Lesson Title	Electromagnetic Spectrum/Spectroscopy
Length of Lesson	1 day
Created By	Kimberley Leggett
Subject	Science
Grade Level	10^{th}, 11^{th}, 12^{th} (Chemistry)
State Standards	Chemistry: 2 a
DOK Level	DOK 2
DOK Application	Predict; compare; make observations; interpret
National Standards	9-12: B: Physical Science; A: Science as Inquiry; G: History and Nature of science
Graduate Research Element	Carbon Fiber Reinforced Polymer (CFRP) is used every day in my research. Carbon is an element so being able to distinguish between different elements is useful for researchers.

Student Learning Goal:
Physical Science: 2. Demonstrate and understanding of the atomic model by explaining atomic structure and chemical bonding: (b) Research and explain crucial contributions and critical experiments of Dalton, Thompson, **Rutherford**, Bohr, de Broglie, and Schrődinger and describe how each discovery contributed to the current model of atomic and nuclear structure

National Science Education Standards of Content 9-12
A: Science as Inquiry: Abilities necessary to do Scientific Inquiry

- Identify questions and concepts that guide scientific investigation

B: Interactions of Energy and Matter

- **Electromagnetic waves result when a charged object is accelerated or decelerated. Electromagnetic waves include radio waves, microwaves, infrared radiation, visible light, ultraviolet radiation, x-rays, and gamma rays. The energy of electromagnetic waves is carried in packets whose magnitude is inversely proportional to the wavelength.**

G: Historical Perspectives

- The historical perspective of scientific explanations demonstrates how scientific knowledge changes by evolving over time, almost always building on earlier knowledge.

Materials Needed (supplies, hand-outs, resources):
Electromagnetic Spectrum device, hydrogen lamp, helium lamp, sodium lamp, and argon lamp checked out from MSU Physics department. Calculator

Lesson Performance Task/Assessment:
There will be a short quiz on the elements and which color it shows also some calculations on the energy of photons.

Lesson Relevance to Performance Task and Students:
The relevance is to demonstrate elements and their electromagnetic spectrum using visual aid.

Anticipatory Set/Capture Interest:
To ask students can you tell which element it is by the color or colors they see. Will demonstrate one first and then will ask them what colors they think they will see for the other three lamps.

Guided Practice:
Use the electromagnetic spectrum set up to demonstrate the color spectrum for hydrogen, helium, sodium, and argon. An example on calculating the energy of a photon will be done.

Independent Practice:
Other calculations for the energy of a photon

Remediation and/or Enrichment:
R: Individual IEP; partner help throughout the lesson
E: Calculations for all the colors and more predictions

Check(s) for Understanding:
A short quiz on the elements and which color it shows will be given and some calculations on the energy of one photon for the different colors in the spectrum that they see.

Closure:
Elements are everywhere in our everyday life and it is important to get students to relate this to their everyday life.

Possible Alternate Subject Integrations:
Physical science – when discussing the electromagnetic spectrum
Math - maybe

Teacher Notes: