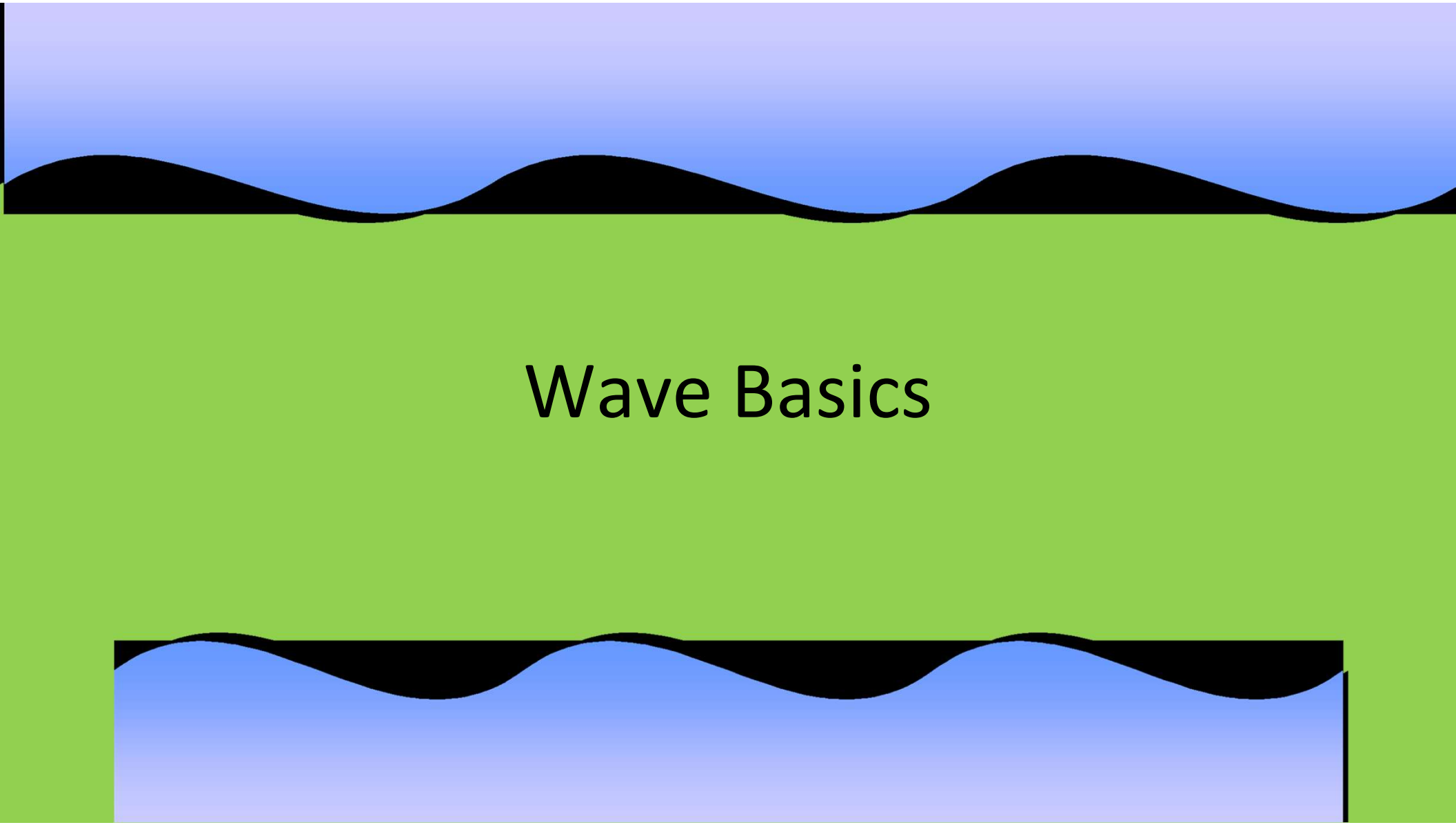
Physics

April 27 – May 8th 2026

Semester 2 Weeks 16 - 17

Monday / Tuesday (April 27 & 28)

- T: 8B - Compare the characteristics of transverse and longitudinal waves including electromagnetic and sound waves.
- 8C - Investigate and analyze characteristics of waves including velocity, frequency, amplitude, and wavelength, and calculate using the relationships between wave speed, frequency, and wavelength.
- O: I will be able to calculate the relationships between the parts of waves
- D: by taking notes and completing a worksheet.
- A: amplitude, frequency, wavelength
- Y: How are waves compared to one another?


