Hillgrove High School
Course: Honors Physics
Text: *Physics (available in CTLS)*
Instructor: Mr. Teters
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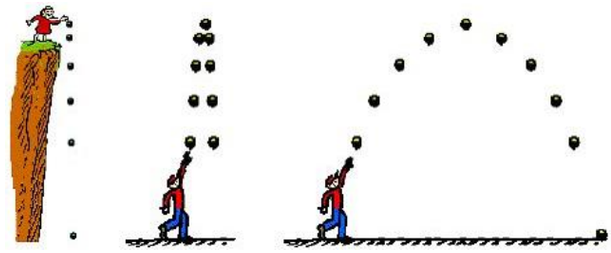

Honors Physics Syllabus

The primary objective of this course is to teach the student an analytical thought process associated with doing science; physics is simply the tool used to teach this quality. Physics involves a problem-solving thought process that the student will learn throughout the course of study. The other objective of the course is to cultivate an appreciation for how the world works around us.

Course Pre-Requisites

Physics is a challenging course that covers a vast amount of material. Physics is designed for the student equipped with the adequate math skills, general science knowledge, and problem-solving skills. Specifically, students must have a solid grasp algebra and trigonometry and previous science classes (honors biology and honors chemistry).

Materials

- Quad-rule graph paper or quad-rule notebook
- 3 ring notebook
- paper (notebook paper)
- pen and pencil
- scientific or graphing calculator

Notebooks are mandatory. Keep all notes, class work, homework, labs, and quizzes in your notebook. You may subdivide your notebook, or you may keep it in chronological order. This will allow you easy access to all materials and will greatly help when studying for the final exam.

Grading Scale

During the semester there will be many points and they will be distributed as follows:

Quizzes*	10%
Homework & Skills checks	10%
Labs	20%
Unit tests	50%
Final exam:	10%
Total:	100%

Following the Cobb County system:
A= 90 -100%
B =80% - 89%
C =74%- 79%
D= 70%-73%
F= below 70%

Honors physics carries a half quality point. You are expected to earn it. Ask for help before you get behind. I have regular office hours and you can always ask if I am available for you to come in at another time. Students should keep all graded materials throughout the term. Students and parents should use Student/ParentVUE to track grades for all coursework throughout the semester.

Cheating

Cheating, or helping others cheat, on any assignment will result in a grade of zero for that assignment. If you let someone else copy your work, you will also receive a zero. Any assignment (e.g., test, lab report, portfolio, or term paper) containing any copied or plagiarized work will receive 0 points (that includes any work copied from another student or source). Refer to the Student Handbook for more details about Hillgrove's cheating policy.

Make up work (due to absence) policy

When you are absent, it is ***your responsibility*** to ask the teacher for any work that was missed and to ask others what was missed. Check the blog for any notes and assignments you missed. It is ***your responsibility*** to set up a time with the teacher to make up tests or labs. If you are absent for a lab, you must make up the lab in-person. Copying your lab group's data does not count as making up a lab. Students are expected to make up all work missed during absence. It is the student's responsibility to find out what work was missed and to turn it in to his/her teachers. Students will be allowed one day for each day absent plus one additional day to make up work missed during absences. For example, if a student is absent for two days, he/she will be allowed three days to make up work that was missed. Work not made up within this time frame could receive a zero. Refer to the Student Handbook for more details about Hillgrove's make-up work policy.

Class Rules

I encourage enthusiasm. However, there is a structure that must be in place to guide that overwhelming enthusiasm and it is as follows.

1. Respect others. Please watch your language and do not belittle other students or teachers.
2. Be prepared to learn. Always bring your notebook, calculator, pen or pencil, and paper. Leave any problems and issues outside the door.
3. Be on time. The tardy policy will be enforced
4. Candy, food, or drinks are permitted in the classroom. However, when you finish, there should be no evidence of food, drink, or candy…in other words clean up after yourself.
5. You must have a pass to use the restroom. Dead time is the first 15 minutes and the last 15 minutes of class; no one will be allowed to use the restroom or leave the classroom during these times.
6. Take care of all items in the classroom. Please take care of the lab equipment.
7. When the teacher talks, please listen. When a student talks, please listen. When you talk, others will listen.
8. Cell phones/electronic devices may be used in class, usage should be limited to the current context of class.

Do your best work at all times. You all can learn physics. Do the work that is asked of you and do it to the best of your ability. Settling for less will disappoint me, but more importantly, it will disappoint you...sooner or later.

Failure to abide by these rules will result in consequences. All general school rules apply and they will be enforced. All general school rules apply and they will be enforced.

