Unit 11 Ch 4 – Electromagnetic Spectrum

Key Terms

- **Electromagnetic Spectrum:** all possible frequencies or wavelengths of radiation
- **Angstrom:** a unit used to represent wavelengths of light (color)
- **Spectroscope:** a tool used to measure the wavelengths of light
- **Edwin Hubble:** Developed the idea of the Red Shift in 1929 based on a study of the light received from the distant galaxies
- **Red shift:** indicates everything in the universe is moving away from each other
- **Blue shift:** indicates objects are getting closer – moving toward each other

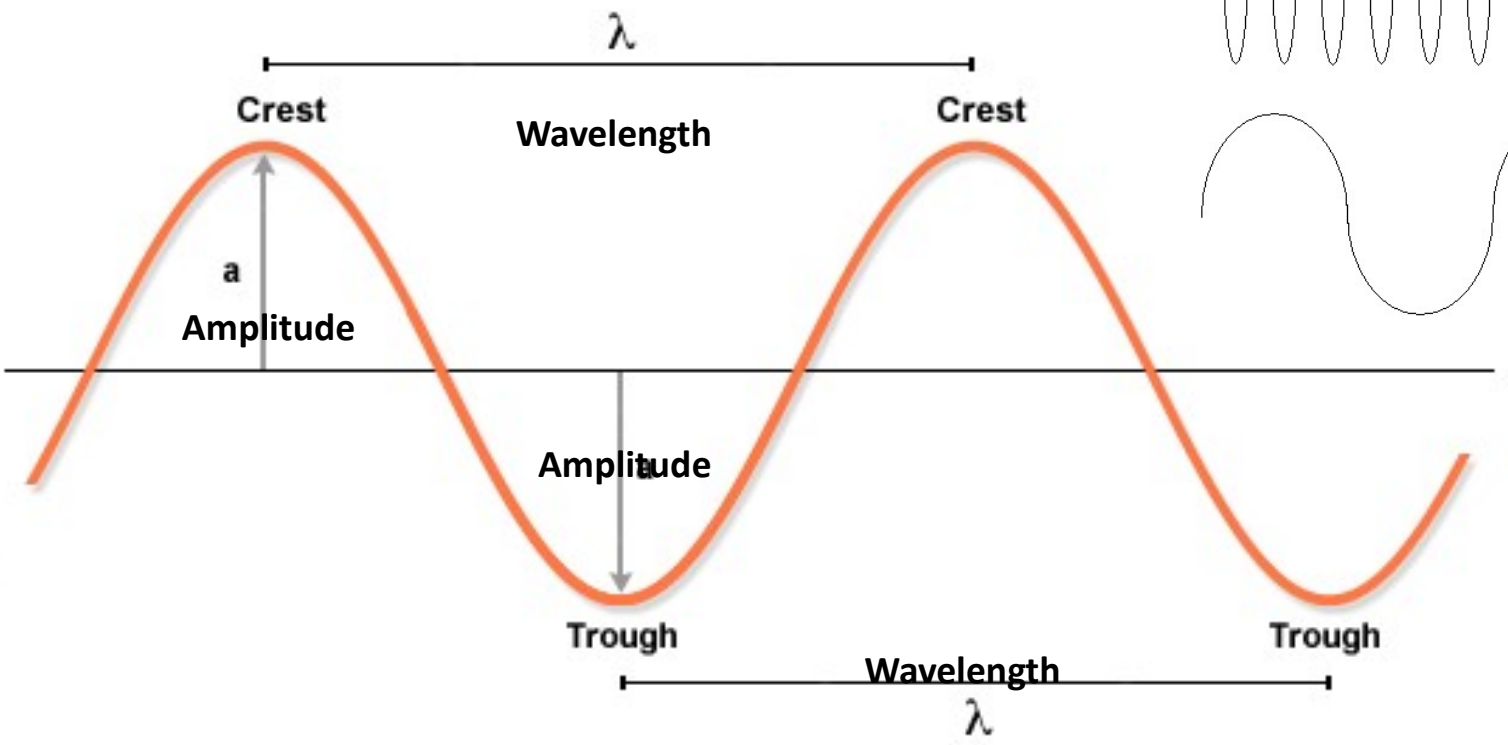
Fast Facts

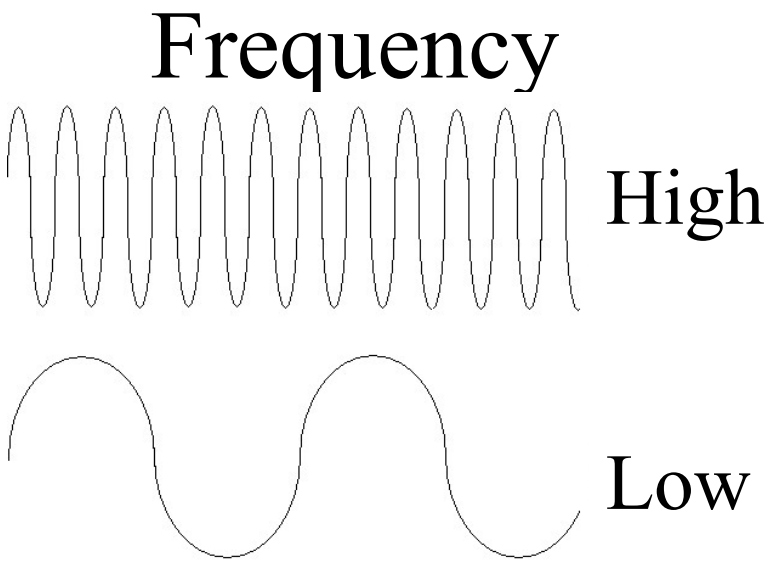
- Light travels at a constant speed: 186,000 miles per second
- Light year – **distance (not time)** light can travel in one year.
- Light is both a wave and a particle (photon)

