2021 Unit A - Kinematics

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Marking Period 1**
Length: **weeks**
Status: **Published**

Transfer Goals

We all construct models to make sense of the world around us. These models act as a convenient way for us to analyze new situations and make connections between novel experiences and our past learning. These models, sometimes, must also be evaluated to make sure that they are an accurate reflection of our world

Students will be able to independently use their learning to construct models of the way that objects move in the natural world and how their movements can impact other objects.

Students will observe several examples of simple motion (constant velocity and acclerated motion) and describe them in several ways. These models would include correct physics vocabulary, position vs time and velocity vs time graphs, motion maps and vector diagrams.

Furthermore, students will make connections between different models and assess those models to determine which model(s) is most closely aligned with their own learning styles and understandings.

Standards and Phenomena

Phenomena

Science and Engineering Practices

Mathematical and computational thinking at the 9–12 builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Use mathematical representations of phenomena to describe explanations.

Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.

Disciplinary Core Ideas

If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system.

Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.

Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment.

Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (tradeoffs) may be needed.

Crosscutting Concepts

Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

When investigating or describing a system, the boundaries and initial conditions of the system need to be defined.

When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

Much of science deals with constructing explanations of how things change and how they remain stable.

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.SSH.4	Demonstrate strategies to prevent, manage, or resolve interpersonal conflicts without harming self or others (defining and understanding the laws of consent and dating violence).
SCI.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.
SCI.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.
SCI.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.
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).

TECH.9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).

Concepts

Essential Questions

- 1) What do we need to measure to learn if an object has constant velocity or accelerated motion?
- 2) How can pictures, words and graphs represent constant velocity and accelerated motion?

Understandings

- 1) Motion can be expressed through several models. These models include pictures, words, graphs and mathematics.
- 2) The models listed above are interchangeable.
- 3) The difference between constant velocity and acceleration, using the models listed above.

Critical Knowledge and Skills

Knowledge

Students will know:

- 1) The difference between scalar vs vector quantities.
- 2) The difference between average vs. Instantaneous Velocity
- 3) The appropriate measurement unit and use of dimensional analysis.
- 4) How motion graphs (position, velocity and acceleration vs time) can be used to represent an object's motion.

Skills

Students will be able to:

- 1) Measure velocity as a change in position over time.
- 2) Measure acceleration as a change in velocity over time.
- 3) Make and analyze graphs of constant and accelerated motion.
- 4) Predict an object's position and motion, given a motion graph.
- 5) Draw and analyze a motion map.

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- 1) PHET Simulation - Representing Constant Velocity
- 2) Constant Velocity Lab - Tumble Buggies
- 3) Moving Man - Accelerated Motion Graphs
- 4) Accelerated Motion Lab Investigation - PasCarts
- 5) Accelerated Motion Performance-Based Assessment
- 6) "Name That Motion" Interactive Game / Assessment (Physics Classroom)
- 7) "Graph That Motion" Interactive Game / Assessment (Physics Classroom)

School Summative Assessment Plan

- Quizzes
- Chapter Summative Assessment
- Lab Activities

Primary Resources

American Modeling Teachers Association(AMTA) Physics Modeling Materials

Supplementary Resources

- The Physics Classroom
- PhET Simulations
- Vernier Sensors
- Logger Pro

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
    - Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
    - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

- **One to One Student's laptop**
    - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student's native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❑ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

MATH - Create and evaluate mathematical and graphic models to represent an object's motion.

SOCIAL STUDIES - Research multicultural scientists

WORLD LANGUAGES - Explore the etymology of physics-related terms to gain an understanding of their meaning and relationships and other terms.

VISUAL/PERFORMING ARTS -

APPLIED TECHNOLOGY - Utilize video technology and data collection technology, along with graphing applications to collect, analyze and display data about an object's motion.

BUSINESS EDUCATION -

GLOBAL AWARENESS -

Learning Plan / Pacing Guide

Week 1:

ICR/RC

"Defining Motion" Google Slides with Guided Notes and Practice

Calculating Speed - Examples and Practice

"Moving Man" - PHET simulation w/ Vernier Graphing App

Week 2

ICR/RC

Describing Motion in Words - The Physics Classroom (Part 1)

Concept Builders - Speed and Velocity vs Distance and Displacement

Describing Motion with Postion vs Time Graphs - The Physics Classroom (Part 2)

Constant Velocity Lab - The Tumble Buggies

Week 3

ICR/RC

Accelerated Motion Webquest - The Physics Classroom

Moving Man - Accelerated Motion Graphs

Accelerated Motion Lab - PasCarts, Vernier Motion Sensors and Graphing App

Week 4

ICR/RC

"Graph That Motion" - Physics Classroom Interactive

"Name That Motion" - Physics Classroom Interactive

Accelerated Motion Performance-Based Assessment

Week 5

ICR/RC

Elastic and Inelastic Collisions - The Physics Classroom

PHET Simulation - Collisions and Momentum

Colliisions and Momentum Lab / Performance-Based Assessment

"Egg Crusher" Lab Activity

2021 Unit B - Forces and Interactions

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Marking Period 1**
Length: **weeks**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.SSH.4	Demonstrate strategies to prevent, manage, or resolve interpersonal conflicts without harming self or others (defining and understanding the laws of consent and dating violence).
SCI.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.
SCI.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.
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).

Phenomena

Science and Engineering Practices

Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.

Use mathematical representations of phenomena to describe explanations.

Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations,

peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Develop a model based on evidence to illustrate the relationships between systems or between components of a system.

Use a model to predict the relationships between systems or between components of a system.

Disciplinary Core Ideas

If a system interacts with objects outside itself, the total momentum of the system can change; however, any such change is balanced by changes in the momentum of objects outside the system.

