Unit 1 Physics

Waves, Light and Sound

9/22 & 9/24

Warm Up

Send me a chat:

- How has the first 3 weeks been?
- What is your workload like?
- What are you enjoying? Not enjoying?

Agenda

- Phenomenon
- Waves on a String Inquiry Lab

Upcoming Dates

- Waves on a String PhET Lab due next block

Phenomenon: Link here

- Show map: https://earthquake.usgs.gov/static/lfs/data/dyfi/pdfs-us/DYFIus_cumul-2017.pdf
- Write down what they notice
- Small Groups (3-4 students)- write down patterns they see
- Show the Did You Feel It? questions online
- Make a class list of observations and questions related to what the students were presented with
- Show map for intensity of earthquakes in the US and video


Major US Cities
Seattle
Portland
San Francisco
San Jose
Fresno
Las Vegas
Los Angeles
San Diego
Salt Lake City
Denver
Colorado Springs
Albuquerque
Phoenix
Minneapolis/ St. Paul
Milwaukee
Chicago
Kansas City
Wichita
Oklahoma City
Dallas
Austin
San Antonio
Houston
Detroit
Cleveland
Buffalo
Boston
Pittsburgh
New York City
Philadelphia
Baltimore
Columbus
Indianapolis
Cincinnati
St. Louis
Louisville
Washington D.C.
Norfolk
Nashville
Charlotte
Memphis
Atlanta
Birmingham
Jacksonville
New Orleans
Tampa
Miami
Anchorage
Honolulu
500 miles
100 miles
N
W
E
S
500 miles
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Lee - Hour 6 Observations

- Most occurrences on the west coast
- Not many in the middle of the U.S.
- A lot of red in California
- Small patch in Oklahoma
- Hawaii get pretty intense too
- Most are not that intense
- A few off of the map
- Mostly purple and blue (least intense) not much red
- Earthquake in Hawaii which is a volcanic island chain
- North Dakota barely has any

Lee - Hour 6 Driving Questions: Earthquakes and How We Feel Them

- How is intensity measured?
- How do we know an actual earthquake happened? Not just someone imagining things
- How do people reach out to record the earthquakes?
- What does intensity mean? Vibration? Something else?
- Where do people to report if they felt it or not?
- Why does OK have so many?
- Why does North Dakota not have any?
- What is the time period of recording?

Waves on a String Inquiry Lab

Due by next class block

9/25 & 9/28

Warm Up

- Write down 3 observations from your Waves on a String PhET Lab.

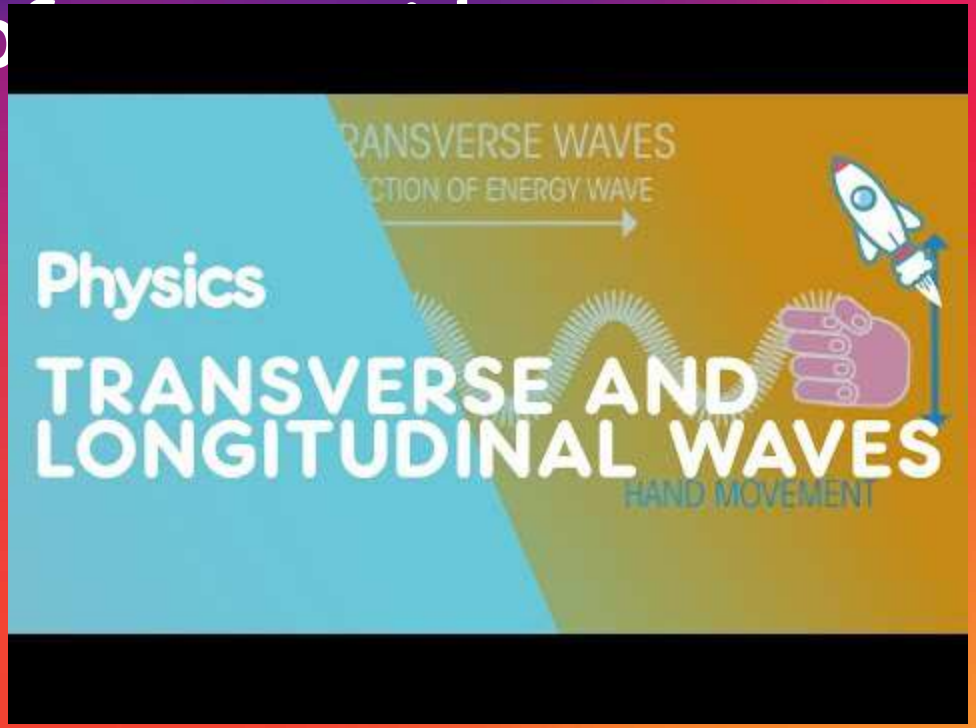
Agenda

- Review Unit Materials
- Review PhET Waves on a String
- Waves Vocab
- Earthquake Project Info
- Part A Work Time

Upcoming Dates

- Earthquake Project due 10/1 (Purple) or 10/2 (Gold)

Types o


RANSVERSE WAVES
CTION OF ENERGY WAVE
Physics
TRANSVERSE AND
LONGITUDINAL WAVES
HAND MOVEMENT

Wave Basics

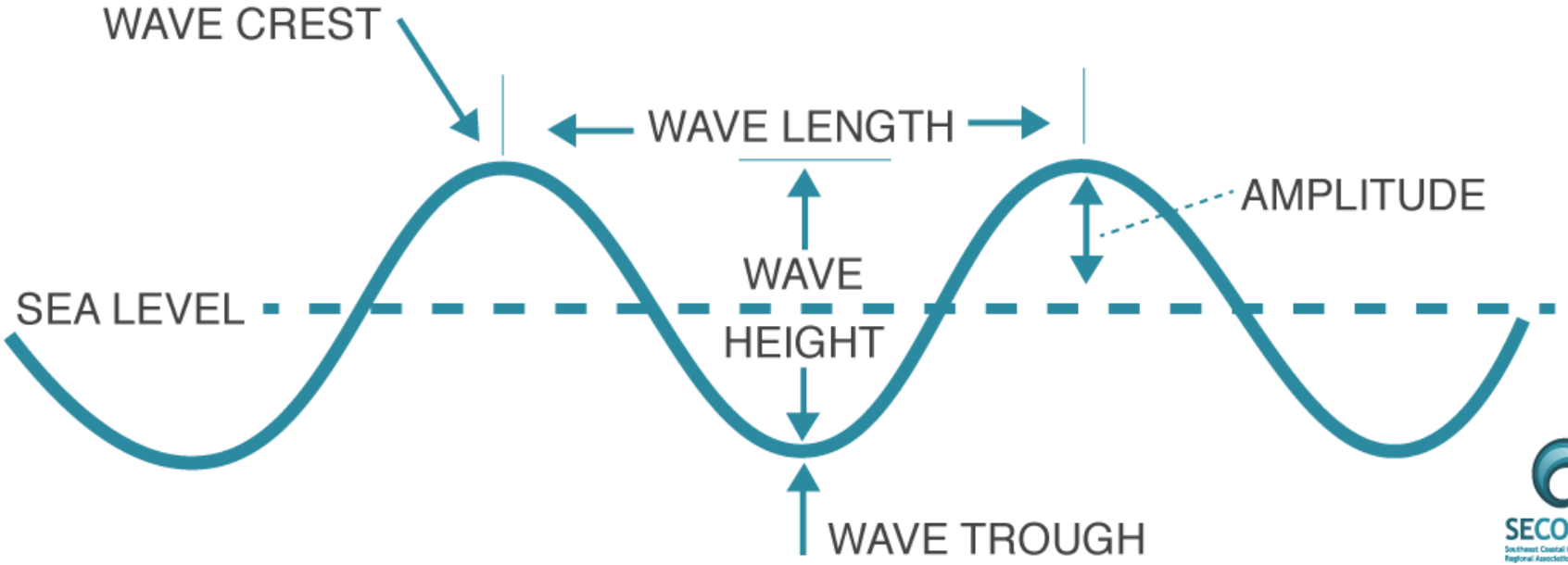
Types of Waves

- Transverse
- Longitudinal
- What was Waves on a String? Sound? Slinky? Ocean Waves?

