Reading Public Schools

Instilling a joy of learning and inspiring the innovative leaders of tomorrow

Science Curriculum Guide **Introduction to Physics**

Course Description

Introduction to Physics is a laboratory science course open to college preparatory sophomores. It is designed to provide students with fundamental knowledge and skills in physics. Scientific principles and methodologies will be practiced through student involvement in laboratory investigations, inquiry and computer-based activities designed to enhance reasoning skills. Introduction to Physics will focus on such traditional topics such as Energy, Matter, and Motion with an emphasis on recognition and modeling patterns in nature. This course provides a solid foundation for college preparatory students to enroll in chemistry or physics classes during their junior/senior years.

Content Standards

Motion and Stability: Forces and Interactions

HS-PS2-1. Analyze data in support of Newton's second law of motion.

HS-PS2-2. Use mathematical representations to demonstrate the Law of Conservation of Linear Momentum.

HS-PS2-4. Describe and predict the effects of gravitational and electrostatic forces between objects.

HS-PS2-5. Provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

HS-PS2-9(MA). Evaluate simple series and parallel circuits to predict changes to voltage, current, or resistance when simple changes are made to a circuit.

HS-PS2-10(MA). Use free-body force diagrams, algebraic expressions, and Newton's laws of motion to predict changes in motion.

Energy

HS-PS3-1. Use mathematical expressions to demonstrate the Law of Conservation of Energy.

HS-PS3-2. Develop models that demonstrate Kinetic and Potential Energy.

HS-PS3-4a. Transfer of Thermal Energy and Thermal Equilibrium

Waves and Their Applications in Technologies for Information Transfer

HS-PS4-1. Analyze the frequency, wavelength, and speed of electromagnetic and mechanical waves.

For a detailed description of the standards, visit: http://www.doe.mass.edu/frameworks/scitech/2016-04.docx

Skills

The high school physics standards place particular emphasis on science and engineering practices of developing and using models, analyzing and interpreting data, using mathematics, and engaging in argument from evidence. Students are expected to:

- use mathematical and graphical representations and models to quantitatively and qualitatively describe, evaluate, and make predictions of a variety of phenomena such as motion, energy, and waves.
- analyze and interpret data gathered during investigations or experiments.
- use relevant, quantitative evidence to develop explanations and arguments.

Subject Introduction to Physics

Units	Essential Questions	Key Activities MAY include...
Unit 1: Motion	• How are multiple representations used to describe an object's motion?	• Vernier Motion Labs • Calculations
Unit 2: Newton's Laws	• How do forces affect the motion of objects?	• Vernier Motion Labs • Free Body Diagrams
Unit 3: Momentum	• How do we observe and calculate the conservation of momentum?	• Labs about momentum both qualitative with marbles and quantitative with vernier.
Unit 5: Energy, Work and Power	• How is energy transformed within and among systems?	• PhET online simulations • Using equations to calculate
Unit 6: Heat	• How does heat energy affect the motion of molecules?	• Hot air balloons, hot water demonstration
Unit 7: Electricity	• How do we experience and describe static electricity? • How do we observe, describe and use current electricity?	• Create and observe static electricity with lab equipment • Build circuits and measure voltage, current, resistance and power.
Unit 8: Waves	• How do we observe, describe and predict the motion of waves? • How do waves interact with matter and with each other? • Where does sound come from and how do we observe it? • Where does light come from and how do we observe it?	• Pendulum lab • Mechanical Waves Lab • Sound and Light Investigations

Reading Public Schools

Instilling a joy of learning and inspiring the innovative leaders of tomorrow

Science Curriculum Guide Overview

Curriculum Guide	Curriculum guides are public documents aligned with the Massachusetts Department of Education Curriculum Frameworks. They focus on the set of standards that students will learn within certain disciplines at appropriate grade levels. Each area of the curriculum is divided into general strands (broad categories) under which the standards fall. When we discuss "standards-based education" we mean that students are measured against their proficiency and growth towards meeting these standards. Curriculum Guides are intended for teachers, parents, and the wider school community as an overview document of the course of study for the year.
Content Standards	The *Introduction to Physics* curriculum at Reading Memorial High School is aligned with the 2016 Massachusetts Science and Technology/Engineering Curriculum Frameworks for High School Introductory Physics . Detailed information for the STE Framework can be found at: http://www.doe.mass.edu/frameworks/scitech/2016-04.pdf. The content standards describe what students should know and be able to do. They build from middle school and allow students to explain additional and more complex phenomena central to the physical world.
Science and Engineering Practices	The integration of science and engineering practices in high school science courses gives students dynamic and relevant opportunities to refine and communicate science understandings to be well prepared for civic life, postsecondary education, and career success.
Essential Questions	Essential questions are questions that are not answerable with an easy answer or a simple instruction. The purpose of essential questions is to provide opportunities for inquiry into the learning and act as an umbrella to anchor the unit/lesson.
Key Activities	Key Activities identified in Curriculum Guides are not intended to be exhaustive, nor are they intended to be prescriptive. The activities identified may function as a menu of curriculum resources from which educators identify the most appropriate tools to utilize in their classrooms.