Wave Basics

A. Wave Definitions

- **Waves**
  - rhythmic disturbances that carry energy
- **Medium**
  - material through which a wave transfers energy
  - solid, liquid, gas, or combination
  - electromagnetic waves don't need a medium (e.g. visible light, x-rays)

A. Two Wave Types

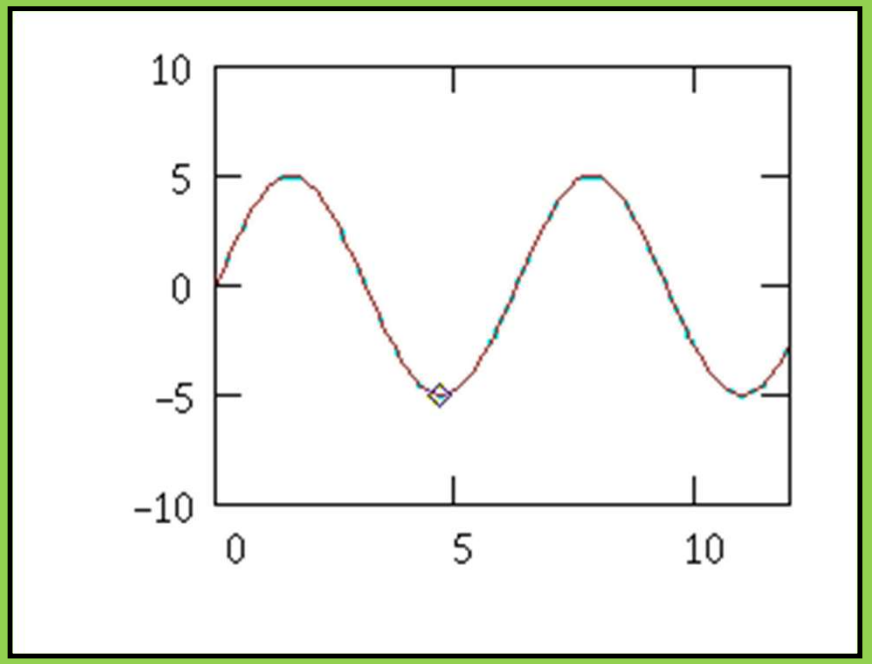
- **Two Types:**

Longitudinal

Transverse

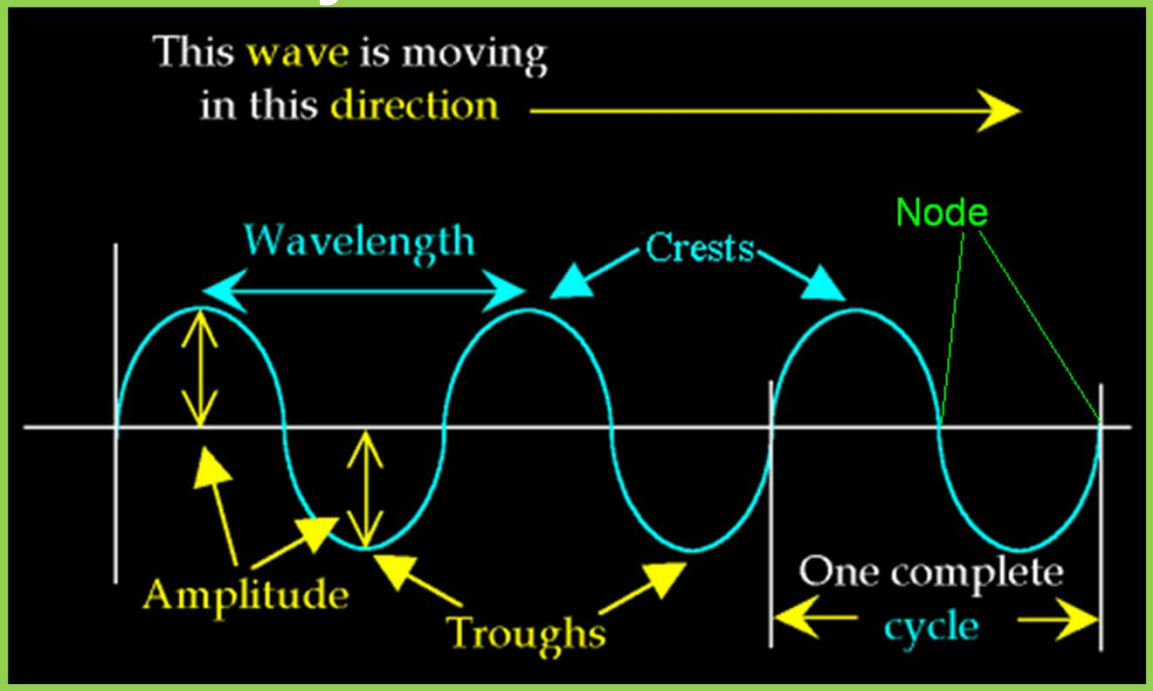
B. Transverse Waves

- **Transverse Waves**
  - medium moves perpendicular to the direction of wave motion



