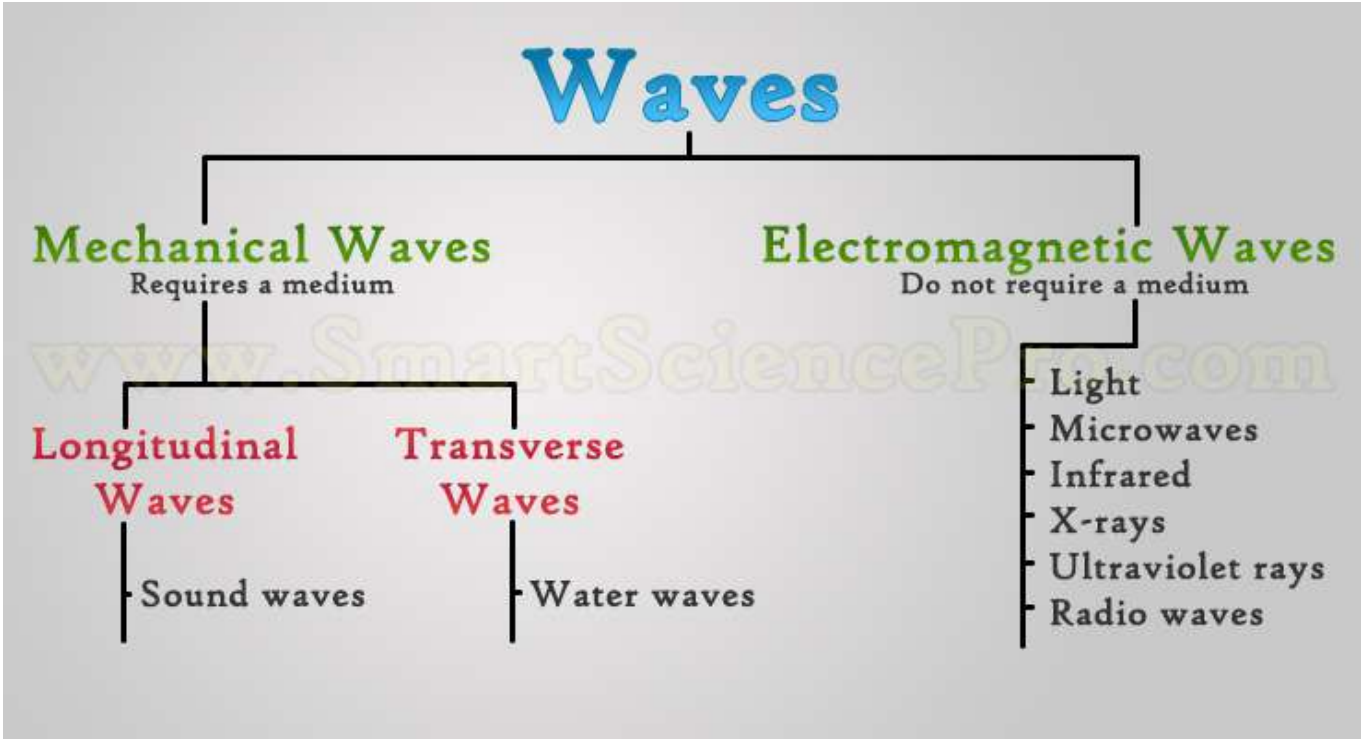
Waves

Unit 10 Physics

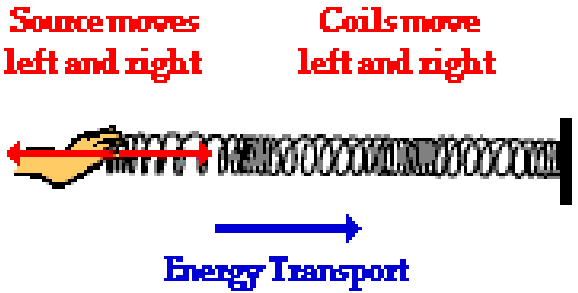
PhET Labs and Cosmos

Please turn into the Turn In Bin!