These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.

At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.

Newton's second law accurately predicts changes in the motion of macroscopic objects.

Crosscutting Concepts

Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

When investigating or describing a system, the boundaries and initial conditions of the system need to be defined.

Much of science deals with constructing explanations of how things change and how they remain stable.

Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Transfer Goals

In the previous unit, students describe the way that objects moved by using a variety of models. These models include written descriptions, graphical representations, charts, diagrams and mathematical analysis. In this unit, students will use those skills to gain an understanding of why objects move in the universe.

Students will learn that matter can interact with other objects in a variety of ways. In many cases, these interactions cause objects to move. Students will frame their analysis of motion in terms of these interactions, specifically through the exertion of forces. By understanding how force can be applied, students will see that our world operates through interactions of object both in contact with others or at a distance.

By identifying forces and creating a free body diagram to represent the composite forces at work, students will gain a better knowledge of the physical universe. This analysis will also include applying Newton's Laws of Motion as a means to justify the effects that force can have on motion, both at the macroscopic and microscopic levels.

Concepts

Essential Questions

- 1) What must we measure and observe to determine if an object has constant velocity or acceleration?
- 2) How does the Earth's trip around the sun result in zero displacement?
- 3) Do pictures, graphs and equations represent the motion of a cart in the same way?

Understandings

- Motion can be expressed through pictures, graphs, and mathematics
- The above modes are related and interchangeable
- The differences between constant velocity and acceleration

Critical Knowledge and Skills

Knowledge

Students will know:

- 1) Scalar vs. vector quantities.
- 2) Average vs. instantaneous velocity.
- 3) Measurement units / dimensional analysis.
- 4) Motion graphs (p vs.t, v vs. t, a vs. t)

Skills

Students will be able to:

- 1) Make and analyze graphs of motion carts.
- 2) Use kinematics equations to predict motion.
- 3) Draw and analyze a motion map.

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Describing Motion – working individually
- Word Splash – Punkin' Chunkin' – working in a group. Categorize words they know, somewhat know, and do not know at all. Making a prediction using the words of what the reading passage will be about. Reveal title and students will predict again what the reading passage is about. Read the passage and fine tune their meanings of the words they did not know.
- Vector Map Lab Activity – creating a map on graph paper by applying what they learned about vectors. Students will then test their maps outside. Student wil also need to predict how many steps it would take them to return to the starting point.
- Constant Velocity Lab – group work. Using beams, cars, and timers to test their knowledge of constant velocity. Applying what they learned and working as a team.
- Accelerated Motion Lab – Students will work in groups and test and collect data on the car's acceleration going uphill and down hill. Students will then graph their findings using Logger Pro and calculate the slope and the acceleration.
- Unit Performance-Based Assessment - students will work in groups with a new and unique example of 1-dimensional motion. Each group witll work collaboratively to design a system that would create that motion and then provide various models (mathematical, visual, graphical, written) that would represent the system and the motion.

School Summative Assessment Plan

- 1) "Introduction to Forces" Web Quest from the Physics Classroom website.
- 2) Force Diagrams Activity
- 3) "Representing Force" Web Quest - The Physics Classroom
- 4) Quantitative Free Body Diagrams - The Physics Classroom Skills Builders
- 5) Unit C Assessment #2 - Motion and Free Body Diagrams

Primary Resources

American Modeling Teachers Association(AMTA) Physics Modeling Materials

Supplementary Resources

- The Physics Classroom
- PhET Simulations
- Vernier Sensors
- Logger Pro

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
    - Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
    - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

- **One to One Student's laptop**
    - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student's native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❑ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

MATH - create mathematical and graphic models to represent the applied forces acting on an object.

SOCIAL STUDIES - Research multicultural scientists

WORLD LANGUAGES - Explore the etymology of physics-related terms to gain an understanding of their meaning and relationships and other terms.

VISUAL/PERFORMING ARTS -

APPLIED TECHNOLOGY - use of Vernier motion sensors and graphing applications to collect and analyze data on forces and motion

BUSINESS EDUCATION -

GLOBAL AWARENESS -

Learning Plan / Pacing Guide

Suggested Differentiated Activities Include:

Week 1:

ICR/RC

Word Splash - "Punkin' Chunkin'

"Introduction to Forces" Web Quest (Physics Classroom)

'Types of Forces" - The Physics Classroom

Picture Walk - Identifying Forces and Force Diagrams

Week 2:

ICR/RC

"Name That Force" - Physics Classroom Concept Builder

Free Body Diagrams - Google Slides with Guided Notes and Practice

"Representing Force" Web Quest - The Physics Classroom

Week 3:

ICR/RC

Qualitative and Quantitative Force Diagrams - Google Slides with Guided Practice and Examples

Quantitative Free Body Diagrams - The Physics Classroom Skills Builders

"The Elevator Ride" - Lab / Performance-Based Assessment

2021 Unit C - Dynamics

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Marking Period 1**
Length: **weeks**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
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TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
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Phenomena

Science and Engineering Practices

Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Evaluate the claims, evidence, and reasoning behind currently accepted explanations or solutions to determine the merits of arguments.

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision

of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Use mathematical representations of phenomena to describe explanations.

Use a model to predict the relationships between systems or between components of a system.

Develop a model based on evidence to illustrate the relationships between systems or between components of a system.

Create a computational model or simulation of a phenomenon, designed device, process, or system.

Disciplinary Core Ideas

Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms.

These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.

Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields.

Newton's second law accurately predicts changes in the motion of macroscopic objects.

Crosscutting Concepts

Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales.

Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

The total amount of energy and matter in closed systems is conserved.

Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem.

Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Changes of energy and matter in a system can be described in terms of energy and matter

flows into, out of, and within that system.

