Integrated Chemistry and Physics
East Chicago Central High School

Integrated Chemistry and Physics

Units of Study

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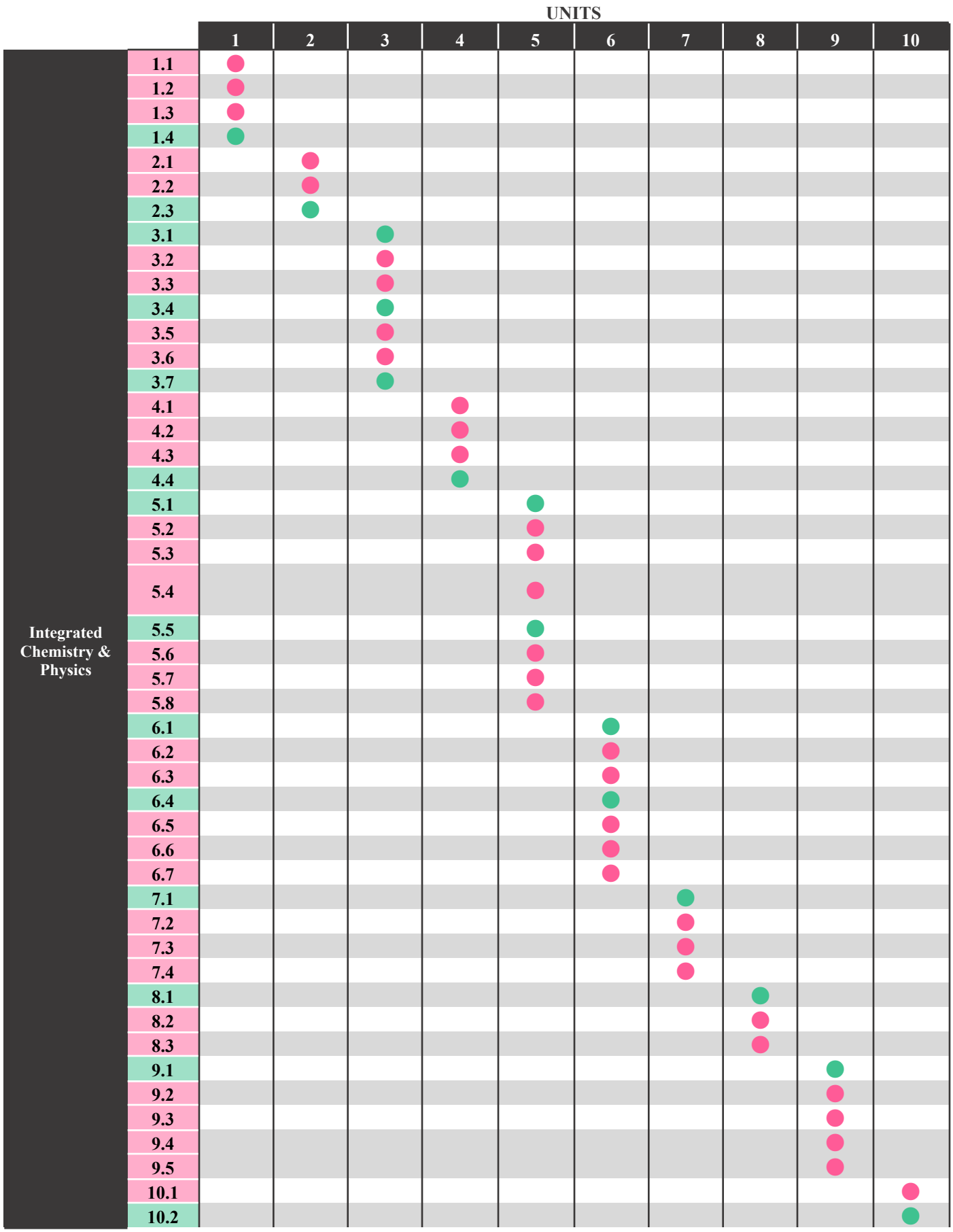
Unit 1:	Constant Velocity	ys
Unit 2:	Uniform Acceleration	🕓 15 Days
Unit 3:	Newton's Laws of Motion	🕓 15 Days
Unit 4:	Energy	🕓 15 Days
Unit 5:	Particle Theory of Matter	🕓 15 Days
Unit 6:	Describing Substances	🕓 15 Days
Unit 7:	Representing Chemical Change	🕓 15 Days
Unit 8:	Electricity and Magnetism	🕓 15 Days
Unit 9:	Waves	🕓 15 Days
Unit 10:	Nuclear Energy	🕓 15 Days

Appendices

Appendix A: Curriculum Refinement Form

Standards Breakdown

Green: Priority Standards **Pink:** Supporting Standards **Gray:** Additional Standards



	10.3										●
	10.4										●
	10.5										●

General Description of the Unit

Speed is the rate at which an object's position changes. It can be calculated by using the formula speed = Distance/Time. An object's velocity describes its speed and direction of motion.

Literacy Assessments*:*

- *Speed & Velocity Teacher Document*
- *Speed & Velocity Student Document*

Priority Standards

- **ICP.1.4:** Distinguish between the terms "speed," "velocity," "average speed," and "average velocity" and determine the value of any of these measurements given either a graphical or mathematical representation.

Supporting Standards

- **ICP.1.1:** Develop graphical, mathematical, and pictorial representations (such as a motion map) that describe the relationship between the clock reading (time) and position of an object moving at a constant velocity and apply those representations to qualitatively and quantitatively describe the motion of an object.
- **ICP.1.2:** Describe the slope of the graphical representation of position vs. clock reading (time) in terms of the velocity of the object moving in one dimension.
- **ICP.1.3:** Distinguish between the terms "distance" and "displacement," and determine the value of either given a graphical or mathematical representation of position vs. clock reading (time).

