

Warm-Up

Introduction to Waves

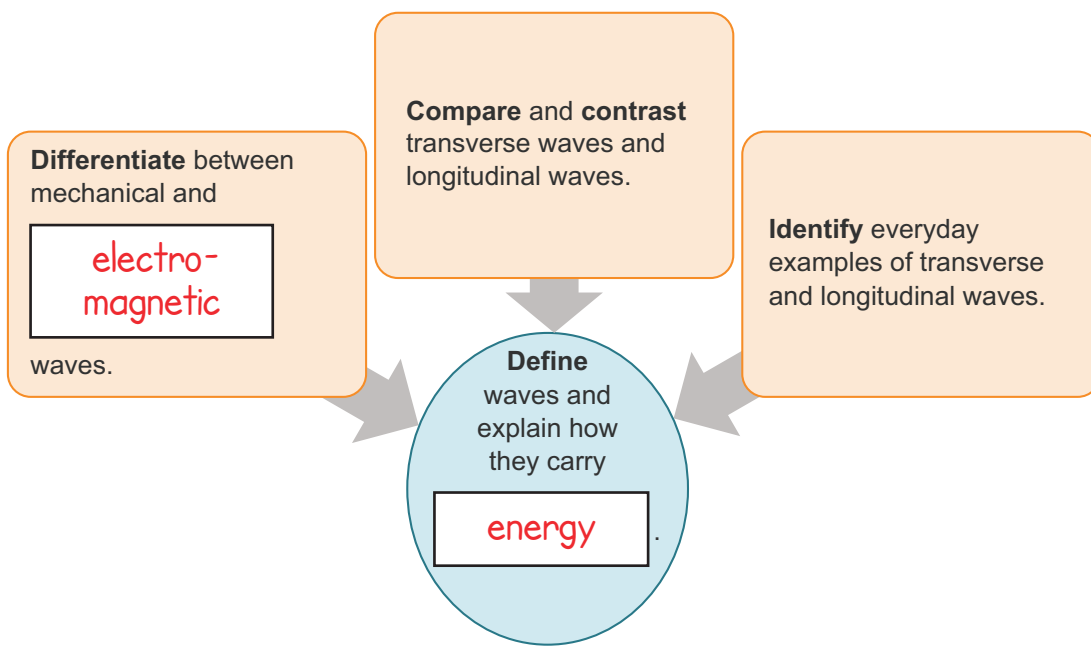


Lesson Question

How are the various types of waves similar and different?



Lesson Goals



Words to Know

Write the letter of the definition next to the matching word as you work through the lesson. You may use the glossary to help you.

 B medium

 C wave

 D mechanical wave

 A transverse wave

A. a type of wave that transfers energy perpendicular to the direction of wave motion

B. the material or substance a wave moves through

C. a disturbance that carries energy from one place to another

D. a type of wave that carries energy through matter

**Words to Know**

<u>F</u> electromagnetic wave	E. a type of wave that transfers energy parallel to the direction of wave motion
<u>H</u> sound wave	F. a wave composed of electric and magnetic fields that radiates out from a source at the speed of light
<u>E</u> longitudinal wave	G. the range of wavelengths and frequencies of electromagnetic waves
<u>G</u> electromagnetic spectrum	H. a wave produced by the compression and expansion of an elastic medium in which it travels, such as air or water

**Review of Energy**

- Energy is the ability to do work.
 - Energy is measured in units such as joules and **calories**.
 - Energy can be transferred from one object to another.
 - Energy can be transformed from one type to another.
 - Energy can be observed in different forms such as heat, **light**, and sound.

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Definition of a Wave

- A **wave** is a disturbance that carries **energy** from one place to another.
 - It transfers energy.
 - It does not transfer **matter**.

Mechanical Waves

- A **mechanical wave** is a type of wave that carries energy through matter.
 - It can be **longitudinal** or transverse.
 - Energy is transferred through vibrating particles (solid, liquid, and gas).
 - Earthquake wave moving through land
 - Ocean wave moving through **water**
 - Sound wave moving through air

Mechanical Waves Need a Medium

- A **medium** is the **material** or substance a wave moves through.
 - Solid
 - Liquid
 - **Gas**

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Longitudinal Waves

- A **longitudinal wave** is a type of wave that transfers energy **parallel** to the direction of wave motion.
 - Particles that the wave disturbs only move a small amount and do not travel with the **wave**.