Much of science deals with constructing explanations of how things change and how they remain stable.

Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.

Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

When investigating or describing a system, the boundaries and initial conditions of the system need to be defined.

Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems.

Systems can be designed to cause a desired effect.

Transfer Goals

Students analyze a free body diagram and evaluate motion, given the forces involved.

Students relate Newton's 3 Laws of Motion to a number of examples for simple, 1-Dimensional motion.

Concepts

Essential Questions

- After measuring or observing the motion of an object, is that object experiencing balanced or unbalanced forces?
- How can a sky diver fall toward earth and not change his/her velocity?
- How could a person gain or lose "weight" while riding a roller coaster?

Understandings

- 1) Newton's First Law states that a change in an object's velocity is only possible when the forces acting upon it are unbalanced.
- 2) Gravity, normal force, friction & air resistance play an essential role in effecting an object's motion on or near the earth.
- 3) Mass is universally constant, while weight can change with differences in gravity.

- 4) Mass is a measure of an object's resistance to a change in its velocity.
- 5) All forces come in pairs, which are equal in magnitude, opposite in direction, and act on separate bodies.

Critical Knowledge and Skills

Knowledge

Students will know:

- 1) The difference between mass and weight.
- 2) The difference between static and kinetic friction.
- 3) Air resistance changes with and object's size, shape and velocity.
- 4) How static equilibrium is attained.

Skills

Students will be able to:

- 1) Draw a free-body diagram of an object experiencing balanced and unbalanced forces.
- 2) Determine the net force acting on an object by mathematical and graphical means.
- 3) Calculate the "missing" force needed to keep an object in equilibrium.
- 4) Use trigonometry to resolve the horizontal and vertical components of the forces and velocity an object experiences.
- 5) Compute terminal velocity of various falling objects.

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Chapter Test
- Lab Practicums

School Summative Assessment Plan

- 1) "The Elevator Ride" - Lab / Performance-Based Assessment
- 2) PHET - Forces and Motion (Part 1)
- 3) PHET - Forces and Motion (Part 2)
- 4) Identifying Action and Reaction Force Pairs

Primary Resources

American Modeling Teachers Association(AMTA) Physics Modeling Materials

Supplementary Resources

-
    - The Physics Classroom
    - PhET Simulations
    - Vernier Sensors
    - Logger Pro

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
    - Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
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Differentiated Instruction

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All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES - Research multicultural scientists

WORLD LANGUAGES - Explore the etymology of physics-related terms to gain an understanding of their meaning and relationships and other terms.

VISUAL/PERFORMING ARTS -

APPLIED TECHNOLOGY - use on-line tools and simulations to represent how forces influence an object's motion.

BUSINESS EDUCATION -

GLOBAL AWARENESS -

Learning Plan / Pacing Guide

Week 1:

ICR/RC

Newton's First Law / Inertia - Google Slides w/ Guided Notes and Practice / Examples (FBD)

"Wordsplash" - The Vomit Comet

Newton's First Law Webquest & Concept Builders - The Physics Classroom

"The Elevator Ride" - Lab / Performance-Based Assessment

Week 2:

ICR/RC

Newton's Second Law of Motion Webquest - The Physics Classroom

Newton's Second Law of Motion Concept Builders and Review Games - The Physics Classroom

PHET Simulation - Forces and Motion

Week 3:

ICR/RC

PHET Simulation - Forces and Motion - With Friction

PHET Simulation - Forces and Motion - F=ma

Newton's Second Law of Motion Concept Builders - The Physics Classroom

Week 4:

ICR/RC

Newton's Third Law of Motion - Google Slides with Guided Notes and Examples

Identifying Action and Reaction Forces Pairs - Webquest - The Physics Classroom

Newton's Second Law of Motion Concept Builders - The Physics Classroom

2021 Unit D - Pressure in Solids and Fluids

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Marking Period 1**
Length: **weeks**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.SSH.4	Demonstrate strategies to prevent, manage, or resolve interpersonal conflicts without harming self or others (defining and understanding the laws of consent and dating violence).
SCI.HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
SCI.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.
SCI.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.
SCI.HS-PS2-6	Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).

Phenomena

Science and Engineering Practices

Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.

Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.

Develop a model based on evidence to illustrate the relationships between systems or between components of a system.

Communicate scientific and technical information (e.g., about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).

Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.

Create a computational model or simulation of a phenomenon, designed device, process, or system.

Disciplinary Core Ideas

Uncontrolled systems always evolve toward more stable states—that is, toward more uniform energy distribution (e.g., water flows downhill, objects hotter than their surrounding environment cool down).

Newton's law of universal gravitation and Coulomb's law provide the mathematical models to describe and predict the effects of gravitational and electrostatic forces between distant objects.

The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.

Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects.

The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms.

Although energy cannot be destroyed, it can be converted to less useful forms—for example, to thermal energy in the surrounding environment.

Newton's second law accurately predicts changes in the motion of macroscopic objects.

Crosscutting Concepts

Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

A stable molecule has less energy than the same set of atoms separated; one must

provide at least this energy in order to take the molecule apart.

Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Transfer Goals

Students utilize pressure differences to exert forces that create acceleration.

Students relate the principles of fluid friction to their previous study of kinematics and dynamics.

Concepts

Essential Questions

- How can something be buoyant, but not floating?
- How come a sharp knife cuts better than a dull one?
- Why can I stop a full-sized car by applying less force than when I apply the brakes on a bicycle?

Understandings

- Buoyant force is present in all fluids and is even found when objects are not fully floating.
- The pressure created by an object is caused by a force exerted over an area.
- Fluid pressure is used throughout our daily lives in a variety of technologies and devices.

