EGG HARBOR TOWNSHIP PUBLIC SCHOOLS
CURRICULUM

COLLEGE PREP (CP) PHYSICS
High School

Length of Course:	Full Year
Elective / Required:	Refer to Program of Studies
Schools:	High School
Student Eligibility:	Grades 11 -12
Credit Value:	5 credits
Date Submitted:	September 2013
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DISTRICT MISSION STATEMENT

Our mission in the Egg Harbor Township School District is to partner with the student, family, school, and community to provide a safe learning environment that addresses rigorous and relevant 21st Century standards and best practices which will develop academic scholarship, integrity, leadership, citizenship, and the unique learning style of students, while encouraging them to develop a strong work ethic and to act responsibly in their school community and every day society.

SCIENCE – PHILOSOPHY

We believe that ALL students regardless of race, ethnicity, socio-economic status, religious background, and/or any other classification are deserving of a holistic science education. This holistic approach would include an education that will allow them to fully discover themselves, their strengths and weaknesses, and benefit from science instruction.

> Scientific literacy assumes an increasingly important role in the context of globalization. The rapid pace of technological advances, access to an unprecedented wealth of information, and the pervasive impact of science and technology on day-to-day living require a depth of understanding that can be enhanced through quality science education. In the 21st century, science education focuses on the practices of science that lead to a greater understanding of the growing body of scientific knowledge that is required of citizens in an ever-changing world (NJCCCS-Science).

Science curricula are designed to reinforce 21st Century Learning, to maximize rigor, relevance, and relationships, and to engage students individually through differentiated instruction.

SCIENCE - STATEMENT OF PURPOSE

Education exists for the purpose of enabling each individual to realize and maintain her/his full potential. Scientifically literate students possess the knowledge and understanding of scientific concepts and processes required for personal decision-making, participation in civic and cultural affairs, and economic productivity.

> Science, engineering, and technology influence and permeate every aspect of modern life. Some knowledge of science and engineering is required to engage with the major public policy issues of today as well as to make informed everyday decisions, such as selecting among alternative medical treatments or

> determining how to invest public funds for water supply options. In addition, understanding science and the extraordinary insights it has produced can be meaningful and relevant on a personal level, opening new worlds to explore and offering lifelong opportunities for enriching people's lives. In these contexts, learning science is important for everyone, even those who eventually choose careers in fields other than science or engineering (NJSLS-Science)
>
> All students engage in science experiences that promote the ability to ask, find, or determine answers to questions derived from natural curiosity about everyday things and occurrences. The underpinning of the revised standards lies in the premise that science is experienced as an active process in which inquiry is central to learning and in which students engage in observation, inference, and experimentation on an ongoing basis, rather than as an isolated a process. When engaging in inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others in their community and around the world. They actively develop their understanding of science by identifying their assumptions, using critical and logical thinking, and considering alternative explanations (NJCCCS-Science).

Our school district provides an extensive science program, which will enable students to succeed and compete in the global marketplace using the New Jersey Student Learning Standards in Science as well as the Next Generation Science Standards.

INTRODUCTION

The most precious resource teachers have is time. Regardless of how much time a course is scheduled for, it is never enough to accomplish all that one would like. Therefore, it is imperative that teachers utilize the time they have wisely in order to maximize the potential for all students to achieve the desired learning.

High quality educational programs are characterized by clearly stated goals for student learning, teachers who are well-informed and skilled in enabling students to reach those goals, program designs that allow for continuous growth over the span of years of instruction, and ways of measuring whether students are achieving program goals.

THE EGG HARBOR TOWNSHIP SCHOOL DISTRICT CURRICULUM TEMPLATE

The Egg Harbor Township School District has embraced the backward-design model as the foundation for all curriculum development for the educational program. When reviewing curriculum documents and the Egg Harbor Township curriculum template, aspects of the backward-design model will be found in the stated enduring *understandings/essential questions, unit assessments,* and *instructional activities*. Familiarization with backward-design is critical to working effectively with Egg Harbor Township's curriculum guides.

GUIDING PRINCIPLES: WHAT IS BACKWARD DESIGN? WHAT IS UNDERSTANDING BY DESIGN?

"Backward design" is an increasingly common approach to planning curriculum and instruction. As its name implies, "backward design" is based on defining clear goals, providing acceptable evidence of having achieved those goals, and then working 'backward' to identify what actions need to be taken that will ensure that the gap between the current status and the desired status is closed.

Building on the concept of backward design, Grant Wiggins and Jay McTighe (2005) have developed a structured approach to planning programs, curriculum, and instructional units. Their model asks educators to state goals; identify deep understandings, pose essential questions, and specify clear evidence that goals, understandings, and core learning have been achieved.

Programs based on backward design use desired results to drive decisions. With this design, there are questions to consider, such as: What should students understand, know, and be able to do? What does it look like to meet those goals? What kind of program will result in the outcomes stated? How will we know students have achieved that result? What other kinds of evidence will tell us that we have a quality program? These questions apply regardless of whether they are goals in program planning or classroom instruction.

The backward design process involves three interrelated stages for developing an entire curriculum or a single unit of instruction. The relationship from planning to curriculum design, development, and implementation hinges upon the integration of the following three stages.

Stage I: Identifying Desired Results: Enduring understandings, essential questions, knowledge and skills need to be woven into curriculum publications, documents, standards, and scope and sequence materials. Enduring understandings identify the "big ideas" that students will grapple with during the course of the unit. Essential questions provide a unifying focus for the unit and students should be able to answer more deeply and fully these questions as they proceed through the unit. Knowledge and skills are the ***"stuff"*** upon which the understandings are built.

Stage II: Determining Acceptable Evidence: Varied types of evidence are specified to ensure that students demonstrate attainment of desired results. While discrete knowledge assessments (e.g.: multiple choice, fill-in-the-blank, short answer, etc…) will be utilized during an instructional unit, the overall unit assessment is performance-based and asks students to demonstrate that they have mastered the desired understandings. These culminating (summative) assessments are authentic tasks that

students would likely encounter in the real-world after they leave school. They allow students to demonstrate all that they have learned and can do. To demonstrate their understandings students can explain, interpret, apply, provide critical and insightful points of view, show empathy and/or evidence self-knowledge. Models of student performance and clearly defined criteria (i.e.: rubrics) are provided to all students in advance of starting work on the unit task.

Stage III: Designing Learning Activities: Instructional tasks, activities, and experiences are aligned with stages one and two so that the desired results are obtained based on the identified evidence or assessment tasks. Instructional activities and strategies are considered only once stages one and two have been clearly explicated. Therefore, congruence among all three stages can be ensured and teachers can make wise instructional choices.

At the curricular level, these three stages are best realized as a fusion of research, best practices, shared and sustained inquiry, consensus building, and initiative that involves all stakeholders. In this design, administrators are instructional leaders who enable the alignment between the curriculum and other key initiatives in their district or schools. These leaders demonstrate a clear purpose and direction for the curriculum within their school or district by providing support for implementation, opportunities for revision through sustained and consistent professional development, initiating action research activities, and collecting and evaluating materials to ensure alignment with the desired results. Intrinsic to the success of curriculum is to show how it aligns with the overarching goals of the district, how the document relates to district, state, or national standards, what a high quality educational program looks like, and what excellent teaching and learning looks like. Within education, success of the educational program is realized through this blend of commitment and organizational direction.

INTENT OF THE GUIDE

This guide is intended to provide teachers with course objectives and possible activities, as well as assist the teacher in planning and delivering instruction in accordance with the New Jersey Core Curriculum Content Standards. The guide is not intended to restrict or limit the teacher's resources or individual instruction techniques. It is expected that the teacher will reflectively adjust and modify instruction and units during the course of normal lessons depending on the varying needs of the class, provided such modified instruction attends to the objectives and essential questions outlined below.