Content Area Literacy Standards

- 9-10.LST.4.1: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words
- 9-10.LST.1.1: Read and comprehend science and technical texts within a range of complexity appropriate for grades 9-10 independently and proficiently by the end of grade 10.
- 9-10.LST.2.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.

Enduring Understandings

- Calculate the speed using a given formula.
- Calculate the momentum of an object using a given formula.

Essential Questions

- How can we analyze the motion of objects?
- What is the relationship between an object's speed and the slope of a line on a speed-time graph.
- How are distance and displacement different?

Key Concepts

- I can distinguish between "speed," "velocity," "average speed," and "average velocity." (ICP.1.4)
- I can calculate the average speed of an object given a graph or mathematical representation. (ICP.1.4)
- I can identify when the speed and average speed are different given a graph or mathematical representation. (ICP.1.4)
- I can calculate the average velocity of an object given a graph or mathematical representation. (ICP.1.4)
- I can calculate the velocity of an object given a graph or mathematical representation. (ICP.1.4)
- I can identify when the velocity and average velocity are different given a graph or mathematical representation. (ICP.1.4)

Related Concepts

- I can develop a graphical representation of an object's position and time when the object is moving at constant velocity. (ICP.1.1)
- I can interpret a graphical representation of an object's position and time when the object is moving at a constant velocity in order to explain the object's motion qualitatively. (ICP.1.1)
- I can interpret a graphical representation of an object's position and time when the object is moving at a constant velocity in order to explain the object's motion quantitatively. (ICP.1.1)
- I can develop a mathematical equation for an object's velocity, position or time when the object is moving at a constant velocity using v=d/t. (ICP.1.1)
- I can apply a mathematical equation for an object's motion when the object is at a constant velocity in order to explain the object's motion qualitatively. (ICP.1.1)

	● I can apply a mathematical equation for an object's motion when the object is at a constant velocity in order to explain the object's motion quantitatively. (ICP.1.1) ● I can develop a pictorial representation of an object's position at various times when the object is moving at constant velocity. (ICP.1.1) ● I can interpret pictorial representations of an object's position at various times when the object is moving at constant velocity to explain the object's motion qualitatively. (ICP.1.1) ● I can interpret pictorial representations of an object's position at various times when the object is moving at constant velocity to explain the object's motion quantitatively. (ICP.1.1) ● I can calculate the velocity by using slope of an object moving in one dimension based on the position time graph. (ICP.1.2) ● I can identify the difference between distance. (ICP.1.3) ● I can determine the distance or displacement graphically when given a graph of position and time. (ICP.1.3) ● I can determine the distance or displacement mathematically when given a position and time of an object. (ICP.1.3)
Science and Engineering Process Standards ● SEPS 2: Developing and Using Models ● SEPS 4: Analyzing and Interpreting Data ● SEPS 5: Using Mathematics and Computational Thinking	**Vocabulary** ● Average ● Constant Velocity ● Displacement ● Distance ● Final position/time ● Frame of Reference ● Initial position/time ● Instantaneous ● Labels ● Meters ● Meters per Second ● Motion ● One dimension ● Rise ● Run ● Seconds ● Slope ● Speed ● Time ● Units ● Velocity

Supplemental Resources

Resources & Materials	Texts & Articles	Videos & Media
Speed Lab- Build 3 paper airplanes and calculate their speeds	● Newsela Article- How Fast Can Humans Run?	● You Tube video: Speed, Distance, and Time (Corbettmath, 13:51)

School Resources

Textbook: Integrated Chemistry & Physics by Glencoe **Chapter 2**	**Formative Assessments** **Quiz on Speed** **Chapter 2 Test**

Unit 2: Uniform Acceleration

General Description of the Unit

Acceleration is the rate of change of velocity. It can be calculated using the formula acceleration = final velocity minus the original velocity divided by the time.

Literacy Assessments*:*

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Priority Standards	**Supporting Standards**
● **ICP.2.3:** For an object thrown vertically, qualitatively describe or quantitatively determine the velocity and acceleration at various positions during its motion.	● **ICP.2.1:** Develop graphical, mathematical, and pictorial representations (such as a motion map) that describe the relationship between the clock reading (time) and velocity of an object moving at a constant acceleration and apply those representations to qualitatively and quantitatively describe the motion of an object in terms of its change in position or velocity. ● **ICP.2.2:** Describe the differences between average velocity and instantaneous velocity and be able to determine either quantity given a graph of position vs clock reading (time).

Content Area Literacy Standards

- 9-10.LST.4.1: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words
- 9-10.LST.1.1: Read and comprehend science and technical texts within a range of complexity appropriate for grades 9-10 independently and proficiently by the end of grade 10.
- 9-10.LST.2.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.

Enduring Understandings	**Essential Questions**
● Calculate the acceleration using a given formula.	● How are acceleration, time, and velocity related? ● How can an object's acceleration be calculated?