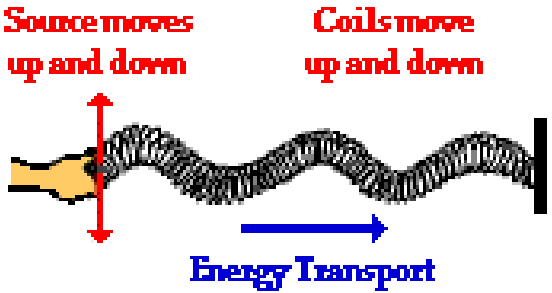
Types of Waves



Longitudinal wave



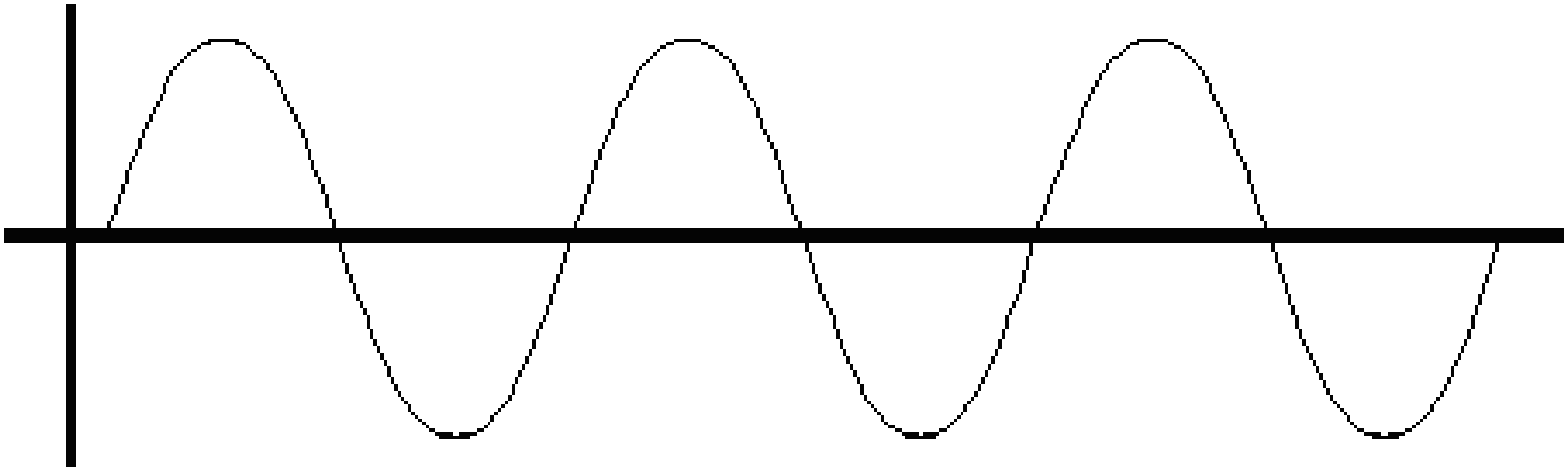
Transverse Wave



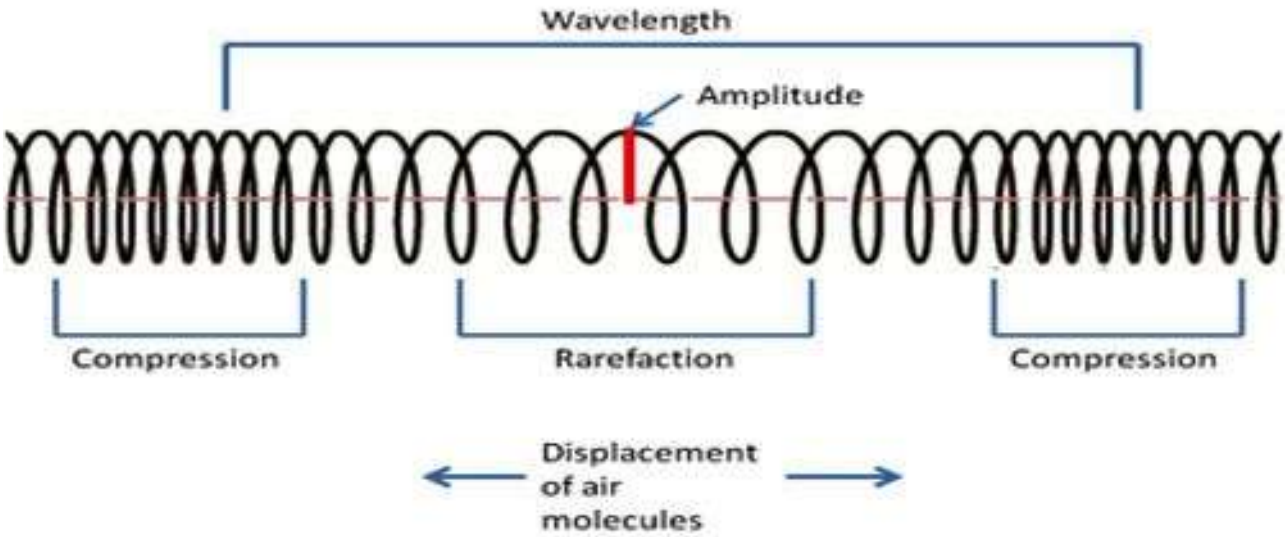
The subsequent direction of motion of individual particles of a medium is the same as the direction of vibration of the source of the disturbance.

Vocabulary to Build

Crest, Trough, Amplitude (m), Wavelength (m), Period (T) (s)



Longitudinal Wave



Frequency and period

$$T = \frac{1}{f}$$

The period of an oscillator is one over its frequency.

$$f = \frac{1}{T}$$

The frequency of an oscillator is one over its period.