Electromagnetic (EM) Spectrum

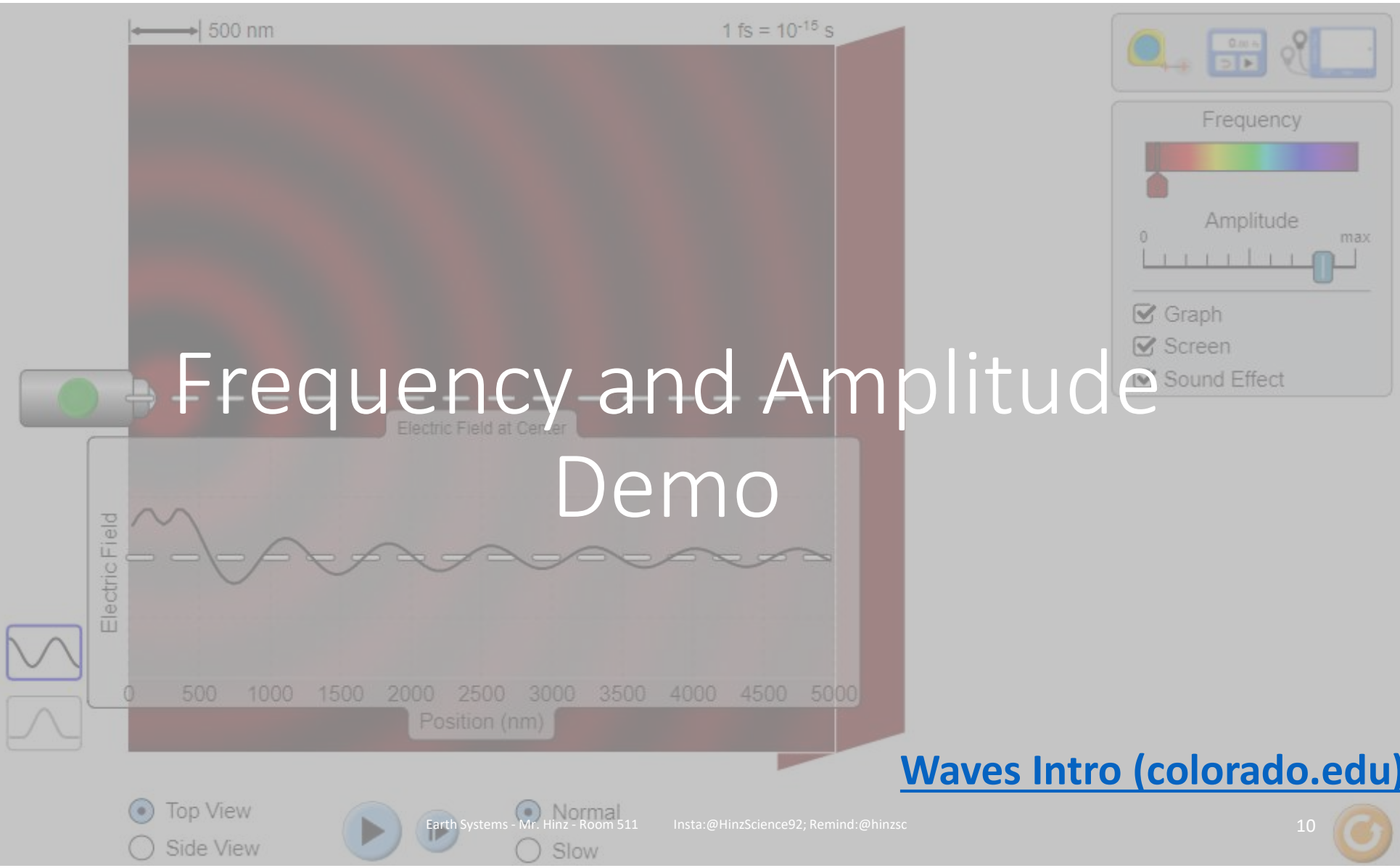
- Displays all types of light
- Visible light is only a small portion of this spectrum
- The type of wave depends on the frequency that the light is traveling.

Wave Characteristics





Frequency and Amplitude Demo

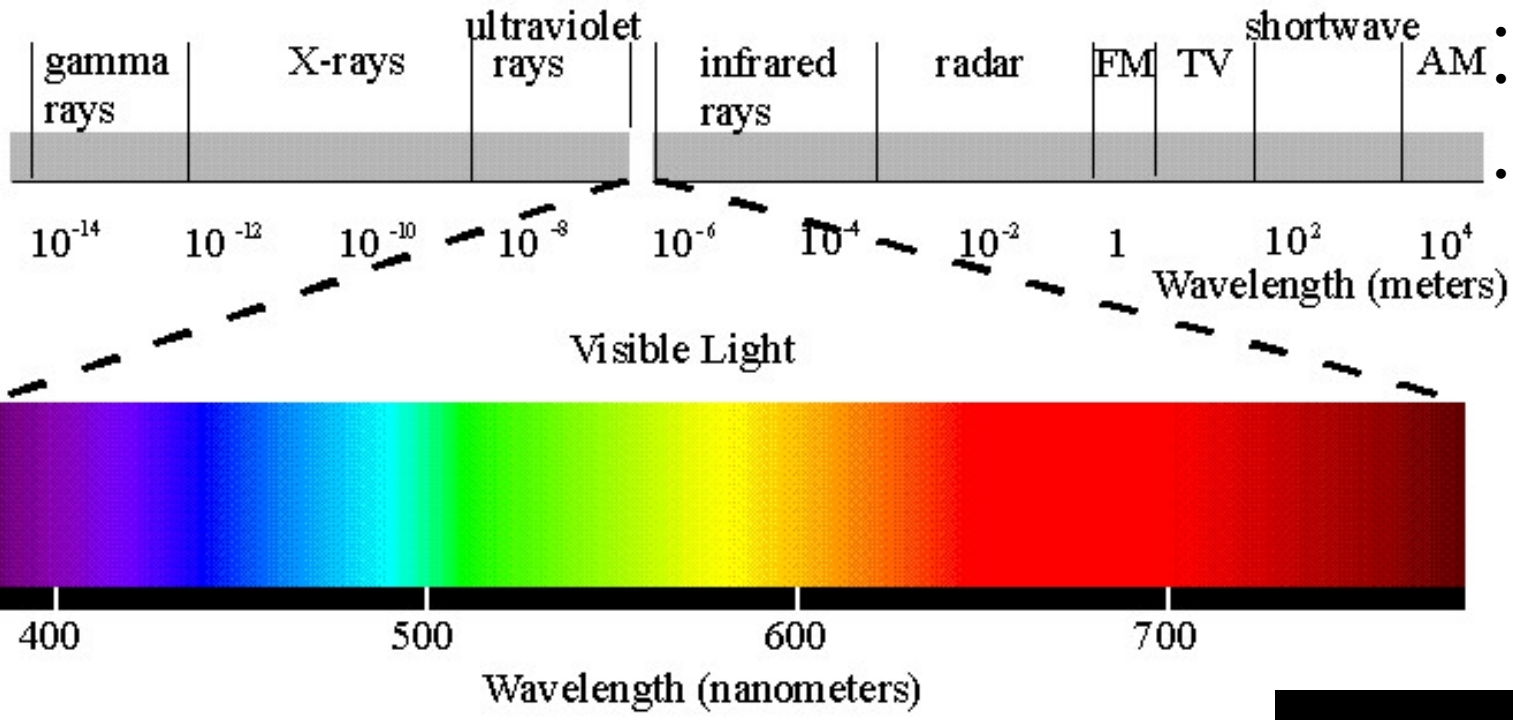


Waves Intro (colorado.edu)

Resource 9

Electromagnetic Spectrum

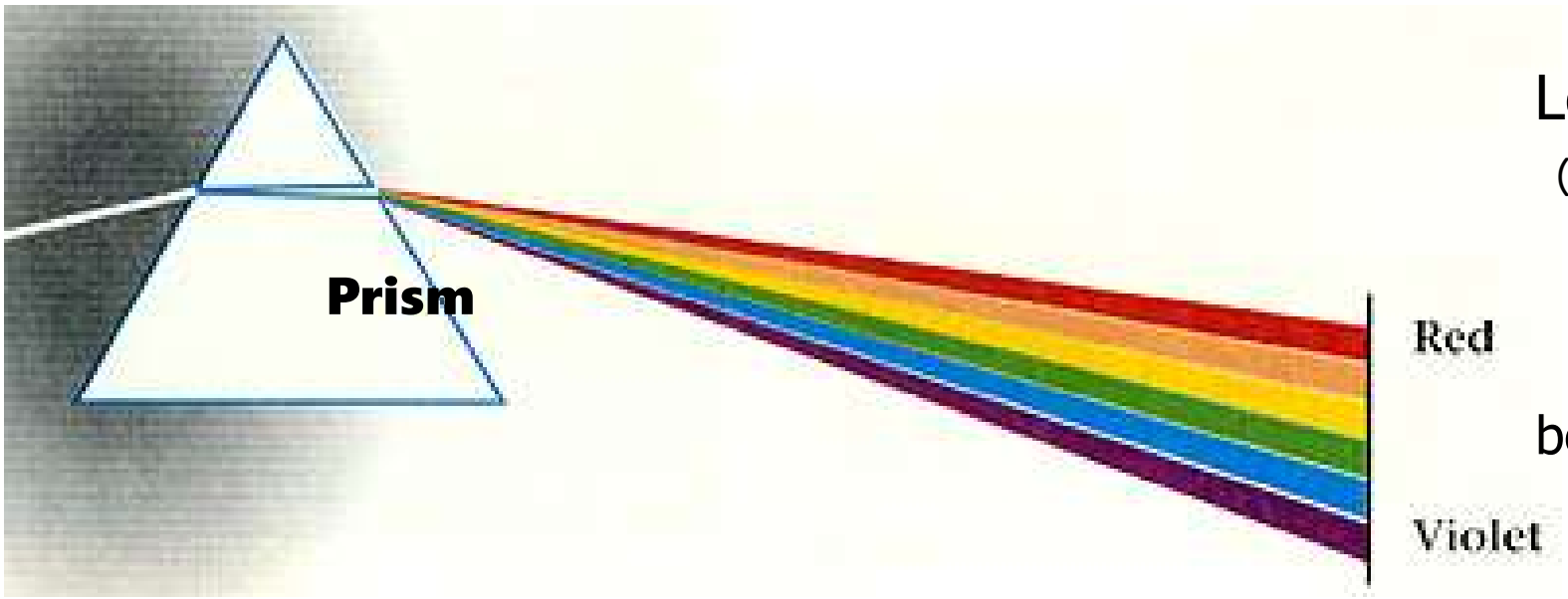
- High Energy
- Short Wavelength
- High Frequency



