HS - Physical Science - 10-12

Huntingdon Area School District

UNITS (19/19 SELECTED)	SUGGESTED DURATION
Unit 1: Module 1 - The Nature of Science	*5 lessons*
Unit 1: Module 2 - Motion	*11 lessons*
Unit 1: Module 3 - Forces and Newton's Laws	*10 lessons*
Unit 2: Module 4 - Work and Energy	*9 lessons*
Unit 2: Module 5 - Thermal Energy	*11 lessons*
Unit 2: Module 6 - Electricity	*9 lessons*
Unit 2: Module 7 - Magnetism and Its Uses	*10 lessons*
Unit 3: Module 9 - Introduction to Waves	*10 lessons*
Unit 3: Module 10 - Sound	*7 lessons*
Unit 3: Module 11 - Electromagnetic Waves	*6 lessons*
Unit 3: Module 12/13 - Light, Mirrors and Lenses	*8 lessons*
Unit 4: Module 14 - Solids, Liquids and Gases	*7 lessons*
Unit 4: Module 15 - Classification of Matter	*7 lessons*
Unit 4: Module 16 - Properties of Atoms and the Periodic Table	*7 lessons*
Unit 4: Module 17 - Elements and their Properties	*7 lessons*
Unit 5: Module 18 - Chemical Bonds	*9 lessons*
Unit 5: Module 19 - Chemical Reactions	*5 lessons*
Unit 5: Module 20 - Radioactivity and Nuclear Reactions	*9 lessons*
Unit 6: Module 21 - Solutions	*11 lessons*

Unit 1: Module 1 - The Nature of Science

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UNIT OVERVIEW

Students will seek to answer the question "How do we know how rainbows form?"

ATTACHMENTS

PS-DCI_Module_1.png

STANDARDS/EXPECTATIONS

BIG IDEAS

Big Ideas

- Students will explore the tools and methods of science.
- Students will explore units and measurement.
- Students will explore how graphs present information.
- Students will explore technology as the application of science.

ESSENTIAL QUESTIONS

Essential Questions

- What are the steps of the methods of science?
- Which units are used when measuring length, volume, mass, electricity, and temperature?
- When would you use a bar graph instead of a line graph?
- How does society affect the technology that we use?

Unit 1: Module 1 - The Nature of Science

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LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know . . . . . (Acquired Knowledge)	**Students can do . . . . . (Acquired Skill)**
Metric System	perform metric conversions
Scientific Method	conduct investigations throughout the year utilizing the scientific method.
Graph types	Use the appropriate graph type for a given data set.
Dependent and independent variables	

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	Description
Module 1 Test	summative	

Unit 1: Module 2 - Motion

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UNIT OVERVIEW

Students will seek to answer the question "Why is this motorbike traveling in an arc?".

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 position and motion.
- Students will explore velocity and momentum.
- Students will explore changes in velocity and acceleration.

ESSENTIAL QUESTIONS

Essential Questions

- Which factors describe the motion of an object?
- How does the velocity of an object affect its momentum?
- How ddoes acceleration result in projectile motion?

Unit 1: Module 2 - Motion

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LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know . . . . . (Acquired Knowledge)	**Students can do . . . . . (Acquired Skill)**

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Module 2 Test	summative	
Answers to Lab Questions	project-based	
Egg Drop Project (due at end of Module 3)	project based	

Unit 1: Module 3 - Forces and Newton's Laws

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UNIT OVERVIEW

Students will seek to answer the question "Why can a car stop faster than a train?".

ATTACHMENTS

PS_-_DCI_Module_3.png

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.J | 3.2.9-12.K | 3.2.9-12.L | 3.2.9-12.M

BIG IDEAS

Big Ideas

- Students will explore types and characteristics of forces.
- Students will explore Newton's Laws of Motion.
- Students will explore the interactions between force, acceleration and momentum.

ESSENTIAL QUESTIONS

Essential Questions

- How does friction affect motion?
- How do forces affect acceleration?
- How do Newton's three laws explain the change of motion that occurs in a collision?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Module 3 Test	summative	
Answers to Lab Questions	project-based	
Egg Drop Project	project-based	

Unit 2: Module 4 - Work and Energy

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UNIT OVERVIEW

Students will seek to answer the question "How can energy be collected and stored for daily use?".

ATTACHMENTS

PS_-_DCI_Module_4.png

PS_-_DCI_Module_4.2.png

STANDARDS/EXPECTATIONS

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

3.2.9-12.P | 3.2.9-12.R | 3.2.9-12.S | 3.2.9-12.O | 3.2.9-12.Q

BIG IDEAS

Big Ideas

- Students will explore how to do work.
- Students will explore the forms and transfer of energy.
- Students will explore the conservation of energy.

