

HS - Honors Physics 1 - 11-12

Huntingdon Area School District

UNITS (16/16 SELECTED)

SUGGESTED DURATION

 Unit 1: Module 1 - A Physics Toolkit	<i>7 lessons</i>
 Unit 1: Module 2 - Representing Motion	<i>8 lessons</i>
 Unit 1: Module 3 - Accelerated Motion	<i>8 lessons</i>
 Unit 1: Module 4 - Forces in One Dimension	<i>11 lessons</i>
 Unit 2: Module 5 - Displacement and Force in Two Dimensions	<i>12 lessons</i>
 Unit 2: Module 6 - Motion in Two Dimensions	<i>11 lessons</i>
 Unit 2: Module 7 - Gravitation	<i>8 lessons</i>
 Unit 2: Module 8 - Rotational Motion	<i>12 lessons</i>
 Unit 3: Module 9 - Momentum and Its Conservation	<i>7 lessons</i>
 Unit 3: Module 10 - Energy and Its Conservation	<i>11 lessons</i>
 Unit 4: Module 13 - Waves and Light	<i>10 lessons</i>
 Unit 4: Module 14 - Sound	<i>9 lessons</i>
 Unit 5: Module 18 - Electrostatics	<i>13 lessons</i>
 Unit 5: Module 20 - Magnetism	<i>11 lessons</i>
 Unit 5: Module 21 - Electromagnetism	<i>9 lessons</i>
 Unit 6: Module 24 - Nuclear and Particle Physics	<i>11 lessons</i>

Unit 1: Module 1 - A Physics Toolkit

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Module 1 provides a review of the mathematical requirements for data collection and analysis through Physics experimentation. Students will review scientific notation, significant figures, metric system, dimensional analysis (factor label method), percent error and graphing.

ATTACHMENTS

 Unit_1_Physics.png

STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.J

3.2.9-12.V

3.5.9-12.OO

3.5.9-12.PP

BIG IDEAS

Big Ideas

- Conversion factors are utilized to solve problems in physics.
- S.I. units are important to the foundation of reporting scientific data in the physics classroom.
- Conversion of units is essential to solving physics problems.
- Error influences and impacts the results of experiments in physics.

ESSENTIAL QUESTIONS

Essential Questions

- Why is it important to make careful measurements?
- How do graphs help scientists analyze data?

Unit 1: Module 1 - A Physics Toolkit

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
the base SI units of measurement.	identify an observation as quantitative or qualitative.
the difference between accuracy and precision.	convert numbers into/from scientific notation and conduct basic mathematical operations with scientific notation without a calculator
how to identify a digit as significant.	read measurements off of instrumentation with the appropriate accuracy and precision.
which graph type is appropriate for a given data set; line, pie, histogram, bar.	Calculate the percent error given experimental data.
the difference between dependent and independent variables.	Interpret graphical data.
	Create graphical representations of experimental data.

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 1 Test	summative	
Laboratory Reports	project based	Scientific writing activity summarizing the experimentation completed.
Build a Rocket Project (due at completion of unit 1)	project-based	

Unit 1: Module 2 - Representing Motion

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek to answer the question "How does a GPS unit know where you are?".

ATTACHMENTS

 Unit_1_Physics.png

STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.I

3.5.9-12.OO

3.5.9-12.PP

BIG IDEAS

Big Ideas

- Students will learn that motion can be modeled by motion diagrams, particle models, vectors, graphs, and mathematical equations.

ESSENTIAL QUESTIONS

Essential Questions

- How do you know something is moving?
- What are some different ways of describing and representing motion?
- What can you learn from a position-time graph?
- How do you describe how fast something is moving?

Unit 1: Module 2 - Representing Motion

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
what a vector is and how it differs from a scalar quantity.	draw motion diagrams.
differences between position, distance and displacement.	combine one-dimensional vectors through both graphical and mathematical means.
mathematical equations for displacement, and velocity.	draw position-time graphs and interpret them.
	utilize the mathematical equations for motion.