- Low Energy
- Long Wavelength
- Low Frequency

ROYGBIV

Refraction of light Through a Spectrum

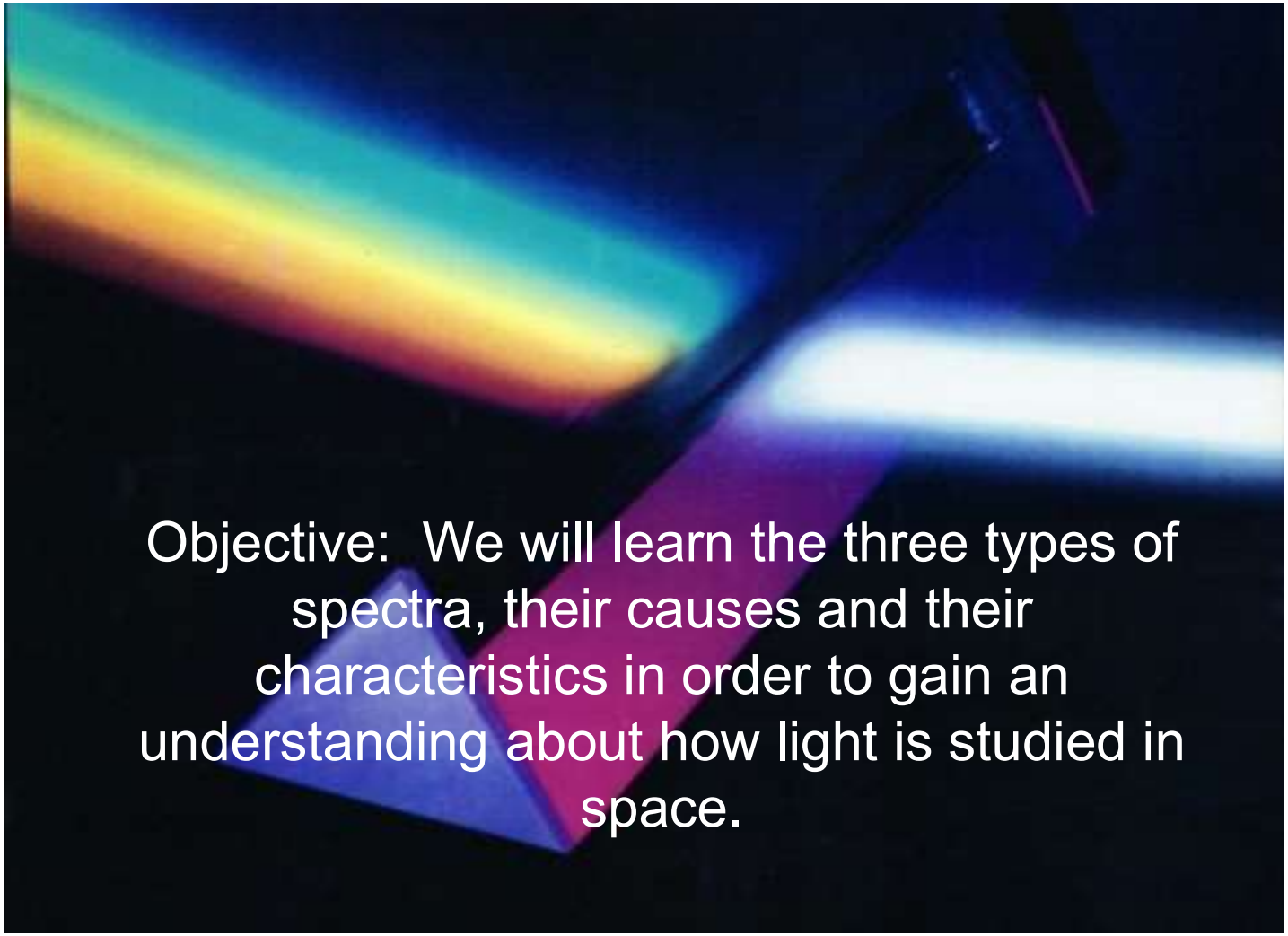


Long waves
(low frequency)

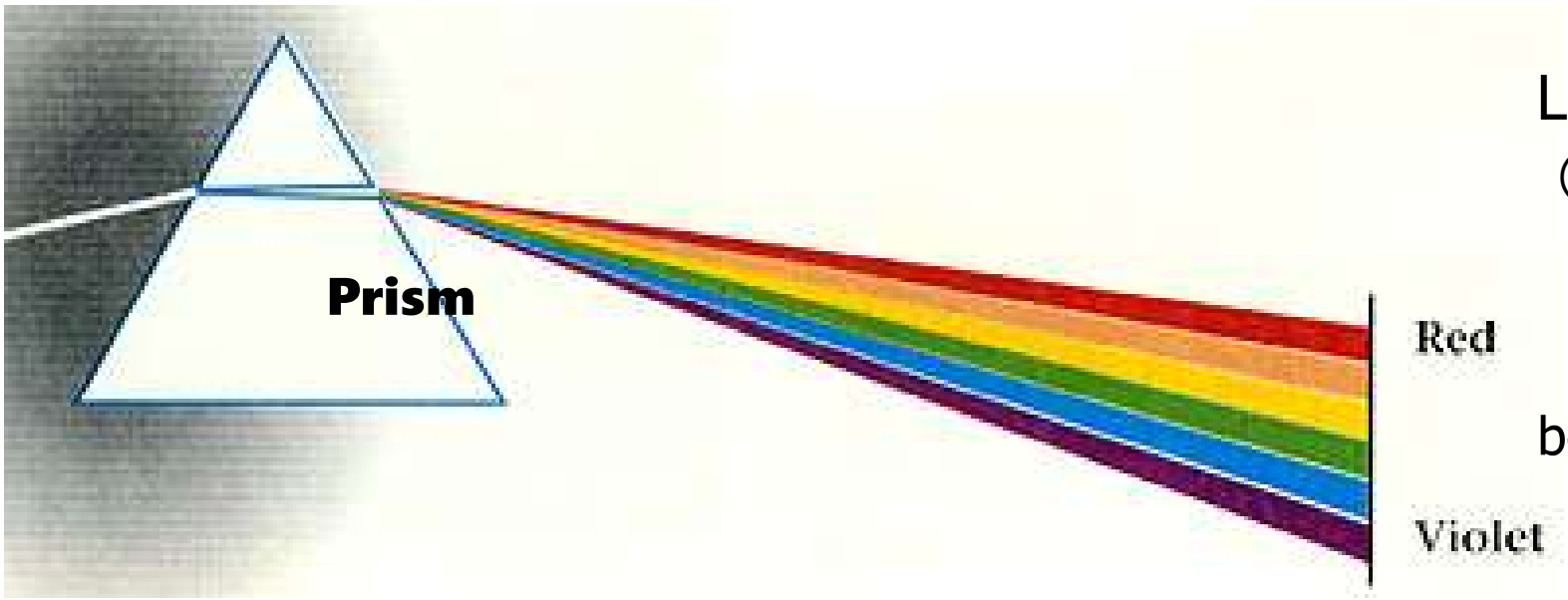
bend **less** than

Short waves
(high frequency)

Unit 11 Ch 5 – 3 Types of Spectra


Objective: We will learn the three types of spectra, their causes and their characteristics in order to gain an understanding about how light is studied in space.