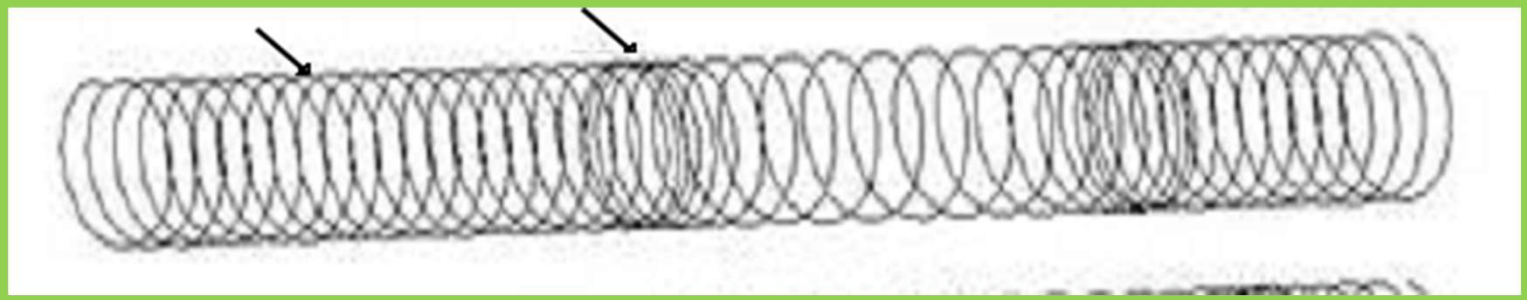
B. Transverse Waves

- **Wave Anatomy**



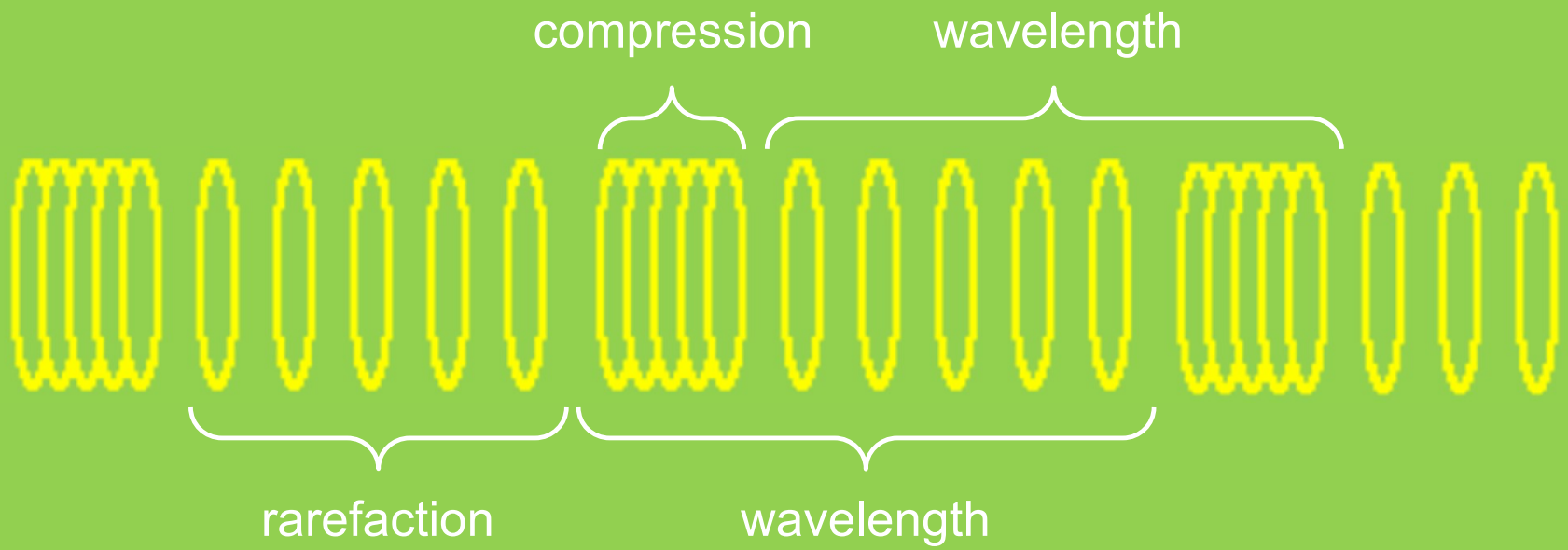
C. Longitudinal Waves

- **Longitudinal Waves** (a.k.a. compressional)
  - medium moves parallel (in the same direction) as the wave motion



