

Honors Physics - Unit 13 - Modern Physics

Unit Focus

This survey unit covers applications of areas of Modern Physics, including the Photo Electric effect, electron transitions and isotopic emission spectra, Special and General Relativity, Matter-Energy relationships, nuclear decay and fusion and a brief introduction to elementary particles (beyond the proton-neutron-electron). The majority of the unit will be student-driven as they complete and present a research project in an area of modern physics in which they are interested.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
<p>NGSS/NSTA Science & Engineering Practices <i>NGSS Science & Engineering Practices: 9-12</i></p> <ul style="list-style-type: none"> Ask questions that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. <i>SE.9-12.1.1</i> Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects <i>SE.9-12.6.3</i> <p>Student Growth and Development 21st Century Capacities Matrix <i>Collaboration/Communication</i></p> <ul style="list-style-type: none"> Collective Intelligence: Students will be able to work respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. <i>MM.3.1</i> 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>T1 Communicate effectively based on purpose, task, and audience to promote collective understanding and/or recommend actions.</p>	
	<p>Meaning</p>	
	<p>Understanding(s)</p>	<p>Essential Question(s)</p>
	<p>U1 Established knowledge provides the foundation for future scientific and engineering advances. U2 Disseminating credible scientific knowledge inspires future inquiry.</p>	<p>Q1 What questions do I wonder about? How can I use science to figure it out?</p>
	<p>Acquisition of Knowledge and Skill</p>	
	<p>Knowledge</p>	<p>Skill(s)</p>
<p>K1 Einstein's Theory of Relativity: How is it Mass and Energy can be interchanged K2 Wave / Particle duality: How do small particles of matter act as both solid particles and as waves? K3 Standard Model: The currently accepted scheme explaining the most fundamental particles in nature and how they interact with each other to form the world we live in. K4 Energy is quantized K5 Materials can absorb and emit energy as determined by their sub atomic structure</p>	<p>S1 Apply understanding of various principles of physics studied during this course to investigate application of these principles to modern physics.</p>	

Stage 1: Desired Results - Key Understandings

K6 When objects move close to the speed of light with respect to a reference frame, relative measurements of time, mass and size are all effected

K7 The speed of light in a vacuum is a constant; objects cannot exceed 3×10^8 m/s

K8 There is a world beyond the bohr model; the fundamental building blocks of the atom involve a newly discovered set of sub-atomic particles

K9 Radioactive decay of unstable elements results in new elements and the emission of energy

K10 An atom's nucleus is held together by binding energy, equal to the mass defect of the nucleus.