ESSENTIAL QUESTIONS

Essential Questions

- How do machines utilize and change work?
- How do you classify and calculate different forms of energy?
- How is energy transformed for a swinging object?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Module 4 Test	summative	
Answers to Lab Questions	project-based	

Unit 2: Module 5 - Thermal Energy

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UNIT OVERVIEW

Students will seek to answer " Why would it be useful to visualize thermal energy?".

ATTACHMENTS

PS_-_DCI_Module_5.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.P | 3.2.9-12.R

BIG IDEAS

Big Ideas

- Students will explore the relationships between heat, thermal energy and temperature.
- Students will explore how heat moves.
- Students will explore thermodynamics and using heat to do work.

ESSENTIAL QUESTIONS

Essential Questions

- Why are there different colors on a thermal image?
- Why, after placing a pot of water on a hot stove, does the water not immediately boil?
- What do a refrigerator and a car engine have in common?

Essential Questions

- What are there different colors on a thermal image?
- Why, after placing a pot of water on a hot stove, does the water not immediately boil?
- What do a refrigerator and a car engine have in common?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Module 5 Test	summative	
Answers to Lab Questions	project-based	

Unit 2: Module 6 - Electricity

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UNIT OVERVIEW

Students will seek to answer the question, "How can you safely conduct electricity underwater?

ATTACHMENTS

PS_-_DCI_Module_6.png

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.L | 3.2.9-12.P | 3.2.9-12.Q

BIG IDEAS

Big Ideas

- Students will explore static electricity.
- Students will explore how charge moves through conductors.
- Students will explore electric circuits.

ESSENTIAL QUESTIONS

Essential Questions

- What is the difference between charging by contact and charging by induction?
- How can the flow of electricity be compared to that of water?
- What are the different ways to connect an electrical circuit?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Module 6 Test	summative	
Answers to Lab Questions	project based	

Unit 2: Module 7 - Magnetism and Its Uses

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UNIT OVERVIEW

Students will seek to answer the question, "What makes something magnetic?".

ATTACHMENTS

PS_-_DCI_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.M | 3.2.9-12.P | 3.2.9-12.Q | 3.2.9-12.S

BIG IDEAS

Big Ideas

- Students will explore the properties of magnets and magnetic fields.
- Students will explore how magnetic fields form in the presence of an electric field.
- Students will explore the properties of electromagnetic induction.

ESSENTIAL QUESTIONS

Essential Questions

- How do magnets interact with other materials?
- How do electromagnets function in electrical devices?
- How can magnetism be used to produce electric current?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Module 7 Test	summative	
Answers to lab questions	project based	

Unit 3: Module 9 - Introduction to Waves

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UNIT OVERVIEW

Students will seek to answer the question, " How do buildings move during an earthquake?".

ATTACHMENTS

PS_-_DCI_Module_9.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.L | 3.2.9-12.M

BIG IDEAS

Big Ideas

- Students will explore the properties of waves and how they transfer energy.
- Students will explore the components of waves.
- Students will explore how waves behave when they encounter either an obstacle or another medium.

ESSENTIAL QUESTIONS

Essential Questions

- How would you describe the motion of a stadium-style wave?
- What are the different ways to measure one wavelength?
- How does light behave when it travels from air to water?

Unit 3: Module 9 - Introduction to Waves

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LEARNING TARGETS: KNOWLEDGE & SKILLS

Knowledge	Skills
Students will know . . . . . (Acquired Knowledge)	**Students can do . . . . . (Acquired Skill)**

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
answers to lab activities	project based	
Module 9 Test	summative	

Unit 3: Module 10 - Sound

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UNIT OVERVIEW

Students will seek to answer the question, "Why do two instruments playing the same note sound different?".

ATTACHMENTS

PS_-_DCI_Module_10.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.V

BIG IDEAS

Big Ideas

- Students will explore the structure and creation of sound waves.
- Students will explore the properties of sound waves.
- Students will explore sound in music.
- Students will explore the uses of sound in technology.

ESSENTIAL QUESTIONS

Essential Questions

- How does sound change when traveling through different mediums?
- Why can you feel the bass of the music at a concert?
- What are beats and why do they occur?
- What does echolocation and ultrasonic imaging have in common?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Answers to lab questions.	project based	
Module 10 Test	summative	

Unit 3: Module 11 - Electromagnetic Waves

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UNIT OVERVIEW

Students will seek to answer the question, "How do we see x-rays?".

