

Electromagnetic Spectrum

8.8C **Exploring** how different wavelengths of the electromagnetic spectrum such as light and radio waves are used to gain information about distances and properties of components in the universe.

Questions

1. Write 3 things you know about the Electromagnetic (EM) Spectrum.
- 2. What is the EM Spectrum?**
3. What is a spectrometer and what is it used for?
- 4. What does ROYGBIV stand for? Why is this information useful?**
5. Describe the characteristics of Radio Waves.
- 6. Describe the characteristics of Light Waves.**

What is the Electromagnetic (EM) Spectrum ?

- Discuss this question with your shoulder partner. (Hint: think light spectrum)
- Write 3 things you know about the EM Spectrum.
- Be prepared to share your answers with the class.

The EM Spectrum

- The EM Spectrum is the range of all possible frequencies of the electromagnetic radiation.
- The EM Spectrum extends from waves with low frequencies and long wavelengths used for modern radio to gamma radiation waves with high frequency and short wavelengths.
- The EM covers wavelengths from thousands of kilometers down to a fraction of the size of an atom.

Spectrometer

- Use one of the spectrometers provided to look at a light source within the classroom.
- Use the colored pencils to record what you see when looking through the spectrometer.

So how do we measure the properties of light?

- A **Spectrometer** is an instrument used to measure properties of light over a specific portion of the EM Spectrum.
 - used to identify materials by measuring the lights intensity
 - used to measure wavelengths that range from Radio to Gamma

Insert visual for frequency and wavelength



Visible light

- Only type of EM wave able to be detected by the human eye
- Violet is the highest frequency light
- Red light is the lowest frequency light
- **ROYGBIV-**
Red, Orange, Yellow, Green, Blue, Indigo, Violet

Uses of Spectrometers

- Turn to your partner and discuss for 2 min how a spectrometer can be useful to an astronomer?
- Don't forget about mr. ROY G BIV!!!!

USGS and MARS

“Dr. Clark and Todd M. Hoefen at the USGS in Denver, Colo. found the plentiful olivine on Mars using data from the Mars Global Surveyor (MGS), Thermal Emission Spectrometer (TES). Olivine, a green mineral sometimes used in jewelry, is found on Mars in volcanic regions.”

Retrieved on July 6th, 2011 from <http://speclab.cr.usgs.gov/mars.press.release.10.2000.html>

USGS and MARS

- Look at the two images at the following link:
<http://speclab.cr.usgs.gov/mars.press.release.10.2000.html>
- Two different spectrometers were used to identify a specific mineral on Mars.
- The top shows reflected light and the bottom showing light and thermal images.
- ***Using the spectrometer helped identify this mineral on the surface of Mars!!!!***



Radio waves

- Longest wavelength of EM waves
- Uses:
 - TV broadcasting
 - AM and FM broadcast radio
 - Avalanche beacons
 - Heart rate monitors
 - Cell phone communication

Pictures for Teacher use

- Teachers the following two slides are hyperlinks to pictures that are relative to the EM Spectrum.
- You can simply click on the link to take you to the picture, or **COPY** the link and **PASTE** the link into your browser's location bar to locate the picture.

Related Images

1. http://www.antonine-education.co.uk/New_items/MUS/images/Making6.gif
2. <http://www.geocities.com/researchtriangle/campus/6791/einstein12.jpg>
3. http://abyss.uoregon.edu/~js/glossary/wave_particle.html
4. http://www.astro.princeton.edu/~gk/A402/electromagnetic_spectrum.jpg
5. <http://science.hq.nasa.gov/kids/imagers/ems/radio.html>
6. <http://www.nentjes.info/Palace/radio-6.gif>
7. <http://www.mobilewhack.com/motorola-h12-bluetooth-headset.jpg>
8. <http://www.stuffintheair.com/radar-real-time-weather.html>
9. <http://www.imaging1.com/gallery/images/AV%20Night%20vision%20goggles.jpg>
10. http://www.global-b2b-network.com/direct/dbimage/50329753/Study_Remote_Control.jpg
11. http://www.georgiaprismaward.com/The_Prism_Story_files/PRISM%20brand%20imagemed.jpg
12. <http://science.hq.nasa.gov/kids/imagers/ems/uv.html>

Related Images

13. http://farm3.static.flickr.com/2385/2381723771_12548f4bd1.jpg?v=1217429879
14. <http://intamod.com.au/images/uv2.JPG>
15. <http://science.hq.nasa.gov/kids/imagers/ems/xrays.html>
16. http://www.sciencelearn.org.nz/var/sciencelearn/storage/images/cont_exts/see_through_body/sci_media/neck_x_ray/17945-5-eng-NZ/neck_x_ray_full_size_portrait.jpg
17. <http://www.epinion.eu/wordpress/wp-content/uploads/2008/05/airport-security1.jpg>
18. <http://science.hq.nasa.gov/kids/imagers/ems/gamma.html>
19. <http://www.aboutnuclear.org/print.cgi?fC=Food>
20. http://www.roswellpark.org/files/1_2_1/brain_spinal/gamma%20knife%204c.jpg