

EVERGREEN COMMUNITY CHARTER SCHOOL CURRICULUM
SCIENCE

Subject: Physics
Grade: 12

Reading Informational Text

Students read, Understand, and respond to informational text – with emphasis on comprehension, making connections among ideas and between texts with focus on textual evidence.

Writing

Students write for different purposes and audiences. Students write clear and focused text to convey a well-defined perspective and appropriate content.

PA Core Standards	Methods/Materials/Evaluation	Goal
<p>3.4.12.A. Apply concepts about the structure and properties of matter.</p> <ul style="list-style-type: none"> • Apply rules of systematic nomenclature and formula writing to chemical substances. • Classify and describe, in equation form, types of chemical and nuclear reactions. • Explain how radioactive isotopes that are subject to decay can be used to estimate the age of materials. • Explain how the forces that bind solids, liquids and gases affect their properties. • Characterize and identify important classes of compounds (e.g., acids, bases, salts). • Apply the conservation of energy concept to fields as diverse as mechanics, nuclear particles and studies of the origin of the universe. • Apply the predictability of nuclear decay to estimate the age of materials that contain radioactive isotopes. • Quantify the properties of matter (e.g., density, solubility coefficients) by applying mathematical formulas. <p>3.4.12.B. Apply and analyze energy sources and conversions and their relationship to heat and temperature.</p> <ul style="list-style-type: none"> • Determine the heat involved in illustrative chemical reactions. • Evaluate mathematical formulas that calculate the efficiency of specific chemical and mechanical systems. • Use knowledge of oxidation and reduction to balance complex reactions • Apply appropriate thermodynamic concepts (e.g., conservation, entropy) to solve problems relating to energy and heat. 	<p>Resources: College Physics, Knight, Jones, Field: Pearson 2013</p> <p>Teacher Developed activities and worksheets including resources from current science literature, videos, internet sites, outside reading.</p> <p>Methods:</p> <ul style="list-style-type: none"> • Observing • Measuring • Data Collection • Pattern recognition • Reasoning and problem solving <p>Evaluation Strategies:</p> <ul style="list-style-type: none"> • Written tests • Quizzes • Projects/demonstrations • Homework • Class discussion 	<p>Provide students with a comprehensive understanding of the fundamental principles of physics, emphasizing real-world applications and problem-solving skills.</p> <p>Top three concepts:</p> <ol style="list-style-type: none"> 1. Understanding the principles of physics allows us to explain the natural world and phenomena in a logical and predictable manner. 2. Physics involves studying the fundamental forces and interactions that govern the behavior of matter and energy. 3. Problem-solving skills and critical thinking are essential in mastering the concepts and applications of physics.

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3.4.12.C. Apply the principles of motion and force.

- Evaluate wave properties of frequency, wavelength and speed as applied to sound and light through different media.
- Propose and produce modifications to specific mechanical power systems that will improve their efficiency.
- Analyze the principles of translational motion, velocity and acceleration as they relate to free fall and projectile motion.
- Analyze the principles of rotational motion to solve problems relating to angular momentum, and torque.
- Interpret a model that illustrates circular motion and acceleration.
- Describe inertia, motion, equilibrium, and action/reaction concepts through words, models and mathematical symbols.

3.4.12.D. Analyze the essential ideas about the composition and structure of the universe.

- Analyze the Big Bang Theory's use of gravitation and nuclear reaction to explain a possible origin of the universe.
- Compare the use of visual, radio and x-ray telescopes to collect data regarding the structure and evolution of the universe.
- Correlate the use of the special theory of relativity and the life of a star.

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Overview	Methods/Materials/Evaluation	Objectives
<p>Covers Isaac Newton's three laws of motion, which explain how forces affect objects and cause motion. These laws include momentum, velocity, mass, and inertia. Students also learn about key forces, such as gravity, friction, and magnetism. One goal of the Force, Motion, and Scientific Theories unit is to familiarize students with the consequences of a nonzero net force applied to an object, or $F=ma$.</p>	<p><u>Part 1: Force and Motion</u></p> <p>Resources: College Physics, Knight, Jones, Field: Pearson 2013</p> <p>Teacher Developed activities and worksheets including resources from current science literature, videos, internet sites, outside reading.</p> <p>Methods:</p> <ul style="list-style-type: none"> • Observing • Measuring • Data Collection • Pattern recognition • Reasoning and problem solving <p>Evaluation Strategies:</p> <ul style="list-style-type: none"> • Written tests • Quizzes • Projects/demonstrations • Homework • Class discussion 	<ul style="list-style-type: none"> • Describe motion • Describe how systems interact • Describe how an object responds to a force • Describe the nature of the force of gravity • Analyze the motion and deformation of extended objects <p>Differentiate among translational motion, simple harmonic motion, and rotational motion in terms of position, velocity, and acceleration.</p> <p>Use force and mass to explain translational motion or simple harmonic motion of objects.</p> <p>Relate torque and rotational inertia to explain rotational motion.</p> <p>Use Newton's laws of motion and gravitation to describe and predict the motion of objects ranging from atoms to the galaxies</p>