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 2 Test	summative	
Lab Reports	project-based	
Build a Rocket Engineering Project (due at conclusion of Unit 1)	project-based	

Unit 1: Module 3 - Accelerated Motion

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek to answer the question "Why do sudden changes in the direction or speed of jet planes affect pilots?".

ATTACHMENTS

 Unit_1_Physics.png

STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.I

3.5.9-12.OO

3.5.9-12.PP

BIG IDEAS

Big Ideas

- Students will expand their knowledge of modeling motion to include accelerated motion.

ESSENTIAL QUESTIONS

Essential Questions

- What are two ways that velocity can change?
- How are position, velocity, acceleration and time related?
- How does an objects speed change as it falls?

Unit 1: Module 3 - Accelerated Motion

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
the one dimensional kinematics equations.	For one dimensional kinematic problems, solve for quantities such as velocity, displacement, acceleration, and time.
what is meant by the term free fall.	Draw and analyze velocity-time graphs.
the difference between instantaneous and average speed and acceleration.	
slope and area of various graphs gives information about an objects motion	

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 3 Test	summative	
Lab Reports	project-based	
Build a Rocket Project (due at end of Unit 1)	project-based	

Unit 1: Module 4 - Forces in One Dimension

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek to answer the question "How do wing suits help BASE jumpers control their velocity?".

ATTACHMENTS

 Unit_1_Physics.png

 Unit_1_Module_4_Physics.png

STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.I

3.5.9-12.NN

3.5.9-12.OO

3.5.9-12.PP

3.5.9-12.W

3.5.9-12.X

3.5.9-12.DD

BIG IDEAS

Big Ideas

- Students will analyze force conceptually and mathematically and be able to describe situations using Newton's 3 laws of motion.

ESSENTIAL QUESTIONS

Essential Questions

- What causes a change in motion?
- How does the drag force change after a skydiver deploys their parachute?
- If you push on a wall, what force does the wall exert on you?

Unit 1: Module 4 - Forces in One Dimension

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
Newton's Three Laws of Motion	calculate accelerations using Newton's second law and understand that accelerations cause changes in motion.
free-body diagrams	utilize Newton's three laws of motion to describe and calculate forces.
concepts of weight, apparent weight, and drag force.	draw and correctly label force diagrams and model situations using these diagrams.

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 4 Test	summative	
Laboratory Reports	project-based	
Build a Rocket Project (due at end of module 4)	project-based	

Unit 2: Module 5 - Displacement and Force in Two Dimensions

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UNIT OVERVIEW

Students will seek to answer the question "How can forces cause so many different types of motion?".

STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.I

3.2.9-12.L

3.3.9-12.D

BIG IDEAS

Big Ideas

- Students will expand their knowledge of motion and the forces that cause it to change in two dimensions.
- Students will expand their knowledge of vectors into 2 dimensions.
- Friction is a result of the apparent weight of an object and the coefficient of friction (types of material in contact).

ESSENTIAL QUESTIONS

Essential Questions

- How can you add forces in two dimensions?
- What forces cause a train to stop?
- How can you analyze forces on a train as it climbs a hill?

Unit 2: Module 5 - Displacement and Force in Two Dimensions

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
Causes of Friction and how to affect it.	Determine the resultant of adding multiple vectors in two dimensions.
what it means to be at equilibrium.	Calculate the coefficient of friction for various surfaces in contact.
static and kinetic friction.	Determine the velocity, acceleration, and displacement of an object moving in two dimensions with and without friction.
free-body diagrams for inclined planes	utilize sin, cos, and tan to resolve a vector into components.

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 5 Test	Summative	
Laboratory Reports	project-based	
Moon Landing Project (due at end of Unit 2)	project-based	

Unit 2: Module 6 - Motion in Two Dimensions

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek to answer the question "Why do thrown basketballs travel in arcs?".

STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.I

3.3.9-12.D

BIG IDEAS

Big Ideas

- Students will explore how the path of a projectile is determined by its launch conditions, gravity and air resistance.
- Students will explore centripetal force, centripetal acceleration, and circular motion, and will use Newton's second law for circular motion.
- Students will explore classical relative motion in one and two dimensions.

ESSENTIAL QUESTIONS

Essential Questions

- What forces affect a basketball's trajectory?
- What force causes an object to move in a circle?
- Does your description of motion depend on your frame of reference?

Unit 2: Module 6 - Motion in Two Dimensions

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
projectiles follow an arc (parabolic path)	calculate the range, flight time, impact velocities of a projectile
centripetal vs centrifugal force.	utilize the equations of kinematics for two dimensions.
frames of reference and relative velocity	calculate centripetal force and acceleration for an object moving in a circular path.
	determine the relative velocity of objects for nonaccelerating frames of reference.

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 6 Test	summative	
Laboratory Reports	project-based	
Moon Landing Project (due at end of Unit 2)	project-based	

Unit 2: Module 7 - Gravitation

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek to answer the question "How can gravity keep moons orbiting planets but also cause things to fall?".

ATTACHMENTS

 Module_7.png

STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.L

3.2.9-12.I

3.3.9-12.D

BIG IDEAS

Big Ideas

- Students will explore Kepler's laws and Newton's law of universal gravitation.
- Students will explore the orbits of planets and satellites and the concept of a gravitational field.
- Brief introduction to Einstein's Theory of gravity.

ESSENTIAL QUESTIONS

Essential Questions

- What role does gravity play in planetary motion?
- How does gravity affect objects that aren't touching?

Unit 2: Module 7 - Gravitation

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
Kepler's law of planetary motion	compare the periods of revolution for various moons and planets using Kepler's Laws.
Newton's law of universal gravitation	calculate the gravitation field of various planets.
how satellites orbit the planet	

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 7 Test	summative	
Laboratory Report	project-based	
Moon Landing Project (due at end of Unit 2)	project-based	

Unit 2: Module 8 - Rotational Motion

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UNIT OVERVIEW

Students will seek to answer the question "Why do all tropical cyclones in the northern hemisphere rotate the same direction?".

STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.I

3.2.9-12.L

3.3.9-12.D

3.5.9-12.OO

3.5.9-12.PP

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3.5.9-12.W

3.5.9-12.X

BIG IDEAS

Big Ideas

- Students will explore how rotational motion can be described in terms of angular displacement, angular velocity, angular acceleration, and angular frequency.
- Students will explore Newtons second law for rotational motion.
- Students will explore stability, static equilibrium and rotating reference frames.

ESSENTIAL QUESTIONS

Essential Questions

- How would you describe the rotation of a hurricane?
- How does force affect rotation?
- Why are some vehicles more likely to roll over than others?

Unit 2: Module 8 - Rotational Motion

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
the relationship between linear measurements and angular ones.	solve mathematical problems involving angular displacement, angular velocity, angular acceleration, and angular frequency
the criteria for equilibrium	solve problems regarding equilibrium and torque.
describe angular motion.	
center of mass	

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 8 Test	summative	
Lab reports	project-based	
Moon Landing Project	project-based	

Unit 3: Module 9 - Momentum and Its Conservation

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek to answer the question "How do rockets accelerate once they reach space?".

ATTACHMENTS

 module_9_Physics.png

STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.J

3.2.9-12.K

BIG IDEAS

Big Ideas

- Students will explore impulse, momentum, and how they are related by the impulse-momentum theorem.
- Students will explore the conservation of momentum in a variety of situations, including collisions, recoil, and gyroscopes.

ESSENTIAL QUESTIONS

Essential Questions

- How do airbags work to save lives?
- What is recoil and how is it useful?

Unit 3: Module 9 - Momentum and Its Conservation

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
conservation of momentum.	utilize the impulse-momentum formula to calculate quantities
impulse	Design a safety system for a vehicle collision (project).
momentum	

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 9 Test	summative	
Lab Reports	project-based	
Crash Safety Project	project-based	

Unit 3: Module 10 - Energy and Its Conservation

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek to answer the question "How can energy from power plants be stored in the power grid for later use?".