Key Concepts	**Related Concepts**
● I can describe the velocity qualitatively at various positions of an object that is launched vertically. (ICP.2.3) ● I can describe the velocity quantitatively at various positions of an object that is launched vertically using a = v/t and a=g=9.8 m/s^2. (ICP.2.3) ● I can explain the acceleration both qualitatively (constant) and quantitatively (-9.8 m/s^2) at various positions of an object that is launched vertically. (ICP.2.3)	● I can develop a graphical representation of an object's position and time when the object is moving at constant acceleration. (ICP.2.1) ● I can interpret a graphical representation of an object's position and time when the object is moving at a constant acceleration in order to explain the object's motion qualitatively. (ICP.2.1) ● I can interpret a graphical representation of an object's position and time when the object is moving at a constant acceleration in order to explain the object's motion quantitatively. (ICP.2.1) ● I can develop a mathematical equation for an object's acceleration, velocity, or time when the object is moving at a constant acceleration. (ICP.2.1) ● I can apply a mathematical equation for an object's motion when the object is at a constant acceleration in order to explain the object's motion qualitatively. (ICP.2.1) ● I can apply a mathematical equation for an object's motion when the object is at a constant acceleration in order to explain the object's motion quantitatively. (ICP.2.1) ● I can develop a pictorial representation of an object's position at various times when the object is moving at constant acceleration. (ICP.2.1) ● I can interpret pictorial representations of an object's position at various times when the object is moving at

	constant acceleration to explain the object's motion qualitatively. (ICP.2.1) ● I can interpret pictorial representations of an object's position at various times when the object is moving at constant acceleration to explain the object's motion quantitatively. (ICP.2.1) ● I can calculate the average velocity of an object traveling under uniform acceleration given a graph. (ICP.2.2) ● I can calculate the instantaneous velocity of an object traveling under uniform acceleration given a graph. (ICP.2.2) ● I can identify when the instantaneous velocity and average velocity are different for an object traveling under uniform acceleration given a graph. (ICP.2.2)

● SEPS 2: Developing and Using Models ● SEPS 4: Analyzing and Interpreting Data ● SEPS 5: Using Mathematics and Computational Thinking	**Vocabulary** ● Acceleration ● Average Velocity ● Gravity (concept and value) ● Horizontal ● Instantaneous Velocity ● Meters per second squared (m/s^2) ● Vertical

Supplemental Resources

Resources & Materials	Texts & Articles	Videos & Media
● Mini-Lab -Determine the Direction of Acceleration (pg 57 in textbook)	● Newsela Article- Acceleration: A Historian Reflects on a Lifetime of Change	● You Tube Video: What is Acceleration? (2.01min)

School Resources

Textbook **Chapter 2**	**Formative Assessments** **Quiz on Acceleration** **Chapter 2 Test**

General Description of the Unit

Unbalanced forces change motion. Discuss Newton's 3 laws of motion to relate the changes in an object's motion with the forces acting on it. Newton's Laws can be used to explain everyday events, such as falling and collisions.

Priority Standards

- **ICP.3.1:** Develop pictorial and graphical representations which show that a single external applied force changes the velocity of an object, and that when no force acts, the velocity of an object remains constant.
- **ICP.3.4:** Develop pictorial and graphical representations which show that a non-zero net force on an object results in an acceleration of the object and that the acceleration of an object of constant mass is proportional to the total force acting on it, and inversely proportional to its mass for a constant applied total force.
- **ICP.3.7:** Develop pictorial and graphical representations which show that when two objects interact, the forces occur in pairs according to Newton's third law and that the change in motion of each object is dependent on the mass of each object.

Supporting Standards

- **ICP.3.2:** Construct force diagrams and combine forces to determine the equivalent single net force acting on the object when more than one force is acting on the object.
- **ICP.3.3:** Distinguish between forces acting on a body and forces exerted by the body. Categorize forces as contact forces, friction, or action at a distance (field) forces.
- **ICP.3.5:** Qualitatively describe and quantitatively determine the magnitude and direction of forces from observing the motion of an object of known mass.
- **ICP.3.6:** Qualitatively describe and quantitatively determine the acceleration of an object of known mass from observing the forces acting on that object.

Content Area Literacy Standards

- 9-10.LST.3.2: Analyze the structure of the relationships among concepts in a text, including relationships among key terms
- 9-10.LST.4.1: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words
- 9-10.LST.2.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.

Enduring Understandings

- Newton's First Law of Motion states that an object moves at a constant velocity unless an unbalanced force acts on it. (Law of Inertia)
- Newton's Second Law of Motion states an object's acceleration is in the same direction as the net force on the object and is equal to the net force exerted on it, divided by its mass. (a = F/m)
- Newton's Third Law of Motion states that when one object exerts a force on a second object, the second object exerts a force on the first that is equal in strength and opposite in direction.

Essential Questions

- How can one explain and predict interactions between objects and within systems of objects?
- How can one predict an object's continued motion, change in motion, or stability?

Key Concepts

- I can draw a pictorial representation demonstrating the velocity of an object experiencing a single uniform force. (ICP.3.1)
- I can develop a graph of an object's velocity when the object is experiencing a single uniform force. (ICP.3.1)
- I can develop a graph that demonstrates the acceleration of an object as it relates to the force applied to the object with a constant mass. (ICP.3.4)
- I can develop a pictorial representation that demonstrates the acceleration of an object as it relates to the force applied to the object with a constant mass. (ICP.3.4)

Related Concepts

- I can develop a force diagram illustrating how multiple forces acting on an object simplify into one net force. (ICP.3.2)
- I can calculate the value of one equivalent net force for an object that experiences multiple forces. (ICP.3.2)
- I can distinguish between forces acting on a body and forces exerted by the body. (ICP.3.3)
- I can categorize forces as contact, friction or field forces based on a given description or pictorial information. (ICP.3.3)
- I can qualitatively describe the magnitude and direction of forces from observing the motion of an object of known mass. (ICP.3.5)