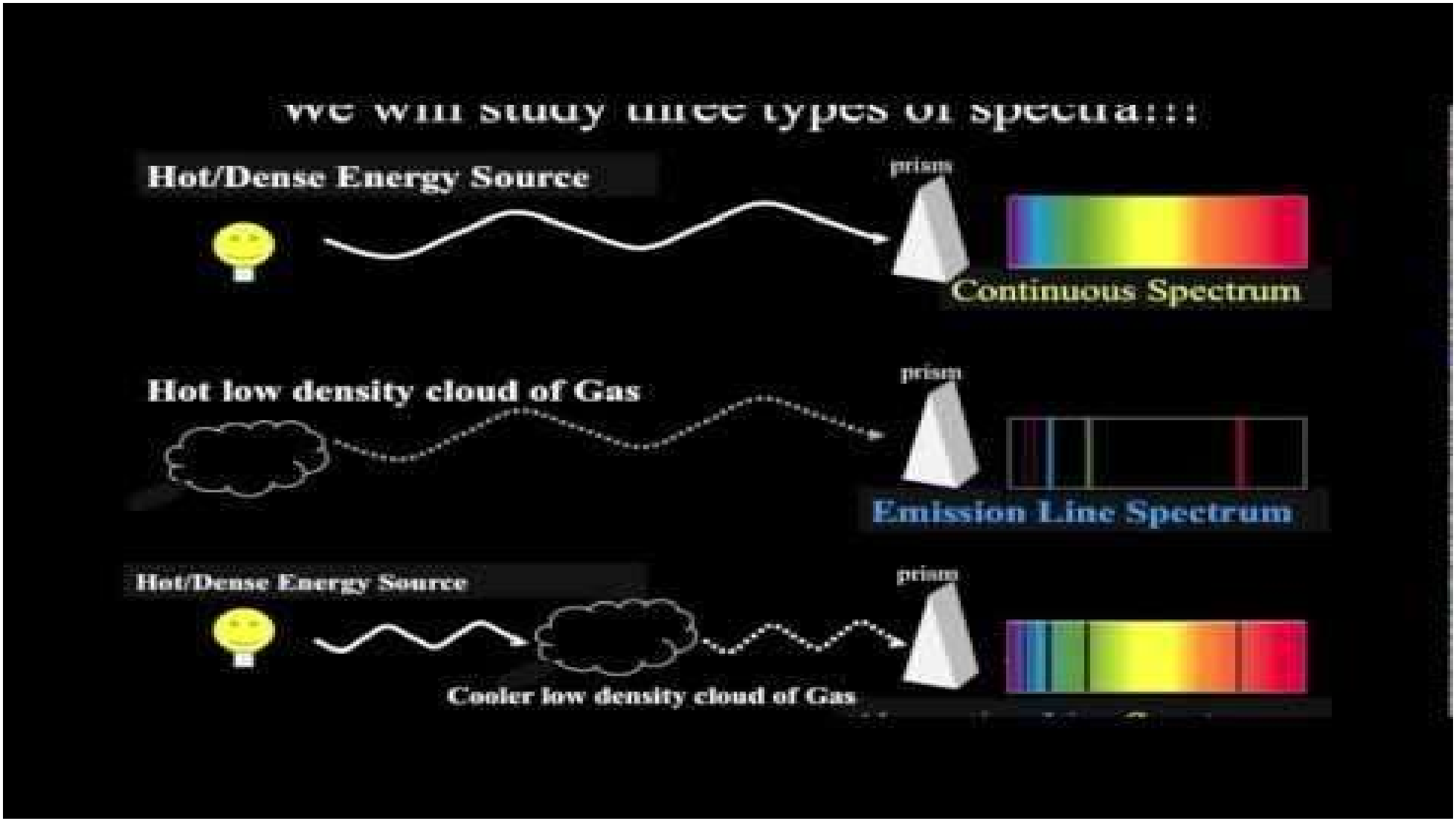
Refraction of light Through a Spectrum



Long waves
(low frequency)

bend **less** than

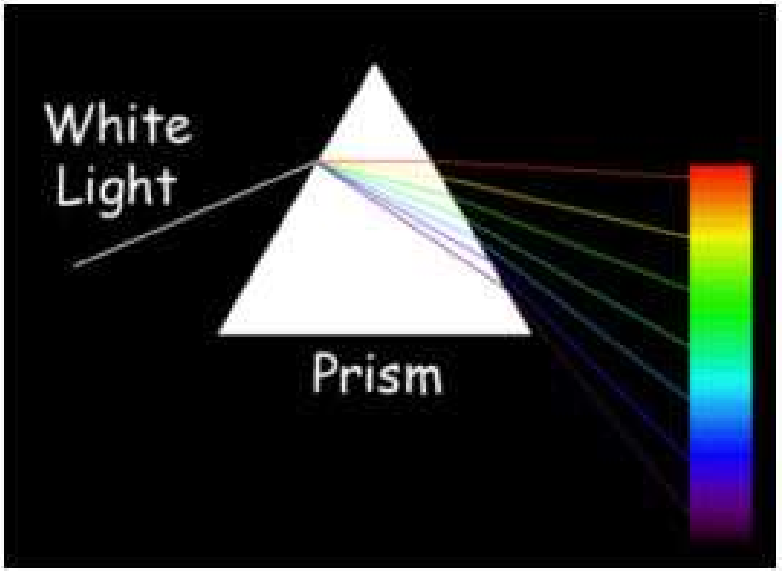
Short waves
(high frequency)



https://www.youtube.com/watch?v=6IMJglnz2Uw

Continuous Spectrum

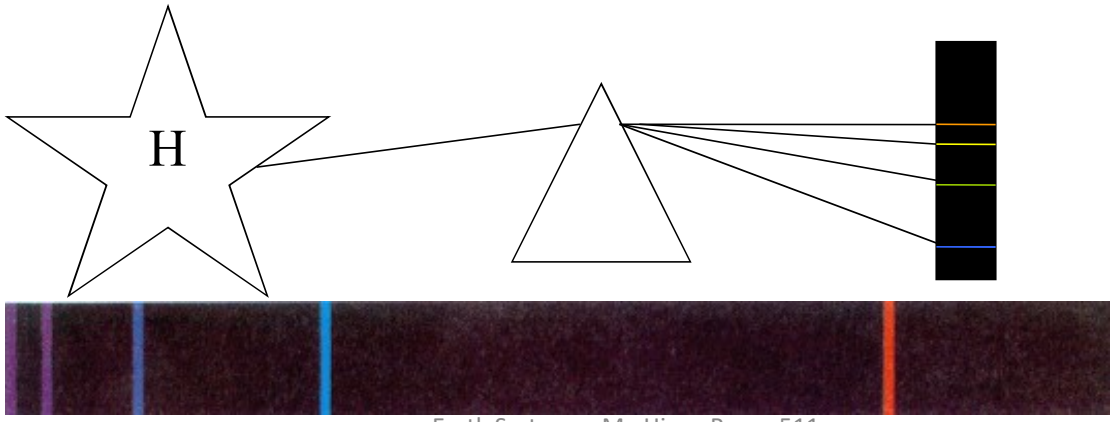
- Full spectrum rainbow.
- Created by pure white light being separated into different colors



Emission (Bright Line) Spectrum

No two gases have like spectrum. Acts like a gas *fingerprint*.