Wave Vocab

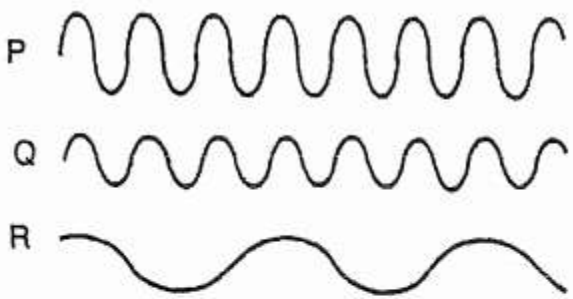
- Wavelength (ƛ)
- Amplitude
- Frequency (Hz)

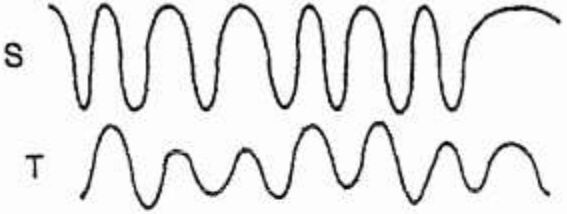
PARTS OF A WAVE



SECOORA
Southeast Coastal Ocean Observing Regional Association

Practice!





(a) Waves P and Q have the same _____, but wave P has twice the _____ of wave Q.

(b) Waves Q and R have the same _____, but wave R has twice the _____ of wave Q.

(c) Wave _____ shows a steady frequency but changing amplitude.

(d) Wave _____ shows steady amplitude but a changing frequency.

(e) Waves _____ and _____ have a low amplitude and a steady frequency.

What's an Earthquake? Tsunami?

3 New Facts

2 Important Details

1 Question you Have

Let’s be a scientist!

Earthquake Project: See Google Classroom (Student Work Packet)

9/29 & 9/30

Warm Up

- Camera's On!
- Open up your Earthquake Project Part A
- Write down one fact about your city in the chat.

Agenda

- Wave Equations
- Review Part A in Breakout Rooms
- Review Part B and Walk Through Info Sheet
- Work Time for Part B and C (Submit for me to check)

Upcoming Dates

- Earthquake Project due 10/2

Wave Formula

m/s = 2.5/s (4m)

Wave Formula

$$v = f \lambda$$

Wave Speed

What determines the speed of a wave?

A. The source
B. The medium
C. The energy/amplitude
D. The frequency

A wave with a frequency of 14 Hz has a wavelength of 3 meters. At what speed will this wave travel?

v = 14/s (3m)

v = 42 m/s

The speed of a wave is 65 m/sec. If the wavelength of the wave is 0.8 meters, what is the frequency of the wave?

v = f (wavelength)
65 m/s = f (0.8 m)
81.2 Hz = f

Earthquake Project

- With your groups, work to answer the questions 1-6 in Part A
- Review answers as class
- Go over Part B

10/1 and 10/2

Warm Up

- Mental Check In: How do you feel today? What is going well in school? What are you struggling with?

Agenda

- Review wave vocab and equations
- Go over Parts B and C
- Work Time on Parts B, C and D

Upcoming Dates

- Earthquake Project due **Monday**
- We will have to time to work in class on Monday

A wave with a frequency of 14 Hz has a wavelength of 3 meters. At what speed will this wave travel?

Wave speed = wavelength * frequency

Wave speed = 3 meters * (14 Hz) = 42 m/s

The speed of a wave is 65 m/sec. If the wavelength of the wave is 0.8 meters, what is the frequency of the wave?

Wave speed = wavelength * frequency
65 m/s = 0.8 m * frequency
Frequency = 81.25 Hz

Part B and C Review

10/5 & 10/6

Warm Up

- Open up your Earthquake Project
- Drop in the chat- what part are you working on? Part A, B, C, D or done? Do you need help?

Agenda

- Review expectations for project
- Work time

Upcoming Dates

- Earthquake Project due by the end of **TODAY!**

#2 Scientific Communication

I can articulate viewpoints clearly, concisely and confidently through written, oral and two-way communication.

	4	3	2	1	0
Communication of Content	Utilizes concise content-specific language and various methods to articulate viewpoints and justifications in an organized manner.	Uses content-specific language and simple methods to articulate viewpoints and justify them.	Uses some content specific language and simple methods to articulate viewpoints.	Uses little content-specific language and cannot articulate viewpoints or justify them.	No content specific language
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Two Way Conversation	Engage in two way dialogue through actionable feedback, relevant questioning, and active listening.	Engages in two way dialogue through feedback and listening.	Engages in some two-way dialogue.	Engages in limited two-way dialogue.	Does not have two-way conversations with others.

10/7 & 10/8

Warm Up

- Next slide… write down everything you notice.

