

Lesson Title	Color-Energy Relationships: Why does radium glow? (2 days)
Resources	Flame test lab from UCSB
Objectives	<ul style="list-style-type: none"> • Write wave equation for light: $c = \lambda\nu$ • Describe relationship between wavelength, frequency, and energy in light. • Describe relationship between color and energy in light. • Identify landmarks on EM spectrum: gamma = most energetic; visible = middle; radio = least energetic. • Explain why radium appears to glow • Explain the relationship between color and composition • Explain how electron excitation/relaxation produces light
Activities	<p>Bellringer: 5-min freewrite with image prompts: Image of Marie Curie with radium. Color image of radium sample glowing. Tell them we're talking about color and energy to guide them.</p> <p>We do: Share freewrites! (~5 min)</p> <ul style="list-style-type: none"> • Totally voluntary! Just a regroup and debrief before we dive into the lesson. <p>I do: Mini-talk (~30 min):</p> <ul style="list-style-type: none"> • $c = \lambda\nu$ <ul style="list-style-type: none"> • What does this mean? What does each variable mean? • Show wave diagram: wavelength, frequency, amplitude • If c is constant and wavelength goes up, what happens to frequency? • EM spectrum <ul style="list-style-type: none"> • High energy = high frequency -- gamma, x-ray, uv • Low energy = low frequency -- radio, microwave, IR • Visible light: Blue = high energy; red = low energy • Radium, ionizing radiation, glow-in-the-dark. <ul style="list-style-type: none"> • Color depends on what you mix it with -- color can tell you what the glowing material is! • Alpha is ionizing and low-energy --- so is thermal energy! <ul style="list-style-type: none"> • That's how fireworks work! <p>Lab introduction (15 minutes):</p> <ul style="list-style-type: none"> • Introduce lab, discuss materials and safety, choose groups <ul style="list-style-type: none"> • There will be fire! So students will have to be super careful. • Distribute lab so students have time to look over and get familiar before we actually do the lab. <p>Day 2 We do: Reintroduce lab: (10 min):</p> <ul style="list-style-type: none"> • I'd do a sample with them to show them how it's done. We'd work through the calculations together & check answers. <p>You do: Flame test lab (45 min):</p>

	<ul style="list-style-type: none">• Students gather data on color and wavelength from flame tests of 3 unknown salts.• Use data to calculate energy & frequency of light, ID unknown• Based on flame test lab from UCSB
Assessment	Lab is the big assessment here --- so informal formative assessments as I check in during the lab, and a summative assessment in the form of the completed lab.
Differentiation	Advance organizers for note-taking and vocab. Accept one-word and diagrammed answers for ELL. Lecture is long, so maybe take a couple movement breaks. If extra time on lab needed, can come in and work on it after class/during lunch/after school/etc.