N.J.A.C. 6A:8-3.1 Required Curriculum Components

Code Language	Evident in Curriculum YES/NO	Comments
Interdisciplinary Connections	**Yes**	**Via lab activities. STEM units in development 1 per marking period**
A pacing guide	**Yes**	**By Unit approximately 2-4 units per marking period**
A list of core instructional materials, including various levels of text at each grade level	**Yes**	**Suggested Activities Labs**
Benchmark assessments	**Yes**	**Teacher-developed and common via pre/post and benchmark assessments**
Modifications for special education students, for ELLs in accordance with N.J.A.C. 6A:15, and for gifted students. (As appropriate) – See Appendix A	**Yes**	**As directed by student's Individual Education Plan**

Unit Name: The Science of Physics and Vectors **Time Frame:** 2 weeks (6-7 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics **Country:** USA
Course/Grade: 11-12 **State/Group:** NJ
School: Egg Harbor Township High School

UNIT SUMMARY

The purpose of this unit is to introduce students to Physics and explain some of the many things done with and possible with Physics. Students will also learn what a vector is and how they can be added graphically and algebraically to model real world occurrences.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
- Web simulators: www.pHET.colorado.edu

STAGE ONE

GOALS AND STANDARDS

HS ETS1-2 – [Content Statement] - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS ETS1-4 – [Content Statement] - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

ENDURING UNDERSTANDINGS

- Physics explains the natural world.
- Vectors can be added graphically and algebraically.
- Vectors can be used to model and analyze real world occurrences.
- Solving problems requires an appreciation of the big picture.

ESSENTIAL QUESTIONS

- Why is it important to study so many subjects in school?
- Why is it important to study Physics?
- Why is it useful to learn problem solving skills?
- How do Physicists solve problems?
- What quantities can be modeled as a vector?
- Can vectors be subtracted?

KNOWLEDGE AND SKILLS

- Explain why the scope of Physics is so vast.
- Identify seven traditional areas of study in Physics.
- Identify the central themes of Physics.
- Describe the steps in the scientific method.
- Evaluate the difference between a scientific law and a theory.
- Explain what a vector is.
- Describe how vectors are used.
- Analyze real world occurrences using vectors and vector addition.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Do nows and/or exit slips
- Individual, small, and large group work
- Homework
- Guided practice

OTHER EVIDENCE

- Common assessment quiz
- Common assessment chapter test
- Review Activity

STAGE THREE

LEARNING PLAN

- Flashcards and/or drill and practice

- Power point presentations
- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.
This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all college prep students.

Unit Name: Motion in One Dimension **Time Frame:** 3 weeks (11-12 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics **Country:** USA
Course/Grade: 11-12 **State/Group:** NJ
School: Egg Harbor Township High School

UNIT SUMMARY

Students will understand math techniques needed to comprehend and solve physical motion problems and questions through the use of graphs and equations.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
- Web simulators: www.pHET.colorado.edu

STAGE ONE

GOALS AND STANDARDS

HS ETS1-2 – [Content Statement] - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS ETS1-4 – [Content Statement] - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

ENDURING UNDERSTANDINGS

- Various skills can be utilized to visualize and analyze content, concepts and data.
- Laboratory safety is paramount.
- Speed is the ratio of distance covered and time.
- Velocity is the ratio of displacement and time.
- Velocity is a speed with direction.
- Acceleration is any change in velocity.

ESSENTIAL QUESTIONS

- How is the motion of an object related to different graphs of the motion of an object.
- How is the graphical representation of motion analyzed using equations?
- How are speed, velocity and acceleration related?
- How does gravity affect the motion of an object?
- How can you distinguish between uniform motion and uniform acceleration?
- How will you be able to describe a change in position?

KNOWLEDGE AND SKILLS

- Define velocity and acceleration operationally.
- Relate the direction and magnitude of velocity and acceleration to the motion of objects.
- Interpret graphs for a moving object and describe in words the information presented in graphs.
- Write equations that describe the position of an object moving at constant velocity.
- Interpret a v-t graph to find the time at which an object has a specific velocity.
- Calculate the displacement of an object from the area under a v-t curve.
- Determine from the curves on a velocity-time graph both the constant and instantaneous acceleration.
- Calculate the velocity and the displacement of an object undergoing constant acceleration.
- Recognize the meaning of the acceleration due to gravity.
- Define the acceleration due to gravity and determine its sign relative to the chosen coordinate system.
- Use the motion equations to solve problems involving freely falling objects.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Do nows and/or exit slips
- Individual, small, and large group work
- Homework
- Guided practice

OTHER EVIDENCE

- Common assessment quiz

- Common assessment chapter test
- Review Activity

STAGE THREE

LEARNING PLAN

- Flashcards and/or drill and practice
- Power point presentations
- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.
This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all college prep students. In additional to the formal assessment all units will end with a project that requires students to apply scientific and mathematical knowledge to solve a real world problem via an engineering model based on design, test and redesign.

Unit Name: Motion in Two Dimensions **Time Frame:** 3 weeks (11-12 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics **Country:** USA
Course/Grade: 11-12 **State/Group:** NJ
School: Egg Harbor Township High School

UNIT SUMMARY

Students will analyze projectile motion using vector analysis and problem solving formulas of uniform acceleration.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
- Web simulators: www.pHET.colorado.edu

STAGE ONE

GOALS AND STANDARDS

HS ETS1-2 – [Content Statement] - Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS ETS1-4 – [Content Statement] - Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

ENDURING UNDERSTANDINGS

- Projectile motion is both horizontal and vertical motion. These two motions are independent of one another and are analyzed separately.
- Trajectories are parabolic.

ESSENTIAL QUESTIONS

- How do gravity and air resistance affect the motion of a projectile?
- What variables affect a trajectory?
- How does gravity impact our lives?

KNOWLEDGE AND SKILLS

- Recognize that the vertical and horizontal motions of a projectile are independent.
- Relate the height, time in the air, and initial vertical velocity of a projectile using its vertical motion, then determine the range.
- Explain how the shape of the trajectory of a moving object depends upon the frame of reference from which it is observed.
- Explain the acceleration of an object moving in a circle at constant speed.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Do nows and/or exit slips
- Individual, small, and large group work
- Homework
- Guided practice

OTHER EVIDENCE

- Common assessment quiz
- Common assessment chapter test
- Review Activity

STAGE THREE

LEARNING PLAN

- Flashcards and/or drill and practice
- Power point presentations
- Lecture with note taking or guided notes
- Whole and small group discussions

- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.
This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all college prep students. In additional to the formal assessment all units will end with a project that requires students to apply scientific and mathematical knowledge to solve a real world problem via an engineering model based on design, test and redesign.

Unit Name: Newton's Laws **Time Frame:** 5 weeks (18-19 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics
Country: USA
Course/Grade: 11-12
State/Group: NJ
School: Egg Harbor Township High School

UNIT SUMMARY

Students will use Newton's laws of motion to determine the magnitude and direction of the net force on an object. Students will use Newton's laws to determine the forces necessary to keep objects in static equilibrium.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
- Web simulators: www.pHET.colorado.edu

STAGE ONE

GOALS AND STANDARDS

HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

ENDURING UNDERSTANDINGS

- Objects in motion must change position.
- An unbalanced force will change the momentum of an object.
- Friction is part of everyday life.

ESSENTIAL QUESTIONS

- What are the laws that govern motion and how do we apply them?
- How does our actual weight differ from how heavy we feel?
- What is equilibrium?

- How does gravity influence simple harmonic motion?
- What are the four fundamental forces and when is each observed?

KNOWLEDGE AND SKILLS

- Differentiate between scalar and vector quantities.
- Recognize Newton's second law of motion and use it to solve motion problems.
- Explain the meaning of Newton's first law and describe an object in equilibrium.
- Describe how the weight and the mass of an object are related.
- Define the friction force and distinguish between static and kinetic friction.
- Explain interaction pairs of forces and how they are related by Newton's third law
- Explain the tension in ropes and strings in terms of Newton's third law.
- Determine force that produces equilibrium when three forces act on an object.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Do nows and/or exit slips
- Individual, small, and large group work
- Homework
- Guided practice

OTHER EVIDENCE

- Common assessment quiz
- Common assessment chapter test
- Review Activity

STAGE THREE

LEARNING PLAN

- Flashcards and/or drill and practice
- Power point presentations
- Lecture with note taking or guided notes
- Whole and small group discussions

- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.
This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all college prep students. In additional to the formal assessment all units will end with a project that requires students to apply scientific and mathematical knowledge to solve a real world problem via an engineering model based on design, test and redesign.