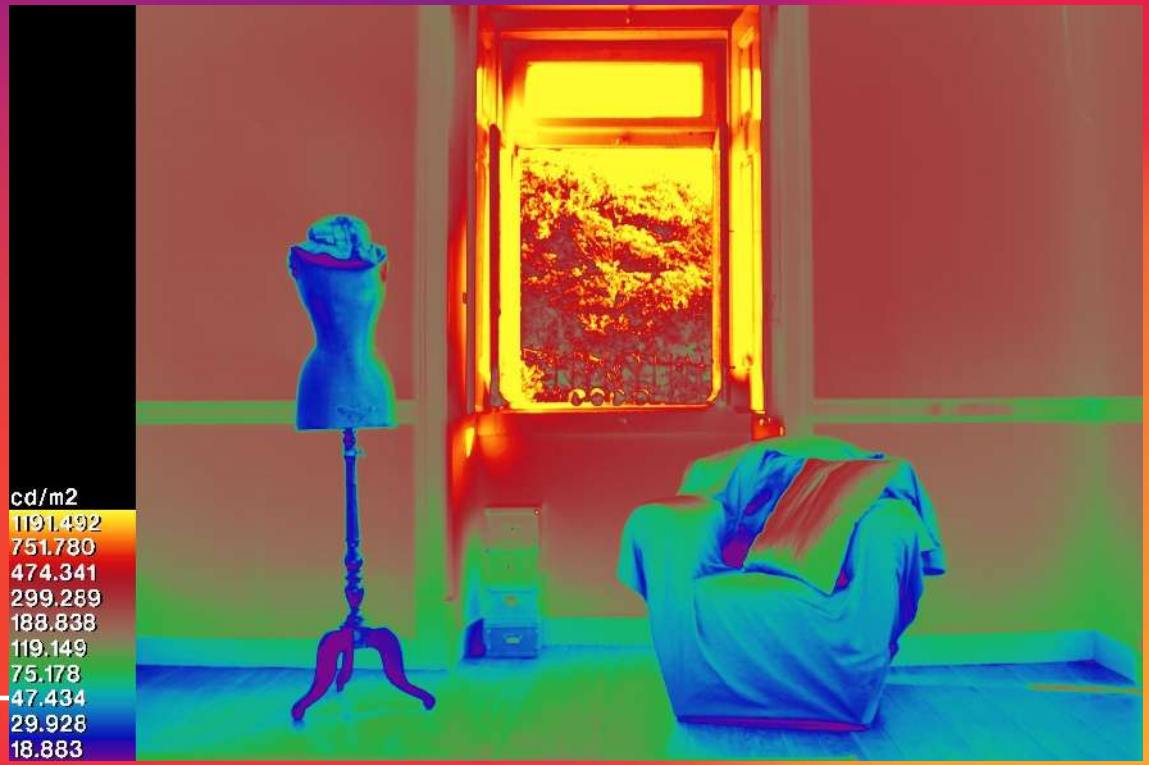
Agenda

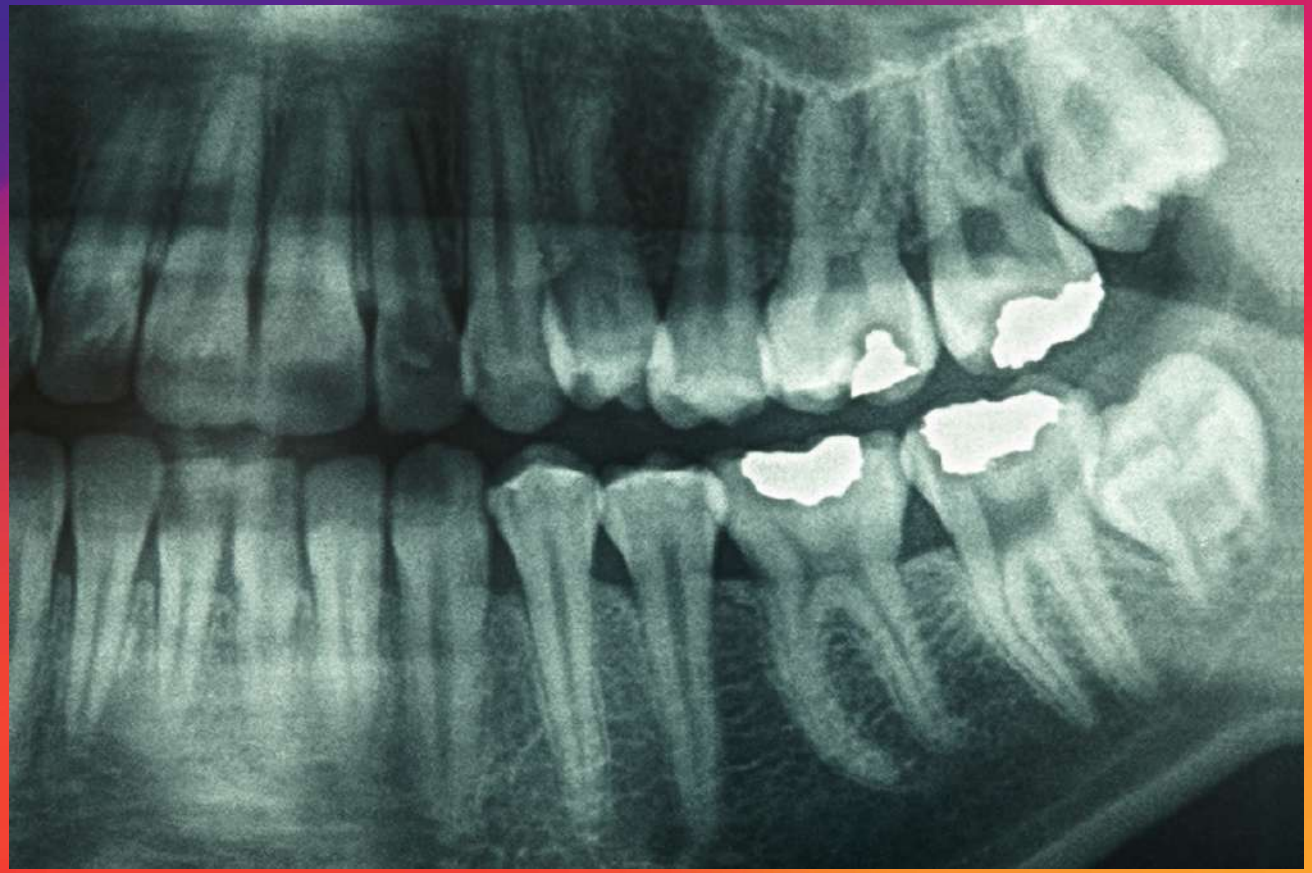
- Phenomenon- Light in Space
- False Color Imaging
- Light Exploration PhET

Learning Goal

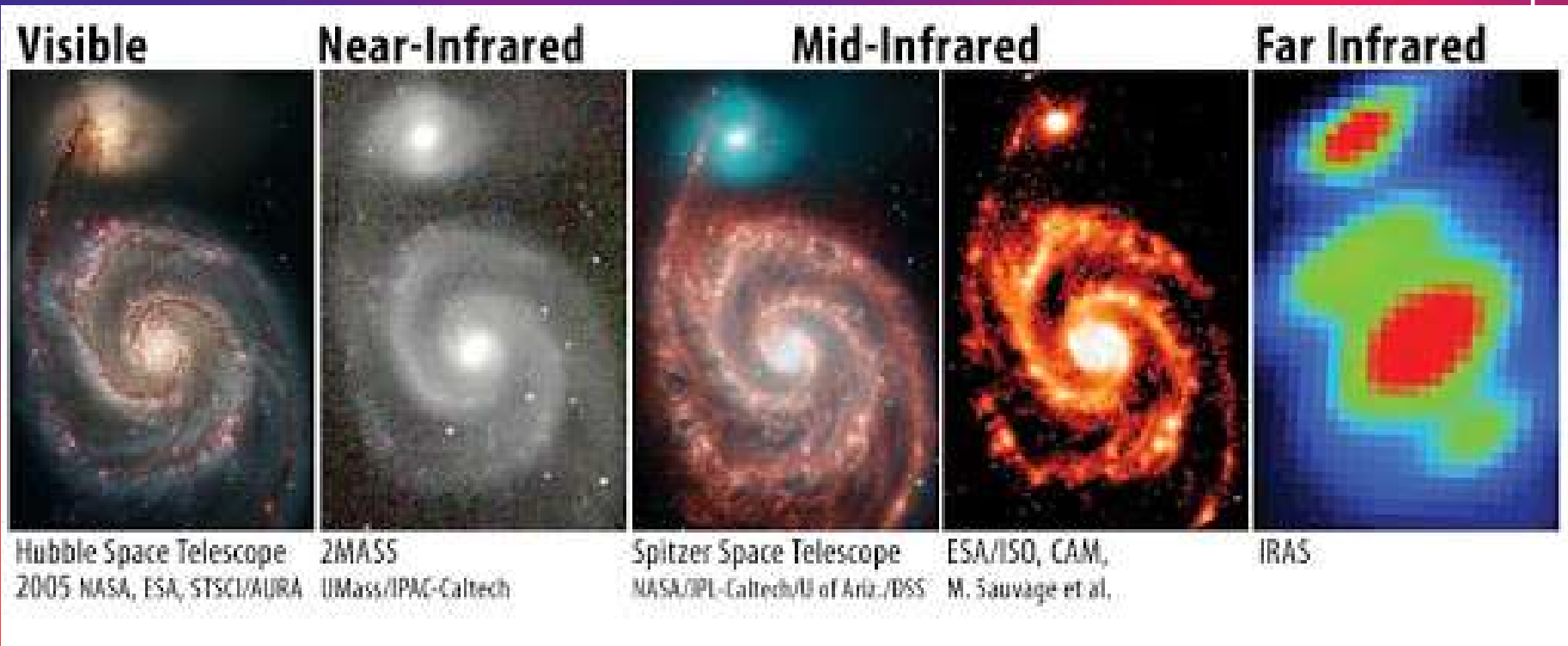
- I can observe the effect of wavelength on objects in space and molecules.

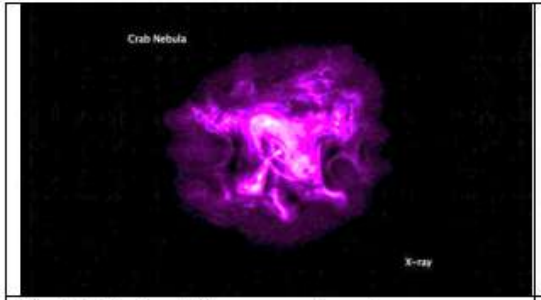
What does this image tell us?