Transverse Waves

- A **transverse wave** is a type of wave that transfers energy **perpendicular** to the direction of wave motion.
 - Particles that the wave disturbs only move a small amount and do not travel with the **wave**.

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Sound Waves

- A **sound wave** is a wave produced by the compression and expansion of an **elastic** medium in which it travels, such as air or water.
 - Sound waves are longitudinal waves.
 - A **medium** is required for energy transfer.

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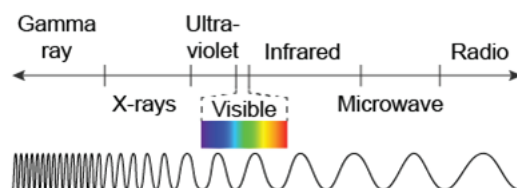
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Electromagnetic Waves

- An **electromagnetic wave** is a wave composed of electric and magnetic fields that **radiates** out from a source at the speed of light.
 - All electromagnetic waves are transverse waves.
 - Energy is carried through **space**.
 - Visible light
 - Microwaves
 - X-rays

Electromagnetic Spectrum

- The **electromagnetic spectrum** is the range of wavelengths and **frequencies** of electromagnetic waves.
 - All waves on this spectrum are **transverse** waves.
 - A medium is not required for energy transfer.



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Speed of Light

- Light travels in a vacuum at $3 \times 10^8 \text{ m/s}$.
- Speed of light: c

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Speed of Sound

- Sound travels at approximately $3.31 \times 10^2 \text{ m/s}$ (under standard temperature and pressure).
- The speed of sound depends on the conditions of the **medium**.

Lightning vs. Thunder**EXAMPLES**

Storm clouds are rolling in. You notice a bolt of lightning but don't hear any thunder for ten seconds. Calculate how far away the bolt of lightning was when it struck.

$$331 \text{ m/s}$$

$$v = \frac{d}{t}$$

$$331 = \frac{d}{10}$$

$$d = \boxed{3,310 \text{ m}}$$

Summary

Introduction to Waves



Lesson Question

How are the various types of waves similar and different?



Answer

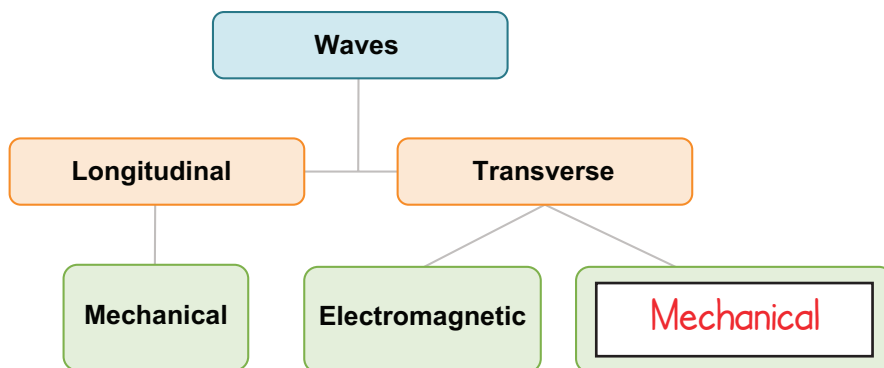
(Sample answer) Waves are disturbances that carry energy from one place to another through a medium and space. Longitudinal waves transfer energy parallel to wave motion, and transverse waves transfer energy perpendicular to wave motion. Waves are also classified by what they move through. Waves that carry energy through matter only are called mechanical waves. Mechanical waves can be longitudinal or transverse. Electromagnetic waves can move whether a medium is present or not.

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Review: Key Concepts

- A wave is a disturbance that carries **energy** from one place to another through matter and **space**.





Summary

Introduction to Waves

Use this space to write any questions or thoughts about this lesson.