LABORATORY SAFETY CONTRACT

Students will follow all instructions regarding safety procedures during laboratory work. Students are expected to conduct themselves in responsible ways at all times while working in the laboratory and not engage in any horseplay. Students are expected to follow the Cobb County Safety Contract provided by your teacher. Students who do not abide by the laboratory rules, will be removed from the lab experiment and may receive a zero for that particular lab.

☆ ***Please sign and date the student information sheet indicating that you have carefully read this syllabus and understand its contents.*** ☆

Final Note

I am your teacher and I want all students to do well. I enjoy teaching. If you need help, please see me or stop by my room. I am here to teach you and to help you—that's what I do.

Topic/Unit description	Approximate Duration	Honors physics scope and sequence GSE Standards
0. Intro to physics; scientific math; graphing	~3 days	
1. Kinematics and motion in 1-dimension	~2 weeks	SP1. Obtain, evaluate, and communicate information about the relationship between distance, displacement, speed, velocity, and acceleration as functions of time. Plan and carry out an investigation of one-dimensional motion to calculate average and instantaneous speed and velocity. • Analyze one-dimensional problems involving changes of direction, using algebraic signs to represent vector direction. • Apply one-dimensional kinematic equations to situations with no acceleration, and positive, or negative constant acceleration.
2. Vectors and projectiles (motion in 2-dimensions)	~2 weeks	b. Analyze and interpret data using created or obtained motion graphs to illustrate the relationships among position, velocity, and acceleration, as functions of time. c. Ask questions to compare and contrast scalar and vector quantities. d. Analyze and interpret data of two-dimensional motion with constant acceleration. • Resolve position, velocity, or acceleration vectors into components (x and y, horizontal and vertical). • Add vectors graphically and mathematically by adding components. • Interpret problems to show that objects moving in two dimensions have independent motions along each coordinate axis. • Design an experiment to investigate the projectile motion of an object by collecting and analyzing data using kinematic equations. • Predict and describe how changes to initial conditions affect the resulting motion.• Calculate range and time in the air for a horizontally launched projectile.
3. Forces and Newton's Laws	~2 weeks	SP2. Obtain, evaluate, and communicate information about how forces affect the motion of objects. a. Construct an explanation based on evidence using Newton's Laws of how forces affect the acceleration of a body. • Explain and predict the motion of a body in absence of a force and when forces are applied using Newton's 1st Law (principle of inertia). • Calculate the acceleration for an object using Newton's 2nd Law, including situations where multiple forces act together. • Identify the pair of equal and opposite forces between two interacting bodies and relate their magnitudes and directions using Newton's 3rd Law. b. Develop and use a model of a Free Body Diagram to represent the forces acting on an object (both equilibrium and non-equilibrium). c. Use mathematical representations to calculate magnitudes and vector components for typical forces including gravitational force, normal force, friction forces, tension forces, and spring forces. d. Plan and carry out an investigation to gather evidence to identify the force or force component responsible for causing an object to move along a circular path. • Calculate the magnitude of a centripetal acceleration. e. Develop and use a model to describe the mathematical relationship between mass, distance, and force as expressed by Newton's Universal Law of Gravitation
3a. Circular Motion and Gravity	~3 days	
4. Momentum and mechanical energy	~2 weeks	SP3. Obtain, evaluate, and communicate information about the importance of conservation laws for mechanical energy and linear momentum in predicting the behavior of physical systems. a. Ask questions to compare and contrast open and closed systems. b. Use mathematics and computational thinking to analyze, evaluate, and apply the principle of conservation of energy and the Work-Kinetic Energy Theorem. • Calculate the kinetic energy of an object. • Calculate the amount of work performed by a force on an object. c. Plan and carry out an investigation demonstrating conservation and rate of transfer of energy (power) to solve problems involving closed systems. d. Construct an argument supported by evidence of the use of the principle of conservation of momentum to • explain how the brief application of a force creates an impulse. • describe and perform calculations involving one dimensional momentum. • connect the concepts of Newton's 3rd law and impulse. • experimentally compare and contrast inelastic and elastic collisions.

Physics Standards

The Science Georgia Standards of Excellence are designed to provide foundational knowledge and skills for all students to develop proficiency in science. The Project 2061's Benchmarks for Science Literacy and the follow up work, A Framework for K-12 Science Education were used as the core of the standards to determine appropriate content and process skills for students. The Science Georgia Standards of Excellence focus on a limited number of core disciplinary ideas and crosscutting concepts which build from Kindergarten to high school. The standards are written with the core knowledge to be mastered integrated with the science and engineering practices needed to engage in scientific inquiry and engineering design. Crosscutting concepts are used to make connections across different science disciplines.