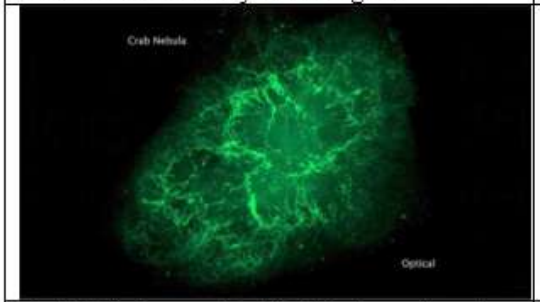
Pillars of Creation: False Coloring


Visible
Near-Infrared
Mid-Infrared
Far Infrared
Hubble Space Telescope
2005 NASA, ESA, STSCI/AURA
2MASS
UMass/IPAC-Caltech
Spitzer Space Telescope
NASA/JPL-Caltech/U of Ariz./DSS
ESA/ISO, CAM,
M. Sauvage et al.
IRAS

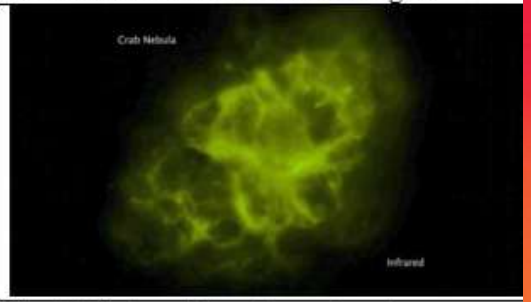


Crab Nebula at X-ray wavelengths

