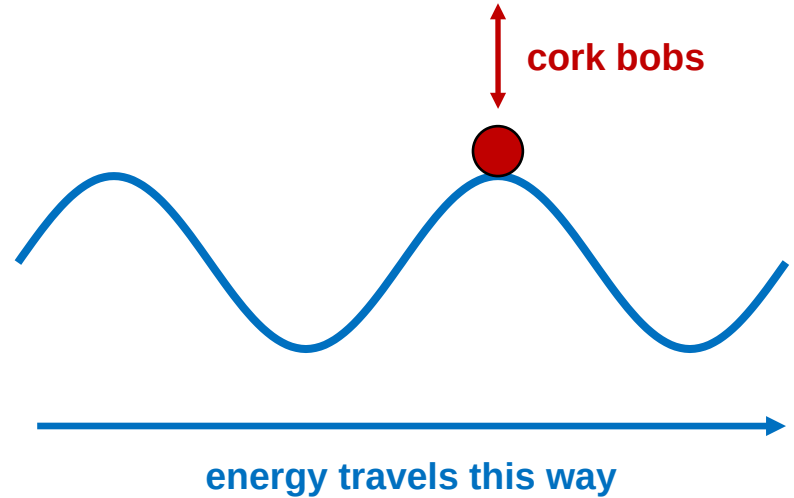


Essential Question

What is a wave, and what does it carry?

What Is a Wave?

- A disturbance that moves
- Carries energy
- Matter stays in place



the wave moves on, the cork stays put

Mechanical vs. Electromagnetic

- Mechanical waves need a medium
- Medium: the stuff that waves
- EM waves can cross empty space

Mechanical

needs a medium

sound, water waves, ropes

Electromagnetic

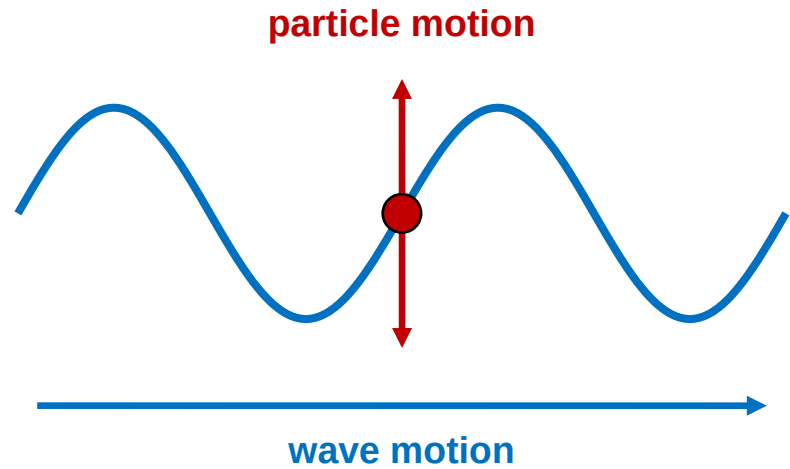
no medium needed

light, radio, X-rays

sunlight crosses empty space

Transverse Waves

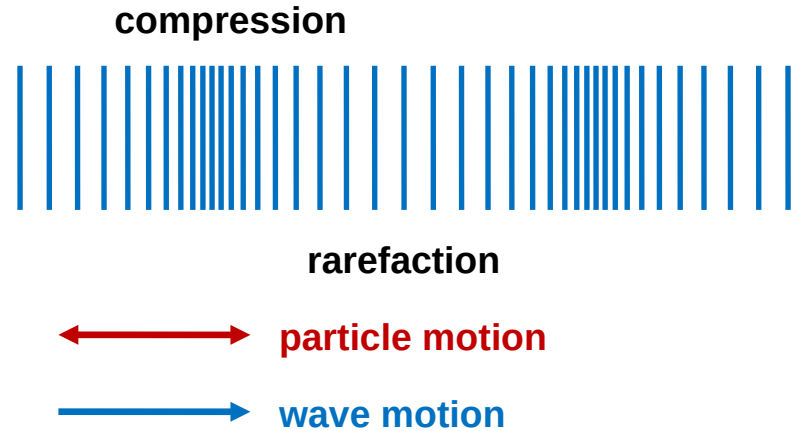
- Particles move perpendicular to the wave
- Like flicking a rope up and down
- Light is transverse