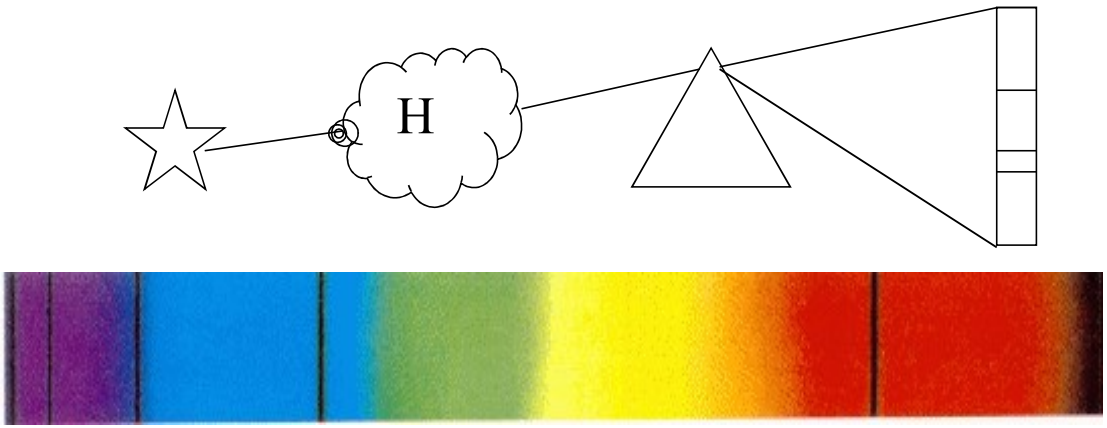
- Gas is heated and viewed through a prism
- Only certain colors (**Bright Lines**) appear
- Every gas produces its own specific wavelengths of light
- When the light is bent, only a few colors are present in the spectrum.



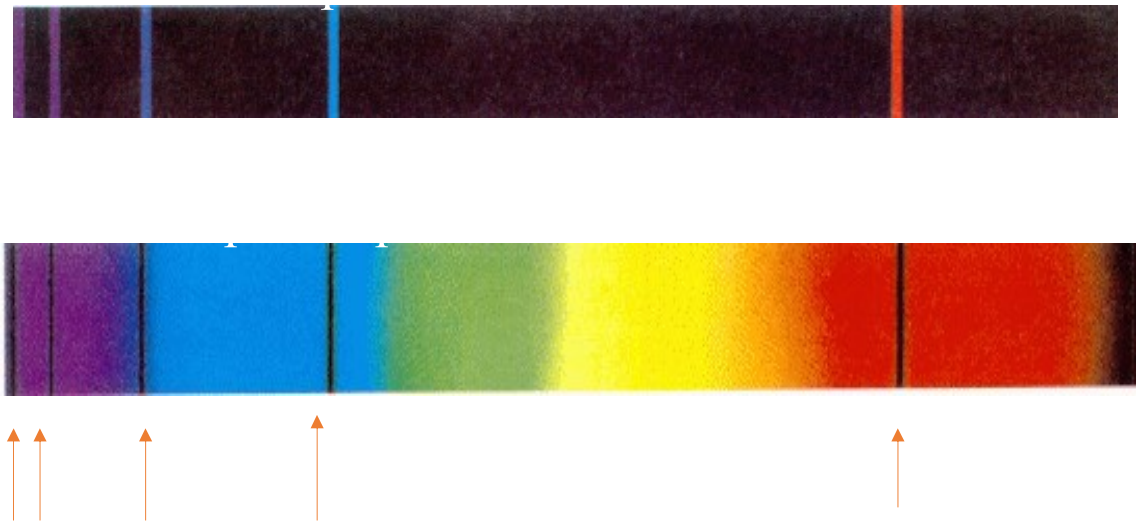
Absorption Spectrum

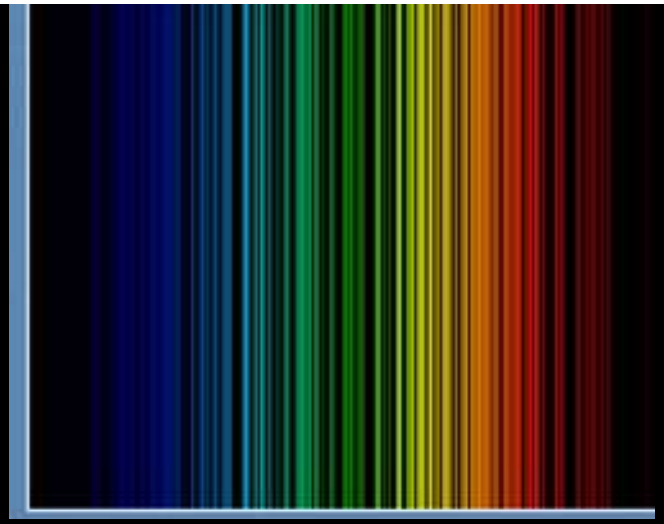
***Spectrum is the fingerprint of that gas**

- **White light passes through a gas**
- **Certain wavelengths are absorbed.**
- **Only the frequencies of that certain gas are absorbed**



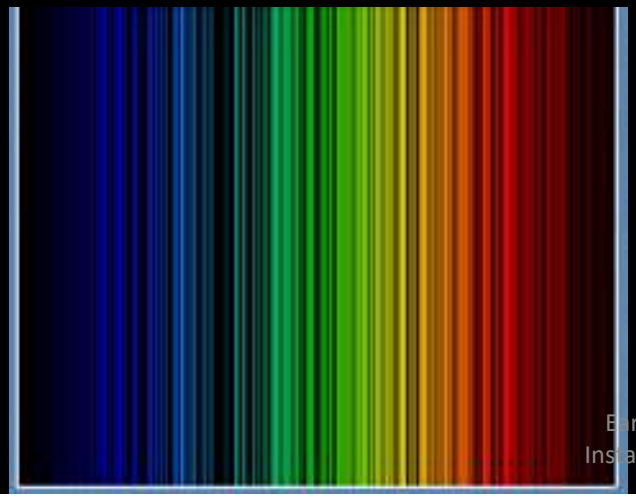
Spectra (Fingerprint) for Hydrogen



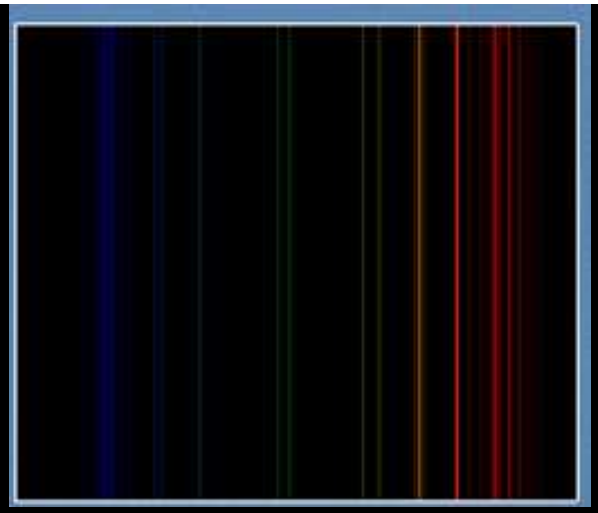


NEON

CHLORINE

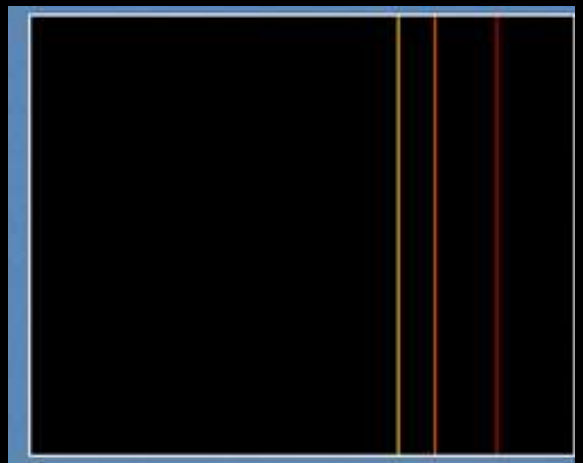


Elements may have similar spectrum, but no two elements share the same.



