

Unit Focus

Students will expand their understanding of the atomic structure with an emphasis on electrons in atoms and the relationship of electrons within the atom to physical and chemical properties. An in depth study of the electromagnetic spectrum is the anchoring phenomenon used to develop a model for the electronic structure of the atom. Through the evaluation of electron configuration, students will develop an understanding of periodic properties including ionization energy, electronegativity, and atomic radius, and the relationship to the valence electrons of each element.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
<p>Next Generation Science <i>High School Physical Sciences: 9 - 12</i></p> <ul style="list-style-type: none"> Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. <i>HS-PS1-1</i> <p>Next Generation Science Standards (DCI) <i>Science: 11</i></p> <ul style="list-style-type: none"> The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. <i>PS1.9.A3</i> The wavelength and frequency of a wave are related to one another by the speed of travel of the wave, which depends on the type of wave and the medium through which it is passing. <i>PS4.9.A1</i> Electromagnetic radiation (e.g., radio, microwaves, light) can be modeled as a wave of changing electric and magnetic fields or as particles called photons. The wave model is useful for explaining many features of electromagnetic radiation, and the particle model explains other features. <i>PS4.9.B1</i> <p>Student Growth and Development 21st Century</p>	<p>T1 Analyze qualitative and quantitative data to interpret patterns, draw conclusions, and/or make predictions. T2 Create models to explore complex systems, show mastery of key science concepts, and/or develop solutions through creation of a product open to testing and redesign.</p>	
	Meaning	
	Understanding(s)	Essential Question(s)
	<p>U1 The organization of elements in the periodic table based on atomic structure facilitates predictions about their characteristics. U2 Wavelength, frequency, and amplitude are properties of a wave that determine its characteristics such as color and energy and are used in everyday scientific applications. U3 Electrons are arranged in energy levels, sublevels, and orbitals. The arrangement of the outermost electrons determines the properties and chemical behaviors of the element.</p>	<p>Q1 How can we use models to represent structure of matter? Q2 What evidence supports the current model (wave mechanical model) of the atom? Q3 How does understanding the organization of the periodic table allow scientists to make predictions? Q4 What information do you need to predict the property of an element?</p>
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<p>K1 That models are directly related to how the Periodic Table is displayed. K2 Electrons can display energy changes as movements between energy levels.</p>	<p>S1 Describe and calculate wavelength, frequency and energy of a photon. S2 Identify electron configuration of a given element, from its position on the periodic table.</p>

Stage 1: Desired Results - Key Understandings

<p>Capacities Matrix</p> <p><i>Critical Thinking</i></p> <ul style="list-style-type: none"> Analyzing: Students will be able to examine information/data/evidence to make inferences and identify possible underlying assumptions, patterns, and relationships. <i>MM.1.2</i> <p><i>Collaboration/Communication</i></p> <ul style="list-style-type: none"> Product Creation: Students will be able to effectively use a medium to communicate important information (findings, ideas, feelings, issues, etc.) for a given purpose. <i>MM.3.2</i> 	<p>K3 Electron configurations describe how electrons space themselves apart from one another and from the nucleus of an atom.</p> <p>K4 Electron configurations explain the properties of elements.</p> <p>K5 Vocabulary: wave, wavelength, frequency, photon, quantum, atomic emission spectrum, electron configuration, principal energy level, sublevel, orbital, periods, groups, valence electrons, ionization energy, atomic radius, and electronegativity.</p>	<p>S3 Describe the energy change that happens during an absorption spectrum.</p> <p>S4 Perform calculations of wavelength, frequency, or energy, given any one of the three variables.</p>
---	--	--