Critical Knowledge and Skills

Knowledge

Students will know:

- How buoyant force is created.
- How to calculate pressure in a fluid and between 2 solids in contact with each other. Sort Order:
- How an airplane can fly, despite its heavy weight.

Skills

Students will be able to:

- Find the buoyant force being applied by water on a number of metal cylinders.
- Use the mathematical equation for pressure to calculate the pressure exerted by one object on another.
- Apply Bernoulli's Principle to an airplane wing and Indy racecar.
- Apply Archimedes' Principle to the construction of a small, metal and foam boat.

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Chapter Test
- Lab Practicums

School Summative Assessment Plan

- 1) PHET - Gas Intro
- 2) PHET - Gas Properties
- 3) Bernoulli's Principle Google Slildes Summary

Primary Resources

American Modeling Teachers Association(AMTA) Physics Modeling Materials

Supplementary Resources

- The Physics Classroom
- PhET Simulations
- Vernier Sensors
- Logger Pro

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
    - Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
    - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

- **One to One Student's laptop**
    - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student's native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❑ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES - Research multicultural scientists

WORLD LANGUAGES - Explore the etymology of physics-related terms to gain an understanding of their meaning and relationships and other terms.

VISUAL/PERFORMING ARTS -

APPLIED TECHNOLOGY - utilize on-line tools and simulations to represent pressure changes and how those pressure changes can affect a defined system.

BUSINESS EDUCATION -

GLOBAL AWARENESS -

Learning Plan / Pacing Guide

Week 1:

ICR/RC

Pressure vs Force - Google Slides with Guided Notes and Practice / Examples

Calculating Pressure

PHET Simulations - "Gases Intro" and "Gas Properties"

Week 2:

ICR/RC

Bernoulli's Principle - Investigation

Bernoulli's Principles - Applications in Everyday Life - Google Slides

Unit Assessment

2021 Unit E - Electromagnetism

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Marking Period 1**
Length: **weeks**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.SSH.4	Demonstrate strategies to prevent, manage, or resolve interpersonal conflicts without harming self or others (defining and understanding the laws of consent and dating violence).
SCI.HS-PS4-5	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.
SCI.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.
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).

Phenomena

Science and Engineering Practices

Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.

Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Communicate technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).

Disciplinary Core Ideas

Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms.

Photoelectric materials emit electrons when they absorb light of a high-enough frequency.

Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields.

These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.

Crosscutting Concepts

Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

Much of science deals with constructing explanations of how things change and how they remain stable.

Systems can be designed to cause a desired effect.

Transfer Goals

Students will use the analogy of a garden hose to better understand direct current.

Students will compare and contrast direct and alternating current.

Students will differentiate between series circuits and parallel circuits.

Students will relate electrical current to magnetic fields.

Students will provide examples of electromagnetic induction.

Concepts

Essential Questions

- How do electricity and magnetism “work together” in my daily life?
- Why do the Christmas lights all go out if just one bulb wiggles loose?
- Why does a cell phone or IPOD charger have that funny box on the wire?

Understandings

- Electric currents can be designed and built to allow current to flow through them in a variety of paths.
- Electromagnetic Induction is a useful tool involved in a surprising number of inventions.
- The electrical current from a battery is different from household current in a few fundamental ways.

Critical Knowledge and Skills

Knowledge

Students will know:

- How to apply Ohm’s law to a simple circuit.
- The key differences between direct current and alternating current.
- The types of energy on the electromagnetic spectrum, their wavelengths and energy content.

Skills

Students will be able to:

- Build a simple series and parallel circuit.
- Calculate the current, resistance and potential in a direct current circuit.
- Create a simple electromagnet.

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Chapter Test
- Lab Practicums

School Summative Assessment Plan

- 1) Building Electrical Circuits (PHET)
- 2) “Electromagnetism” Computer Lab
- 3) “Electromagnetic Induction” Activity
- 4) Electromagnetic Radiation Webquest / Review Assessment

Primary Resources

American Modeling Teachers Association(AMTA) Physics Modeling Materials

Supplementary Resources

- The Physics Classroom
- PhET Simulations
- Vernier Sensors
- Logger Pro

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
    - Google Classroom - Used for daily interactions with the students covering a vast majority of

different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
    - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

- **One to One Student's laptop**
    - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student's native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❑ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES - Research multicultural scientists

WORLD LANGUAGES - Explore the etymology of physics-related terms to gain an understanding of their meaning and relationships and other terms.

VISUAL/PERFORMING ARTS -

APPLIED TECHNOLOGY - use on-line tools to evaluate various forms of energy within the electromagnetic spectrum.

BUSINESS EDUCATION -

GLOBAL AWARENESS -

Learning Plan / Pacing Guide

Week 1:

ICR/RC

"Lightning" Wordsplash

Electrolyte Demo (Pickle and Gatorade)

Building Simple Electrical Circuits (PHET)

"Simple Electric Circuits' Activity (Assessment)

Week 2:

ICR/RC

Electromagnetic Induction

"Electromagnetics" On-Line simulation

"Electromagnetism" Computer Lab

Week 3:

ICR/RC

"The Electromagnetic Spectrum" - PHET simulation

"Electromagnetism" On-Line exhibits

Electromagnetic Spectrum Webquest / Assessment

2021 Unit F - Energy

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Marking Period 1**
Length: **weeks**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.SSH.4	Demonstrate strategies to prevent, manage, or resolve interpersonal conflicts without harming self or others (defining and understanding the laws of consent and dating violence).
SCI.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).
SCI.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.
SCI.HS-PS3-5	Develop and use a model of two objects interacting through electric or magnetic fields to illustrate the forces between objects and the changes in energy of the objects due to the interaction.
SCI.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.
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
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Phenomena

Science and Engineering Practices

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Mathematical and computational thinking at the 9–12 builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

Disciplinary Core Ideas

Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms.

