Lesson Title	Electromagnetic Spectrum
Length of Lesson	1 day (50 minutes)
Created By	Hannah Box
Subject	Physical science
Grade Level	8th
State Standards	Eighth Grade: 2e
DOK Level	DOK 2
DOK Application	Predict, Interpret, Compare, Identify Patterns
National Standards	5-8: B: Energy Transfer
Graduate Research Element	Used in fellows spectroscopy to identify compounds.

Student Learning Goal:

State Standards Eighth Grade:
2e. Contrast various components of the electromagnetic spectrum (e.g., infrared, visible light, ultraviolent) and predict their impacts on living things. (DOK 2)

National Standards: B: Energy Transfer:
Light interacts with matter by transmission (including refraction), absorption, and scattering (including refraction). To see an object, light from that object-emitted by or scattered from it—must enter the eye

Materials Needed (supplies, hand-outs, resources):

Diffraction Grating for each student, various element lamps, and a worksheet for each student.

Lesson Performance Task/Assessment:

The students will be asked to look through a diffraction grating and draw the emission spectrum that they see. They will also complete questions on their worksheet.

Lesson Relevance to Performance Task and Students:

The students will be able to recognize the types of light that can be emitted or absorbed and see examples through the lamps.

Anticipatory Set/Capture Interest:

Show a video of someone inhaling Helium and talking. (See teacher's notes)

Guided Practice:

The teacher will need to cover the basics of light and energy transfer.

- Compressional waves - such as sound waves - require a medium to transfer energy.
- Transverse waves - such as light waves - can transfer energy in a vacuum, without a medium.

The frequency and wavelength of a wave determines how much energy a wave has. Frequency is the number of wave crests that pass a point during one second. Wavelength is the distance between two identical points on two adjacent waves. The shorter the wavelength, the more energy the wave has. But as wavelength increases, frequency decreases. As electrons absorb energy they become excited and move to higher energy levels. Energy is released in set amounts of energy as the electrons fall back into lower energy levels. Light energy is called photons. One type of electromagnetic radiation is visible light. The electromagnetic spectrum is something scientists use to classify the different types of electromagnetic radiation. Similar to how the periodic table of elements is classified according to their structure, electromagnetic radiation is classified according to wavelengths and frequencies. Although there are different types of electromagnetic radiation, they all travel at the same speed - the speed of light or 186,000 miles per second. Humans are only able to see one small portion of the spectrum, which is visible light.

Next, show the students representations of the electromagnetic spectrum and the different types of radiation. Red in the visible spectrum is low energy and high wavelength. This is because energy and wavelength have an inverse relationship. Violet is high energy and low wavelength. Energy and frequency are directly proportional to each other.

After the material has been covered, the teacher will dim the lights in the classroom and turn on the element lamps one at a time. The students will have to become familiar with using the diffraction gratings to see the spectra. It is easier to see the spectrum if the grating is held out to the side of the students head and by using the peripheral vision. With each lamp, the student should draw what they see. Once the students have drawn out each spectrum, have the students find the elements on the periodic table. The students should be able to identify trends.

Independent Practice:

The students will be responsible for drawing the spectrum that they observe. It would be beneficial for the students to work alone and not in groups. They will have to complete the worksheet and answer questions.

Remediation and/or Enrichment:

Remediation:
Individual IEP. Have the students work in groups and brainstorm the questions together.

Enrichment:
The students could see more than the suggested 5 lamps and be introduced to wavelength calculations.

Check(s) for Understanding:

Why do you think that we see only a few lines for H but much more for Ne?

After seeing these elements, could you predict the spectrum for uranium?

What else have we done this year that is similar? How is it related?

Closure:

The students will see an emission spectrum of several elements and will be able to relate what they see back to the electromagnetic spectrum.

Possible Alternate Subject Integrations:

Physics:
This lesson could serve as an introduction to wavelength and the calculations that are associated with it.

Chemistry:
This is the basis for spectroscopy, which chemists use to identify compounds.

Teacher Notes:

Lamps and diffraction gratings can be acquired at physics and chemistry departments

http://www.youtube.com/watch?v=d-XbjFn3aqE

Worksheet is attached to this lesson plan