● I can develop a graph that demonstrates the acceleration of an object is proportional to the total force acting on it. (ICP.3.4) ● I can develop a graph that demonstrates the acceleration of an object as it inversely related to the mass of an object. (ICP.3.4) ● I can develop pictorial and graphical representations which show that when two objects interact, the forces occur in pairs according to Newton's third law. (ICP.3.7) ● I can develop pictorial and graphical representations which show that the change in motion of each object is dependent on the mass of each object. (ICP.3.7)	● I can quantitatively determine the magnitude and direction of forces from observing the motion of an object of known mass. (ICP.3.5) ● I can qualitatively describe the acceleration of an object of known mass from observing the forces acting on that object. (ICP.3.6) ● I can quantitatively determine the acceleration of an object of known mass from observing the forces acting on that object. (ICP.3.6)

Science and Engineering Process Standards	**Vocabulary**
● A	● Acceleration ● Action ● Applied force ● Constant ● Contact forces ● Direction ● External ● Field forces ● Force ● Force Diagrams ● Friction ● Inversely Proportional ● Kilogram ● Magnitude ● Mass ● Motion ● Net Force ● Newton's First and Second Laws ● Newton's First Law ● Newton's Second Law ● Newton's Third Law ● Observing Motion ● Reaction ● Unit Newton ● Unit of a Newton ● Velocity

Supplemental Resources

Resources & Materials	**Texts & Articles**	**Videos & Media**
● Lab on Newton's First Law-Law of Inertia	● Newsela Article- - What are Newton's Laws of Motion?	● Understanding Car Crashes: it's Basic Physics

School Resources

Textbook **Chapter 3**	**Formative Assessments** **Quiz on Newton's 2nd Law** **Quiz on all of Newton's Laws** **Chapter 3 Test**

General Description of the Unit

Work is force applied through a distance and machines make doing work easier or faster by changing the force needed to do the work. Energy is the ability to cause change. Kinetic energy is the energy of motion, while potential energy is stored energy due to the interactions between objects. Forms of energy include mechanical, electrical, chemical, thermal, and radiant energy. Energy cannot be created or destroyed. Temperature is a measure of the average kinetic energy of the particles of an object. There are 3 ways to transfer heat energy: conduction, convection, and radiation.

Literacy Assessments*:*

- *Heat Transfer Teacher Document*
- *Heat Transfer Student Document*

Priority Standards

- **ICP.4.4:** Qualitatively and quantitatively analyze various scenarios to describe how energy may be transferred into or out of a system by doing work through an external force or adding or removing heat.
- **ICP.5.5:** Evaluate graphical or pictorial representations that describe the relationship among the volume, temperature, and number of molecules and the pressure exerted by the system to qualitatively and quantitatively describe how changing any of those variables affects the others.

Supporting Standards

- **ICP.4.1:** Define energy as a quantity that can be represented as being within a system that is distinct from the remainder of the universe and is measured in Joules.
- **ICP.4.2:** Identify forms of energy present in a system (kinetic, gravitational, elastic, etc.), and pictorially represent the distribution of energies, such as using pie or bar charts.
- **ICP.4.3:** Understand and explain that the total energy in a closed system is conserved.
- **ICP.5.4:** Distinguish “temperature” from “thermal energy,” compare and contrast the Fahrenheit, Celsius, and Kelvin temperature scales, and convert temperatures between them.
- **ICP.5.3:** At the particle level, describe the relationship between temperature and the average kinetic energy of particles in the system and describe how a thermometer measures the temperature of a system.

Content Area Literacy Standards

- 9-10.LST.4.1: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words
- 9-10.LST.1.1: Read and comprehend science and technical texts within a range of complexity appropriate for grades 9-10 independently and proficiently by the end of grade 10.
- 9-10.LST.2.2: Determine the central ideas or conclusions of a text; trace the text’s explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.

Enduring Understandings

- Work is force applied through a distance and is measured in Joules.
- Kinetic energy is energy of motion.
- Potential energy is energy that is stored due to the interactions between objects.
- The law of conservation of energy states that energy cannot be created or destroyed, it can be converted from one form to another or transferred from one place to another.

Essential Questions

- How does the flow of energy affect the materials in the system?
- How is energy transferred and conserved?
- What is the ability of energy?

Key Concepts

- I can qualitatively and quantitatively analyze various scenarios to describe how energy may be transferred into or out of a system by doing work through an external force or adding or removing heat. (ICP.4.4)

Related Concepts

- I can define energy as a quantity that can be represented as being within a system that is distinct from the remainder of the universe and is measured in Joules. (ICP.4.1)

● I can quantitatively analyze various scenarios to describe how energy may be transferred into or out of a system by doing work through an external force or adding or removing heat. (ICP.4.4)	● I can identify forms of energy present in a system (kinetic, gravitational, elastic, etc.) (ICP.4.2) ● I can pictorially represent the distribution of energies, such as using pie or bar charts. (ICP.4.2) ● I can explain that the total energy in a closed system is conserved. (ICP.4.3) ● I can describe how a thermometer measures the temperature of a system. (ICP.5.3) ● I can distinguish temperature from thermal energy. (ICP.5.4) ● I can compare and contrast the Fahrenheit, Celsius, and Kelvin temperature scales. (ICP.5.4) ● I can convert temperatures between the various scales. (ICP.5.4)

Science and Engineering Process Standards	**Vocabulary**
● SEPS 2: Developing and Using Models ● SEPS 5: Using Mathematics and Computational Thinking ● SEPS 7: Engaging in Argument from Evidence	● Conservation of Energy ● Elastic Potential Energy ● Energy ● External Force ● Gravitational Potential Energy ● Heat ● Joules ● Kinetic Energy ● System

Supplemental Resources

Resources & Materials	**Texts & Articles**	**Videos & Media**
● Popcorn Lab- 3 Ways to Cook Popcorn to Demonstrate the 3 Types of Heat Transfer ● Lab on Work and Power	● Newsela Articles ● - Six Kinds of Simple Machines ● Matter and Energy- What is Energy? ● What is Heat Energy?	● You Tube video: WCLN-Physics-Energy 4-Calculating Work

School Resources

Textbook **Chapter 4** **Chapter 5**	**Formative Assessments** **Quiz on Work** **Quiz on Heat Transfer** **Test on Chapter 4** **Test on Chapter 5**

General Description of the Unit

Matter can exist as a solid, liquid , gas, or plasma. The atoms and molecules that make up matter are in continuous, random motion.

