Lesson Title	**Atomic Relationships: Radioactive Decay (2 class days)**
Resources	Alpha Decay and Beta Decay labs, Crash Course Chemistry and Fermilab videos
Objectives	• Distinguish among alpha, beta, gamma radiation types, and the relationship between the particles emitted by each, and the amount of energy emitted by each. • Explain why radioactive decay happens. • Describe the relationship between parent and daughter isotopes • Describe the relationship between mass and energy.
Activities	**Day 1** **I do:** Mini-talk (~30 min) • $E = mc^2$: What does this equation mean? (E and m are related. Atoms are tiny, so special relativity is totally cool here.) • Show a uranium decay series. What's happening to mass through the series? Where does the mass go? • Why do these atoms lose mass? Why do they need to lose energy? (Energetic stability) • Videos from Crash Course Chemistry and Fermilab • Define each type of decay, give examples, show nuclear equations. Point out parent vs daughter isotopes. • Show cloud chamber pictures, describe how it works. **We do:** Cloud chamber! (25 min) • I'll tell them which patterns correspond to which type of decay • Take five minutes to make observations in notebook. No guiding questions here---anything goes: questions, pictures, descriptions, etc. • What questions do you have? Informal group discussion for ~10 minutes. • Debrief: Patterns are formed by radioactive decay from isotopes around us--such as natural radon (alpha) potassium in our bods and the earth (beta) cosmic rays (gamma)! Regroup (10 min) • Introduce lab, have students partner up, distribute lab for them to take a look over. • Exit ticket ◦ Name one type of radioactive decay. What type of particle is emitted? Is it low, middle, or high-energy? **Day 2** Bellringer: Radium-226 undergoes alpha decay. What type of particle is emitted? What is the mass of the daughter isotope? **I do:** Recap and reintroduce lab (~15 minutes) • Go over bellringer • Go back over tier-3 words • Go back over lab instructions, take questions. **You do:** Alpha and Beta Decay Lab (45 minutes)

	• Students will work in small pairs to start their guided inquiry with the Alpha Decay and Beta Decay PhET simulations. • Guides are based on Trish Loblein's activities for Alpha Decay and Beta Decay.
Assessment	Exit tickets/bellringers, labs
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.