Crosslake Community School
ONLINE PROGRAM

Physics A

Crosslake Community High School

INSTRUCTOR

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Office Hours: I am online 11 AM to 3 PM, but I check back often in the afternoon and evening.

TABLE OF CONTENTS

COURSE DESCRIPTION

Physics - Semester A is the first part of a two-semester, full-year course based on the Minnesota 9th - 12th grade science standards. Mathematical concepts are used to help describe observable, measurable events and some less visual natural phenomena. Students earn 0.5 credit in each semester. At the end of this syllabus, the course outline shows which topics, through assignments, projects, and exams, are covered in Physics - Semester A.

PREREQUISITES

It is very helpful if students have passed an Algebra II class and an introductory Physical Science class before taking this Physics class. Students with a better understanding of Intermediate Algebra will be more prepared for the mathematics used in the class. Students with a better understanding of introductory scientific measurement and conversion processes will be more prepared for some of the concepts discussed in the class.

COURSE GOALS & OBJECTIVES

- Distinguish between hypotheses, theories, and laws.
- Show how scientists communicate, share information, and support the importance of peer review.
- Select and use appropriate tools to perform tests and collect data.
- Select and use appropriate technology such as computers and graphing calculators to gather, analyze, interpret, and display data.
- Use the SI system of measurement to convert between standard and metric, and metric and metric, and to recognize approximate representations of measurement.
- Differentiate between accuracy and precision.
- Read and interpret graphs.
- Distinguish between direct and inverse relationships.
- Calculate percent error.
- Analyze and evaluate scientific explanations.
- Distinguish between constant velocity and constant acceleration.
- Use graphs to analyze motion with constant acceleration.
- Solve problems involving distance, time, velocity, and acceleration.
- Interpret motion maps to describe linear motion.
- Calculate the average velocity of a moving object.
- Use graphs to determine acceleration.
- Recognize the relationships between position, time, velocity, and acceleration.
- Use vector diagrams to determine the resultant vector.
- Resolve a vector into horizontal and vertical components.
- Solve problems involving projectile motion.
- Identify examples of projectile motion.
- Recognize that the horizontal and vertical motions of a projectile are independent.
- Determine how net force affects the motion of an object.
- Identify and describe various forces.
- Analyze free-body diagrams.
- Examine the four fundamental forces.
- Compare the characteristics, strengths, and ranges of the fundamental forces.
- Use vectors to calculate the effect of forces on objects.
- Describe Newton’s first law of motion and how it relates to inertia.
- Explain Newton’s third law of motion and how it relates to action and reaction forces.

- Interpret free-body diagrams for accelerating objects.
- Calculate force, mass, or acceleration given the other two quantities.
- Describe Newton's second law of motion.
- Determine how force and mass affect acceleration.
- Calculate the acceleration of a moving object.
- Analyze and compare the momentum and impulse of different objects.
- Solve problems involving impulse.
- Calculate mass, velocity, or momentum given the other two quantities.
- Describe impulse and how it relates to momentum.
- Apply the law of conservation of momentum to analyze collisions between objects.
- Solve problems involving the conservation of momentum.
- Describe the law of conservation of momentum.
- Use mathematical representations to show that the total momentum of a system of objects is conserved when there is no net force on the system.
- Calculate the momentum of a moving object before and after a collision.
- Demonstrate that momentum is conserved during a collision.
- Describe the effect of gravity on an object.
- Explain the relationships among gravitational force, mass, and distance.
- Solve problems that involve the universal law of gravitation.
- Use mathematical representations to predict the gravitational and electrostatic forces between objects.
- Solve problems involving centripetal acceleration.
- Describe and calculate tangential speed.
- Define and identify examples of centripetal acceleration.
- Describe how circular motion is caused by centripetal force.
- Explain the relationship between centripetal force and inertia.
- Use centripetal force concepts to solve problems.
- Interpret motion maps to describe circular motion.
- Explain how Newton's universal law of gravitation affects orbital motion.
- Identify the forces acting on an object in orbit.
- Solve problems involving the orbital speed and period of an object in orbit.
- Explain the effects of Earth, the moon, and the Sun on each other.
- Describe Kepler's three laws of planetary motion.
- Solve problems using Kepler's laws.

- Analyze how stellar spectra are used to identify the composition and motion of a star.
- Distinguish between the different types of stars and their life cycles.
- Examine evidence for the big bang theory.
- Describe the evolution of the universe.
- Compare the work done in different situations.
- Explain how work and power are related.
- Calculate work and power.
- Define and describe work.
- Describe the work-energy theorem and use it to solve problems.
- Define kinetic energy and identify situations in which it's present.
- Calculate kinetic energy, mass, or velocity given the other two quantities.
- Identify and describe different types of potential energy.
- Solve problems involving the potential energy of an object.
- Solve problems involving energy transformations.
- Explain how energy changes form.
- Analyze and interpret energy transfer diagrams.
- Identify and describe examples of energy transformations.
- Apply the law of conservation of energy to solve problems.
- Use energy transfer diagrams to illustrate that energy is conserved.
- Explain the law of conservation of energy.
- Explain how temperature relates to kinetic energy.
- Describe specific heat and explain why it differs from one substance to another.
- Distinguish between temperature, thermal energy, and heat.
- Solve problems involving specific heat.
- Explain how electromagnetic waves transfer energy by radiation.
- Explain how molecular movement transfers thermal energy by conduction.
- Describe how fluid movement transfers thermal energy by convection.
- Relate the potential energy of an object to the temperature change of water.
- Calculate gravitational potential energy and heat.
- Describe the conversion of gravitational potential energy to thermal energy in a system.
- Identify the properties of the fourth state of matter: plasma.
- Differentiate among the four states of matter.
- Identify and describe the six changes of state.
- Solve problems involving latent heat of fusion and latent heat of vaporization.