Unit Name: Fluid Dynamics **Time Frame:** 3 weeks (11-12 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics **Country:** USA
Course/Grade: 11-12 **State/Group:** NJ
School: Egg Harbor Township High School

UNIT SUMMARY

Students will determine how buoyant forces act and help objects float. Students will determine how fluids apply pressure.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
- Web simulators: www.pHET.colorado.edu

STAGE ONE

GOALS AND STANDARDS

HS-PS2-1. Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

ENDURING UNDERSTANDINGS

- Force is a vector quantity that causes changes in motion.
- Pushing down on a fluid results in the fluid pushing back up.
- The magnitude of a buoyant force for a floating object is equal to the weight of the object.
- The magnitude of a buoyant force for a submerged object is equal to the weight of fluid displaced by the object.
- Pressure is a measure of force exerted over a given area.
- The pressure in a fluid increases with depth.

ESSENTIAL QUESTIONS

- How do steel ships float?
- Why do objects get crushed at different depths?

KNOWLEDGE AND SKILLS

- Calculate the Buoyant force exerted on a given object.
- Contrast a gas and a liquid.
- Relate pressure, force and area.
- Describe how fluid pressure increases with depth.
- Apply the principle of buoyancy to design and build a cardboard boat capable of carrying your team across the pool.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Do nows and/or exit slips
- Individual, small, and large group work
- Homework
- Guided practice

OTHER EVIDENCE

- Common assessment quiz
- Common assessment chapter test
- Review Activity

STAGE THREE

LEARNING PLAN

- Flashcards and/or drill and practice
- Power point presentations
- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion

- Online models and simulators

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.
This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all college prep students. In additional to the formal assessment all units will end with a project that requires students to apply scientific and mathematical knowledge to solve a real world problem via an engineering model based on design, test and redesign.

Unit Name: Energy and Energy Conservation **Time Frame:** 4 weeks (15-16 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics **Country:** USA
Course/Grade: 11-12 **State/Group:** NJ
School: Egg Harbor Township High School

UNIT SUMMARY

Students will recognize that work and power describe how energy moves through the environment. Students will confirm that energy is the total amount of energy in a closed system remains constant.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
- Web simulators: www.pHET.colorado.edu

STAGE ONE

GOALS AND STANDARDS

HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

ENDURING UNDERSTANDINGS

- Energy cannot be created or destroyed.
- All energy transfers are governed by the law of conservation of energy.

- Energy is converted in a system.
- The kinetic energy of an object is proportional to its mass and the square of its velocity.
- The gravitational potential energy of an object depends on the object's weight and distance from the Earth's surface.
- The sum of kinetic and potential energy is called mechanical energy.
- The total energy of a closed isolated system is constant.

ESSENTIAL QUESTIONS

- How are work and power related to energy and each other?
- Why does energy have a role in the physical world?
- What is the difference between momentum and energy?
- How do changes in the amount of energy occur?
- Is this change positive or negative? Can it be both?
- When is equilibrium (balance) achieved?
- How do objects interact during different types of collisions?
- How is the momentum of objects affected during collisions?
- How is momentum conserved for elastic and inelastic collisions?

KNOWLEDGE AND SKILLS

- Compare the system before and after an event in energy problems.
- Describe relationship -> work and energy.
- Calculate the kinetic energy of a moving object.
- Calculate work done by a force.
- Identify the force that does work.
- Differentiate between work and power and correctly calculate power used.
- Use a model to relate work and energy.
- Determine how to find the gravitational potential energy of a system.
- Identify ways in which elastic potential energy is stored in a system.
- Solve problems using the law of conservation of energy.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Do nows and/or exit slips
- Individual, small, and large group work
- Homework

- Guided practice

OTHER EVIDENCE

- Common assessment quiz
- Common assessment chapter test
- Review Activity

STAGE THREE

LEARNING PLAN

- Flashcards and/or drill and practice
- Power point presentations
- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.
This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment common to all college prep students. In additional to the formal assessment all units will end with a project that requires students to apply scientific and mathematical knowledge to solve a real world problem via an engineering model based on design, test and redesign.