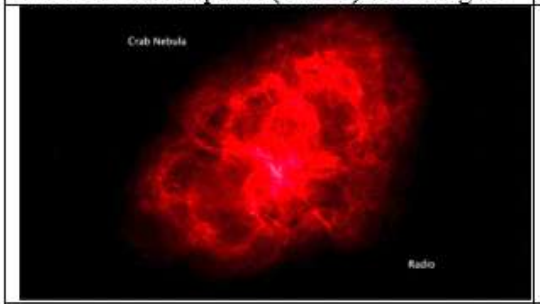
Crab Nebula at ultraviolet wavelengths



Crab Nebula at optical (visible) wavelengths



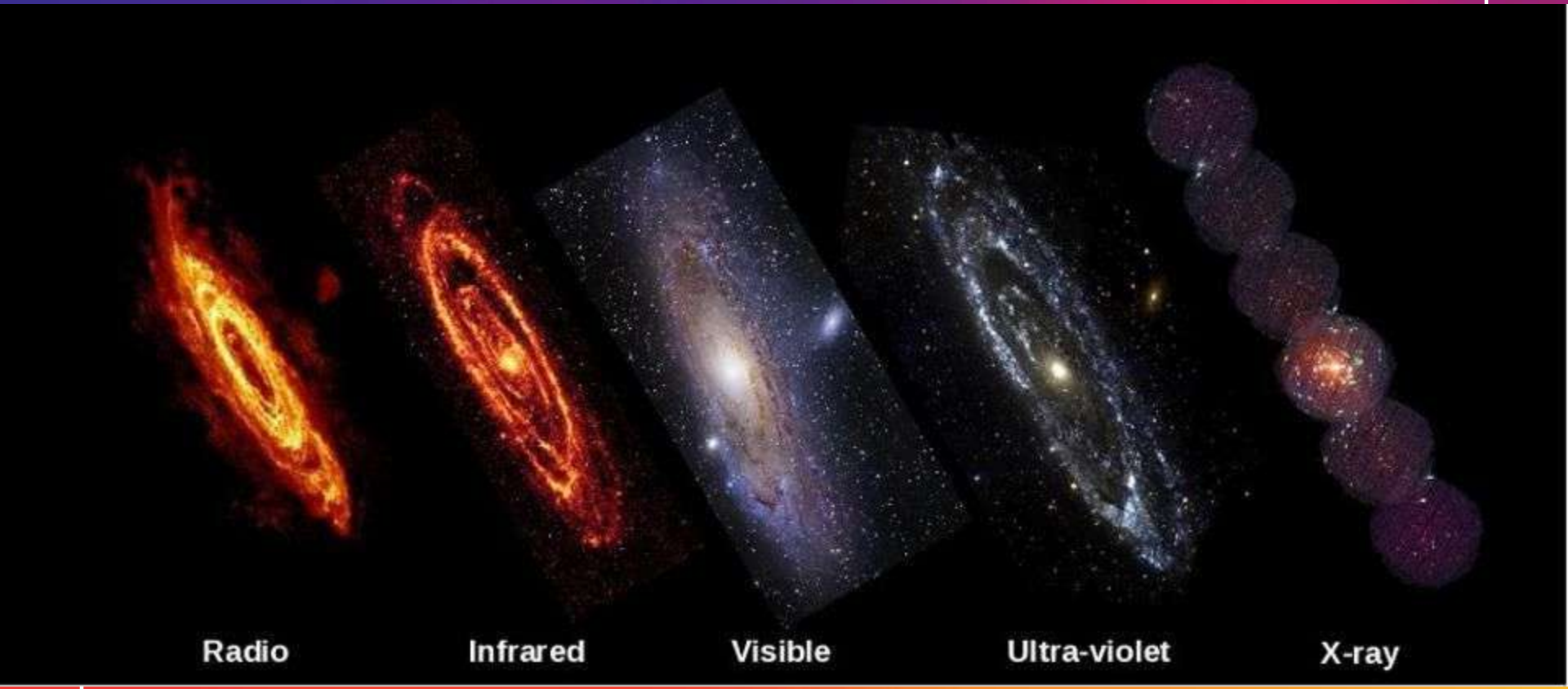
Crab Nebula at infrared wavelengths

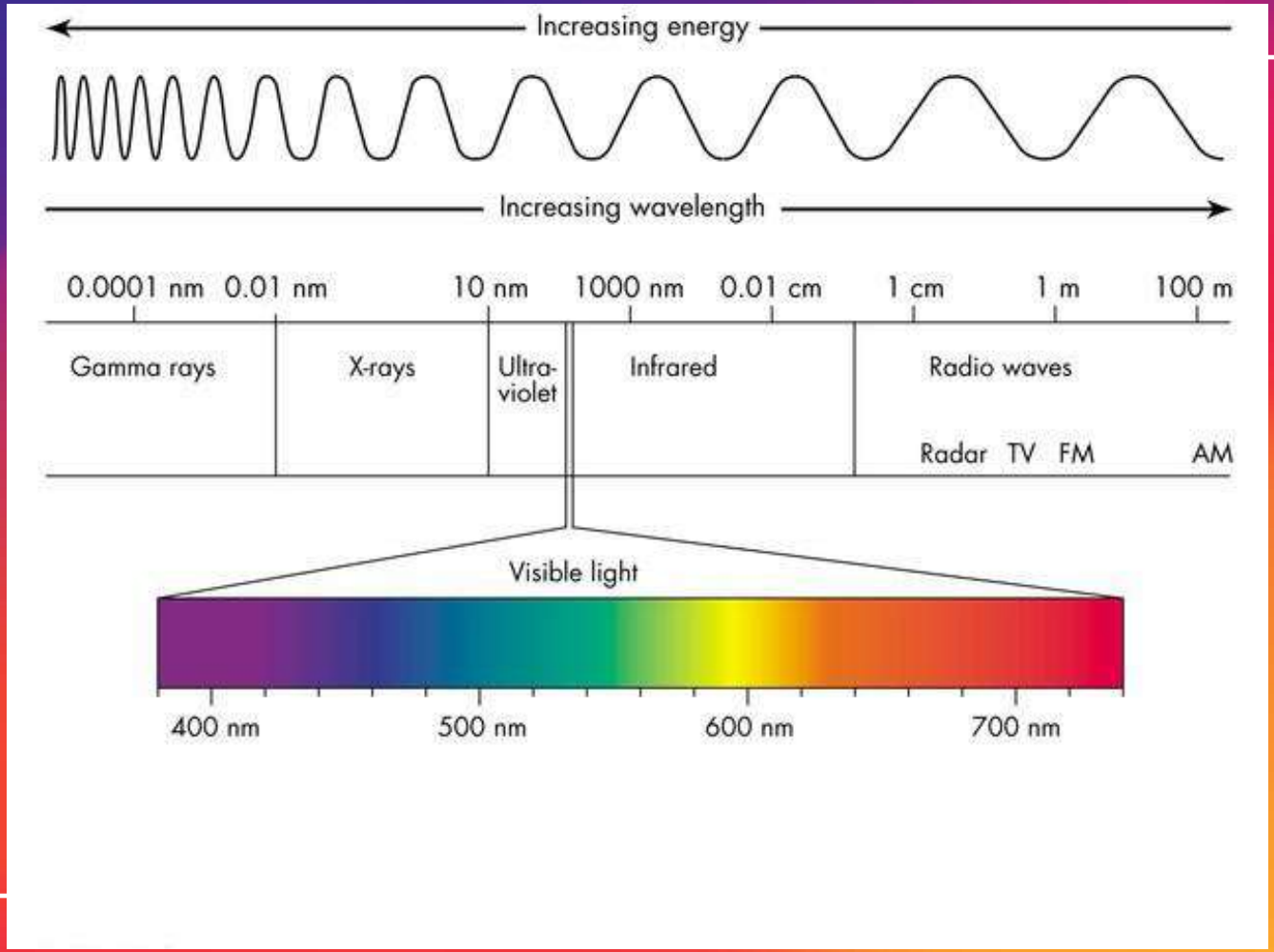


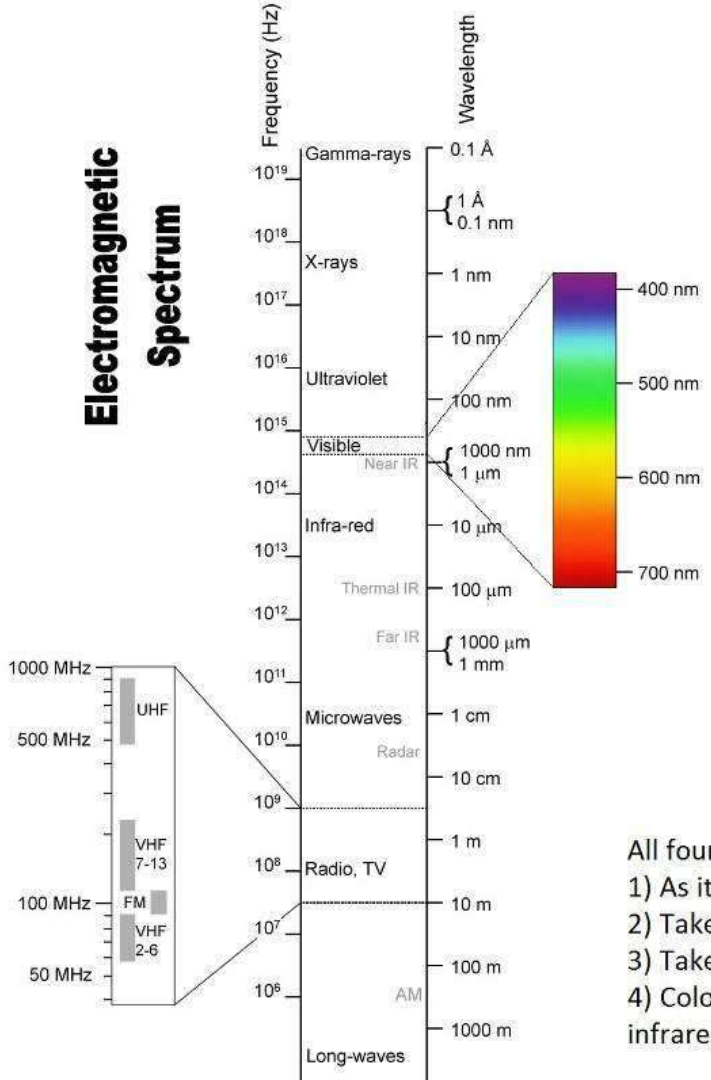
Crab Nebula at radio wavelengths

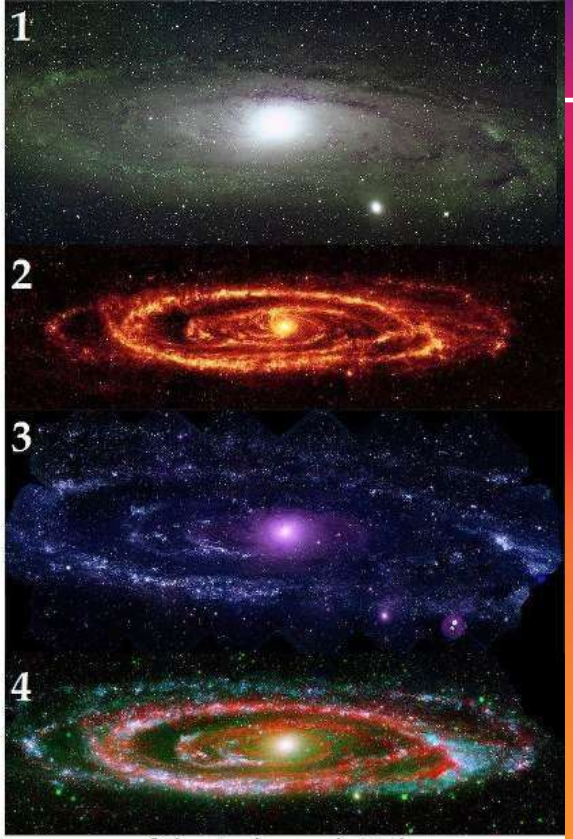
Crab Nebula with all wavelengths combined.