ATTACHMENTS

PS_-_DCI_Module_11.png

STANDARDS/EXPECTATIONS

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

3.2.9-12.U | 3.2.9-12.T | 3.2.9-12.V | 3.2.9-12.W | 3.2.9-12.X | 3.2.9-12.M

BIG IDEAS

Big Ideas

- Students will explore the structure of electromagnetic waves.
- Students will explore the electromagnetic spectrum.
- Students will explore the uses of radio and microwaves in communication.

ESSENTIAL QUESTIONS

Essential Questions

- How do electromagnetic waves interact with the things around us?
- Why can I see only part of the electromagnetic spectrum?
- Why do I lose cell signal when I run the microwave oven?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Answers to Lab questions	project based	
Module 11 Test		

Unit 3: Module 12/13 - Light, Mirrors and Lenses

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UNIT OVERVIEW

Students will seek to answer the questions, "How does light transmit information?", and "What is the farthest you can see with a telescope like this?".

ATTACHMENTS

PS_-_DCI_Module_12_13.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.V | 3.2.9-12.X

BIG IDEAS

Big Ideas

- Students will explore how light interacts with itself and other objects.
- Students will explore how color is seen and what happens when different colors are mixed.
- Students will explore how lightbulbs, lasers, and other emitters of light work.
- Students will explore ways to use polarizing filters, holograms, and optical fibers.
- Students will explore the characteristics and properties of mirrors and types of images they form.
- Students will explore the characteristics and properties of lenses and types of images they form.
- Students will explore the different types of optical instruments.

Unit 3: Module 12/13 - Light, Mirrors and Lenses

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ESSENTIAL QUESTIONS

Essential Questions

- How are rainbows and mirages formed?
- What are the similarities and differences between light and pigments?
- What are the differences between incandescent, fluorescent, neon and laser lights?
- How are holograms made?
- How do different types of mirrors form images?
- How do different types of lenses form images?
- Why do some optical instruments use more than one lens or mirror?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Answers to lab questions	project based	
Module 12/13 Test	summative	

Unit 4: Module 14 - Solids, Liquids and Gases

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UNIT OVERVIEW

Students will seek to answer the question, "Why does a balloon shrink and crumple when liquid nitrogen is poured on it?".

ATTACHMENTS

PS_-_DCI_Module_14.png

STANDARDS/EXPECTATIONS

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

3.2.9-12.B | 3.2.9-12.N | 3.2.9-12.P | 3.2.9-12.Q

BIG IDEAS

Big Ideas

- Students will explore the kinetic theory and how it connects the arrangement and behavior of atoms, ions, and molecules to the common states of matter.
- Students will explore the properties and behavior of fluids, including three of the major principles that describe fluids, Archimedes', Pascal's, and Bernuolli's.
- Students will explore how gases are affected by changes in Pressure, Temperature, Volume and Temperature.

ESSENTIAL QUESTIONS

Essential Questions

- How do changes in thermal energy affect the particles that makeup matter?
- What principles describe the behavior of fluids?
- How do gases respond to changes in pressure and temperature?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Answers to lab questions	project based	
Module 14 Test	summative	

Unit 4: Module 15 - Classification of Matter

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UNIT OVERVIEW

Students will seek to answer the question, "Could a person really sink and disappear into a pit of quicksand?".

ATTACHMENTS

PS_-_DCI_Module_15.png

STANDARDS/EXPECTATIONS

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

3.2.9-12.G | 3.3.9-12.P | 3.3.9-12.R

BIG IDEAS

Big Ideas

- Students will explore the composition of matter, with a focus on identifying and classifying pure substances and mixtures.
- Students will explore the properties and changes of matter.

ESSENTIAL QUESTIONS

Essential Questions

- What are the differences between substances and mixtures?
- How are properties and changes of matter classified?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Answers to Lab questions	project based	
Module 15 Test	summative	

Unit 4: Module 16 - Properties of Atoms and the Periodic Table

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UNIT OVERVIEW

Students will seek to answer the question, "Why are there different colors on the periodic table?".

ATTACHMENTS

PS_-_DCI_Module_16.png

STANDARDS/EXPECTATIONS

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

3.2.9-12.A 3.2.9-12.C

BIG IDEAS

Big Ideas

- Students will explore the subatomic particles that make up atoms, how scientists model atoms, and the history of the atomic model.
- Students will explore atomic mass and mass number.
- Students will explore the origins of the periodic table as well as the structure and function of the different elements.