- Explain and interpret heating curves.
- Apply the first law of thermodynamics to describe how heat engines work.
- Solve problems using the first law of thermodynamics.
- Explain the first law of thermodynamics.
- Apply the second law of thermodynamics to describe how heat engines work.
- Describe how the first and second laws of thermodynamics are related.
- Explain why entropy increases over time.

REQUIRED MATERIALS

Students will need: Daily access to computer or laptop with working internet access; notebook paper for notes and calculations;writing utensils; calculator; optional for hands-on lab activities: simple science supplies (kitchen chemistry type materials).

TECHNICAL REQUIREMENTS

Students will need to be able to create, save, modify, and submit documents including using programs such as Microsoft Office or Google Docs. If the student submits an assignment in a format that is un-openable by the instructor, that assignment will need to be re-submitted in one of the common formats. Students will need daily internet access and intermediate understanding of how to use email. Students must use their assigned Crosslake email.

TEACHER CONTACT & COMMUNICATION

Regular communication is critical to your success in this class. It is important that as soon as you have a question you cannot answer, that you reach out to me or your Learning Coach. Or, if I contact you, that you respond quickly so you can get the most out of this course..
I will return all communications within 24 hours.

Feedback

I will grade assignments regularly, usually within 2 school days, and provide feedback to you on these assignments. Read through the feedback and ask clarifying questions, since I write these comments to help you improve your learning in this course.

Office hours

I will be available to answer questions and help work through assignments during the common hours posted at the top of this syllabus. This is a great time to contact me since I will usually be able to get back to you very quickly.

Additional support

If you need additional academic support beyond regular feedback and communication with me, please let me or your Learning Coach know so that we can connect you with appropriate help.

COURSE POLICIES

Attendance/Participation Policy

Attendance and participation are based on daily logins to the course and regular completion of assignments. To stay on track, you should follow the due dates for activities and assignments listed in the syllabus or learning management system. For more specific information about attendance, including excused/unexcused absences, see the Crosslake Community High School Parent/Student Course Handbook

Missing or Late Work

All work is due at the end of the semester. However, if a student waits until the last week or two to complete the coursework, it is unlikely that he or she will earn a passing grade. To help you plan and manage time, I have created a course schedule included in the syllabus. Missing work at the end of the semester will be counted as 0 points.

Questions

Please ask questions as soon as you have them; if you aren't clear on a concept, it is likely that others have the same question. The sooner you ask a question, the sooner I can help you!

Academic integrity

Do not copy someone else's work and present it as your own; do not plagiarize something from the internet; do not take credit for someone else's work; and do not allow anyone copy your work. Possible consequences for cheating in this class: Reduced assignment or test scores; no credit earned; meeting with parents, student, and administration; possible course failure and delayed graduation.

COURSE ACTIVITIES

Activity type	Attempts		% of final grade
Quizzes	2		20%
Tests	2		30%
Exams	2		20%

Assignments			10%
Labs			20%
TOTAL			**100%**

COURSE OUTLINE & SCHEDULE: 3.6 hours per week

(This is a guideline based on students starting at the beginning of the semester. Students starting later in the term will have a different schedule. Look at your course management system for the current due dates.)

Week	Start Day	Unit	Assignments Due
1		Nature of Science and Engineering	• Hypotheses, Theories, and Laws • Scientific Methods • Safety in Science • Tools, Technology, and Measurement
2			• Accuracy and Precision • Data Analysis • Evaluating Scientific Explanations • The Progress of Scientific Knowledge
3		Motion: One- and Two-Dimensional Motion	• Unit Test • Speed and Velocity • Acceleration
4			• Lab: Motion with Constant Acceleration • Vectors • Projectile Motion
5		Motion: Forces and Momentum	• Unit Test • Introduction to Forces • Fundamental Forces
6			• Newton's First and Third Laws • Newton's Second Law • Lab: Newton's Second Law
7			• Impulse and Momentum • Conservation of Momentum
8			• Lab: Conservation of Linear Momentum • Unit Test
9		Motion: Circular Motion	• Universal Law of Gravitation

		and Gravity	• Centripetal Acceleration • Circular Motion • Orbital Motion
10		Energy: Introduction to Energy	• Earth-Moon-Sun System • Origin and Evolution of the Universe • Unit Test • Work and Power
11			• Kinetic Energy • Potential Energy • Energy Transformations • Conservation of Energy
12		Energy: Heat Transfer and Thermodynamics	• Unit Test • Temperature and Heat • Heat Transfer
13			• Lab: Mechanical Equivalent of Heat • States of Matter
14			• Changes of State • First Law of Thermodynamics • Second Law of Thermodynamics
15			• Unit Test • Cumulative Exam

Supplemental Student Communication

Progress Reporting

CCHS staff will submit progress reports to the local school contact person upon completion of the student's academic term. The student and family may access regular progress reports in the online learning platform through the student gradebook anytime.

Final Grades and Submissions

Semester and final grades are submitted to the school counselor within 10 days of the end of the semester. Successfully completed CCHS courses are worth .5 semester credits; credit conversions and graduation requirements do differ between school districts. Contact your school counselor for your local district's graduation requirements and credit conversion.