Wave Speed Equation

Worksheet Practice

Wave Station Practice

For each wave A-L…

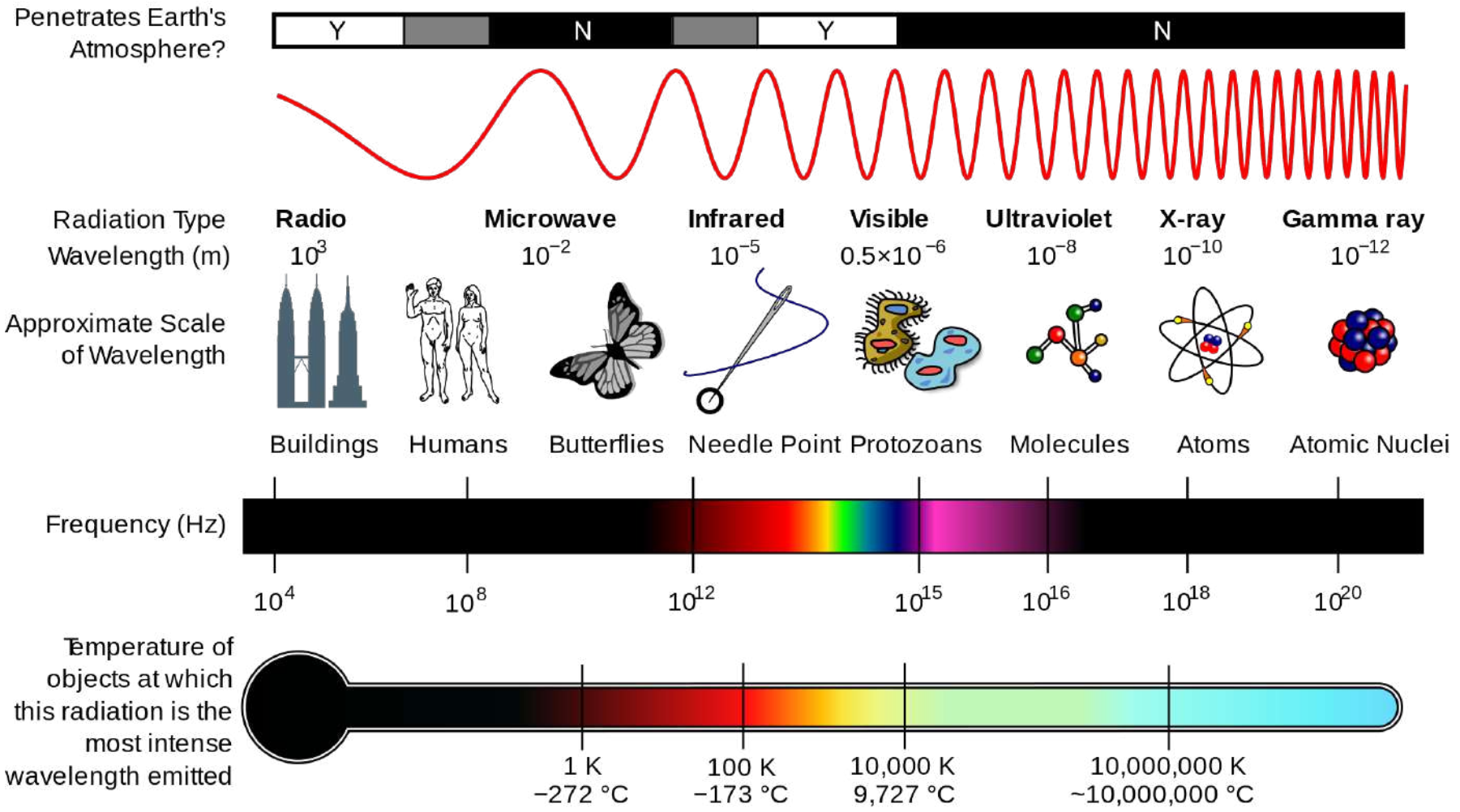
Units

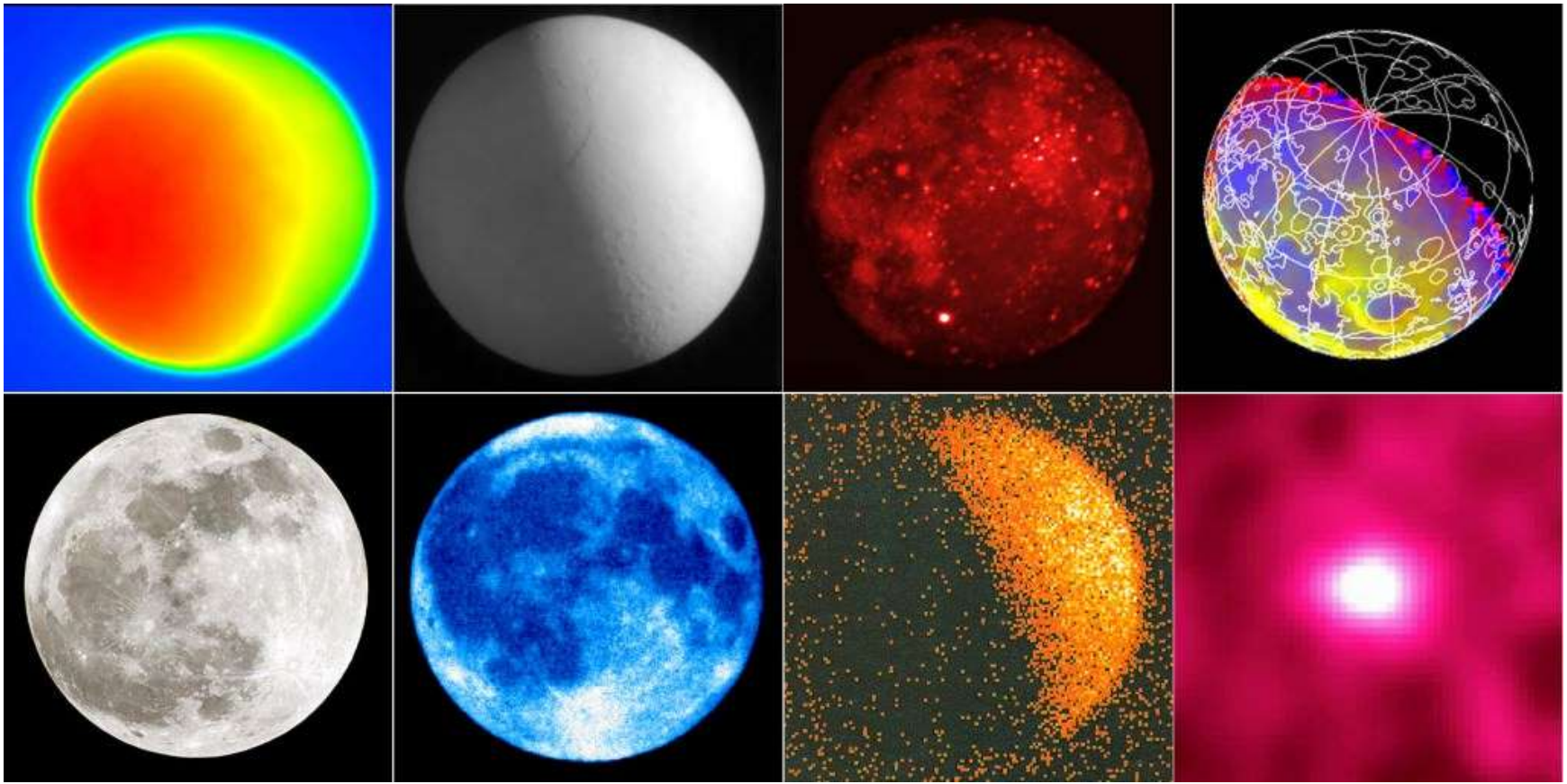
- Amplitude — cm
- Wavelength — cm