Priority Standards

- **ICP.5.1:** Develop pictorial representations which show that matter is made of particles.

Supporting Standards

- **ICP.5.2:** Describe the assumptions used to develop the kinetic theory of gasses.
- **ICP.5.6:** Describe and demonstrate how the kinetic theory can be extended to describe the properties of liquids and solids by introducing attractive forces between the particles.
- **ICP.5.7:** Analyze a heating / cooling curve to describe how adding or removing thermal energy from a system changes the temperature or state of an object and be able to identify the melting and freezing temperatures of the system.
- **ICP.5.8:** Collect and use experimental data to determine the number of items in a sample without actually counting them and qualitatively relate this to Avogadro's hypothesis.

Content Area Literacy Standards

- 9-10.LST.4.1: Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words
- 9-10.LST.1.1: Read and comprehend science and technical texts within a range of complexity appropriate for grades 9-10 independently and proficiently by the end of grade 10.
- 9-10.LST.2.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.

Enduring Understandings

- Matter can exist as a solid,liquid, gas. or plasma.
- The kinetic theory is an explanation of how the particles in gases behave.
- Gases respond to changes in pressure, temperature, and volume in predictable ways.

Essential Questions

- Which state of matter do you believe is the most important for survival?
- How does temperature affect matter?

Key Concepts

- I can create a pictorial representation which shows that matter is made of particles. (ICP.5.1)
- I can evaluate graphical or pictorial representations that describe the relationship among the volume, temperature, and number of molecules and the pressure exerted by the system to qualitatively describe how changing any of those variables affects the others. (ICP.5.5)
- I can evaluate graphical or pictorial representations that describe the relationship among the volume, temperature, and number of molecules and the pressure exerted by the system to quantitatively describe how changing any of those variables affects the others. (ICP.5.5)

Related Concepts

- I can describe the assumptions used to develop the kinetic theory of gasses. (ICP.5.2)
- I can describe at the particle level the relationship between temperature and the average kinetic energy of particles in the system. (ICP.5.3)
- I can describe how the kinetic theory can be extended to describe the properties of liquids and solids by introducing attractive forces between the particles. (ICP.5.6)
- I can analyze a heating / cooling curve to describe how adding or removing thermal energy from a system changes the temperature or state of an object. (ICP.5.7)
- I can identify the melting and freezing temperatures of the system. (ICP.5.7)
- I can collect experimental data to determine the number of items in a sample without actually counting them. (ICP.5.8)
- I can use experimental data to determine the number of items in a sample. (ICP.5.8)
- I can relate collected experimental data qualitatively to Avogadro's hypothesis. (ICP.5.8)

Science and Engineering Process Standards

- SEPS 3: Planning and Carrying Out Investigations
- SEPS 4: Analyzing and Interpreting Data

Vocabulary

- Average Kinetic Energy
- Avogadro's Hypothesis
- Celsius
- Fahrenheit
- Freezing Temperature
- Heating / Cooling Curve
- Kelvin
- Kinetic
- Kinetic Theory
- Kinetic Theory of Gasses
- Liquids
- Matter
- Melting Temperature
- Molecules
- Particles
- Pictorial Representation
- Pressure
- Sample
- Solids
- State
- System
- System Changes
- Temperature
- Thermal Energy
- Thermometer
- Volume

Supplemental Resources

Resources & Materials

- Lab- Phase Changes

Texts & Articles

- Newsela Article- The 3 Phases of Matter: Solids. Liquids, and Gases

Videos & Media

- You Tube Video: Phase Changes_ Middle School Science (7:40 min)
- You Tube Video: Phases of Matter and Phase Changes (6:06 min)

School Resources

Textbook
Chapter 14

Formative Assessments
Quiz over Solids, Liquids and Gases
Chapter 14 Test

General Description of the Unit

Matter exists as either a pure substance or a mixture. A physical property can be observed without changing the identity of the material; a chemical property can be observed when one or more new substances are formed. The properties of an element are determined by the structure of its atoms.

Literacy Assessments:

- *Molecules, Mixtures, & Compounds Teacher Document*
- *Molecules, Mixtures, & Compounds Student Document*

Priority Standards

- **ICP.6.1:** Distinguish between elements, mixtures, and compounds based on their composition and bonds and be able to construct or sketch particle models to represent them.
- **ICP.6.4:** Given the periodic table, determine the atomic mass, atomic number, and charges for any element.

Supporting Standards

- **ICP.6.2:** Develop graphical and mathematical representations to show that mixtures can be made in any proportion and separated based on the properties of the components of the mixture and apply those representations to quantitatively determine the ratio of components.
- **ICP.6.3:** Cite the evidence that supports the idea that some pure substances are combined of elements in a definite ratio, as for example seen in electrolysis of water.
- **ICP.6.5:** Given a periodic table, understand and describe the significance of column location for the elements by calculation of molar ratios of known compounds.
- **ICP.6.6:** Develop graphical and mathematical representations that describe the relationship between volume and mass of an object, describe the slope in terms of the object's density, and apply those representations to qualitatively and quantitatively determine the mass or volume of any object.
- **ICP.6.7:** Describe how both density and molecular structure are applicable in distinguishing the properties of gases from those of liquids and solids.