Unit Name: Momentum and Collisions **Time Frame:** 4 weeks (15-16 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics **Country:** USA
Course/Grade: 11-12 **State/Group:** NJ
School: Egg Harbor Township High School

UNIT SUMMARY

Students will describe momentum and impulse and apply them to the interaction of objects. Students will analyze the change in momentum during a collision.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
- Web simulators: www.pHET.colorado.edu

STAGE ONE

GOALS AND STANDARDS

HS-PS2-2. Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.

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HS-PS2-3. Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.

ENDURING UNDERSTANDINGS

- Momentum is converted in a system.
- Momentum is a characteristic of mass and velocity and is conserved in collisions.

ESSENTIAL QUESTIONS

- Why does momentum have a role in the physical world?
- What is momentum and impulse and how are they related?
- What is the difference between momentum and inertia?

KNOWLEDGE AND SKILLS

- Compare the system before and after an event in momentum problems.
- Define the momentum of an object.

- Define the impulse given to an object.
- Recognize that impulse equals the change in momentum of an object.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Do nows and/or exit slips
- Individual, small, and large group work
- Homework
- Guided practice

OTHER EVIDENCE

- Common assessment quiz
- Common assessment chapter test
- Review Activity

STAGE THREE

LEARNING PLAN

- Flashcards and/or drill and practice
- Power point presentations
- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators

Student progress will be measured by formative and summative assessments. To maximize student understanding current and cumulative topics will be assessed weekly.
This unit is sequenced to begin with an informal assessment of prior knowledge of topics within the unit and determine any misconceptions. Students will then build small concrete blocks of information pertinent to mastery of this unit. Finally, students will be asked to use this information to evaluate higher level problems. This unit will end with a formal assessment

common to all college prep students. In additional to the formal assessment all units will end with a project that requires students to apply scientific and mathematical knowledge to solve a real world problem via an engineering model based on design, test and redesign.

Unit Name: Circular Motion & Universal Gravitation **Time Frame:** 2 weeks (6-7 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics
Country: USA
Course/Grade: 11-12
State/Group: NJ
School: Egg Harbor Township High School

UNIT SUMMARY

Students will analyze circular motion using vector analysis and problem solving formulas of uniform acceleration.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
- Web simulators: www.pHET.colorado.edu

STAGE ONE

GOALS AND STANDARDS

HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.

HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

ENDURING UNDERSTANDINGS

- Gravity is the predominant cause of changes in our universe.
- An object moving in a circle at a constant speed is accelerating toward the center of the circle.

ESSENTIAL QUESTIONS

- How is planetary motion similar to projectile motion?
- How does gravity impact our lives?

KNOWLEDGE AND SKILLS

- Explain the acceleration of an object moving in a circle at constant speed.
- Describe how centripetal acceleration depends upon the object's speed and the radius of the circle.
- Recognize the direction of the force that causes centripetal acceleration.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Do nows and/or exit slips
- Individual, small, and large group work
- Homework
- Guided practice

OTHER EVIDENCE

- Common assessment quiz
- Common assessment chapter test
- Review Activity

STAGE THREE

LEARNING PLAN

- Flashcards and/or drill and practice
- Power point presentations
- Lecture with note taking or guided notes
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Unit Name: Waves and Energy Transfer **Time Frame:** 2 weeks (11-12 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics **Country:** USA
Course/Grade: 11-12 **State/Group:** NJ
School: Egg Harbor Township High School

UNIT SUMMARY

Students will determine how mechanical waves transfer energy and describe and solve problems involving wave interactions.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
- Web simulators: www.pHET.colorado.edu

STAGE ONE

GOALS AND STANDARDS

HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

ENDURING UNDERSTANDINGS

- Waves transfer energy without transferring matter.
- Mechanical waves require a medium.
- A continuous wave is a regular repeating sequence of wave pulses.
- Interference occurs when two or more waves move through a medium at the same time.

ESSENTIAL QUESTIONS

- How do waves transfer energy?
- How do waves interact?
- How do waves impact our lives?