- # of Waves in view — waves
- Time for waves to pass — s
- Period = Time / # of Waves — s
- Frequency = # of Waves / Time — Hz
- Speed = wavelength / period — cm/s

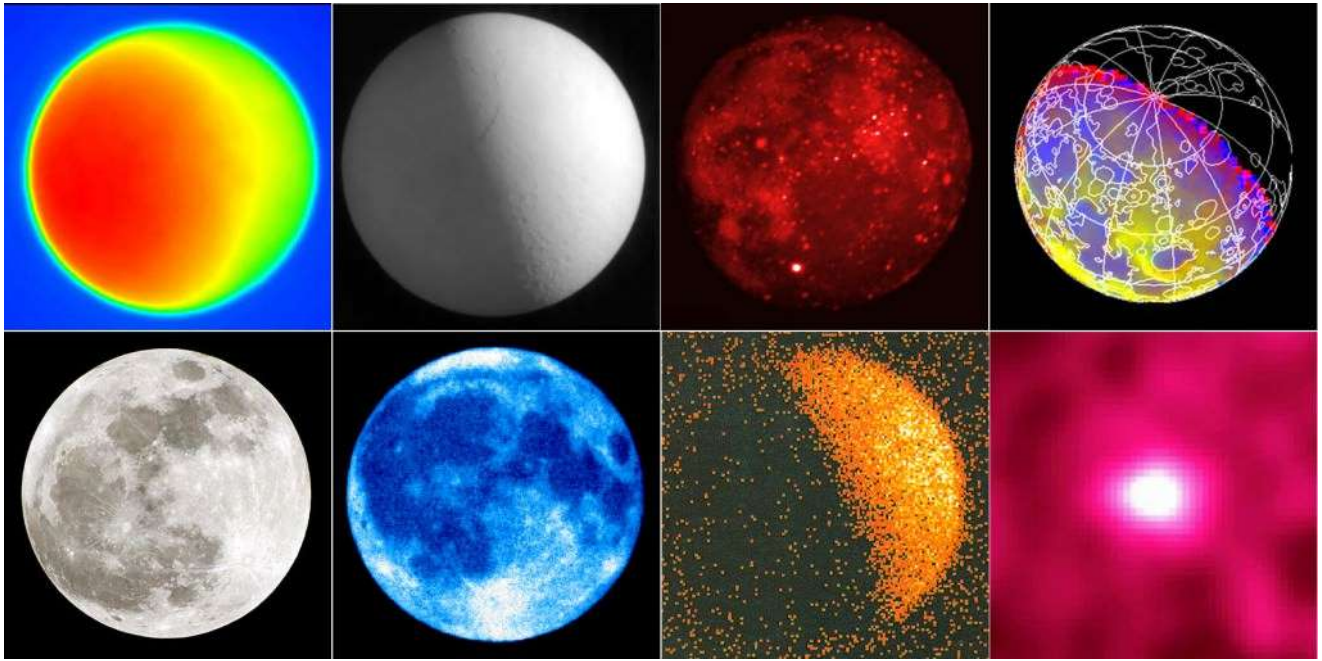
Is there a relationship?