Content Area Literacy Standards

- 9-10.LST.1.1: Read and comprehend science and technical texts within a range of complexity appropriate for grades 9-10 independently and proficiently by the end of grade 10.
- 9-10.LST.2.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.

Enduring Understandings

- Matter exists as either a pure substance or a mixture.
- Protons and neutrons form the nucleus of an atom, and electrons occupy a space surrounding the nucleus.
- All atoms of the same element have the same number of protons but can have different numbers of neutrons.
- Atoms of elements that are in the same group of the periodic table have similar physical and chemical properties.

Essential Questions

- How can one explain the structure, properties and interactions of matter?
- How do particles combine to form the variety of matter one observes?

Key Concepts

- I can distinguish between elements, mixtures, and compounds based on their composition and bonds. (ICP.6.1)
- I can construct or sketch particle models to represent them. (ICP.6.1)

Related Concepts

- I can develop graphical representations to show that mixtures can be made in any proportion and separated based on the properties of the components of the mixture. (ICP.6.2)
- I can develop mathematical representations to show that mixtures can be made in any proportion and

● I can determine the atomic mass, atomic number, and charges for any element given a periodic table. (ICP.6.4)	separated based on the properties of the components of the mixture. (ICP.6.2) ● I can apply those representations to quantitatively determine the ratio of components. (ICP.6.2) ● I can cite the evidence that supports the idea that some pure substances are combined of elements in a definite ratio, as for example seen in electrolysis of water. (ICP.6.3) ● I can describe the significance of column location for the elements by calculation of molar ratios of known compounds given a periodic table. (ICP.6.5) ● I can develop graphical representations that describes the relationship between volume and mass of an object (ICP.6.6) ● I can develop mathematical representations that describe the relationship between volume and mass of an object (ICP.6.6) ● I can describe the slope in terms of the object's density. (ICP.6.6) ● I can apply those representations to qualitatively and quantitatively determine the mass or volume of any object. (ICP.6.6) ● I can describe how both density and molecular structure are applicable in distinguishing the properties of gases from those of liquids and solids. (ICP.6.7)

Science and Engineering Process Standards	**Vocabulary**
● SEPS 6: Constructing Explanations and Designing Solutions ● SEPS 7: Engaging in Argument from Evidence	● Atomic Mass ● Atomic Number ● Bonds ● Charge ● Components ● Compounds ● Density ● Electrolysis ● Elements ● Gases ● Liquids ● Mass ● Mixture ● Molar Ratios ● Molecular Structure ● Particle Models ● Periodic Table ● Proportion ● Pure Substances ● Ratio ● Solids ● Volume

Supplemental Resources

Resources & Materials	**Texts & Articles**	**Videos & Media**
● The Periodic Table Lab	● Newsela Article- The Periodic Table: A Classic Design	● You Tube video: The Periodic Table Explained: Introduction

School Resources

Textbook **Chapter 15** **Chapter 16** **Chapter 17**	**Formative Assessments** **Quiz over composition of matter-Chapter 15.** **Chapter 15 Test** **Quiz over Structure of Atom - Chapter 16** **Electron Dot Diagram Quiz- Chapter 16** **Chapter 16 Test**

	Quiz over Metals and Nonmetals **Chapter 17 Test**

General Description of the Unit

A chemical reaction involves changing one or more substances into a different substance or substances. A balanced chemical equation describes the rearrangement of atoms in a chemical reaction. Reactions can be classified into 5 main categories based on how atoms are rearranged.

Literacy Assessments:

- *Conservation of Energy Teacher Document*
- *Conservation of Energy Student Document*

- *Chemical Reactions Teacher Document*
- *Chemical Reactions Student Document*

Priority Standards

- **ICP.7.1:** Pictorially or mathematically represent chemical changes using particle diagrams and chemical equations.

Supporting Standards

- **ICP.7.2:** Demonstrate the Law of Conservation of Matter in terms of atoms and mass of substances by balancing equations.
- **ICP.7.3:** Differentiate the basic types of reactions, for example: synthesis, decomposition, combustion, single replacement, and double replacement.
- **ICP.7.4:** Using balanced equations and stoichiometric calculations, demonstrate the principle of Conservation of Matter in terms of atoms and mass.

Content Area Literacy Standards

- 9-10.LST.1.1: Read and comprehend science and technical texts within a range of complexity appropriate for grades 9-10 independently and proficiently by the end of grade 10.
- 9-10.LST.2.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.
- 9-10.LST.3.1: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

Enduring Understandings

- Atoms form ionic bonds by transferring electrons and form covalent bonds by sharing electrons.
- For both ionic and covalent compounds, you can write a name from the chemical formula ro a chemical formula from the name.
- There are 5 main categories of chemical reactions: combustion, synthesis, decomposition, single displacement, and double displacement.
- A balanced chemical equation describes the rearrangement of atoms in a chemical reaction.

Essential Questions

- How do substances combine or change (react) to make new substances?
- How does one characterize and explain these reactions and make predictions about them?