transverse: perpendicular motion

Longitudinal Waves

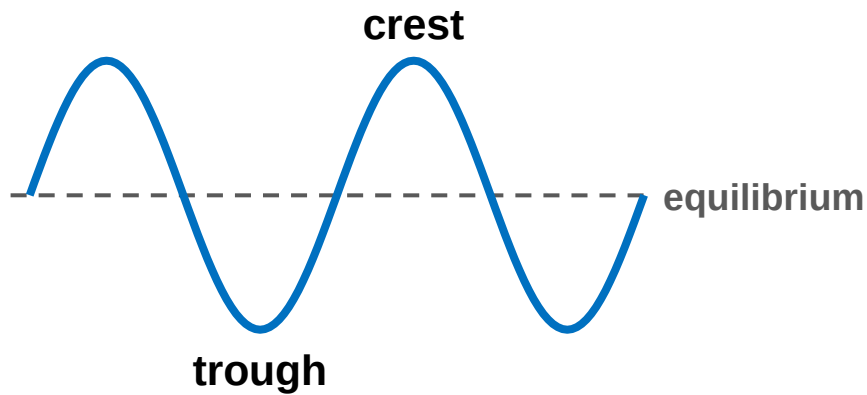
- Particles move parallel to the wave
- Compressions and rarefactions
- Sound is longitudinal



longitudinal: parallel motion

Parts of a Transverse Wave

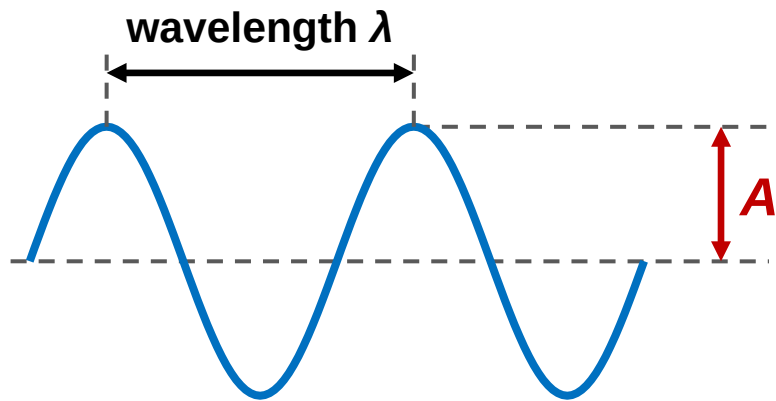
- Crest: the highest point
- Trough: the lowest point
- Equilibrium: the rest position



crest on top, trough on the bottom

Amplitude and Wavelength

- Amplitude A : equilibrium to crest
- Wavelength λ : one full cycle
- Measure λ crest to crest



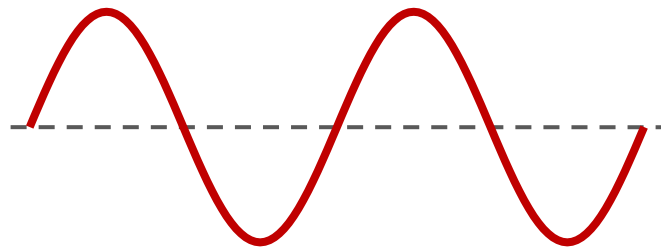
λ : crest to crest A : rest line to crest

Amplitude and Energy

- Bigger amplitude, more energy
- Loud sounds: big amplitude
- Tall ocean waves: big amplitude