Mathematical expressions, which quantify how the stored energy in a system depends on its configuration (e.g., relative positions of charged particles, compression of a spring) and how kinetic energy depends on mass and speed, allow the concept of conservation of energy to be used to predict and describe system behavior.

Energy cannot be created or destroyed, but it can be transported from one place to another and transferred between systems.

At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.

Conservation of energy means that the total change of energy in any system is always equal to the total energy transferred into or out of the system.

When two objects interacting through a field change relative position, the energy stored in the field is changed.

Crosscutting Concepts

Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

Energy cannot be created or destroyed—only moves between one place and another place, between objects and/or fields, or between systems.

Cause and effect relationships can be suggested and predicted for complex natural and human designed systems by examining what is known about smaller scale mechanisms within the system.

Models can be used to predict the behavior of a system, but these predictions have limited precision and reliability due to the assumptions and approximations inherent in models.

Transfer Goals

All object in the natural interact with and are affected by energy in a variety of ways.

When matter interacts with other types of matter, an exchange of energy often occurs.

The natural world and our man-made society are both filled with many examples of energy interactions and transformations.

Concepts

Essential Questions

- How does the universe use energy as a form of currency?
- How do we use energy in our everyday life?
- Why is it so important for us to conserve energy?

Understandings

- Universal energy can exist in many forms.
- Energy is an inherent characteristic of all matter.
- The dynamics of the universe are often accompanied by energy transformations.

Critical Knowledge and Skills

Knowledge

Students will know:

- The criteria used to classify energy.
- The difference between chemical and mechanical energy.
- How energy can be conserved and dissipated in a closed system.

Skills

Students will be able to:

- Calculate the mechanical efficiency of a closed system.
- Explain energy transformations within a closed system
- Compare and contrast various forms of universal energy.

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Chapter Test
- Lab Practicums

School Summative Assessment Plan

- 1) "Types of Energy" Webquest
- 2) Energy Skate Park - PHET Simulation
- 3) Energy Transformation Simulation Activity (PHET)
- 4) Solar Oven / Hot Dog Cooker
- 5) Unit Assessment - Energy Power Point

Primary Resources

American Modeling Teachers Association(AMTA) Physics Modeling Materials

Supplementary Resources

- The Physics Classroom
- PhET Simulations
- Vernier Sensors
- Logger Pro

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
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    - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

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Differentiated Instruction

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Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES - Research multicultural scientists

WORLD LANGUAGES - Explore the etymology of physics-related terms to gain an understanding of their meaning and relationships and other terms.

VISUAL/PERFORMING ARTS -

APPLIED TECHNOLOGY -

BUSINESS EDUCATION -

GLOBAL AWARENESS -

Learning Plan / Pacing Guide

Week 1:

ICR / RC

"What is Energy" Webquest

Types of Energy Digital Notebook

Energy Skate Park - PHET Simulation (Mechanical Energy)

Week 2:

ICR / RC

PHET Energy Skate Park - Part 2

"Name That Energy" Concept Buillder - The Physics Classroom

Energy and Work Webquest - The Physics Classroom

"Work" and "Match That Energy Bar Graoh" Concept Buillder - The Physics Classroom

Week 3:

ICR / RC

Heat Energy, Temperature and Kinetic Energy - PHET Simulation

"Making Stuff Colder" Investigation

"Energy Transformation Within a System" Investigation - PHET Simulation

Rube Goldberg Devices

Week 4:

ICR / RC

LOL Charts - Tracking Energy Transformations Through a Defined System

LOL Charts - Physics Interactives - The Physics Classroom

Summative Assessment - Student-Generated Google Slides Presentations

2021 Unit G - Matter and its Interactions

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Marking Period 1**
Length: **weeks**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.SSH.4	Demonstrate strategies to prevent, manage, or resolve interpersonal conflicts without harming self or others (defining and understanding the laws of consent and dating violence).
SCI.HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
SCI.HS-PS1-1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
TECH.9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).

Phenomena

Science and Engineering Practices

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Constructing explanations and designing solutions in 9–12 builds on K–8 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

Communicate technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically).

Disciplinary Core Ideas

The periodic table orders elements horizontally by the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states.

Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons.

These relationships are better understood at the microscopic scale, at which all of the different manifestations of energy can be modeled as a combination of energy associated with the motion of particles and energy associated with the configuration (relative position of the particles). In some cases the relative position energy can be thought of as stored in fields (which mediate interactions between particles). This last concept includes radiation, a phenomenon in which energy stored in fields moves across space.

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At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.

Crosscutting Concepts

Much of science deals with constructing explanations of how things change and how they remain stable.

Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

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When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

Transfer Goals

Students will relate the repeating patterns in the Periodic Table to the repetitive nature of atomic structure, specifically electron arrangement.

Students will explain the structure of atoms in terms of the physical and chemical properties of the elements on the Periodic Table.

Concepts

Essential Questions

- How do advances in technology allow for new scientific discovery?
- If I could see the building blocks of solids, liquids, and gases, how would they be the same? How would they be different?
- What does making popcorn have to do with gas temperature and pressure?
- What visual clues suggest a chemical reaction is taking place?
- Why does the Periodic Table have the strange shape it has?