ESSENTIAL QUESTIONS

Essential Questions

- Can an atom be broken into smaller parts?
- How can we know the mass of a single atom?
- Why is part of the periodic table separate and below the rest of it?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Answers to Lab Questions	project based	
Module 16 Test	summative	

Unit 4: Module 17 - Elements and their Properties

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UNIT OVERVIEW

Students will seek to answer the question, "Why does this lava burn blue?".

ATTACHMENTS

PS_-_DCI_Module_17.png

STANDARDS/EXPECTATIONS

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

3.2.9-12.A | 3.2.9-12.B | 3.2.9-12.G | 3.2.9-12.N | 3.2.9-12.C

BIG IDEAS

Big Ideas

- Students will explore metals and their properties.
- Students will explore nonmetals and their properties.
- Students will explore mixed groups, semiconductors, and metalloids.

ESSENTIAL QUESTIONS

Essential Questions

- What are the properties of a typical metal?
- What are the properties of a typical nonmetal?
- What are the differences between metals, nonmetals, and metalloids?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Answers to Lab questions	project based	
Module 17 Test	summative	

Unit 5: Module 18 - Chemical Bonds

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UNIT OVERVIEW

Students will seek to answer the question, "What makes these rock crystals form perfect cubes?".

ATTACHMENTS

PS_-_DCI_Module_18.png

STANDARDS/EXPECTATIONS

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

3.2.9-12.A | 3.2.9-12.B | 3.2.9-12.C | 3.2.9-12.D | 3.2.9-12.G | 3.2.9-12.N | 3.3.9-12.P | 3.3.9-12.R

BIG IDEAS

Big Ideas

- Students will explore how and why compounds form.
- Students will explore ionic and covalent bonds.
- Students will explore methods for writing chemical formulas, the importance of oxidation numbers, and how to name polyatomic ions.

ESSENTIAL QUESTIONS

Essential Questions

- Can you name some common compounds and the individual elements that make them up?
- What is the difference between ionic and covalent bonds?
- Can you name the chemical formula for some common compounds?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

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

Unit 5: Module 19 - Chemical Reactions

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UNIT OVERVIEW

Students will seek to answer the question. "What chemical reactions occur when you bake cupcakes?".

ATTACHMENTS

PS_-_DCI_Module_19.png

STANDARDS/EXPECTATIONS

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

3.2.9-12.C | 3.2.9-12.D | 3.2.9-12.E | 3.2.9-12.F | 3.2.9-12.G

BIG IDEAS

Big Ideas

- Students will explore chemical reactions.
- Students will explore the different types of chemical reactions.
- Students will explore the relationships between chemical reactions and energy.
- Students will explore reaction rates and equilibria.

ESSENTIAL QUESTIONS

Essential Questions

- How do you write a chemical equation for a chemical reaction?
- How do you classify chemical reactions?
- How does the energy of reactants and products compare in different reactions?
- What determines the rate of a reaction?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Answers to Lab Questions	project based	
Module 19 Test	summative	

Unit 5: Module 20 - Radioactivity and Nuclear Reactions

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UNIT OVERVIEW

Students will seek to answer the question, "How does a nuclear reactor work?".

ATTACHMENTS

PS_-_DCI_Module_20.png

STANDARDS/EXPECTATIONS

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

3.2.9-12.H | 3.2.9-12.A | 3.2.9-12.B | 3.2.9-12.N

BIG IDEAS

Big Ideas

- Students will explore the nucleus of an atom.
- Students will explore nuclear radiation.
- Students will explore the applications of radiation.

ESSENTIAL QUESTIONS

Essential Questions

- How do you break an atom?
- How can we get electricity from breaking the atom?
- How can radiation both cause and cure radiation?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Answers to Lab Questions	project based	
Module 20 Test	summative	

Unit 6: Module 21 - Solutions

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UNIT OVERVIEW

Students will seek to answer the question, "How do crystals form?".

ATTACHMENTS

PS_-_DCI_Module_21.png

STANDARDS/EXPECTATIONS

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

3.2.9-12.B | 3.2.9-12.E | 3.2.9-12.N

BIG IDEAS

Big Ideas

- Students will explore solutes, solvents, and solutions.
- Students will explore concentration and solubility.
- Students will explore how ions form in solutions.
- Students will explore why water does not always dissolve substances.

ESSENTIAL QUESTIONS

Essential Questions

- How do solutions form?
- What is concentration and solubility?
- How do ions form in solution?
- How does polarity affect solubility?

LEARNING TARGETS: KNOWLEDGE & SKILLS

EVIDENCE OF LEARNING & ASSESSMENT

Name of Assessment	**Type** (formative, summative, project-based, diagnostic)	**Description**
Answers to Lab questions	project based	
Module 21 Test	summative	