ATTACHMENTS

 Module_10_Physics.png

STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.O

3.2.9-12.Q

3.2.9-12.J

3.5.9-12.DD

3.5.9-12.PP

3.5.9-12.OO

3.2.9-12.P

BIG IDEAS

Big Ideas

- Students will explore work, energy, and power, and the relationships among them.
- Students will explore different forms of energy, with an emphasis on macroscopic kinetic energy and gravitational potential energy.
- Students will explore the law of conservation of energy and use it to analyze collisions.
- Students will explore the benefits of simple and compound machines.

ESSENTIAL QUESTIONS

Essential Questions

- What is Energy?
- What are some forms of energy?
- Can energy be lost?
- How do machines make tasks easier?

Unit 3: Module 10 - Energy and Its Conservation

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
types of energy.	utilize the work-energy theorem to calculate energy transformations.
work, power, and energy (physics definitions).	utilize experimental data to prove the law of conservation of energy
simple and compound machines	utilize simple machines to create a vehicle for the Crash Safety Project.
mechanical advantage.	

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 10 Test	summative	
Lab Reports	project-based	
Crash Safety Project (due after module 14)	project-based	

Unit 4: Module 13 - Waves and Light

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UNIT OVERVIEW

Students will seek to answer the question "How do waves affect our everyday lives?".

ATTACHMENTS

 module_13_Physics.png

 DCI_Module13_Physics.png

STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.T

3.2.9-12.U

3.2.9-12.V

3.2.9-12.X

3.2.9-12.W

BIG IDEAS

Big Ideas

- Students will explore periodic motion, including the specific cases of masses on springs, pendulums and resonance.
- Students will explore the properties of waves, including amplitude, wavelength, frequency, wave speed and period.
- Students will explore reflection, refraction and interference of waves

ESSENTIAL QUESTIONS

Essential Questions

- What are some types of repetitive motion?
- What are some common types of waves?
- What happens when two waves meet?

Unit 4: Module 13 - Waves and Light

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
simple harmonic motion.	Calculate wave speeds, frequencies, periods for given waves.
identify parts of a wave.	Determine the periods of oscillation for repetitive motion.
wave behaviors, reflection, refraction, and interference.	Graphically show constructive and destructive interference of 2 waves when they interact.
Principle of Superposition	

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 13 Test	summative	
Lab Reports	project-based	
Making Music Project (due at end of 4th quarter)	project-based	

Unit 4: Module 14 - Sound

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek to answer the question "Why does a fire truck siren pitch change as it passes you?".

ATTACHMENTS

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STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.T

BIG IDEAS

Big Ideas

- Students will explore the properties of sound waves, how humans perceive them, and the doppler effect.
- Students will explore how sound is created and how musical instruments work.

ESSENTIAL QUESTIONS

Essential Questions

- What factors affect the pitch of sound?
- How is pitch controlled in a musical instrument?

Unit 4: Module 14 - Sound

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
open versus closed end tubes for sound generation	calculate resonance frequencies for various sound waves.
doppler effect	determine the doppler shift for moving objects.
physics of music	determine the frequency of vibrations of string instruments

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 14 Test	summative	
Lab Reports	project-based	
Making Music Physics Lab Project	project based	

Unit 5: Module 18 - Electrostatics

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek to answer the question "Why does the rod cause the water to bend?".

ATTACHMENTS

 Module_18_Physics.png

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STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.L

3.2.9-12.S

3.2.9-12.N

3.2.9-12.I

BIG IDEAS

Big Ideas

- Students will explore the evidence we have for electric charge and how some materials are electric conductors while others are electrical insulators.
- Students will explore how objects can be charged, as well as Coulomb's Law.
- Students will explore electric fields and how they can be modeled.

- Students will explore electrical potential energy, capacitors, and how the charge of an electron was determined.

ESSENTIAL QUESTIONS

Essential Questions

- Why does rubbing your shoes on the carpet lead to a shock when you touch a metal door knob?
- How can objects be electrically charged?
- How can we explain how electric forces work at a distance?
- What is a capacitor and how does it work?