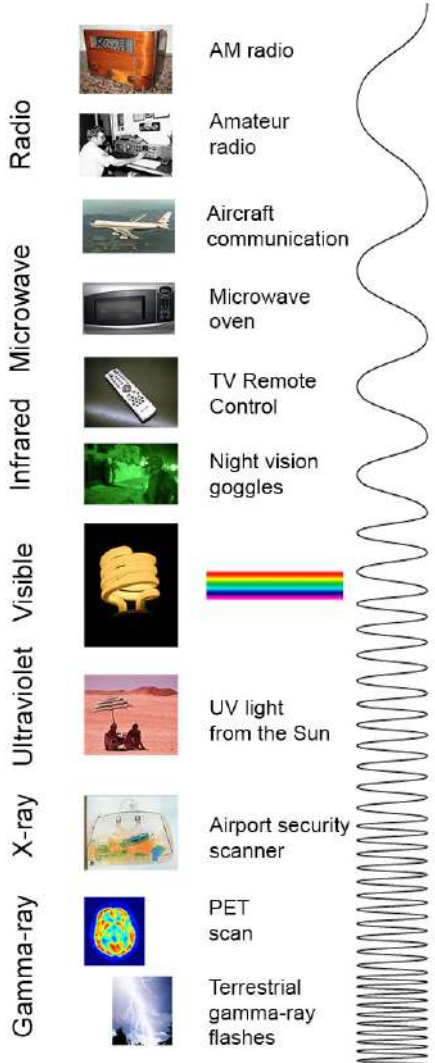
Choose 3 to graph by yourself. Determine what type of relationship (no correlation, positive, negative, inverse). You must choose at least one with amplitude and one without amplitude.

- Amplitude vs. Frequency
- Period vs. Frequency
- Frequency vs. Speed
- Period vs. Speed
- Wavelength vs. Speed
- Amplitude vs. Speed
- Wavelength vs. # of waves
- Frequency vs. Wavelength
- Amplitude vs. Period


Penetrates Earth's Atmosphere?
Y
N
Y
N
Radiation Type
Wavelength (m)
Approximate Scale of Wavelength
Radio
10^{3}
Microwave
10^{-2}
Infrared
10^{-5}
Visible
0.5×10^{-6}
Ultraviolet
10^{-8}
X-ray
10^{-10}
Gamma ray
10^{-12}
Buildings
Humans
Butterflies
Needle Point
Protozoans
Molecules
Atoms
Atomic Nuclei
Frequency (Hz)
10^{4}
10^{8}
10^{12}
10^{15}
10^{16}
10^{18}
10^{20}
Temperature of objects at which this radiation is the most intense wavelength emitted
1 K
−272 °C
100 K
−173 °C
10,000 K
9,727 °C
10,000,000 K
~10,000,000 °C




Radio
Far Infrared
Microwave
Mid Infrared
Near Infrared
Visible
UV
X-Ray
Gamma Ray


Radio
AM radio
Amateur radio
Microwave
Aircraft communication
Microwave oven
Infrared
TV Remote Control
Night vision goggles
Visible
Ultraviolet
UV light from the Sun
X-ray
Airport security scanner
Gamma-ray
PET scan
Terrestrial gamma-ray flashes

Go to PDF Powerpoint

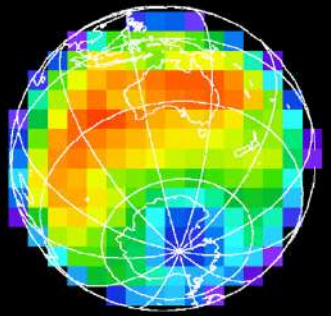
- Dog
- Unknown Object
- Explain False Color Imaging (Sensor -> data -> assign color -> create image we can see)
- Coloring Monday and Tuesday in class