BROMINE

BORON



Unit 11 Ch 5A – Spectroscopy Lab

EMS LAB (Spectroscopy Lab)

- Form groups of no more than 4! Write the names of your group members on a yellow sticky note.
- When I tell you, Trade in the yellow sticky for Crayons
- On my “Go!” you may start the lab.

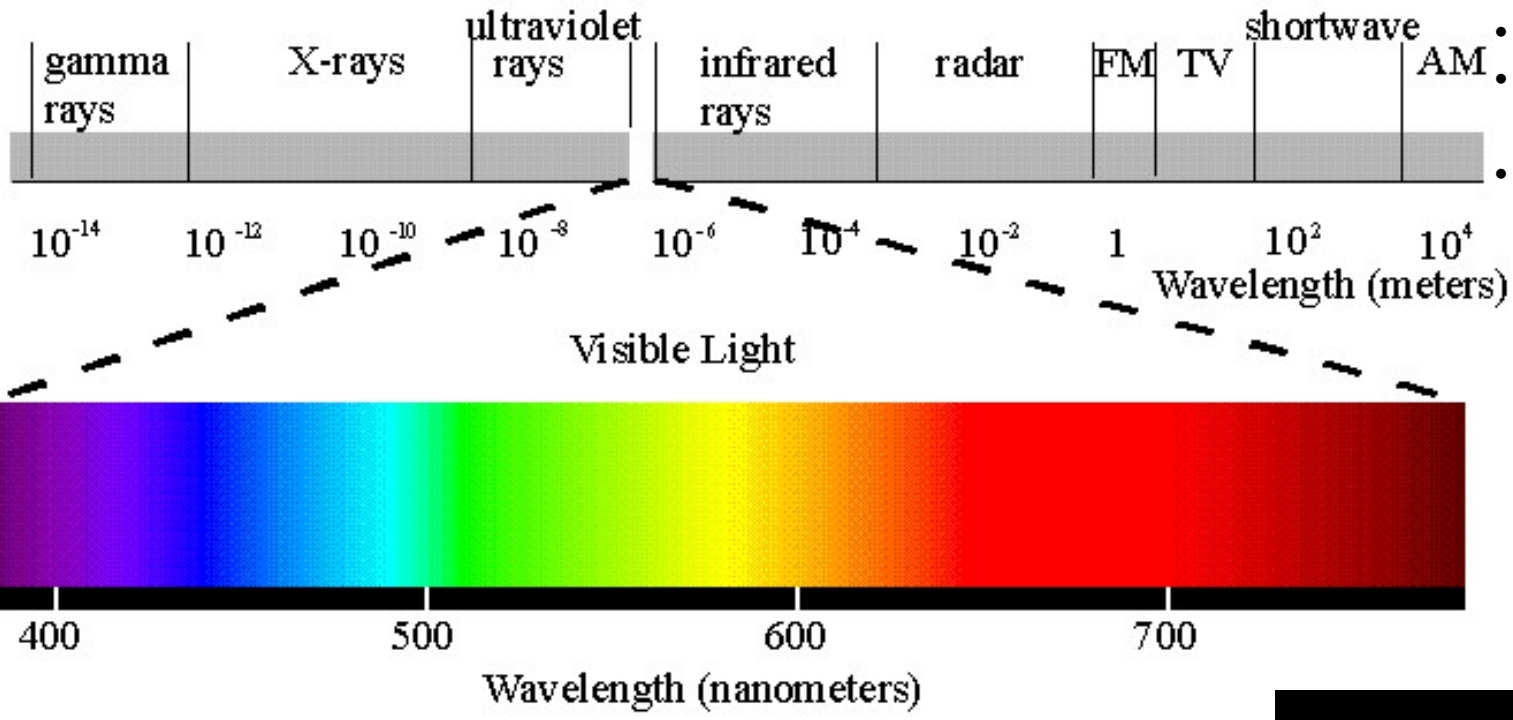
EMS LAB (Spectroscopy Lab)

- Follow directions- Share supplies with your partners
- Look through the narrow center end
- Line the light up with the small, vertical opening
- See the colors / spectrum to the right of your eye
- When you are done, answer the questions on page 2
- **You mess up the stuff (Spectroscopes, Lamps, Crayons,…) - You FAIL!**
- **Don't turn in a full set of Crayons for your group – You all FAIL!**
- **You screw around-You FAIL!**