C. Longitudinal Waves

- **Wave Anatomy**

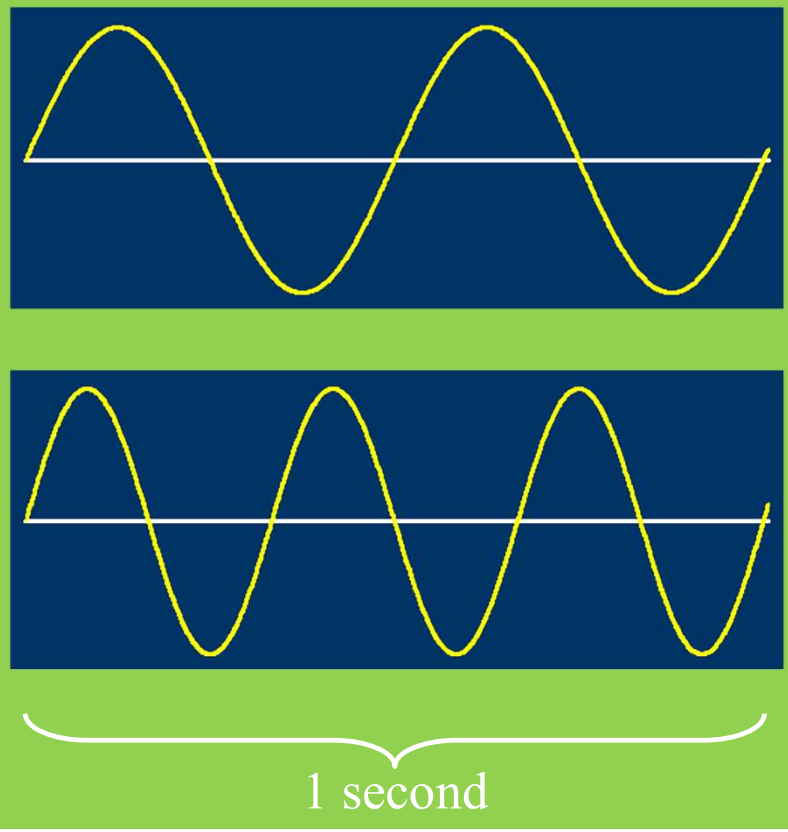


Parts of a wave

- Crest: top of a wave
- Trough: bottom of a wave
- ***Amplitude,*** A is height of the wave.
- ***Wavelength,*** λ length of a wave
- Cycle: one wave

D. Measuring Waves

- **Frequency** (f)
  - Definition: # of waves passing a point in 1 second
  - Unit: Hertz (Hz)