- Tuesday- Wien’s Law, look at example
- Start next activity when gone

THEMIS

Visible Image

Temperature Image

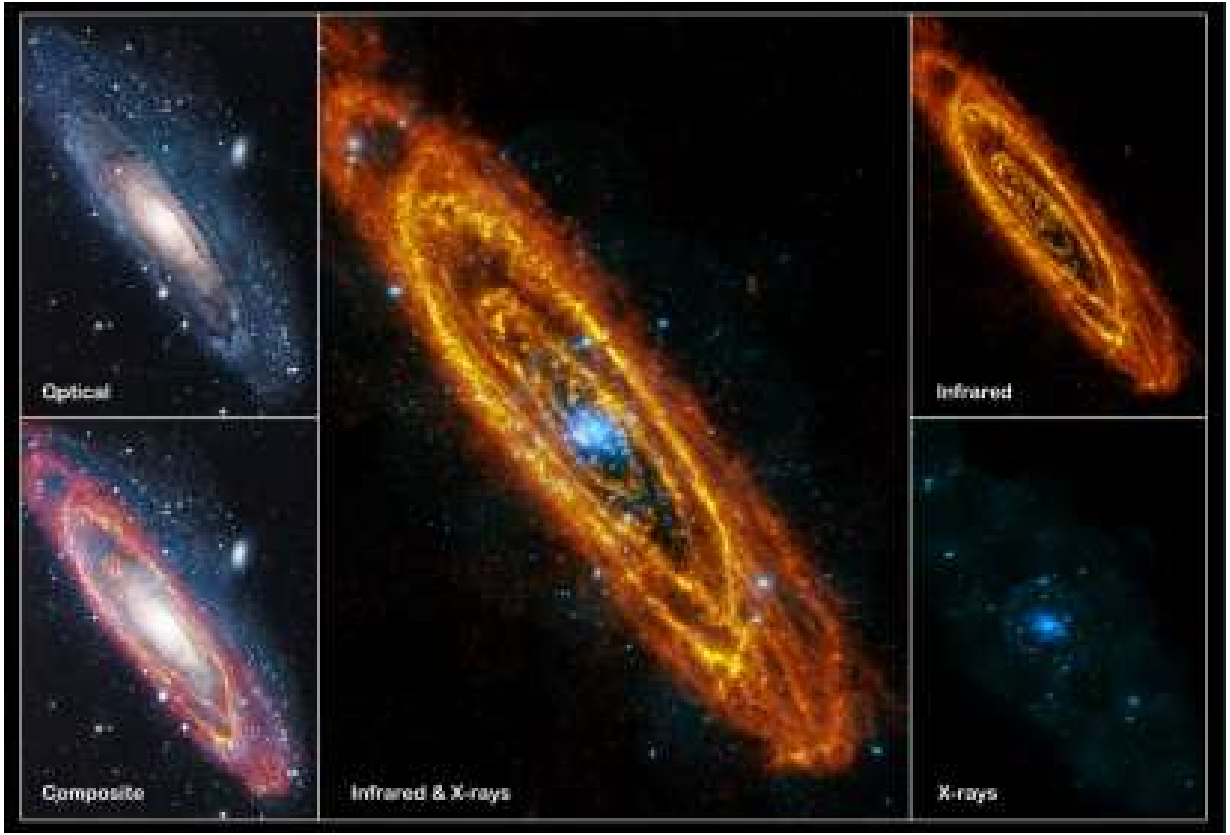


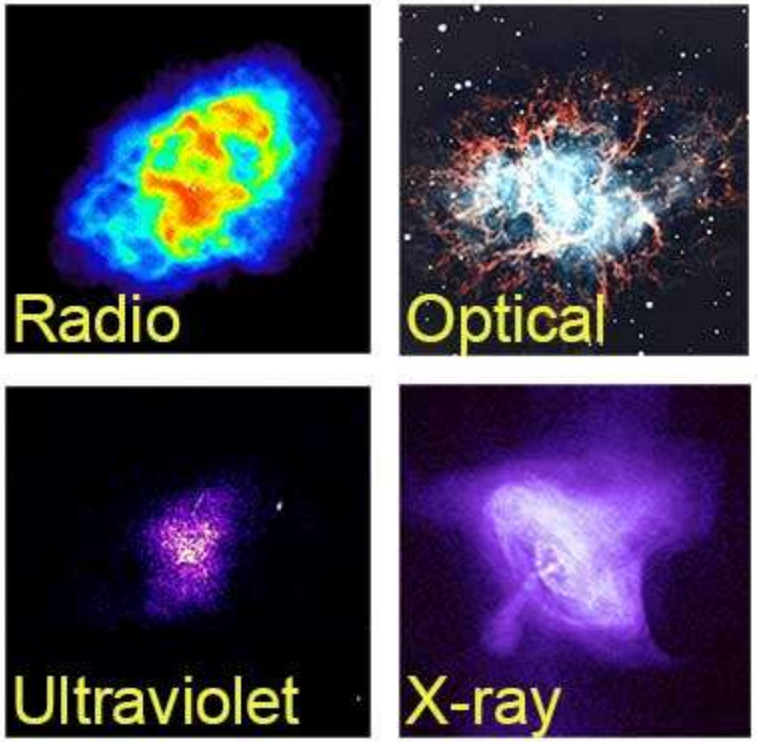
https://www.jpl.nasa.gov/spaceimages/details.php?id=PIA22343