KNOWLEDGE AND SKILLS

- Identify how waves transfer energy without transferring matter.
- Contrast transverse and longitudinal waves.
- Relate wave speed, wavelength, and frequency.
- Relate a wave's speed to the medium in which the wave travels.
- Describe how waves are reflected and refracted at boundaries between media, and explain how waves diffract.
- Apply the principle of superposition to the phenomenon of interference.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Do nows and/or exit slips
- Individual, small, and large group work
- Homework
- Guided practice

OTHER EVIDENCE

- Common assessment quiz
- Common assessment chapter test
- Review Activity

STAGE THREE

LEARNING PLAN

- Flashcards and/or drill and practice
- Power point presentations
- Lecture with note taking or guided notes

- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators

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Unit Name: Sound **Time Frame:** 1 weeks (4 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics **Country:** USA
Course/Grade: 11-12 **State/Group:** NJ
School: Egg Harbor Township High School

UNIT SUMMARY

Students will determine how sound waves transfer energy and describe and solve problems involving wave interactions.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
- Web simulators: www.pHET.colorado.edu

STAGE ONE

GOALS AND STANDARDS

HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information.

ENDURING UNDERSTANDINGS

- Waves transfer energy without transferring matter.
- Mechanical waves require a medium.
- A continuous wave is a regular repeating sequence of wave pulses.
- Interference occurs when two or more waves move through a medium at the same time.
- Sound is a pressure variation transmitted through matter as a longitudinal wave.
- Sound is produced by vibrating objects in matter.

ESSENTIAL QUESTIONS

- How do waves transfer energy?
- How do waves interact?

- How do waves impact our lives?
- Can cell phones ring in space?

KNOWLEDGE AND SKILLS

- Identify how waves transfer energy without transferring matter.
- Contrast transverse and longitudinal waves.
- Relate wave speed, wavelength, and frequency.
- Relate a wave's speed to the medium in which the wave travels.
- Describe how waves are reflected and refracted at boundaries between media, and explain how waves diffract.
- Apply the principle of superposition to the phenomenon of interference.
- Demonstrate knowledge of the nature of sound waves and the properties sound shares with other waves.
- Solve problems relating the frequency, wavelength, and velocity of sound.
- Relate the physical properties of sound waves to the way we perceive sound.
- Define the Doppler shift and identify some of its applications.

STAGE TWO

PERFORMANCE TASKS

- Laboratory investigations within small groups
- Constructed response
- Graphic organizers or models
- Do nows and/or exit slips
- Individual, small, and large group work
- Homework
- Guided practice

OTHER EVIDENCE

- Common assessment quiz
- Common assessment chapter test
- Review Activity

STAGE THREE

LEARNING PLAN

- Flashcards and/or drill and practice
- Power point presentations

- Lecture with note taking or guided notes
- Whole and small group discussions
- Laboratory groups
- Inquiry based activities with reflective discussion
- Online models and simulators

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Unit Name: Light and Optics **Time Frame:** 2 weeks (7-8 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics **Country:** USA
Course/Grade: 11-12 **State/Group:** NJ
School: Egg Harbor Township High School

UNIT SUMMARY

Students will determine how light travels. Students will understand how lenses and mirrors are used to create different images.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
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STAGE ONE

GOALS AND STANDARDS

HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.

HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other.

ENDURING UNDERSTANDINGS

- Light is an electromagnetic wave that stimulates the retina of the eye.
- Light travels in a straight line through any uniform medium.
- Materials can be characterized as being transparent, translucent, or opaque.
- White light is a combination of the spectrum of colors, each having different wavelengths.
- The law of reflection states that the angle of reflection is equal to the angle of incidence.
- Refraction is the bending of light rays at the boundary between two media.

ESSENTIAL QUESTIONS

- How can we visualize the path of light?
- How are colors formed?
- How is light polarized?
- How does light interact with matter?

KNOWLEDGE AND SKILLS

- Recognize that light is the visible portion of an entire range of EM frequencies.
- Describe the ray model of light.
- Define luminous intensity, luminous flux, and illuminance.
- Explain the formation of color by light and by pigments or dyes.
- Explain the cause and give examples of interference in thin films.
- Explain the law of reflection.
- Calculate the index of refraction in a medium.
- Distinguish between diffuse and regular reflection and provide examples.
- Explain dispersion of light in terms of the index of refraction.
- Explain total internal reflection.
- Define the critical angle.
- Explain effects caused by the refraction of light in a medium with varying refractive indices.