Understandings

- Changes can occur to matter as either physical change or chemical change
- Chemists develop models of what an atom is "like". These models have changed over time and will continue to change in the future.
- Fundamental differences in the arrangement and movement of atoms and molecules account for the physcial properties of the 3 major phases of matter
- The chemical properties of atoms follow repeating patterns related to the arrangement

Critical Knowledge and Skills

Knowledge

Students will know:

- Similarities and differences of various atomic models.
- The kinetic molecular model as a means for explaining the physical properties of solids, liquids, and gases.
- The Periodic Table is a valuable tool to learn about the structure of the atom
- Atoms have inherent energy that impacts its properties

Skills

Students will be able to:

- Compare and contrast the 3 phases of matter in terms of their shape and volume
- Differentiate between physical changes and chemical changes
- Predict how the pressure and temperature of a gas might change with its volume
- Use the Periodic Table to predict physical and chemical properties of atoms

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Chapter Test
- Lab Practicums

School Summative Assessment Plan

- 1) Build an Atom (PHET Simulation)
- 2) "Periodic" Paint Swatches
- 3) On-Line Periodic Table Investigation (www.chemicalelements.com)
- 4) How Much Water is in Popcorn? (Physical and Chemical Changes)
- 5) Physical or Chemical Change? (On-Line Investigation)
- 6) Evidence of Chemical Reactions
- 7) Signs of Chemical Change Google Slides Project

Primary Resources

American Modeling Teachers Association(AMTA) Physics Modeling Materials

Supplementary Resources

- The Physics Classroom

- PhET Simulations
- Vernier Sensors
- Logger Pro

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
    - Google Classroom - Used for daily interactions with the students covering a vast majority of different educational resources (Daily Notes, Exit Tickets, Classroom Polls, Quick Checks, Additional Resources/ Support, Homework, etc.)
    - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

- **One to One Student's laptop**
    - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student’s native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

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Interdisciplinary Connections

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES - Research multicultural scientists

WORLD LANGUAGES - Explore the etymology of physics-related terms to gain an understanding of their meaning and relationships and other terms.

VISUAL/PERFORMING ARTS -

APPLIED TECHNOLOGY -

BUSINESS EDUCATION -

GLOBAL AWARENESS -

Learning Plan / Pacing Guide

Week 1:

ICR / RC

Picture Walk - Introduction to Chemistry / What is Chemistry?

"Build an Atom" PHET Simuation - Introductory Investigation

"Build an Atom" PHET Simuation - Making Atomic Symbols

"Build an Atom" PHET Simuation - Review Game

Periodic Table - An Introduction

Week 2:

ICR / RC

Periodic Table Scavenger Hunt

Interacitve Periodic Table Webquest (www.chemicalelements.com)

"Element Adventure" - Google Slides Report

Week 3:

ICR / RC

Periodic Table Google Slides - Notes with Guided Practice and Review / Examples

"Hunting the Elements" - Parts 1 and 2

Periodic Paint Samples

Week 4:

ICR / RC

Carbon Footprint Calculator

"Physical and Chemical Changes" - Webquest

"Hunting the Elements" - Parts 3 and 4

Physical vs Chemical Change - How to Tell the Difference?

Week 5:

ICR / RC

What are the Signs of a Chemical Change?

Evidence of Chemical Change - Video Gallery

Signs of Chemical Change - Google Slides (Summative Assessment)

2021 Unit H - Chemical Bonds

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Marking Period 1**
Length: **weeks**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.SSH.4	Demonstrate strategies to prevent, manage, or resolve interpersonal conflicts without harming self or others (defining and understanding the laws of consent and dating violence).
SCI.HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
SCI.HS-PS1-5	Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs.
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
TECH.9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
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TECH.9.4.12.IML.3	Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions (e.g., S-ID.B.6a., 8.1.12.DA.5, 7.1.IH.IPRET.8).

Phenomena

Science and Engineering Practices

Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.

Develop a model based on evidence to illustrate the relationships between systems or between components of a system.

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and

developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Constructing explanations and designing solutions in 9–12 builds on K–8 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

Disciplinary Core Ideas

Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.

A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart.

Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.

At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.

Crosscutting Concepts

Much of science deals with constructing explanations of how things change and how they remain stable.

Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena.

Transfer Goals

Students will predict the chemical reactivity of an element, based on its position in the Periodic Table.
Students will differentiate between the 3 major types of chemical bonds.
Students will be able to group two or more elements together and determine the type of chemical bond they would form.

Concepts

Essential Questions

- How can I figure out what elements will react very violently, while others won't react at all?
- Why are some substances much more reactive than others?
- Why does Gatorade and a Lipton Cup of Soup cause a light bulb to light up?

Understandings

- Atoms have a "ground state" where they are most chemically stable.
- Atoms will gain, lose or share its valence electrons in order to have an octet. This behavior is highly predictable, based on the identity of the atoms involve.
- The octet rule describes how atoms gain, lose or share electrons to form chemical bonds.

Critical Knowledge and Skills

Knowledge

Students will know:

- How to predict the types of chemical bonds that will occur.
- The four main types of chemical bonds.
- The importance of valence electrons to chemical bonding.

Skills

Students will be able to:

- Draw a Lewis Dot Diagram of a chemical bond.
- Draw electron dot diagrams of selected atoms' valence electrons, given their position on the periodic table.
- Use the octet rule to predict what types of chemical bonds will form during chemical reactions.