D. Measuring Waves

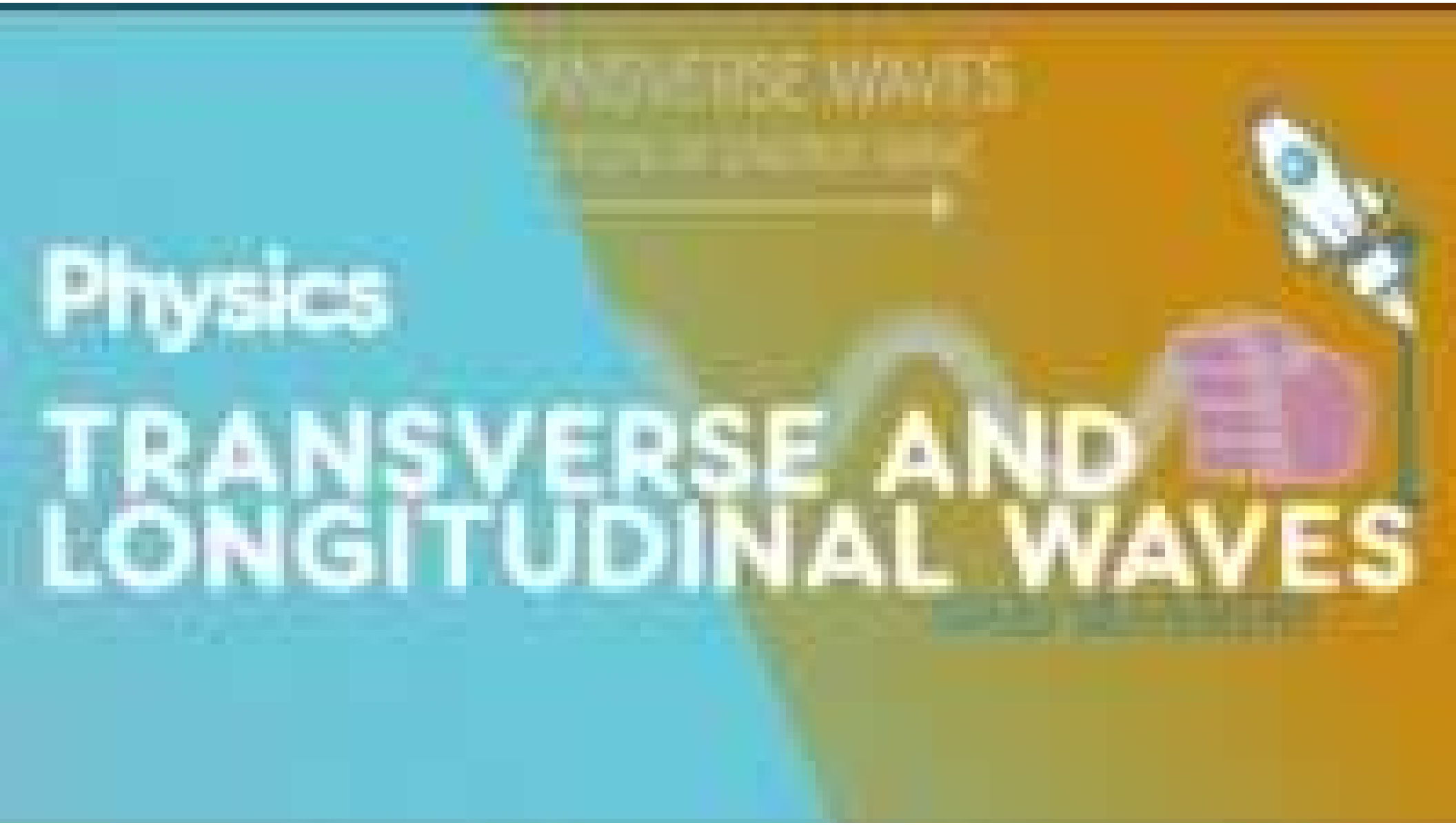
- **Velocity** ***(v)***
  - speed of a wave as it moves forward
  - depends on wave type and medium

$$v = \lambda \times f$$

v: velocity (m/s)

λ: wavelength (m)

f: frequency (Hz)


Physics
TRANSVERSE AND
LONGITUDINAL WAVES

Wednesday / Thursday (April 29 & 30)

Journal 6.2

- What are some personal obstacles that you want to overcome in the next few years?

- T: 8D - Investigate behaviors of waves, including reflection, refraction, diffraction, interference, standing wave, the Doppler effect and polarization and superposition.
- O: I will continue to explore waves
- D: by reading a Actively Learn article and completing a PhET simulation about wave interference.
- A:waves, wavelength, amplitude, interference
- Y: What are the main types of wave interference?

Friday (May 1)

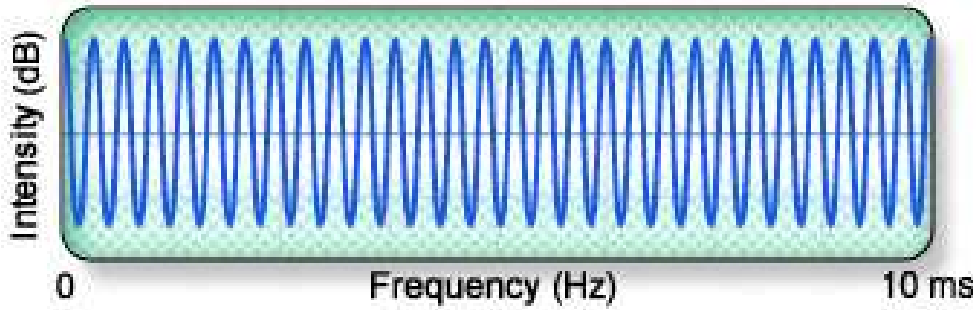
- C-day

Monday / Tuesday (May 4 & 5)

- T: 8B - Compare the characteristics of transverse and longitudinal waves including electromagnetic and sound waves.
  - 8C - Investigate and analyze characteristics of waves including velocity, frequency, amplitude, and wavelength, and calculate using the relationships between wave speed, frequency, and wavelength.
  - 8D - Investigate behaviors of waves, including reflection, refraction, diffraction, interference, standing wave, the Doppler effect and polarization and superposition.
- O: I will learn about how sound waves travel
- D: by watching a video, taking notes, and completing a worksheet.
- A: medium, rarefactions, compressions
- Y:How are sound waves similar to light waves? How are they different?