STAGE TWO

PERFORMANCE TASKS

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OTHER EVIDENCE

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- Review Activity

STAGE THREE

LEARNING PLAN

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Unit Name: Electricity **Time Frame:** 1 week (4 lecture days)
Author: Egg Harbor Township High School Science Department

UNIT

Subject: CP Physics **Country:** USA
Course/Grade: 11-12 **State/Group:** NJ
School: Egg Harbor Township High School

UNIT SUMMARY

Students will classify electrical charge and analyze how charge interacts with matter and solve problems relating to charge, electric fields, and forces.

UNIT RESOURCES

- Textbook- Holt Physics 2009
- Lab Manuals and materials

Internet Resource Links:

- Discovery: www.unitedstreaming.com
- NBC Learn Videos: www.nbclearn.com
- eLibrary science: http://science.bigchalk.com/sciweb/science/do/search
- Online textbook: Holt Physics
- Web simulators: www.pHET.colorado.edu

STAGE ONE

GOALS AND STANDARDS

HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

ENDURING UNDERSTANDINGS

- Electrical force fields exist around all charges.
- Current electricity is the continuous motion of electrical charges and how this can be used to do work.
- There are two kinds of electrical charge, positive and negative. Like charges repel; unlike charges attract.
- Electrical charge is not created or destroyed.
- Objects can be charged by transfer of electrons.
- An electric field exists around any charged object.
- Electric potential difference is the change in potential energy per unit charge in any electric field.

ESSENTIAL QUESTIONS

- How is electrical energy stored and transferred?

- How does moving an electric charge do work?
- How do different circuits perform electrical work?

KNOWLEDGE AND SKILLS

- Use Coulomb's law to solve problems relating to electrical force.
- Describe the differences between conductors and insulators.
- Recognize that objects that are charged exert forces, both attractive and repulsive.
- Demonstrate that charging is the separation, not the creation, of electrical charges.
- Define and measure an electric field.
- Solve problems relating to charge, electric fields, and forces.
- Define and calculate electric potential difference.
- Explain how Millikan used electric fields to find the charge of the electron.
- Describe capacitance and solve problems.

STAGE TWO

PERFORMANCE TASKS

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- Constructed response
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OTHER EVIDENCE

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LEARNING PLAN

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Curriculum Resources - Differentiated Instruction

Special Education Interventions in General Education

Visual Supports
Extended time to complete tests and assignments
Graphic Organizers
Mnemonic tricks to improve memory
Study guides
Use agenda book for assignments
Provide a posted daily schedule
Use of classroom behavior management system
Use prompts and model directions
Use task analysis to break down activities and lessons into each individual step needed to complete the task
Use concrete examples to teach concepts
Have student repeat/rephrase written directions
Heterogeneous grouping

Resources:

Do to Learn:
http://www.do2learn.com/

Sen Teacher:
http://www.senteacher.org/

Intervention Central:
http://www.interventioncentral.org/

Learning Ally:
https://www.learningally.org/

English Language Learners Interventions in Regular Education
Resources:

FABRIC - Learning Paradigm for ELLs (NJDOE)
www.nj.gov/education/bilingual/pd/**fabric**/**fabric**.pdf

Guide to Teaching ELL Students
http://www.colorincolorado.org/new-teaching-ells

Edutopia - Supporting English Language Learners
https://www.edutopia.org/blog/strategies-and-resources-supporting-ell-todd-finley

Reading Rockets
http://www.readingrockets.org/reading-topics/english-language-learners

Gifted and Talented Interventions in Regular Education
Resources:

Who are Gifted and Talented Students
http://www.npr.org/sections/ed/2015/09/28/443193523/who-are-the-gifted-and-talented-and-what-do-they-need

Hoagies Gifted Education Page
http://www.hoagiesgifted.org/programs.htm

21st Century Learning
Resources:

Partnership for 21st Century Learning
http://www.p21.org/

Career Ready Practices (NJDOE)
http://www.nj.gov/education/cte/hl/CRP.pdf