Figure 8.1


Radio
Infrared
Visible
Ultra-violet
X-ray

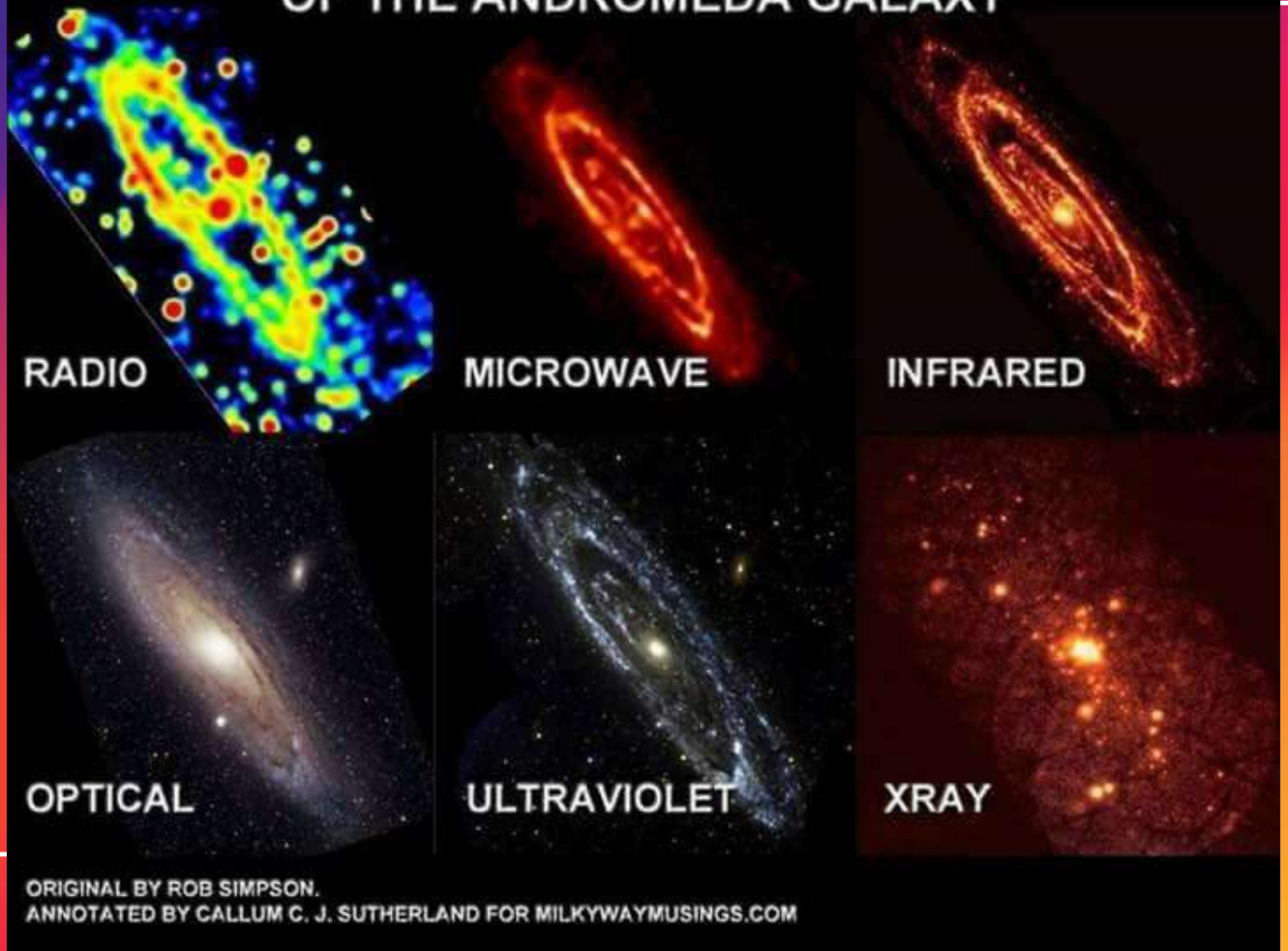

Increasing energy
Increasing wavelength
0.0001 nm
0.01 nm
10 nm
1000 nm
0.01 cm
1 cm
1 m
100 m
Gamma rays
X-rays
Ultra-violet
Infrared
Radio waves
Radar
TV
FM
AM
Visible light
400 nm
500 nm
600 nm
700 nm





All four images are of the Andromeda Galaxy
1) As it appears in visible light.
2) Taken by the Spitzer Space Telescope in infrared.
3) Taken by the Swift Space Observatory in ultraviolet.
4) Color composite Containing:
infrared (red channel) and ultraviolet (blue channel)

THE MULTIPLE WAVELENGTHS OF THE ANDROMEDA GALAXY



PhET Molecules and Light

10/9 & 10/12

Warm Up

- Share something **positive** that happened to you in the past week in the chat.

Agenda

- Light and Molecules Work Time
- Light and Molecules Conclusions
- Invisible Universe
- Reflection

Upcoming Dates

Conclusions Hour 1

Microwave	Infrared	Visible	UV
Spun around, vibrated, exitted	Vibrate together, light would bounce off	Right through the molecules	Completely went through, no bouncing off, towards the end broke off
Where hydrogen was, **electron acceleration**	Sees farther into the Milky way, Longer wavelengths intersteller dust, shorter (closer	Find certain gasses, dust and stars	Shows young stars, clusters, star forming reasons (new stars)

Conclusions Hour 2

Microwave	Infrared	Visible	UV
Made them spin (CO, H2O, O3, NO2), passed through, some bounced off	Mostly bounced off, made them shake (methane)	Mostly passed through, nitrogen dioxide glowed	Passed through, some molecules broke apart from each other
How different molecules interacted and what galaxies are made up of, shows	Reveals stars and stardust in the Milky Way	Don’t need special instruments to see things,	Shows the heat of stars,

Conclusions Hour 4

Microwave	Infrared	Visible	UV
Spin (H20, NO2, O3, CO), some just passed through	Bounces off, wobbles, sometimes it goes through	Mostly went through, NO lit up	Mostly passed through, breaks some apart
Where H2O, NO2, O3 and CO are, where electrons are being accelerated	Reviews different stars in the Milky Way (shorter wavelengths), longer show interstellar dust	Can see light, bright red regions made by glowing gas, see stars within a few thousand light years of	See stars that heat up in different regions,

Conclusions Hour 6

Microwave	Infrared	Visible	UV
Some passed through, some molecules spinned, some bounced off/redirected	Molecules shake, some passed through, some bounced off	Mostly passed through, made NO2 glow	Passed through, NO2, O3 broke weakest bond
	Reveals stars in the Milky Way, longer wavelengths show	Shows gas around stars	See hot interstellar medium and stars forming

10/13 & 10/14

Warm Up

- What are some ways you would describe light? Where do you see light in your everyday life?

Agenda

- E&M Spectrum- Visible Light Review
- How we see color? PhET Color Vision
- Waves Light Exploration Live Demos
- Reflection vs. Refraction

Upcoming Dates

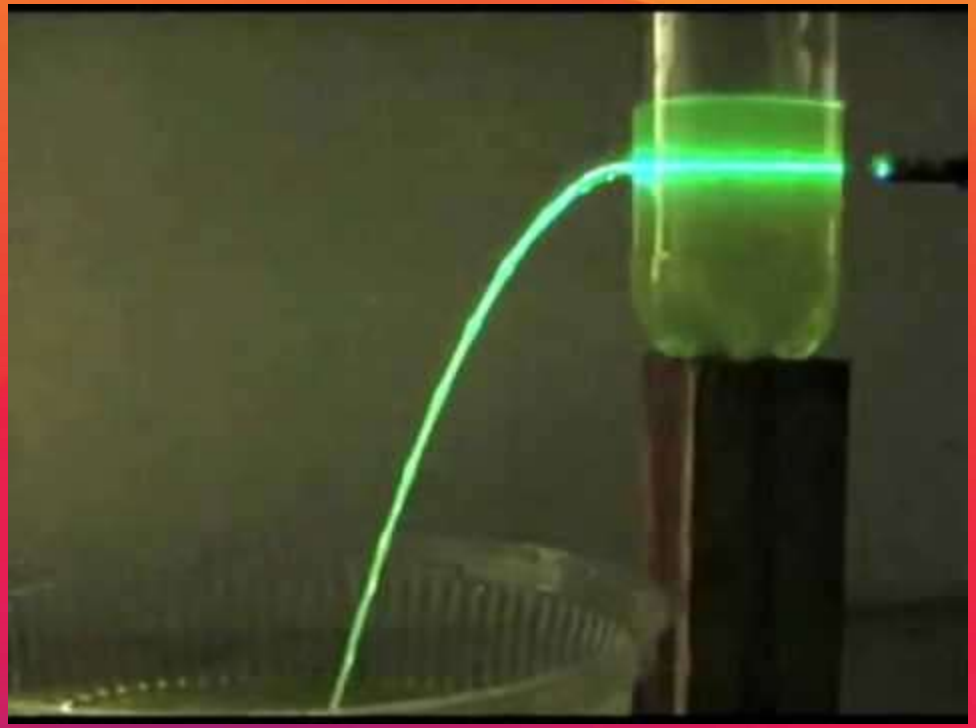
Finish Unit 1 Part 2 on Thursday/Friday- CER

Light Demos- On Your Own

How do we model in physics?

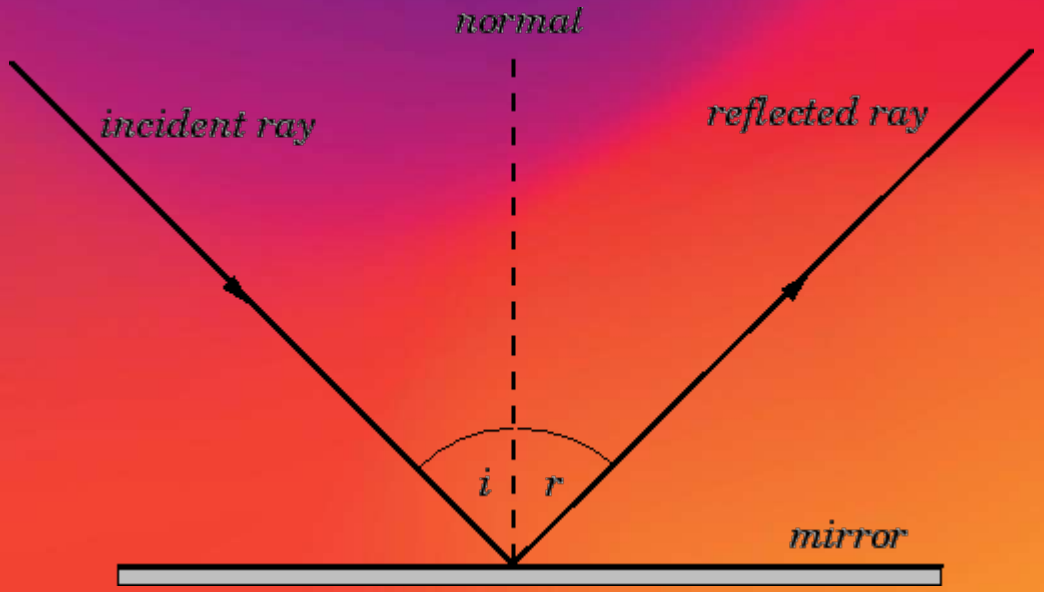
- Model what you see in a mirror
- Model what you see when you look out a window
- Model what you see when you look at yourself on a black screen (phone, computer screen or tablet)