Sound Energy

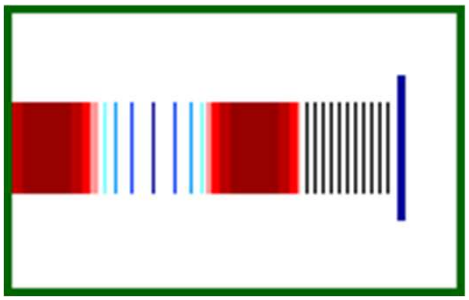
Sound travels on a longitudinal wave:



Notice that sound travels in a spiral form like a slingy☺

Imagine what happens when you drop a stone into a pool of water. Waves ripple out from the spot where the stone entered the water. The way waves move across the water is similar to how **sound waves** travel through the air.

When you speak or shout, your vocal chords **vibrate** . These vibrations travel in all directions through the air as waves. When the waves reach our ears, they make our eardrums vibrate too, so we can hear the words.



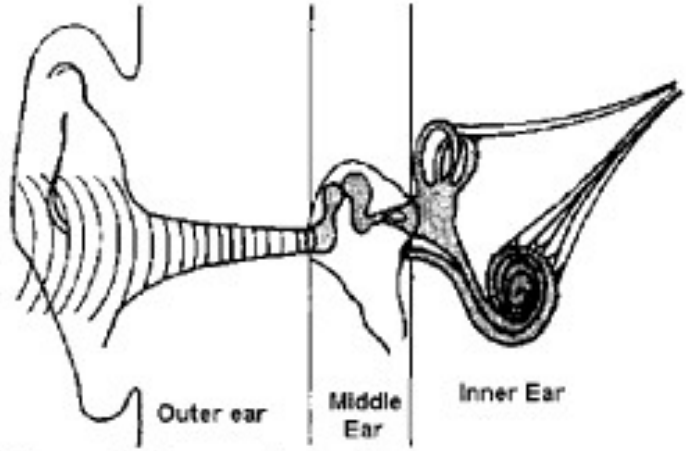


Figure 1. The sections of the ear

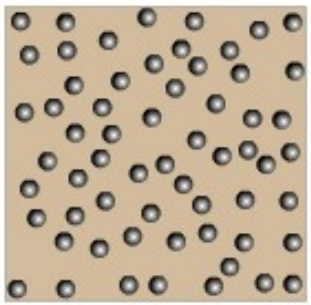
Sound waves travel on a **MEDIUM**:

Any SOLID, LIQUID OR GAS

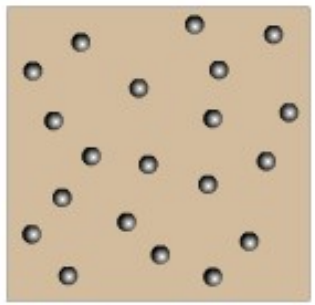
Sound travels by pushing the particles of a substance. The particles push into the particles next to them, and then return to their original position. And the sound continues to travel in this form until it reaches your ear!

Which state of substance would sound travel through faster?

SOLID



LIQUID



GAS

WHY?

Mediums:

- Sound travels through a solid faster, than through a liquid, which is faster, than through a gas.
  - Our ears are custom to hear sound through a gas…

Substance	Temp (°C)	Speed (m/s)
Gases		
Carbon Dioxide	0	259
Oxygen	0	316
Air	0	331
Air	20	343
Helium	0	965
Liquids		
Chloroform	20	1004
Ethanol	20	1162
Mercury	20	1450
Water	20	1482
Solids		
Lead	–	1960
Copper	–	5010
Glass	–	5640
Steel	–	5960

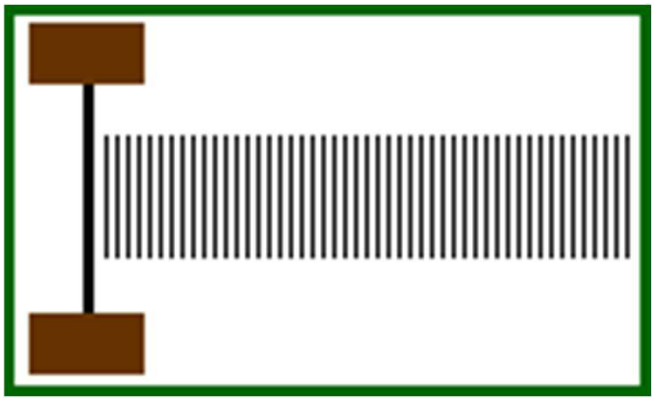
In movies and on TV, you'll sometimes see and hear things exploding in outer space -- alien spacecraft and things like that.

