

9-12 Physics

Course Description:

Physics is the study of the properties and interactions of matter and energy. Through hands-on explorations that integrate math and technology, students will develop a strong understanding of content and skills. During the first semester, the content focus is force and motion with crosscutting concepts of patterns and cause and effect relationships. During the second semester, the content focus is energy (in a wide variety of forms), with crosscutting concepts of systems and the law of conservation of energy. The course is designed to lay a strong foundation of science concepts and skills that will be built upon in subsequent science courses.

As a course for 9th graders, mathematical analysis is limited to the Algebra 1 level. Problem solving will reinforce solving for a variable in equations with one unknown. Students also review ideas related to graphing, slope, direct, inverse, and inverse square relationships.

Curriculum Work So Far:

1. Discussed the goals for students in the 9-12 Science program and steps to achieve those goals.
2. Mapped out the current reality of the course
3. Discussed and explored the NGSS standards
4. Drafted a curricular scope & sequence

Unit 1: Balanced Forces

Unit 2: Constant Velocity

Unit 3: Unbalanced Forces

Unit 4: Energy

Unit 5: Work, Power, Efficiency

Unit 6: Electricity

Unit 7: Waves

5. Developed enduring understandings, essential questions, and student learning goals in alignment with the Missouri Learning Standards for Science. The enduring understandings and essential questions that drive the course are listed below.

Course Enduring Understandings:

- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
- Use mathematical representations of phenomena to describe explanations.
- Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.
- Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.
- Use mathematical representations of phenomena to describe explanations.
- Apply scientific ideas to solve a design problem, taking into account possible unanticipated effects.
- Create a computational model or simulation of a phenomenon, designed device, process, or system.
- Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.

Course Essential Questions:

- What factors affect force?
- What factors affect inertia?
- What is the relationship between an object's position and change in time?
- What does the slope of a position-time graph represent?
- What is the relationship between the net force and acceleration on an object?
- What is the effect on an object's motion when forces are not balanced?
- How are work and energy related?
- How are series and parallel circuits similar and different?
- How are waves related to energy?

Student Learning Overview:

- Physics (9th grade) is a full year course that introduces students to the underlying laws and concepts of the physical world. KHS science sequence starts with physics because it includes the most fundamental concepts necessary to understand more complex phenomena in subsequent courses like chemistry and biology.
- This course includes embedded scientific and engineering practices. Engaging in the practices of science and engineering helps students understand how scientific knowledge develops. These scientific and engineering practices include the use of scientific skills and processes to explore the content of science as outlined in the Science Standards of Learning. The engineering design practices are an application of the science content while trying to solve a problem or design an object, tool, process, or system. These scientific and engineering practices are critical to physics instruction.