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## Lesson Plan

<b>LESSON NAME</b>	<u>Lightwaves</u>
<b>GRADE</b>	<u>High School</u>
<b>SUBJECT</b>	<u>Physics</u>
<b>LESSON TOPIC</b>	<u>Electromagnetic Spectrum and X-Rays</u>
<b>NUMBER HOURS FOR LESSON</b>	<u>1 hour</u>

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Using your daily logs, create a lesson based on your activities completing a project or job shadowing.

**Summary:** Using the space below, summarize the lesson plan in 10-20 sentences. Explain how this lesson is connected to your externship and how you are involving industry in this lesson.

This lesson will discuss all the possible frequency ranges for electromagnetic radiation. I will use my experience in the radiology lab conducting X-rays, as an example of how humans experience electromagnetic radiation. We experience electromagnetic radiation whether we want to or not, and we can use it as a tool to describe many different things we observe. Students will create their own chart of the Electromagnetic Spectrum to fill out, as I will be at the board creating a chart labeling the different measurements and observations of the spectrum. Using a PEAK strategy called 'Interactive Notes' students will not need to copy what the teacher writes on the board, but rather provide examples or notes of their own with teacher guidance, but still have the option of copying teacher notes if they'd like. The notes are meant to be a student led and individual pursuit. The wavelength frequency will be listed from longest to shortest which in order goes Long and Shortwave Radio, Microwave, Infrared, Visible, Ultraviolet, X-ray, and Gamma Rays. The teacher will start by describing the Visible wavelength because those of us with the sense of sight can see the wavelengths with our eyes. This is represented in the colors we see. The teacher will display a picture of the Rainbow on the SmartBoard and ask students to keep this in mind while passing out light prisms. Students will go to the windows of the classroom with their light spectrums and discuss with each other how light and the light prism interact with each other. On the opposite side of paper from which they were creating their electromagnetic radiation notes, the students will write the letters going down the page in the order of 'R-O-Y-G-B-I-V' and label each letter and it's word with the corresponding colors of 'Red-Orange-Yellow-Green-Blue-Indigo-Violet'. Afterwards, we will discuss the unit of (Hz) for measuring the frequency of the wavelength. We will then turn the classroom radio on and change the frequency to different stations to see how they broadcast at different frequencies. The frequency increases. That will mean we've discussed visible light, radio waves, and the last one for the day will be X-Rays. The teacher will post a picture of a Human X-Ray from the internet and ask students if the wavelength of the X-ray is an increase or decrease in frequency when compared to other areas of the electromagnetic spectrum. The teacher will explain to students how the X-ray wavelength can penetrate the Human body and get absorbed by human bones because of the density, which is how we use X-Rays in the medical fields. Explaining how the X-ray machine can increase the frequency and duration of the wavelength to get better X-rays on areas of the body more dense than others. Before collecting students notes to check for understanding, he or she will tell students how exposure to wavelength frequencies greater than the visible light spectrum can be dangers to human health and a contributable cause to Cancer. This includes Ultra-Violet, X-ray, and Gamma Radiation.

**Outcomes:** List the measurable (or achieved) outcomes students will demonstrate at the end of the lesson.

1 - Students will be able to list the different Radiation types of the Electromagnetic Spectrum. These include

1.)Radio Waves 2.)Microwaves 3.)Infared 4.)Visible light 5.)Ultra-violet 6.)X-Rays 7.)Gamma Rays

2- Students will be able to identify the Visible Light Spectrum colors in order of increasing wavelengths. 1.)Red

2.)Orange 3.)Yellow 4.)Green 5.)Blue 6.)Indigo 7.)Violet

3- Students will be able to identify what practical engineering uses Radio Waves and X-Rays have to society.

Examples can include 1.)Radio waves – Communication 2.) X-rays- Allow radiologist to take human X-rays.