Is that really possible knowing what we know about sound?

Compressions and Rarefactions:

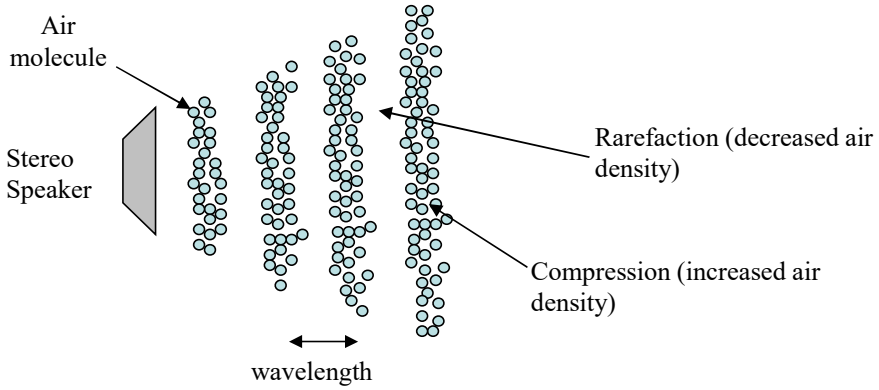
Compressions: area of sound waves where molecules are closer together (E)

Rarefaction: area of sound where molecules are further apart (B)



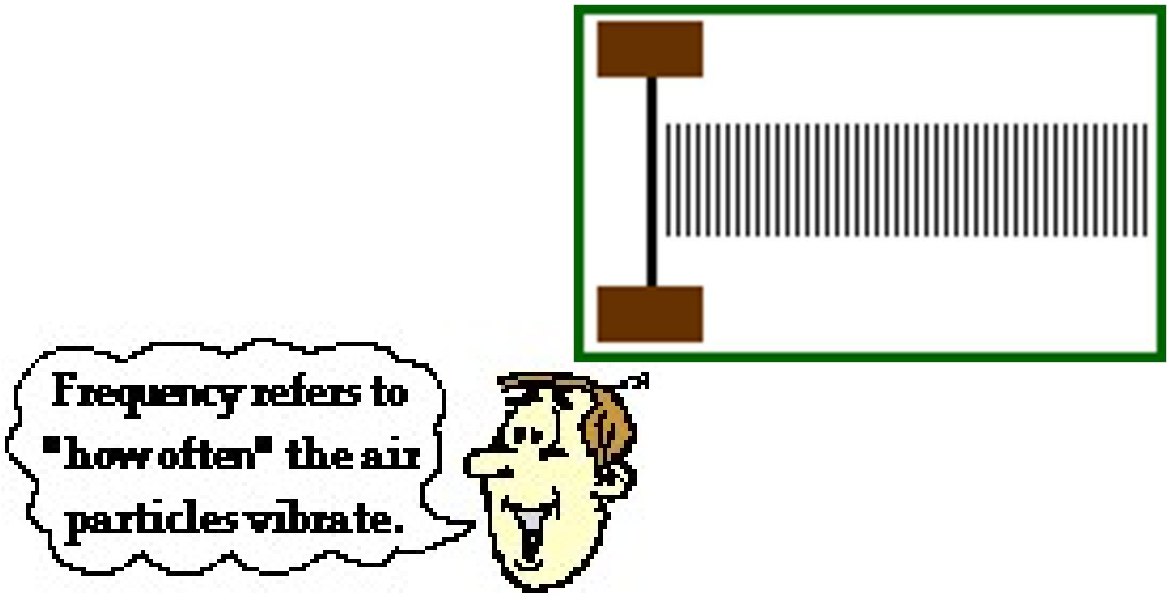
Wavelength:

Wavelength: distance from end of compression to the end of the next compression (A)



Frequency:

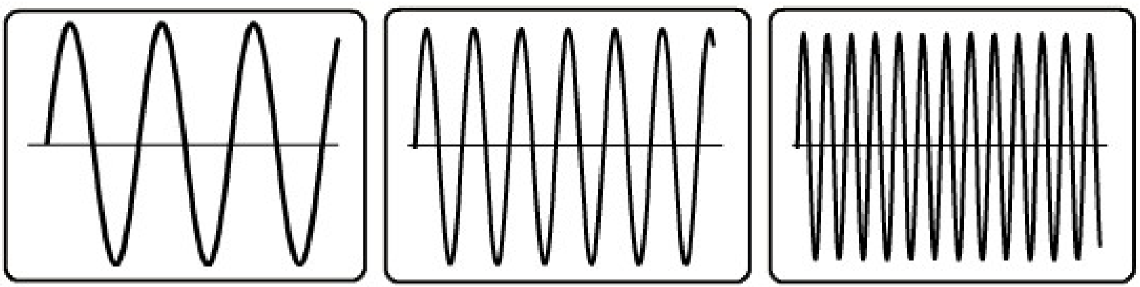
Frequency: the number of waves produced per second (C)



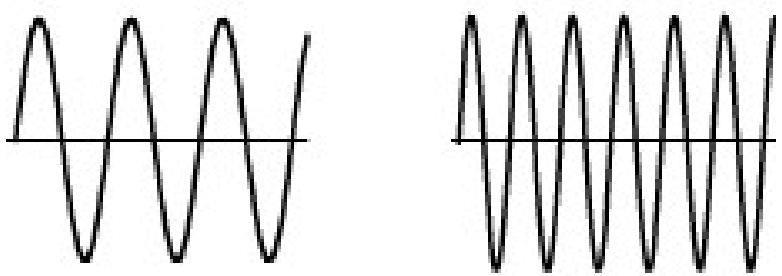
PITCH

Pitch is the **rate at which the vibrations are produced**.

The higher the frequency, the higher the pitch.



The more waves per second (or the higher the frequency), the higher the pitch!



Lower Pitch

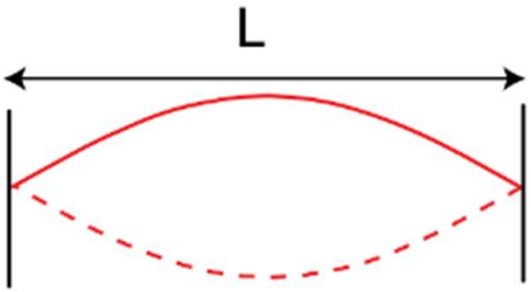
Higher Pitch

Intensity

Intensity depends on the **strength, or amplitude, of the vibrations producing the sound**.

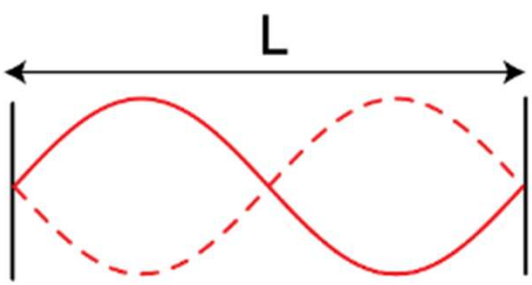
If a piano string is struck forcefully the string swings back and forth in a wider arc. The stronger vibration then produces a louder tone since stronger vibrations compress the molecules of the air more forcefully and gives them greater energy, which is interpreted by our ears as a louder sound.

Harmonics



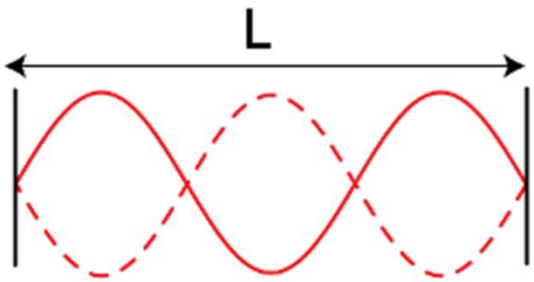
1st harmonic

$$\lambda = 2L \rightarrow f = \left(\frac{v}{2L}\right)$$



2nd harmonic

$$\lambda = L \rightarrow f = 2\left(\frac{v}{2L}\right)$$



3rd harmonic

$$\lambda = \frac{2L}{3} \rightarrow f = 3\left(\frac{v}{2L}\right)$$

plus higher harmonics

Wednesday / Thursday (May 6 & 7)

- Test Review and DCA

- T: 8B - Compare the characteristics of transverse and longitudinal waves including electromagnetic and sound waves.
  - 8C - Investigate and analyze characteristics of waves including velocity, frequency, amplitude, and wavelength, and calculate using the relationships between wave speed, frequency, and wavelength.
  - 8D - Investigate behaviors of waves, including reflection, refraction, diffraction, interference, standing wave, the Doppler effect and polarization and superposition.
- O: I will demonstrate my understanding of waves
- D: by taking my DCA.
- A: medium, rarefactions, compressions
- Y: What are commonalities between all waves?

Friday (May 8th)

- C-day