The Science Georgia Standards of Excellence drive instruction. Hands-on, student-centered, and inquiry-based approaches should be the emphasis of instruction. The standards are a required minimum set of expectations that show proficiency in science. However, instruction can extend beyond these minimum expectations to meet student needs. At the same time, these standards set a maximum expectation on what will be assessed by the Georgia Milestones Assessment System.

Topic/Unit description	Approximate Duration	Honors physics scope and sequence GSE Standards
5a. Electrostatics and electric fields 5b. Current electricity and circuits 5c. Magnetism and electromagnetism	~2 weeks ~3 days	SP5. Obtain, evaluate, and communicate information about electrical and magnetic force interactions. a. Develop and use mathematical models and generate diagrams to compare and contrast the electric and gravitational forces between two charged objects. b. Plan and carry out investigations to demonstrate and qualitatively explain charge transfer by conduction, friction, and induction. c. Construct an explanation based on evidence of the behavior of charges in terms of electric potential energy. d. Plan and carry out an investigation of the relationship between voltage, current, and power for direct current circuits. (Clarification statement: Application of Ohm's Law to different circuit configurations, not limited to parallel and series, and calculations of equivalent resistance are expected.) e. Plan and carry out investigations to clarify the relationship between electric currents and magnetic fields. (Clarification statement: This includes coils and their importance in the design of motors and generators.)
6. Waves and Sound 7. Light and Optics	~2 weeks ~2 weeks	SP4. Obtain, evaluate, and communicate information about the properties and applications of waves. a. Develop and use mathematical models to explain mechanical and electromagnetic waves as a propagating disturbance that transfers energy. (Clarification statement: Mathematically describe how the velocity, frequency, and wavelength of a propagating wave are related.) b. Develop and use models to describe and calculate characteristics related to the interference and diffraction of waves (single and double slits). c. Construct an argument that analyzes the production and characteristics of sounds waves. (Clarification statement: Includes, but not limited to, Doppler Effect, standing waves, wavelength, the relationship between amplitude and the energy of the wave, and the relationship between frequency and pitch.) d. Plan and carry out investigations to characterize the properties and behavior of electromagnetic waves. (Clarification statement: Properties of waves include, but not limited to, amplitude, frequency, wavelength, and the relationship between frequency or wavelength and the energy of the wave.) e. Plan and carry out investigations to describe common features of light in terms of color, polarization, spectral composition, and wave speed in transparent media. • Analyze experimentally and mathematically aspects of reflection and refraction of light waves and describe the results using optical ray diagrams. • Perform calculations related to reflections from plane surfaces and focusing using thin lenses. f. Plan and carry out investigations to identify the behavior of light using lenses. (Clarification statement: Investigations concerning Snell's Law, optical ray diagrams, and thin lens equation should be conducted.) g. Plan and carry out investigations to describe changes in diffraction patterns associated with geometry and wavelength for mechanical and electromagnetic waves.
Nuclear Physics	~2 days	SP6. Obtain, evaluate, and communicate information about nuclear changes of matter and related technological applications. a. Develop and use models to explain, compare, and contrast nuclear processes including radioactive decay, fission, and fusion. b. Construct an argument to compare and contrast mechanisms and characteristics of radioactive decay. (Clarification statement: Include alpha, beta, and gamma decays and their effects.) c. Develop and use mathematical models and representations to calculate the amount of substance present after a given amount of time based on its half-life and relate this to the law of conservation of mass and energy.

Science consists of a way of thinking and investigating, as well a growing body of knowledge about the natural world. To become literate in science, students need to possess sufficient understanding of fundamental science content knowledge, the ability to engage in the science and engineering practices, and to use scientific and technological information correctly. Technology should be infused into the curriculum and the safety of the student should always be foremost in instruction.

The Physics Georgia Standards of Excellence are designed to continue the student investigations of the physical sciences that began in grades K-8, and provide students the necessary skills to be proficient in physics. These standards include more abstract concepts such as nuclear decay processes, interactions of matter and energy, velocity, acceleration, force, energy, momentum, properties and interactions of matter, electromagnetic and mechanical waves, and electricity, magnetism and their interactions. Students investigate physics concepts through experiences in laboratories and field work using the science and engineering practices of asking questions and defining problems, developing and using models, planning and carrying out investigations, analyzing and interpreting data, using mathematics and computational thinking, constructing explanations and designing solutions, engaging in argument from evidence, and obtaining, evaluating, and communicating information.