Key Concepts

- I can pictorially or mathematically represent chemical changes using particle diagrams and chemical equations. (ICP.7.1)

Related Concepts

- I can demonstrate the Law of Conservation of Matter in terms of atoms and mass of substances by balancing equations. (ICP.7.2)
- I can tell the difference between the basic types of reactions: synthesis, decomposition, combustion, single replacement, and double replacement. (ICP.7.3)
- I can demonstrate the principle of Conservation of Matter in terms of atoms and mass using balanced equations and stoichiometric calculations. (ICP.7.4)

Science and Engineering Process Standards

- SEPS 2: Developing and Using Models
- SEPS 5: Using Mathematics and Computational Thinking

Vocabulary

- Atoms
- Balanced Equations

	● Balancing Equations ● Chemical Changes ● Chemical Equations ● Conservation of Matter ● Decomposition ● Double Replacement ● Law of Conservation of Matter ● Mass ● Single Replacement ● Stoichiometric Calculations ● Synthesis

Supplemental Resources

Resources & Materials	Texts & Articles	Videos & Media
● Lab: Strength of Attraction:Ions vs Molecules pg 572 in textbook	● Newsela Article: Ionic vs Covalent Bonding: Understanding the Difference	● You Tube video: Ionic vs. Covalent Bonds

Textbook **Chapter 18** **Chapter 19**	**Formative Assessments** **Quiz over ionic and covalent bonding** **Chapter 18 Test** **Quiz over types of chemical reactions** **Chapter 19**

General Description of the Unit

Electricity consists of static and moving electric charges. Our ability to manipulate electric charge has allowed us to produce everything from electric lights to digital music players to ultraportable computers.

Literacy Assessments*:*

- *Electrical Current Teacher Document*
- *Electrical Current Student Document*

Priority Standards

- **ICP.8.1:** Describe electrical current in terms of the motion of electrons within a device and relate the rate of motion of the electrons to the amount of current measured.

Supporting Standards

- **ICP.8.2:** Describe the relationship among voltage, current, and resistance for an electrical system consisting of a single voltage source and a single device.
- **ICP.8.3:** Describe on a macroscopic scale how any distribution of magnetic materials (e.g. iron filings, ferrofluid, etc.) aligns with the magnetic field created by a simple magnet.

Content Area Literacy Standards

- 9-10.LST.1.1: Read and comprehend science and technical texts within a range of complexity appropriate for grades 9-10 independently and proficiently by the end of grade 10.
- 9-10.LST.2.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.
- 9-10.LST.3.1: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

Enduring Understandings

- Like electric charges repel each other, and unlike charges attract each other.
- An electric current is a flow of electric charge.
- Use Ohm's Law to calculate the current, voltage, or resistance. (I = V/R)

Essential Questions

- How can objects become electrically charged?
- How does Ohm's law relate current, voltage difference, and resistance?

Key Concepts

- I can describe electrical current in terms of the motion of electrons within a device. (ICP.8.1)
- I can relate the rate of motion of the electrons to the amount of current measured. (ICP.8.1)

Related Concepts

- I can describe the relationship among voltage, current, and resistance for an electrical system consisting of a single voltage source and a single device. (ICP.8.2)
- I can describe on a macroscopic scale how any distribution of magnetic materials (e.g. iron filings, ferrofluid, etc.) aligns with the magnetic field created by a simple magnet. (ICP.8.3)

Science and Engineering Process Standards

- SEPS 6: Constructing Explanations and Designing Solutions
- SEPS 8: Obtaining, Evaluating, and Communicating Information

Vocabulary

- Current
- Electrical Current
- Electrical System
- Electrons
- Ferrofluid
- Macroscopic Scale
- Magnet
- Magnetic Field
- Magnetic Materials
- Resistance
- Voltage
- Voltage Device
- Voltage Source

Supplemental Resources

Resources & Materials	Texts & Articles	Videos & Media
● Lab on Conductors & Insulators	● Newsela Articles; ● Everyday Mysteries; What is Static Electricity ● Interconnecting Relationship Between Electricity and Magnetism ● Electricity Provides the Energy Used to Power Most of the Modern World	● You Tube video: Introduction to Electricity-Video for Kids (5:25)

School Resources	
Chapter 6	**Formative Assessments** Quiz over Electricity Chapter 6 Test

General Description of the Unit

Waves are one of many ways to transfer energy. All types of waves, including water waves, waves on a rope, or spring, sound waves, and light waves, transfer energy without transferring matter.

Priority Standards

- **ICP.9.1:** Develop qualitative particle models of mechanical waves and explain the relationship of the particles and their interactions in transverse and longitudinal waves, as well as, how waves appear in nature as in water waves and tsunamis, ground waves in earthquakes, and sound waves.

Supporting Standards

- **ICP.9.2:** Develop and apply a simple mathematical model regarding the relationship among frequency, wavelength, and speed of waves in a medium as well.
- **ICP.9.3:** Qualitatively describe the reflection and transmission of a mechanical wave at either a fixed or free boundary or interface.
- **ICP.9.4:** Describe how interacting waves produce different phenomena than singular waves in a medium (e.g. periodic changes in volume of sound or resonance).
- **ICP.9.5:** Describe and provide examples of how modern technologies use mechanical or electromagnetic waves and their interactions to transmit information.

Content Area Literacy Standards

- 9-10.LST.1.1: Read and comprehend science and technical texts within a range of complexity appropriate for grades 9-10 independently and proficiently by the end of grade 10.
- 9-10.LST.2.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.
- 9-10.LST.3.1: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

Enduring Understandings

- Wave properties depend on the vibrations of the wave source and the material in which the wave travels.
- Calculate the wave speed using a given formula.

Essential Questions

- How are waves used to transfer energy and information?
- What are the various methods for creating waves?