http://www.intellicast.com/Global/Satellite/Infrared.aspx?region=hiusa

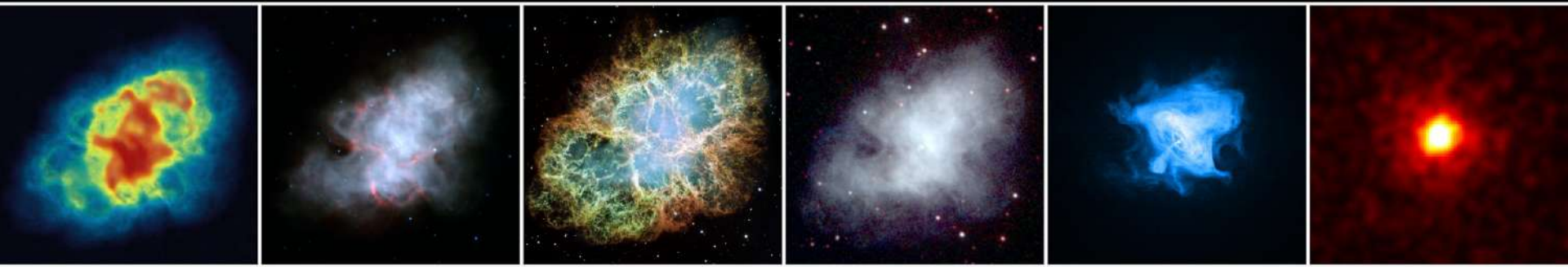
Tuesday & Wednesday Student Goals

- Finish coloring the galaxy false colored images on Multiwavelength Packet 3 and 4
- Get a Galactic Inquiry packet and complete the activities (make sure you read the directions)!
- Read and answer the questions on Pages 5-7 in your Multiwavelength Packet


Optical
Infrared
Composite
Infrared & X-rays
X-rays


Radio
Optical
Ultraviolet
X-ray

CRAB NEBULA



RADIO	INFRARED	VISIBLE LIGHT	ULTRAVIOLET	X-RAYS	GAMMA RAYS

Wrap It Up- Build a Model

You need to show

- Wavelength (2 different ways to find)
- Amplitude
- Speed
- Frequency
- Any other important information

Determining Relationships from Data

Determine the relationships using Waves on a String PhET lab and Wave Stations.

You must state your answer, reasoning and why with equations AND data.

1) Does amplitude affect the frequency, wavelength and/or speed?
2) If wavelength increases, what happens to frequency?
3) If wavelength decreases, what happens to frequency?
4) If frequency increases, what happens to speed?
5) If wavelength increases, what happens to speed?
6) When speed increases, what must happen to frequency, wavelength and amplitude?

Must be done for Friday- we are peer reviewing.

Determining Relationships

Peer Review:

- You will pair up with another group from another table.
- Present your findings for all questions
- Give feedback and ask questions (look for evidence)
- Make any changes after peer review and turn in!

Longitudinal wave

Source moves left and right

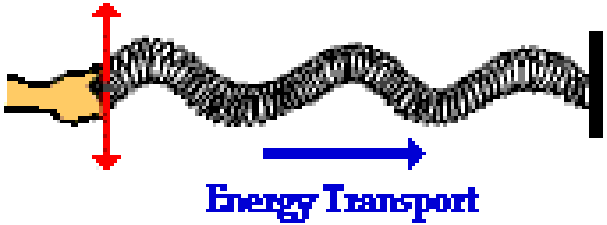
Coils move left and right

Energy Transport

Transverse Wave

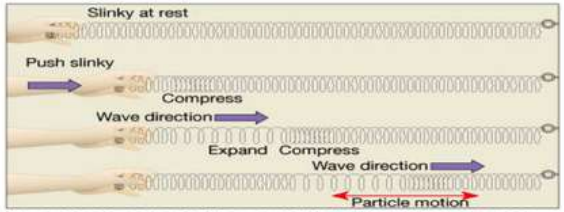
Source moves up and down

Coils move up and down

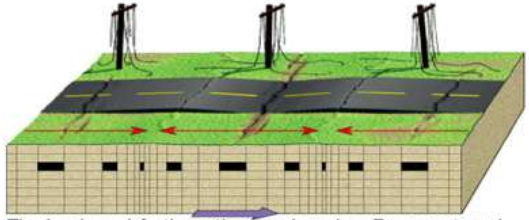


Energy Transport

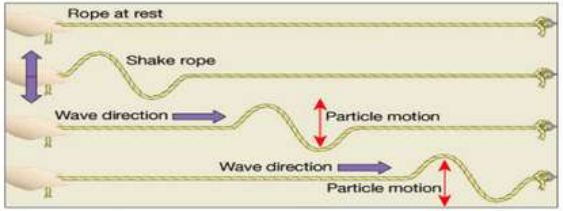
The subsequent direction of motion of individual particles of a medium is the same as the direction of vibration of the source of the disturbance.