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Chapter Test
- Lab Practicums

School Summative Assessment Plan

- 1) "Chemical Bonding" Notes and Activity
- 2) "The Octet Rule" Notes and Activity
- 3) Lewis Dot Structures for Metals and Non-Metals
- 4) Lewis Structures for First 20 Elements (Periodicity)
- 5) "How Many Electrons?" (Periodic Table Review)
- 6) "Ionic Bonding" Simulation - Fruit Loops
- 7) "Covalent Bonding" Simulation - Fruit Loops
- 8) Chemical Bonding On-Line Tutorial

Primary Resources

American Modeling Teachers Association(AMTA) Physics Modeling Materials

Supplementary Resources

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- PhET Simulations
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Technology Integration and Differentiated Instruction

Technology Integration

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Interdisciplinary Connections

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VISUAL/PERFORMING ARTS -

APPLIED TECHNOLOGY -

BUSINESS EDUCATION -

GLOBAL AWARENESS -

Learning Plan / Pacing Guide

Week 1:

ICR / RC

"The Octet Rule" Google Slides with Guided Practice and Examples

Lewis Dot Structures for metals and non-metals

"Chemical Bonding" Google Slides with Guided Practice and Examples

Week 2:

ICR / RC

Ionic Bonding Webquest

Ionic Bonding "Fruit Loop" Lab

Naming and Chemical Formulas for Ionic Compounds

Lewis Structures - Ionic Compounds

Week 3:

ICR / RC

Covalent Bonding Webquest

Covalent Bonding "Fruit Loop" Lab

Naming and Chemical Formulas for Covalent Compounds

Lewis Structures - CovalentCompounds

Week 4:

ICR / RC

Ionic and Covalent Bonding On-Line Tutorial

Chemical Bonding Unit Assessment

2021 Unit I - Chemical Reactions and Equations

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Marking Period 1**
Length: **weeks**
Status: **Published**

Standards and Phenomena

Science Standards

HE.9-12.2.1.12.EH.1	Recognize one's personal traits, strengths, and limitations and identify how to develop skills to support a healthy lifestyle.
HE.9-12.2.1.12.EH.3	Describe strategies to appropriately respond to stressors in a variety of situations (e.g., academics, relationships, shootings, death, car accidents, illness).
HE.9-12.2.1.12.SSH.4	Demonstrate strategies to prevent, manage, or resolve interpersonal conflicts without harming self or others (defining and understanding the laws of consent and dating violence).
SCI.HS-PS1-7	Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.
SCI.HS-PS1-8	Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.
TECH.9.4.12.CT.1	Identify problem-solving strategies used in the development of an innovative product or practice (e.g., 1.1.12acc.C1b, 2.2.12.PF.3).
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Phenomena

Science and Engineering Practices

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Use mathematical representations of phenomena to support claims.

Develop a model based on evidence to illustrate the relationships between systems or between components of a system.

Mathematical and computational thinking at the 9–12 builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

Disciplinary Core Ideas

Energy is a quantitative property of a system that depends on the motion and interactions of matter and radiation within that system. That there is a single quantity called energy is due to the fact that a system's total energy is conserved, even as, within the system, energy is continually transferred from one object to another and between its various possible forms.

The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions.

At the macroscopic scale, energy manifests itself in multiple ways, such as in motion, sound, light, and thermal energy.

Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process.

Crosscutting Concepts

The total amount of energy and matter in closed systems is conserved.

When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

Much of science deals with constructing explanations of how things change and how they remain stable.

In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved.

Transfer Goals

A chemical change is one in which reactants are changed in products, having new characteristic properties.

The law of conservation of mass requires an understanding of the need to conserve mass. Thus chemical equations need to be balanced.

Further, knowledge of the types of chemical reactions allows for the prediction of products.

Concepts

Essential Questions

- How can we tell if a chemical reaction has occurred?
- How can we represent what happens during a chemical reaction?
- How does an equation show the law of conservation of mass
- How can we identify the type of reaction?

Understandings

- How can we identify the type of reaction?
- Law of conservation of matter, balancing
- Many reactions have predictable outcomes
- Reactions can be described by symbols and formulas

Critical Knowledge and Skills

Knowledge

Students will know:

- A chemical reaction can be represented by a balanced chemical equation

Skills

Students will be able to:

- Cite evidence of a reaction
- Describe types of reactions
- Write and balance chemical equations

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Chapter Test
- Lab Practicums

School Summative Assessment Plan

- 1) Writing and Classifying Chemical Equations
- 2) Classifying Chemical Reactions
- 3) Balancing Chemical Equations Practice
- 4) Conservation of Mass Lab
- 5) "Reactants, Products and Leftovers" (PHET Simulation)
- 6) Factors that Affect Reaction Rate Lab
- 7) Activation Energy & Catalyst Activity
- 8) Reaction Rate (PHET Simulation)
- 9) Reaction Rate Video Demonstrations
- 10) Iron Nail Lab

Primary Resources

American Modeling Teachers Association(AMTA) Physics Modeling Materials

Supplementary Resources

- The Physics Classroom
- PhET Simulations
- Vernier Sensors
- Logger Pro

Technology Integration and Differentiated Instruction

Technology Integration

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Interdisciplinary Connections

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES - Research multicultural scientists.

WORLD LANGUAGES - Explore the etymology of physics-related terms to gain an understanding of their meaning and relationships and other terms.

VISUAL/PERFORMING ARTS -

APPLIED TECHNOLOGY -

BUSINESS EDUCATION -

GLOBAL AWARENESS -

Learning Plan / Pacing Guide

Week 1:

ICR / RC

"Chemical Equations" Google Slides with Guided Practice and Examples

Parts of a Chemical Equation - Reactants and Products

PHET Simulation - Reactants, Products and Leftovers - The Sandwich Shop

Week 2:

ICR / RC

The Law of Conservation of Matter - Web Quest

Chemical Equations - Balanced or Unbalanced?