Key Concepts

- I can construct qualitative particle models of mechanical waves. (ICP.9.1)
- I can explain the relationship of the particles and their interactions in transverse and longitudinal waves. (ICP.9.1)
- I can explain how waves appear in nature as in water waves and tsunamis, ground waves in earthquakes, and sound waves. (ICP.9.1)

Related Concepts

- I can develop a simple mathematical model regarding the relationship among frequency, wavelength, and speed of waves in a medium. (ICP.9.2)
- I can apply a simple mathematical model regarding the relationship among frequency, wavelength, and speed of waves in a medium. (ICP.9.2)
- I can qualitatively describe the reflection and transmission of a mechanical wave at a fixed boundary. (ICP.9.3)
- I can qualitatively describe the reflection and transmission of a mechanical wave at a free boundary. (ICP.9.3)
- I can qualitatively describe the reflection and transmission of a mechanical wave at an interface. (ICP.9.3)
- I can describe how interacting waves produce different phenomena than singular waves in a medium. (ICP.9.4)
- I can describe how modern technologies use mechanical or electromagnetic waves and their interactions to transmit information. (ICP.9.5)
- I can provide examples of how modern technologies use mechanical or electromagnetic waves and their interactions to transmit information. (ICP.9.5)

Science and Engineering Process Standards

Vocabulary

● SEPS 2: Developing and Using Models ● SEPS 5: Using Mathematics and Computational Thinking ● SEPS 6: Constructing Explanations and Designing Solutions ● SEPS 8: Obtaining, Evaluating, and Communicating Information	● Fixed Boundary ● Free Boundary ● Frequency ● Interacting Waves ● Interface ● Longitudinal Waves ● Mechanical Wave ● Medium ● Particles ● Reflection ● Resonance ● Transmission ● Transverse Waves ● Wavelength ● Mechanical Waves ● Electromagnetic Waves ● Transmit

Supplemental Resources

Resources & Materials	Texts & Articles	Videos & Media
● Lab- Wave Speed and Tension Pg 285 in Textbook	● Newsela Articles: ● Wave Properties ● How Do Waves Behave? ● Measurable Properties of Waves	● YouTube video: Introduction to Waves (Atomic School;5:17)

School Resources

Textbook	Formative Assessments
Chapter 9	Quiz over waves Chapter 9 Test

General Description of the Unit

The energy resources that we use can be renewable or nonrenewable. Our use of these resources impacts our daily lives and the environment in which we live.

Literacy Assessments*:*

- *Atomic Models Teacher Document*
- *Atomic Models Student Document*

- *The Atomic Nucleus Teacher Document*
- *The Atomic Nucleus Student Document*

Priority Standards	**Supporting Standards**
● **ICP.10.2:** Describe the model of the atomic nucleus and explain how the nucleus stays together in spite of the repulsion between protons.	● **ICP.10.1:** Describe and compare/contrast the atomic models suggested by Rutherford and Bohr. ● **ICP.10.3:** Develop and apply simple qualitative models or sketches of the atomic nucleus that illustrate nuclear structures before and after undergoing fusion, fission, or radioactive decay. ● **ICP.10.4:** Distinguish between fusion, fission, and radioactivity and qualitatively compare the amount of energy released in these processes. ● **ICP.10.5:** Explain the potential applications and possible consequences as the result of nuclear processes such as the generation of energy at nuclear power plants, including the potential damage that radioactivity can cause to biological tissues.

Content Area Literacy Standards

- 9-10.LST.1.1: Read and comprehend science and technical texts within a range of complexity appropriate for grades 9-10 independently and proficiently by the end of grade 10.
- 9-10.LST.2.2: Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate, objective summary of the text.

Enduring Understandings	**Essential Questions**
● Nuclear power plants transform nuclear energy into electrical energy. ● Renewable energy resources help lesson human dependence on fossil fuels.	● What forces hold nuclei together and mediate nuclear processes? ● What distinguishes a nuclear reaction from an ordinary chemical reaction?
Key Concepts	**Related Concepts**
● I can describe the model of the atomic nucleus. (ICP.10.2) ● I can explain how the nucleus stays together in spite of the repulsion between protons. (ICP.10.2)	● I can describe the atomic models suggested by Rutherford and Bohr. (ICP.10.1) ● I can compare/contrast the atomic models suggested by Rutherford and Bohr. (ICP.10.1) ● I can develop simple qualitative models or sketches of the atomic nucleus that illustrate nuclear structures before and after undergoing fusion, fission, or radioactive decay. (ICP.10.3) ● I can apply simple qualitative models or sketches of the atomic nucleus that illustrate nuclear structures before and after undergoing fusion, fission, or radioactive decay. (ICP.10.3) ● I can distinguish between fusion, fission, and radioactivity. (ICP.10.4) ● I can qualitatively compare the amount of energy released in these processes. (ICP.10.4) ● I can explain the potential applications and possible consequences as the result of nuclear processes such

	as the generation of energy at nuclear power plants, including the potential damage that radioactivity can cause to biological tissues. (ICP.10.5)

Science and Engineering Process Standards	**Vocabulary**
● SEPS 1: Asking Questions and Defining Problems ● SEPS 2: Developing and Using Models ● SEPS 8: Obtaining, Evaluating, and Communicating Information	● Atomic Models ● Atomic Nucleus ● Biological Tissues ● Bohr ● Consequences ● Energy ● Fission ● Fusion ● Nuclear Power Plants ● Nuclear Processes ● Protons ● Radioactive Decay ● Radioactivity ● Rutherford

Supplemental Resources

Resources & Materials	**Texts & Articles**	**Videos & Media**
●	● Newsela Articles: ● The Sun, an Engine of Nuclear Energy ● Nuclear Power as an Energy Source Has its Pros and Cons ● How Atomic and Thermonuclear Bombs work	● :YouTube video: Nuclear Energy Explained:How Does it Work? (Kurzgesagt, 5:18)

School Resources

Textbook	**Formative Assessments**
Chapter 8	**Quiz over chapter 8** **Chapter 8 Test**