Resource 9

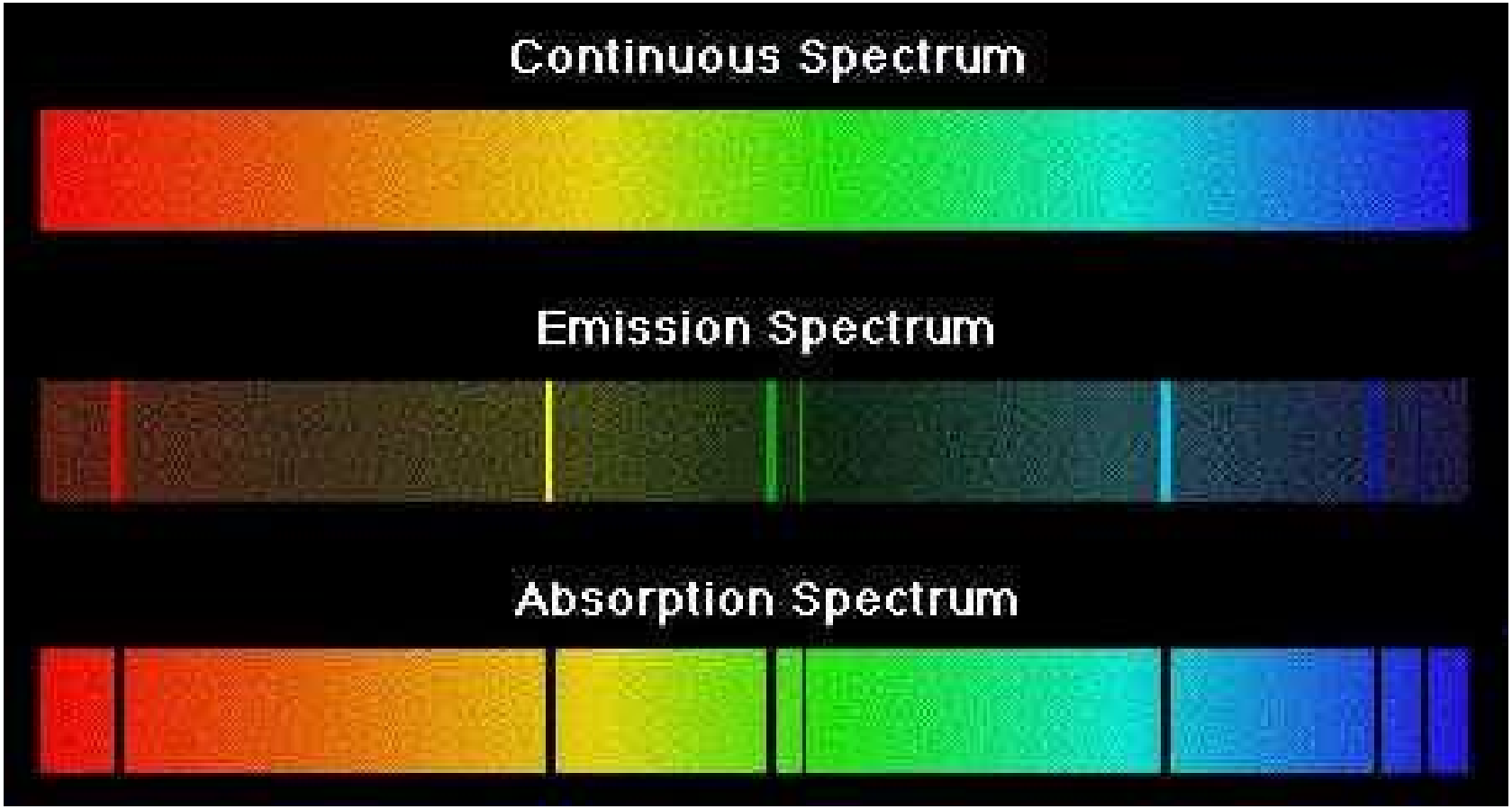
Electromagnetic Spectrum

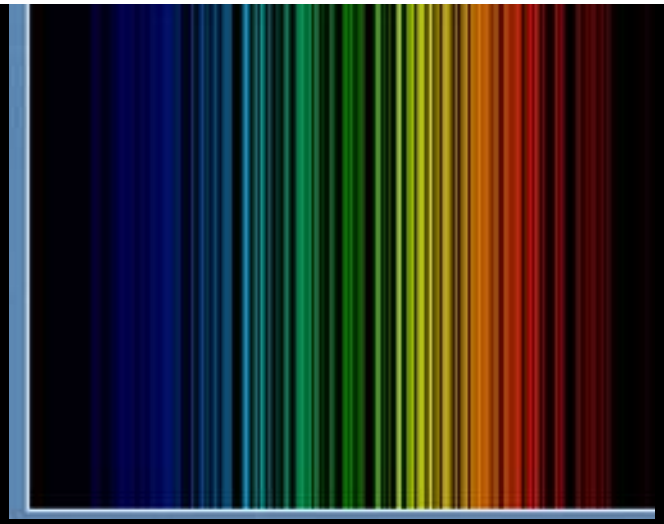
- High Energy
- Short Wavelength
- High Frequency



- Low Energy
- Long Wavelength
- Low Frequency

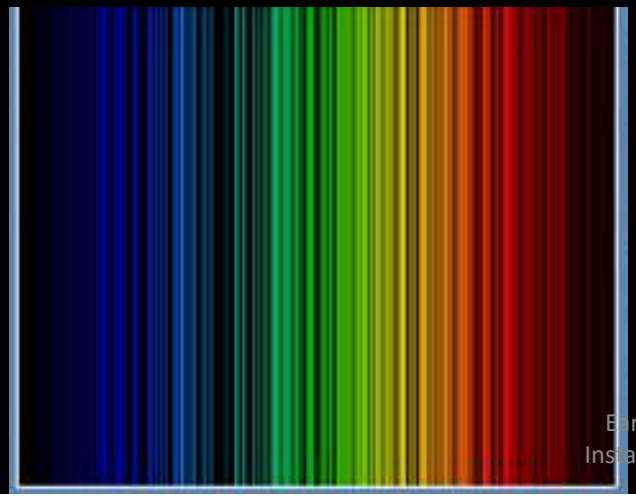
ROYGBIV


Continuous Spectrum
Emission Spectrum
Absorption Spectrum

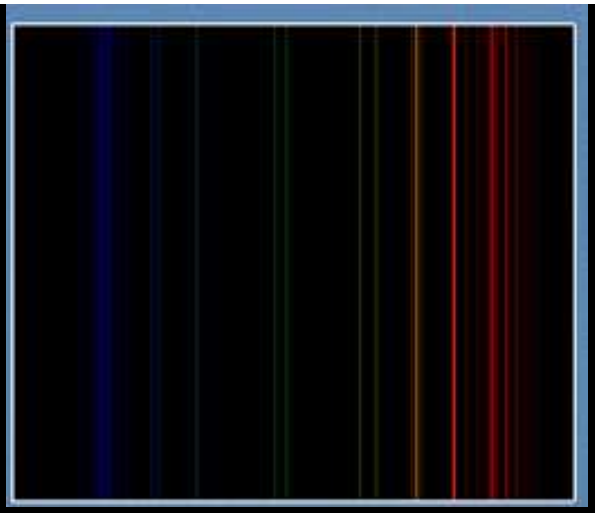


NEON

CHLORINE

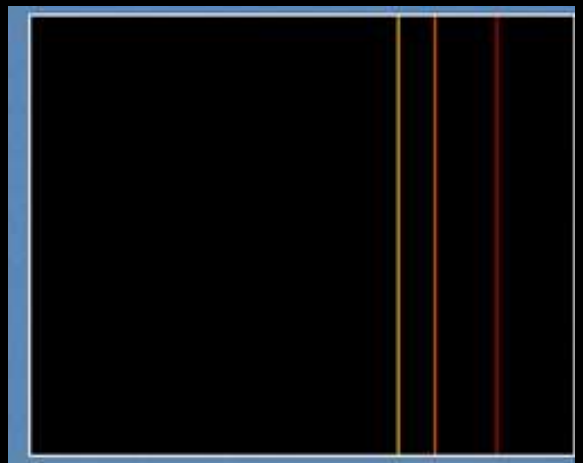


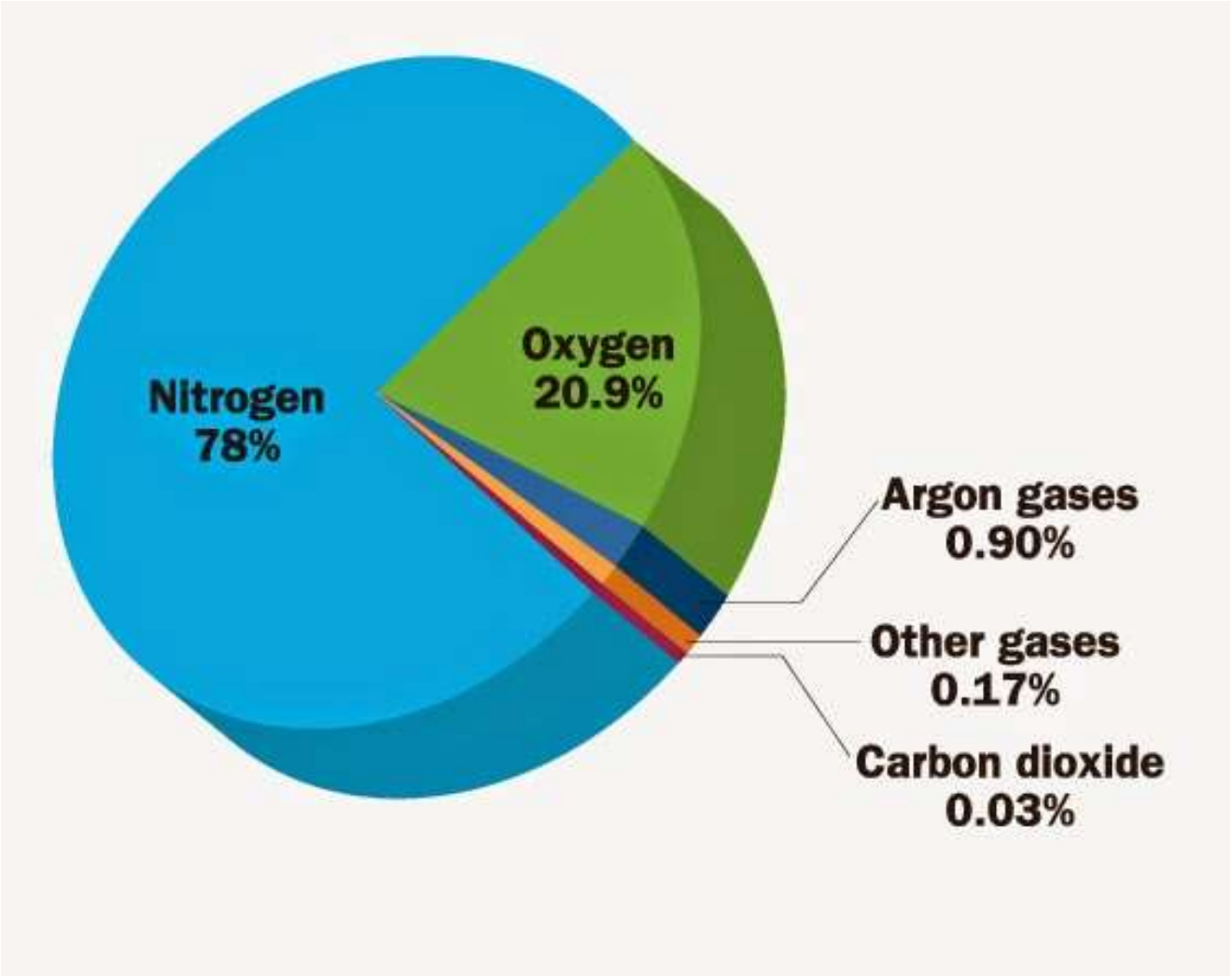
Elements may have similar spectrum, but no two elements share the same.

