



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	
NGSS/NSTA Science & Engineering Practices <i>NGSS Science & Engineering Practices: 9-12</i> - 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> Madison Public Schools Profile of a Graduate <i>Collaboration/Communication</i> - Collective Intelligence: Working respectfully and responsibly with others, exchanging and evaluating ideas to achieve a common objective. (POG.3.1) - Product Creation: Effectively use a medium to communicate important information. (POG.3.2)	T1 Communicate effectively based on purpose, task, and audience to promote collective understanding and/or recommend actions.	
	Meaning	
	Understanding(s)	Essential Question(s)
	U1 Established knowledge provides the foundation for future scientific and engineering advances. U2 Disseminating credible scientific knowledge inspires future inquiry.	Q1 What questions do I wonder about? How can I use science to figure it out?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	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 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 sum-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.	S1 Apply understanding of various principles of physics studied during this course to investigate application of these principles to modern physics.