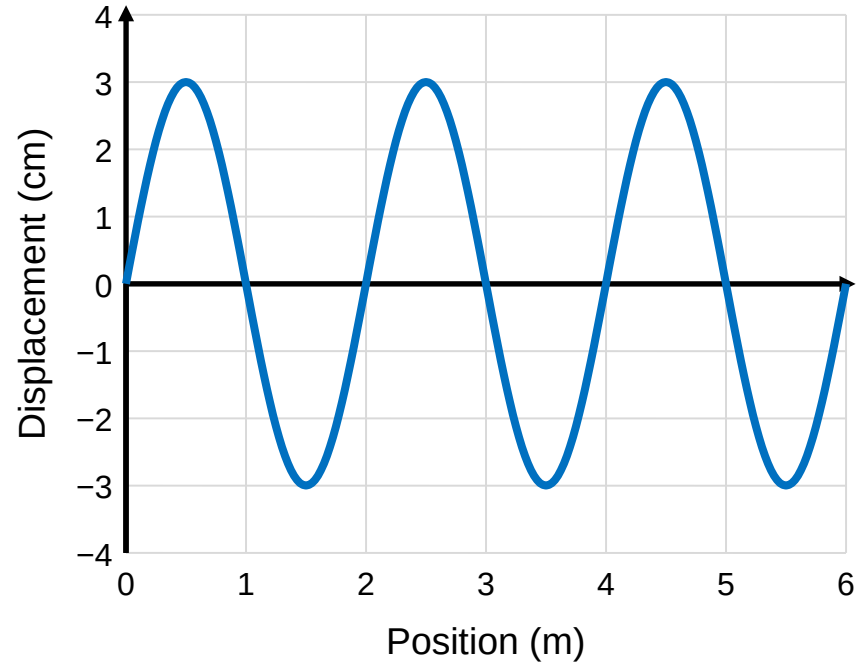
small A: less energy



big A: more energy

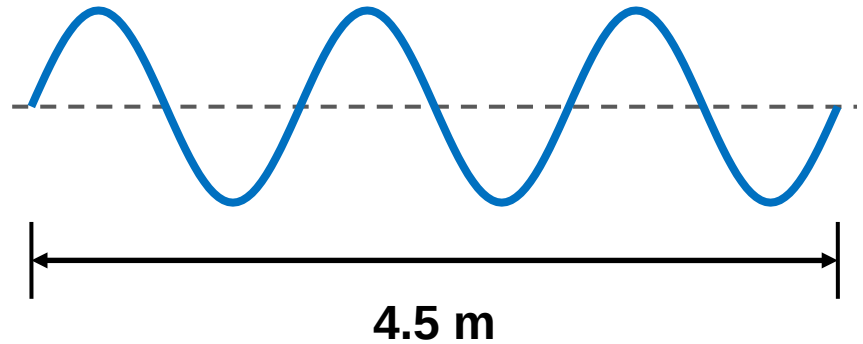
Example: Reading a Wave Graph

The graph shows a wave on a rope. Find the amplitude and the wavelength.



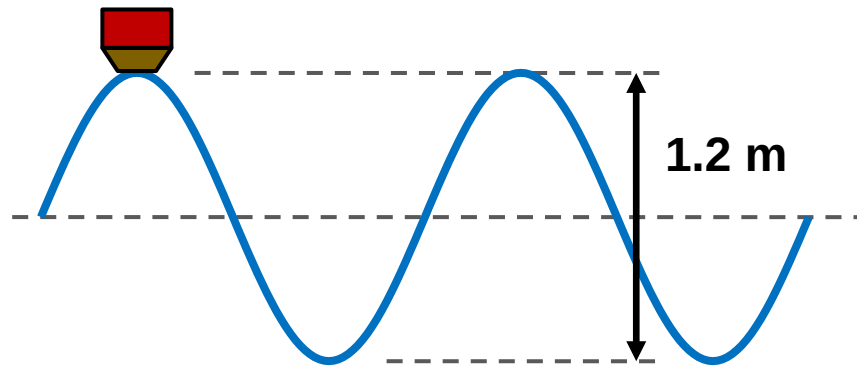
Example: Counting Wavelengths

A wave on a rope shows exactly 3 full wavelengths along a 4.5 m section. What is the wavelength?



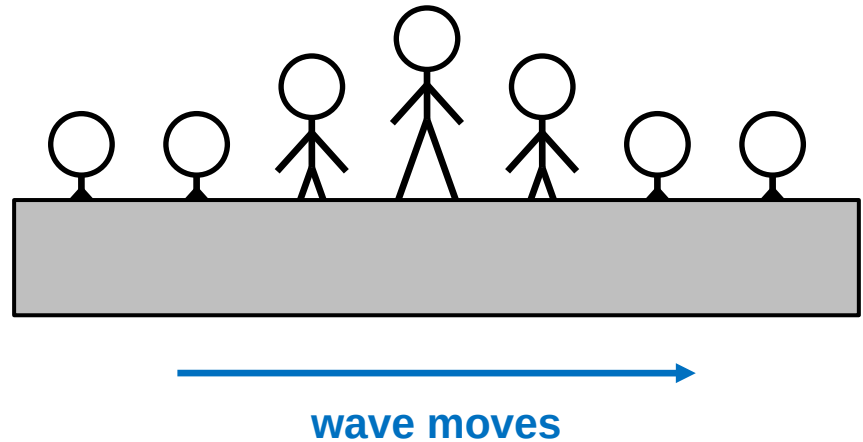
Example: Crest to Trough

A boat rides over ocean waves. It moves 1.2 m from the top of a crest to the bottom of a trough. What is the amplitude of the waves?



Example: The Stadium Wave

Fans do "the wave": each person stands up and sits down as the wave travels around the stadium. Is it transverse or longitudinal? Does any fan travel around the stadium?



Big Ideas

- Waves carry energy, not matter
- Mechanical waves need a medium; EM waves don't
- Transverse: perpendicular. Longitudinal: parallel
- λ : crest to crest. Bigger A , more energy