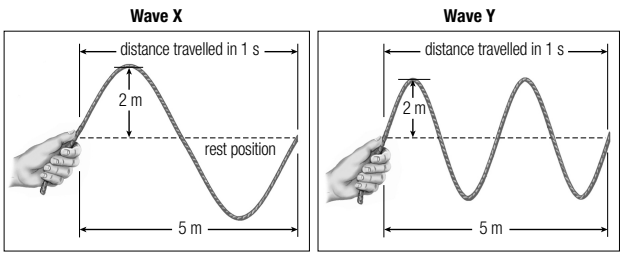
A. The wavelength of a wave increases as the frequency increases.

B. The wavelength of a wave increases as the frequency decreases.

C. The wavelength of a wave decreases as the frequency decreases.

D. The wavelength of a wave decreases as the frequency stays the same.

Use the following diagrams to answer questions 9 and 10.



9. Wave X has a higher frequency than Wave Y.

A. The statement is supported by the the diagrams.

B. The statement is not supported by the diagrams.

C. You cannot tell by looking at the diagrams.

10. Which statement is correct?

A. Amplitude and wavelength are the same for both waves.

B. Amplitude is the same for both waves.

C. Wavelength is the same for both waves.

D. Neither amplitude nor wavelength is the same for both waves.