High School Physics Curriculum Pacing Guide

Modern & Nuclear Physics

Crosscutting Concepts: Energy and Matter; Stability and Change; Scale, Proportion, and Quantity

Topics: Fission, Fusion, Radioactive Decay, Half-Life

2-week Instructional Segment

Anchoring Phenomenon	Standard	Instructional Segments	Disciplinary Core Ideas	Science and Engineering Practices	Instructional Notes
Areas around a nuclear accident remain unsafe for humans for years.	**SP6a** **SP6b** **SP6c**	**Nuclear Physics**	From A Framework for K-12 Science Education: ***By the end of grade 12*** **PS1C: Nuclear Processes** ● Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve changes in nuclear binding energies. ● The total number of neutrons plus protons does not change in any nuclear process (conservation of nucleon number). ● Strong and weak nuclear interactions determine nuclear stability and processes. ● Spontaneous radioactive decays follow a characteristic exponential decay law. ● Nuclear lifetimes allow radiometric dating to be used to determine the ages of rocks and other materials from the isotope ratios present.	● Developing and Using Models ● Engaging in Argument from Evidence	Background: By the end of this unit, students are using the following language in their speaking and writing during EXPLAIN or ELABORATE. • Radioactive decay • Fission • Fusion • Alpha decay • Beta decay • Gamma decay • Nucleus • Alpha particle • Half life

			PS2B: Types of Interactions • Attraction and repulsion between electric charges at the atomic scale explains the structure, properties, and transformations of matter. • The strong and weak nuclear interactions are important inside atomic nuclei--for example, they determine the patterns of which nuclear isotopes are stable and what kind of decays occur for unstable ones. **PS4B: Electromagnetic Radiation** • Electromagnetic radiation (e.g. radio, microwaves, light) can be modeled as particles called photons. The particle model explains other features. • Photovoltaic materials emit electrons when they absorb light of a high-enough frequency. • Atoms of each element emit and absorb characteristic frequencies of light. These characteristics allow identification of the presence of an element, even in microscopic quantities.		• Conservation of mass • Radiation