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<p>Conservation laws will give a new and different perspective on motion. Some are easily analyzed from the perspective of Newton’s laws, but others make more sense when analyzed from a conservation-law perspective. An important goal is to learn which perspective is best for a given problem.</p>	<p><u>Part 2: Conservation Laws</u></p> <p>Resources: College Physics, Knight, Jones, Field: Pearson 2013</p> <p>Teacher Developed activities and worksheets including resources from current science literature, videos, internet sites, outside reading.</p> <p>Methods:</p> <ul style="list-style-type: none"> • Observing • Measuring • Data Collection • Pattern recognition • Reasoning and problem solving <p>Evaluation Strategies:</p> <ul style="list-style-type: none"> • Written tests • Quizzes • Projects/demonstrations • Homework • Class discussion 	<ul style="list-style-type: none"> • Describe how a system “after” an interaction relates to the system “before” • Describe what quantities are conserved, and under what conditions • Describe why some energy changes are more efficient than others <p>Explain the translation and simple harmonic motion of objects using conservation of energy and conservation of momentum.</p> <p>Describe the rotational motion of objects using the conservation of energy and conservation of angular momentum.</p> <p>Explain how gravitational, electrical, and magnetic forces and torques give rise to rotational motion.</p>

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PA Core Standards/Assessment Anchors	Methods/Materials/Evaluation	Objectives
<p>CC.3.5.12.A-J CC.3.6.12.A-J 3.1.B.A.1-8 3.2.12 A-D 3.2.P.B3 3.7.12 A-E 3.8.12 A-C</p>	<p><u>Part 3: Properties of Matter</u> Resources: College Physics, Knight, Jones, Field: Pearson 2013</p> <p>Teacher Developed activities and worksheets including resources from current science literature, videos, internet sites, outside reading.</p> <p>Methods:</p> <ul style="list-style-type: none"> • Observing • Measuring • Data Collection • Pattern recognition • Reasoning and problem solving <p>Evaluation Strategies:</p> <ul style="list-style-type: none"> • Written tests • Quizzes • Projects/demonstrations • Homework • Class discussion 	<ul style="list-style-type: none"> • Describe how macroscopic flows of energy and matter in heat transfer and fluid flow. <p>Analyze the factors that influence convection, conduction, and radiation between objects or regions that are at different temperatures.</p>

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Overview	Methods/Materials/Evaluation	Objectives
<p>Motion that Repeats Again and Again.</p> <p>Develop language and tools needed to describe oscillations, then extend analysis to consider oscillations that travel – waves.</p> <p>Explore the Wave Model and what happens when waves collide.</p>	<p><u>Part 4: Oscillations and Waves</u></p> <p>Resources: College Physics, Knight, Jones, Field: Pearson 2013</p> <p>Teacher Developed activities and worksheets including resources from current science literature, videos, internet sites, outside reading.</p> <p>Methods:</p> <ul style="list-style-type: none"> • Observing • Measuring • Data Collection • Pattern recognition • Reasoning and problem solving <p>Evaluation Strategies:</p> <ul style="list-style-type: none"> • Written tests • Quizzes • Projects/demonstrations • Homework • Class discussions 	<ul style="list-style-type: none"> • Describe oscillatory motion • Describe how a wave travels through a medium • Describe the distinguishing features of waves • Describe what happens when two waves meet <p>Explain how waves transfer energy without transferring matter.</p> <p>Explain how waves carry information from remote sources that can be detected and interpreted.</p> <p>Describe the causes of wave frequency, speed, and wave length.</p>

Overview	Methods/Materials/Evaluation	Objectives
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Investigating how light works aided by the Ray Model. Use of the Ray Model to analyze many practical applications of optics. Light has both wave-like and particle-like aspects.

Part 5: Optics

Resources:
College Physics, Knight, Jones, Field:
Pearson 2013

Teacher Developed activities and worksheets including resources from current science literature, videos, internet sites, outside reading.

Methods:

- Observing
- Measuring
- Data Collection
- Pattern recognition
- Reasoning and problem solving

Evaluation Strategies:

- Written tests
- Quizzes
- Projects/demonstrations
- Homework
- Class discussion

- Describe the consequences of the wave nature of light
- Describe how light rays refract and reflect to form images in the ray model

Explain how waves transfer energy without transferring matter.

Explain how waves carry information from remote sources that can be detected and interpreted.

Describe the causes of wave frequency, speed, and wave length.

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<p>Understand how charges move through electric circuits.</p>	<p><u>Part 6: Electricity and Magnetism</u></p> <p>Resources: College Physics, Knight, Jones, Field: Pearson 2013</p> <p>Teacher Developed activities and worksheets including resources from current science literature, videos, internet sites, outside reading.</p> <p>Methods:</p> <ul style="list-style-type: none"> • Observing • Measuring • Data Collection • Pattern recognition • Reasoning and problem solving <p>Evaluation Strategies:</p> <ul style="list-style-type: none"> • Written tests • Quizzes • Projects/demonstrations • Homework • Class discussion 	<ul style="list-style-type: none"> • Describe how charged particles interact • Describe how electric circuits work • List the properties and characteristics of electric and magnetic fields <p>Explain how stationary and moving particles result in electricity and magnetism.</p> <p>Develop qualitative and quantitative understanding of current, voltage, resistance, and the connections among them.</p> <p>Explain how electrical induction is applied in technology</p>