1AD

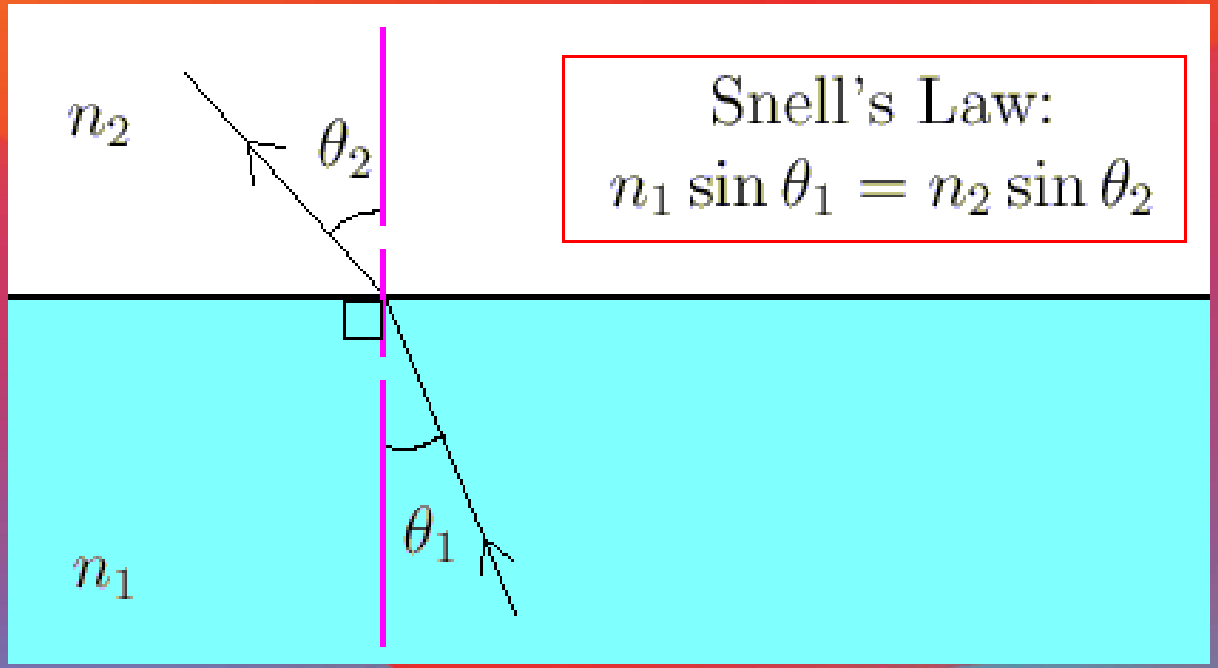



pour the
magic
liquid....

Law of Reflection



Snell's Law



Snell's Law:

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

10/15 & 10/16

Warm Up

- What is the difference between reflection and refraction? Give an example.
- Is there someone in this class you want to work with on a lab?

Agenda

- Reflection Lab with Breakout Group and Group CER
- Refraction Lab on your own and CER

10/19 & 10/20

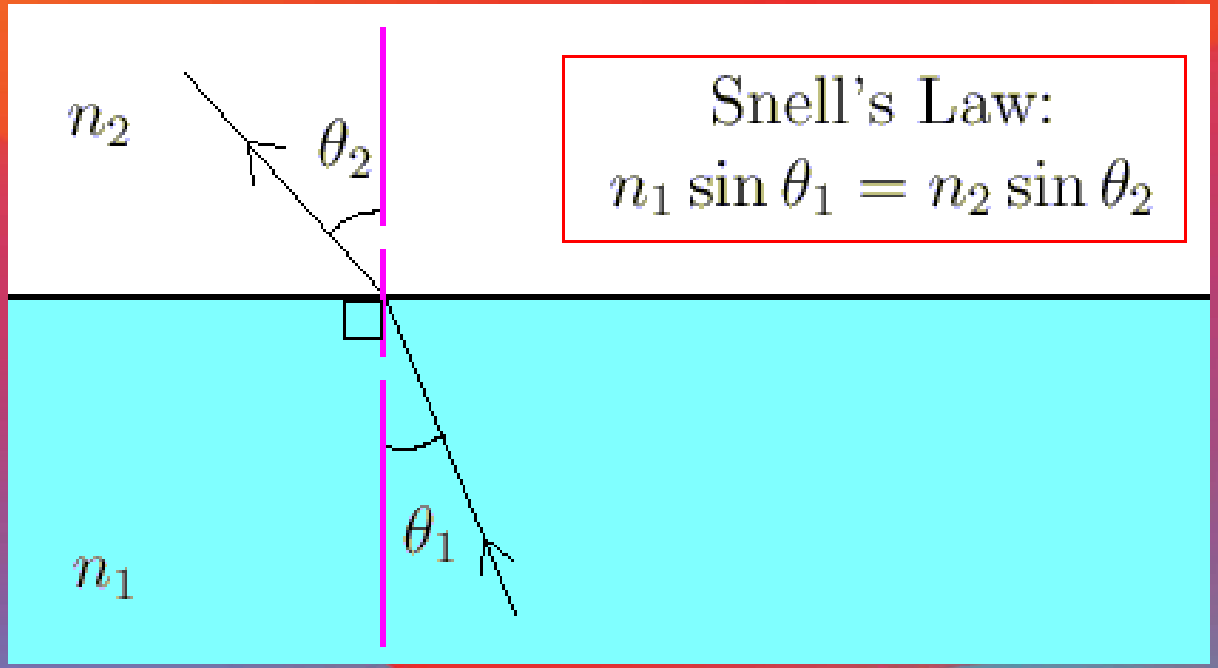
Warm Up

- Open up your refraction lab.
- What is Snell's Law?

Agenda

- Refraction Lab Questions
- 20 Minute Work Time
- Present to teacher and self evaluate Communication of Content, Verbal/Nonverbal Communication & 2 Way Conversation

Snell's Law



Snell's Law:

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

$n_1(\sin @_1) = n_2 (\sin @_2)$

$1.00 (\sin 45) = 1.33 (\sin @_2)$

$\frac{1.00 (\sin 45)}{1.33} = \sin @_2$

$0.5316 = \sin @_2$

$\sin^{-1} (0.5316) = @_2$

$@_2 = 32$ degrees

#2 Scientific Communication

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10/21 & 10/22

Warm Up

- Did you hear the thunder last night?
- Describe what you feel or see when thunder happens.

Agenda

- Introduction to Sound Demos
  - Tuning forks and water
  - Doppler Effect
- Sound Labs
- Present Refraction CER to Teacher

Hour 6 Observations

- C didn’t affect the water as much
- Lower the pitch the bigger the splash
- All disrupted the water
- Pitch dampened once fork was put in the water
-