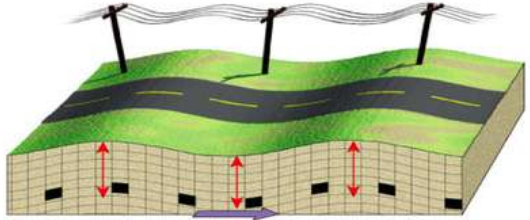
P waves are compression waves that alternately compress and expand the material through which they pass.



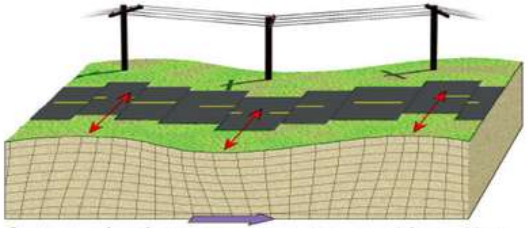
The back-and-forth motion produced as P waves travel along the surface can cause the ground to buckle and fracture.



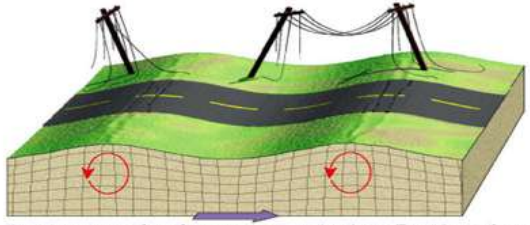
S waves are transverse waves which cause material to shake at right angles to the direction of wave motion. The length of the red arrow is the displacement, or amplitude, of the S wave.



S waves cause the ground to shake up-and-down and sideways.



One type of surface wave moves the ground from side to side and can damage the foundations of buildings.



Another type of surface wave travels along Earth's surface much like rolling ocean waves. The arrows show the movement of rock as the wave passes. The motion follows the shape of an ellipse.

Period and Frequency

$$\text{Frequency} = \frac{1}{\text{Periodic time}} \quad \text{or} \quad f = \frac{1}{T}\ \text{Hz}$$

$$\text{Periodic time} = \frac{1}{\text{Frequency}} \quad \text{or} \quad T = \frac{1}{f}\ \text{sec}$$

Practice Problems

Complete all practice problems #1-#6 for Monday

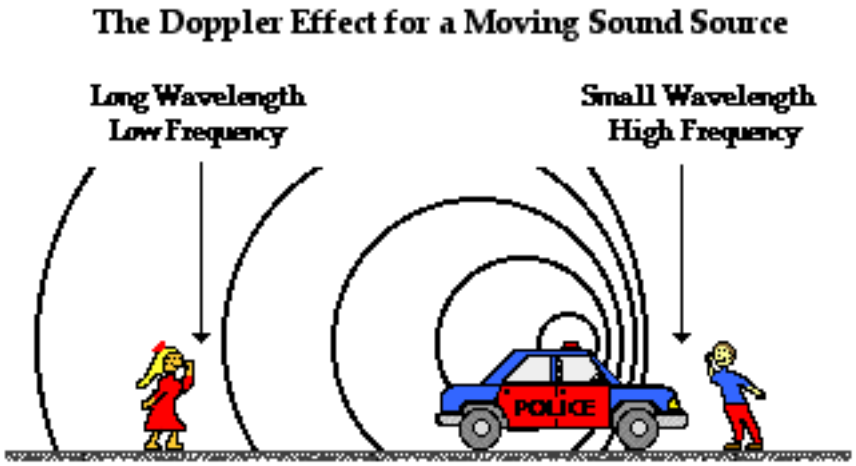
Sound Waves

Type of Noise	Listen through	Result
Tap Lightly on Desk	Air	
Tap Lightly on Desk	Desk	
Tap Hard on the Desk	Air	
Tap Hard on the Desk	Desk	

Doppler Effect

https://www.youtube.com/watch?v=a3RfULw7aAY

https://www.youtube.com/watch?v=wrzWAox8NCM



Equation for the doppler effect

$$f' = f\left(\frac{v + v_O}{v - v_S}\right)$$

f’ = observed frequency

f = source frequency

v = speed of sound (343 m/s)

Vo = observer velocity

Vs = source velocity

\+ If going towards

\- If going away

Sample Problem

A car travels towards you with a velocity of 10 m/s. The car horn has a frequency of 250 Hz.

What is the frequency when the car is coming towards you?

What is the frequency when the car is going past you?

What is the frequency if you run towards the car at 5 m/s?

What is the frequency if you run away from the car at 6 m/s?

By the end of the hour

Complete all practice problems and turn in!

Wave Vocabulary Project

Vocab Words:

Transmission, Reflection, Refraction, Absorption, Diffraction, Scattering, Interference

Wave Vocabulary Mini Project

You and your group 1-2 students will randomly be given a vocab word. For each work create a **mini poster** (1-2 sheets of copy paper):

- Title and names
- Definition in a way a students would understand
- Drawing/Diagram of what this looks like
- Examples in everyday life
- Compare or contrast to another vocab word

You must also choose a **demonstration/physical example** that will show this vocabulary word. It should be simple and easy to have in class tomorrow during our gallery walk.

Topics for Unit 10 Test- Study Guide will be available on Google Classroom Later today