Balancing Chemical Equations - PHET Activity and Game

PHET Simulation - Reactants, Products and Leftovers - Chemical Equations Section

Week 3:

ICR / RC

"Classifying Types of Chemical Reactions" - Google Slides with Guided Practice and Examples

Classifying Chemical Reactions Based on a Chemical Equation - Practice

Google Slides Summary - Types of Chemical Reactions

Week 4:

ICR / RC

Reaction Rate, Catalysts and Activation Energy - Google Slides with Guided Practice and Examples

Speeding Up a Chemical Reaction and Getting a Date to the Dance

Rate of Reaction Web Quest

Week 5:

ICR / RC

Reaction Rate, Catalysts and Activation Energy - YouTube Video Demnstrations

Rates of Reaction (PHET) - Part 1

Rates of Reaction (PHET) - Part 2

Assessment - Iron Nail Lab

2021 Unit J - Waves and Their Uses

Content Area: **Science**
Course(s): **Generic Course**
Time Period: **Marking Period 1**
Length: **weeks**
Status: **Published**

Standards and Phenomena

Science Standards

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SCI.HS-PS2	Motion and Stability: Forces and Interactions
SCI.HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
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Phenomena

Science and Engineering Practices

Modeling in 9–12 builds on K–8 experiences and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.

Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

Develop a model based on evidence to illustrate the relationships between systems or between components of a system.

Planning and carrying out investigations to answer questions or test solutions to problems in 9–12 builds on K–8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical and empirical models.

Disciplinary Core Ideas

"Electrical energy" may mean energy stored in a battery or energy transmitted by electric currents.

A stable molecule has less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart.

Forces at a distance are explained by fields (gravitational, electric, and magnetic) permeating space that can transfer energy through space. Magnets or electric currents cause magnetic fields; electric charges or changing magnetic fields cause electric fields.

Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy.

Crosscutting Concepts

Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.

Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system.

When investigating or describing a system, the boundaries and initial conditions of the system need to be defined and their inputs and outputs analyzed and described using models.

Much of science deals with constructing explanations of how things change and how they remain stable.

Transfer Goals

Students will identify various forms of electromagnetism used in their daily lives.

Students will explain the functions of medical imaging technology that use electromagnetic waves (X-Ray, Ultrasound, magnetic resonance imaging, etc.

Students will differentiate between the types of energy on the electromagnetic spectrum, in terms of their wavelength, frequency and relative strength.

Students will study the relationships between an electric current and a magnetic field.

Concepts

Essential Questions

- How do Xray and ultrasound machines work?
- What creates a sonic boom?
- Why do ocean waves behave the way they do?
- Why does a surfer get pushed along through the water, in front of the water wave.

Understandings

- Electromagnetic energy occurs throughout the universe.
- Transverse waves behave in regular, predictable ways with measurable qualities.
- Various forms of electromagnetism differ by wavelength and the energy they contain.

Critical Knowledge and Skills

Knowledge

Students will know:

- The measurable parts of a transverse wave.
- The types of energy on the electromagnetic spectrum, their wavelengths and energy content.

Skills

Students will be able to:

- Relate frequency, wavelength and pitch of a sound wave.

Assessment and Resources

School Formative Assessment Plan (Other Evidence)

- Quizzes
- Chapter Test
- Lab Practicums

School Summative Assessment Plan

- 1) Introduction to Waves - PHET Simulation
- 2) Properties of Waves - The Physics Classroom
- 3) Electromagnetic Spectrum Web Quest

Primary Resources

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Supplementary Resources

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- PhET Simulations
- Vernier Sensors
- Logger Pro

Technology Integration and Differentiated Instruction

Technology Integration

- **Google Products**
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    - GAFE (Google Apps For Education) - Using various programs connected with Google to collaborate within the district, co-teachers, grade level partner teacher, and with students to stay connected with the content that is covered within the topic. Used to collect data in real time and see results upon completion of the assignments to allow for 21st century learning.

- **One to One Student's laptop**
    - All students within the West Deptford School District are given a computer, allowing for 21st century learning to occur within every lesson/topic.

Differentiated Instruction

Gifted Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, the Gifted Students are given choice on topic and subject matter allowing them to explore interests appropriate to their abilities, areas of interest and other courses.

English Language Learners (N.J.A.C.6A:15)

❑ Within each lesson, the English Language Learners are given choice of topic and resources so that their materials are within their ability to grasp the language.

❑ All assignments have been created in the student's native language.

❑ Work with ELL Teacher to allow for all assignments to be completed with extra time.

At-Risk Students (N.J.A.C.6A:8-4.3c)

❑ Within each lesson, the at-risk students are given choice of topic and resources so that their materials are within their ability level and high-interest.

Special Education Students (N.J.A.C.6A:8-3.1)

❑ Within each lesson, special education students are given choice of topic and resources so that their materials are within their ability level and high-interest.

❑ All content will be modeled with examples and all essays are built on a step-by-step basis so modifications for assignments in small chunks are met.

All other IEP modifications will be honored (ie. hard copies of notes, directions restated, etc.)

Interdisciplinary Connections

MATH - Use mathematical models (graphs, equations) .

SOCIAL STUDIES - Research multicultural scientists

WORLD LANGUAGES - Explore the etymology of physics-related terms to gain an understanding of their meaning and relationships and other terms.

VISUAL/PERFORMING ARTS -

APPLIED TECHNOLOGY -

BUSINESS EDUCATION -

GLOBAL AWARENESS -

Learning Plan / Pacing Guide

Week 1:

ICR/RC

"The Nature of Waves" Webquest - The Physics Classroom

"Wave Basics" Concept Builder - The Physics Classroom

Introduction to Waves - PHET Simulation

"Wordsplash" - "The 100 Foot Wave" and Big-Wave Surfing

Week 2:

ICR/RC

"Properties of Waves" Webquest - The Physics Classroom

Waves on a String - PHET Simulation

"Rocking the Boat" Concept Builder - The Physics Classroom

Sound and Light Waves - Google Slides Summary Presentation

Week 3:

ICR/RC

Electromagnetic Spectrum - Google Slides with Guided Notes and Review Questions

Electromagnetism - Webquest

Summative Assessment