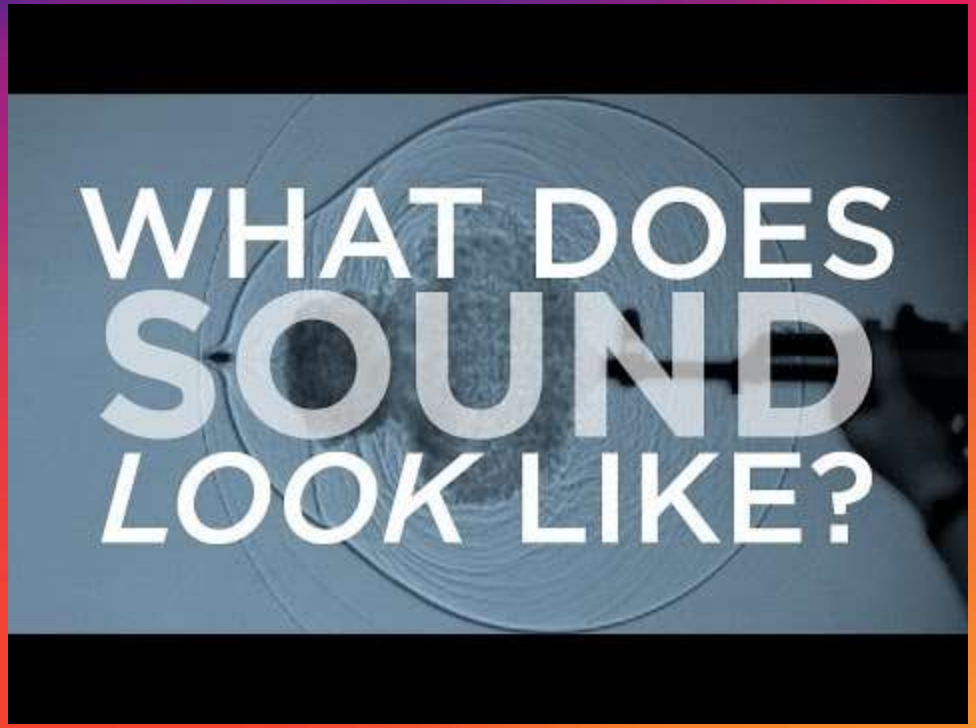
10/23 & 10/26

Warm Up

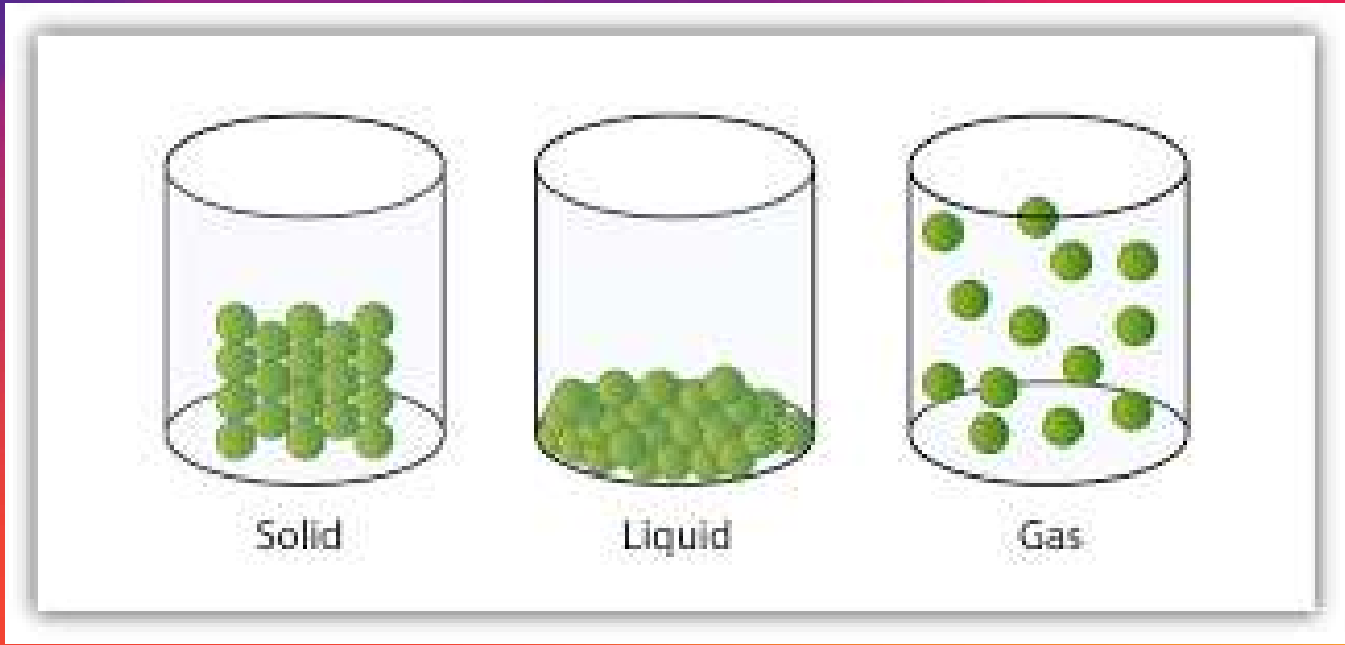
- Share something positive from this week. What is something you are looking forward to in the future?

Agenda

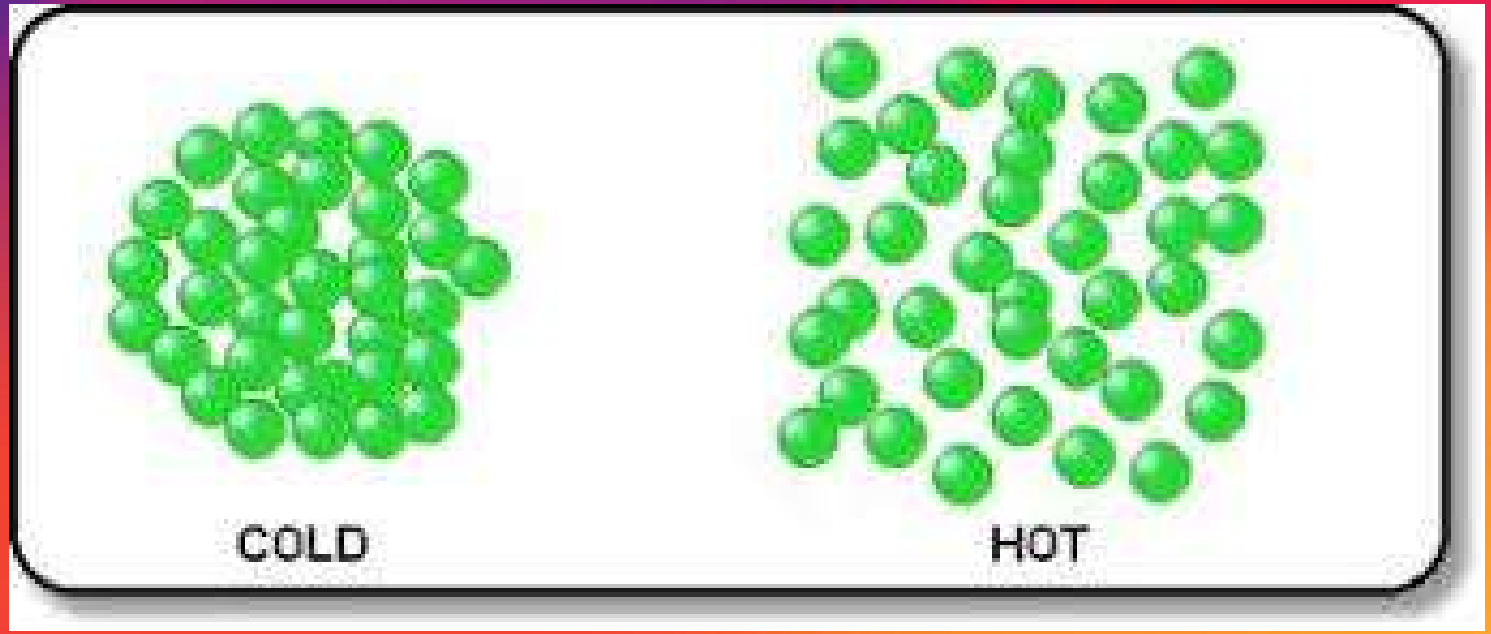
- Review Sound Labs
- Class conclusions
- Sound Waves
- Speed of Sound
- Final CER
- Any presentations & missing work


WHAT DOES
SOUND
LOOK LIKE?

https://www.nde-ed.org/EducationResources/HighSchool/Sound/speedinmaterials.htm


Solid
Liquid
Gas

https://www.ksla.com/2018/10/22/weather-or-not-how-cold-air-impacts-your-tire-pressure/



Speed of Sound

https://www.nde-ed.org/EducationResources/HighSchool/Sound/speedinmaterials.htm

Final Phenomenon: Does sound travel faster on a cold or hot day? Model and explain your reasoning.