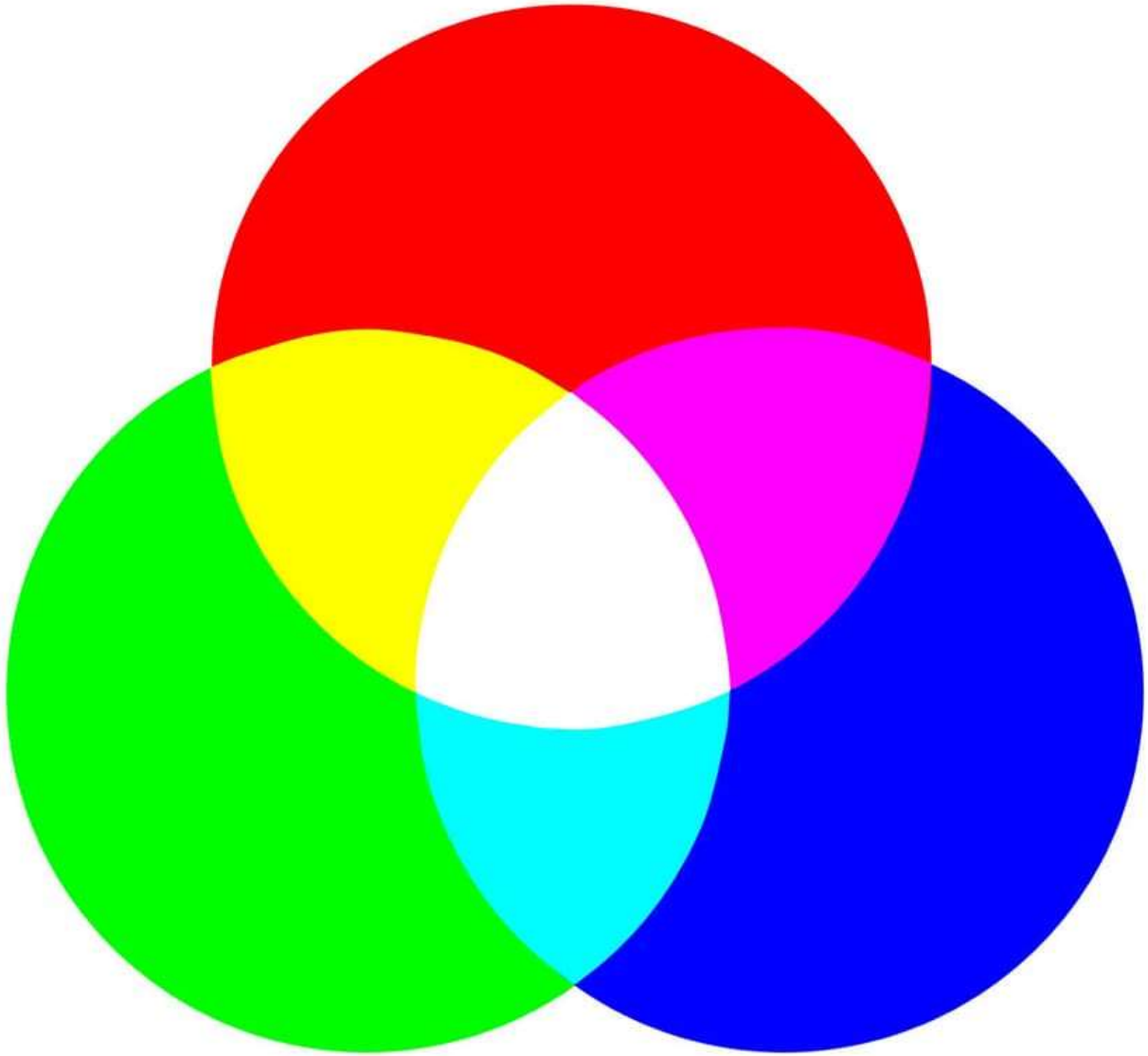


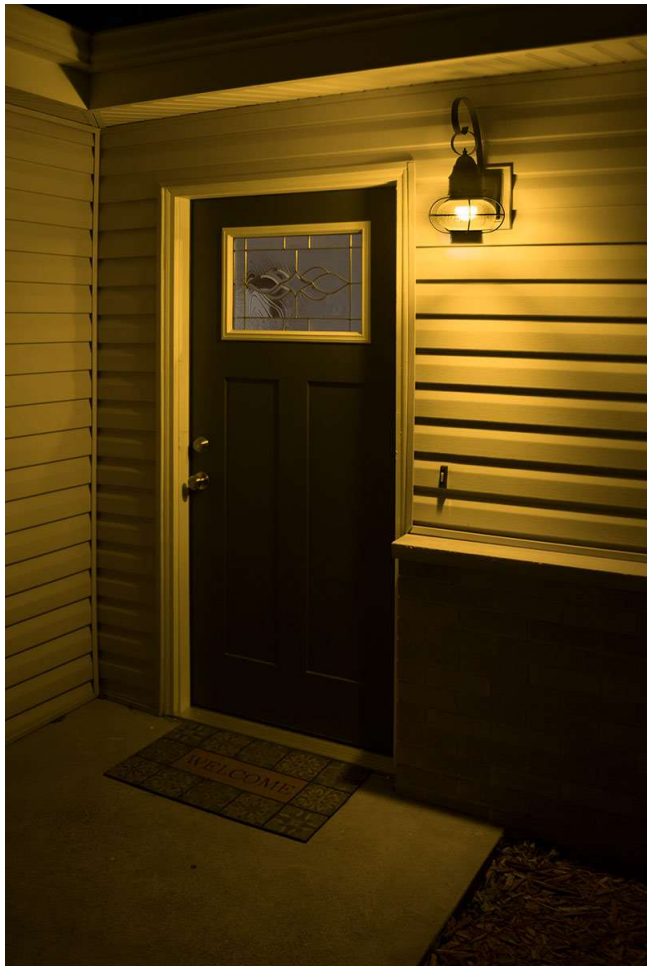
BROMINE

BORON




Nitrogen
78%
Oxygen
20.9%
Argon gases
0.90%
Other gases
0.17%
Carbon dioxide
0.03%




WELCOME