**Standards:** List national and/or industry standards that this lesson will meet.

**\*Alaska State Science Content Standard**

**E. Science and Technology:** A student should understand the relationships among science, technology, and society.

1) develop an understanding of how scientific knowledge and technology are used in making decisions about issues, innovations, and responses to problems and everyday events;

**\*[10] SB3.3** comparing the relative wavelengths and applications of different forms of electromagnetic radiation (i.e., x-ray, visible, infrared, microwaves, radio)

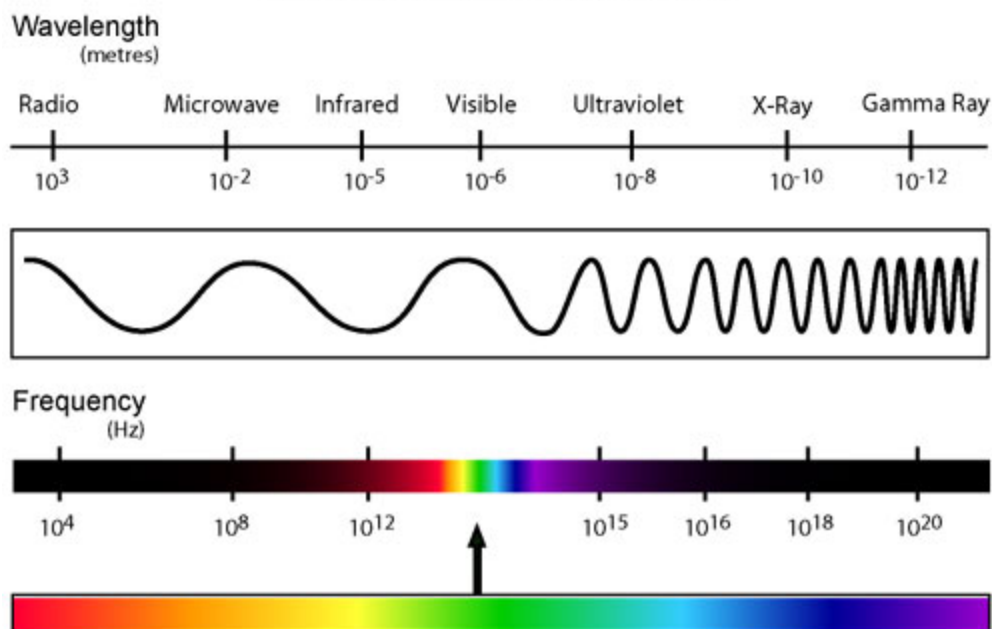
**Equipment/Supplies/Materials:** List items needed to teach and complete this lesson.

- 1.) Pictures of a Rainbow and a Medical X-Ray of a human body part
- 2.) Operating Radio
- 3.) Light Prism
- 4.) Blank Sheets of paper for students and their interactive notes

**Activities:** Clearly outline the activities of the teacher, student, and resources (funds, equipment, community based resources, industry experts, etc.) needed, during the delivery of the lesson. The information needs to be detailed so another person can teach the lesson. In addition, supporting documents (handouts, PowerPoint presentation, examples, quizzes, etc.) for this lesson must be developed and submitted to Blackboard with this document.

- 1.) Teacher will need items depicting how the Visible light Spectrum works (i.e. Light Prism) and Radio waves (i.e. Radio)
- 2.) Teacher created chart at the classroom resembling of the following. . .(These are interactive notes and do not need to be exactly duplicated.)

# THE ELECTRO MAGNETIC SPECTRUM



AND ON THE REVERSE SIDE FOR THE VISIBLE LIGHT SPECTRUM

- RED
- ORANGE
- YELLOW
- GREEN
- BLUE
- INDIGO
- VIOLET

**Evaluation:** Summarize how students are evaluated. You will need to develop a rubric **and** upload the file with this assignment to Blackboard, for more information see **Links for Building Rubrics** in Blackboard. The rubric must clearly state what students need to demonstrate or provide evidence that they have met the above outcomes.

Scroll below....

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## Note Taking Rubric

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Name of Note-taker: \_\_\_\_\_ Date: \_\_\_\_\_

Score: \_\_\_\_\_/\_\_\_\_\_

Name 1. Yes \_\_\_\_\_ No \_\_\_\_\_

Topic 2. Yes \_\_\_\_\_ No \_\_\_\_\_

Handwriting is legible 3. Yes \_\_\_\_\_ No \_\_\_\_\_

Student has the different electromagnetic wavelengths listed in proper order. 4. Yes \_\_\_\_\_ No \_\_\_\_\_

Student has the Visible Light Spectrum listed in the proper order of ROYGBIV 5. Yes \_\_\_\_\_ No \_\_\_\_\_

ROYGBIV is written in their corresponding colors 6. Yes \_\_\_\_\_ No \_\_\_\_\_

**Comments.**