Unit 5: Module 18 - Electrostatics

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
Coulomb's Law	calculate forces of attraction and repulsion using Coulomb's Law
Conduction vs Induction	Map Electric Field lines for point charges and parallel plates.
Electric Fields	

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 18 Test	summative	
Lab Reports	project-based	

Unit 5: Module 20 - Magnetism

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek to answer the question "What makes this electromagnet stronger than a typical refrigerator magnet?"

ATTACHMENTS

 Module_20_Physics.png

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STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.M

3.2.9-12.S

3.2.9-12.P

3.2.9-12.Q

BIG IDEAS

Big Ideas

- Students will explore the properties of magnets, magnetic domains, magnetic fields, and electromagnets.
- Students will explore the effects of magnetic forces on current-carrying wires and moving charged particles, as well as related applications, such as galvanometers and motors.

ESSENTIAL QUESTIONS

Essential Questions

- Why are some materials magnetic and others are not?
- What role do magnetic forces play in everyday life?

Unit 5: Module 20 - Magnetism

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
properties of magnets and magnetic fields	Draw magnetic fields
	Use the Right-Hand Rule to explain how an electrical current creates a magnetic field.
	Use Right Hand Rule to show the relationship between current, Force, and Magnetic Field strength.

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 20 Test	summative	
Lab Reports	project-based	

Unit 5: Module 21 - Electromagnetism

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek the answer to the question "What causes the Northern Lights?".

ATTACHMENTS

 Module_21_Physics.png

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STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.2.9-12.M

3.2.9-12.U

3.2.9-12.W

3.2.9-12.X

BIG IDEAS

Big Ideas

- Students will explore how changing magnetic fields induce currents and how generators work.
- Students will explore Lenz's law, eddy currents, self-inductance, and transformers.
- Students will explore Thomson's experiments with cathode ray tubes and mass spectrometers, both of which demonstrate how charged particles behave in electric and magnetic fields.
- Students will explore the properties and technological applications of electromagnetic waves.

ESSENTIAL QUESTIONS

Essential Questions

- How can a magnet generate a current?
- How do transformers help with the distribution of electricity in the power grid?
- How does a mass spectrometer work?
- What do electric and magnetic fields have to do with light?

Unit 5: Module 21 - Electromagnetism

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
Lenz's Law	create an electromagnet
Induced current	calculate the strength of the magnetic field based on Lenz's Law.
Right-Hand Rule	
Thomson and Milliken electron experiments.	

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 21 Test	summative	
Lab Reports	project-based	

Unit 6: Module 24 - Nuclear and Particle Physics

HS - Honors Physics 1 - 11-12

UNIT OVERVIEW

Students will seek the answer to the question "How does the Sun produce energy and how can we replicate it?".

ATTACHMENTS

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STANDARDS/EXPECTATIONS

Pennsylvania - Grade 9-12 - Science, Technology & Engineering, And Environmental Literacy & Sustainability Standards (STEELS) (2023)

3.3.9-12.A

3.2.9-12.H

BIG IDEAS

Big Ideas

- Students will explore the structure of the nucleus, the forces acting on the particles within it, and the energy binding its particles together.
- Students will explore radioactive decay, fission, and fusion.
- Students will explore how scientists use particle accelerators and detectors to determine the fundamental make up of the universe, which is described by the Standard Model.

ESSENTIAL QUESTIONS

Essential Questions

- What is inside an atom?
- How can nuclear reactions be useful?
- How do scientists discover particles they can't see?

Unit 6: Module 24 - Nuclear and Particle Physics

HS - Honors Physics 1 - 11-12

LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know (Acquired Knowledge)	Students can do (Acquired Skill)
strong nuclear force	Calculate half lives
alpha, beta, and gamma decay	write reactions for radioactive decay of elements
particle accelerators	

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	Type (formative, summative, project-based, diagnostic)	Description
Module 24 Test	summative	
Lab Report	project-based	
Making Music Physics Lab	project-based	