Essential Outcomes
Integrated Chemistry/Physics Pacing Guide

1) Properties of Matter: Macroscopic as a Model for Microscopic- Understand how the energies and motions of atoms and molecules at the microscopic level can be used to understand and predict the macroscopic properties of matter of gases, liquids and solids.

Learning Goals:

A) ICP.3.1 Describe how we use macroscopic properties of matter to model microscopic processes.

B) ICP.5.1 Recognize and describe physical properties of matter and use these to differentiate between pure substances and mixtures.

C) ICP.3.2 Study the characteristics of solids, liquids, and gases and their changes of state and interpret them in terms of a molecular model which describes their energies and motions.

D) ICP 3.3 Understand how thermal energy (the microscopic motions of the atoms and/or molecules) is related to the macroscopic concept of temperature. Examine the differences in these concepts by measuring the temperature changes, and determining specific heat capacity, of water as it is heated or cooled.

E) ICP.3.4 Understand how the microscopic kinetic molecular theory, explains observations of macroscopic gas behavior in terms of temperature, volume, pressure, and the number of particles (using the mole concept).

2.) Chemical Energy, Reactions, and Bonding- Describe how energy is produced and absorbed in chemical reactions.

Learning Goals:

A) ICP.5.3 Understand that the atomic number is unique to each element and is the number of protons in the nucleus of the element.

B) ICP.7.2 Differentiate between protons, neutrons, and electrons and determine the number of these subatomic particles in each atom.

C) ICP 5.2 Use the periodic table to understand important patterns in properties of elements. Recognize that the pattern of properties of the elements correlates most closely with the configuration of the electrons in each element.

D) ICP.5.4 Use the concept of the mole to relate number of moles and the mass of a sample of a pure substance of known chemical composition.

E) ICP.5.5 Using conservation principles write and balance chemical equations.

F) ICP.5.6 Identify key indicators of a chemical change and classify simple types of chemical reactions. Differentiate between covalent, ionic, hydrogen and Van der Waals bonding, and write formulas for and name compounds of each type.
G) ICP.5.7 Explain that in exothermic chemical reactions chemical energy is converted into other forms such as thermal, electrical, light, and sound energy.
H) ICP.4.3 Explain that electrons can absorb energy and can release energy, and that electrons in atoms do this at specific energies.

3) Nuclear Energy (fission/fusion)- Describe how the stability of nuclei in terms of the binding energies of their constituent protons and neutrons explains the energy production processes of fission and fusion.

A) ICP.7.1 Demonstrate how historical models and experiments supported the development of our current understanding of the atom and its nucleus.
B) ICP.7.2 Differentiate between protons, neutrons, and electrons and determine the number of these subatomic particles in each atom.
C) ICP.7.3 Understand that the stability of nuclei depends on the numbers of neutrons and protons.
D) ICP.7.4 Understand that fission results from large, less stable nuclei decomposing to form smaller, more stable nuclei.
E) ICP.7.5 Understand that fusion results from two smaller nuclei combining to form one larger nucleus.
F) ICP 7.6 Understand that the energy radiated from the sun derives from the fusion process.
G) ICP.7.7 Describe the various forms of emission that are typical of radioactive decay.
H) ICP 7.8 Relate the fission process to the human development and use of the fission process in war (uncontrolled) and in peace (controlled).

4) Motion and Energy of Macroscopic Objects- Describe and explain the motion of macroscopic objects in terms of Newton's laws and use the concepts of kinetic and potential energy to describe motion.

A) ICP.1.1 Measure the motion of objects to understand the relationships between distance, velocity, and acceleration and deepen understanding through graphical analysis of the time dependence of acceleration, velocity and distance.
B) ICP.1.2 Describe and apply Newton's three laws of motion. By experimentation, determine the relationships among the variables in Newton's laws and how all three laws relate mass, acceleration and force as a triad of proportional variables, leading to the definitions of momentum and energy.
C) ICP.1.3 Describe how Newton's law of universal gravitation, together with the laws of motion, explains the motions of objects on earth and of the moon, planets and stars.
D) ICP.1.4 Describe the kinetic and potential energies of macroscopic objects, and use measurements to develop an understanding of these forms of energy.

5) Energy Transport / Heat- Describe how vibrations and waves transport energy.

A) ICP 3.3 Understand how thermal energy (the microscopic motions of the atoms and/or molecules) is related to the macroscopic concept of temperature. Examine the differences in these concepts by measuring the temperature changes, and determining specific heat capacity, of water as it is heated or cooled.
B) ICP.4.1 Using conservation of energy, calculate the thermal energy released or absorbed by an object and distinguish between exothermic and endothermic changes.
C) ICP.5.7 Explain that in exothermic chemical reactions chemical energy is converted into other forms such as thermal, electrical, light, and sound energy.
D.) ICP.4.2 Differentiate between conduction, convection, and radiation and identify them as types of energy transfer.

6) Mechanical Energy and Propagation of Energy by Waves- Explain that waves transmit energy, come in two forms, transverse and longitudinal, and occur throughout nature.

A) ICP 2.1 Identify properties of objects that vibrate, using Newton's laws to understand the motion. Understand that vibrating objects can give rise to mechanical waves.
B) ICP.2.2 Identify properties of waves including frequency, wavelength, amplitude, energy, and wave speed.
C) ICP 2.3 Describe how energy is propagated by waves without the transfer of mass using examples such as water waves, earthquakes, and sound waves.
D) ICP.2.4 Apply the properties of waves to wave phenomena including reflection, and refraction, as well as the transmission and loss of energy.
E) ICP.4.4 Describe the relationships between velocity, frequency, wavelength, and energy in electromagnetic waves. Describe the regions of the electromagnetic spectrum.
F) ICP 4.5 Understand that from diffraction we know that visible light is an electromagnetic wave.

7) Electrical Energy Propagation and Magnetism- Describe how the movement and transfer of changed particles results in the transfer of electrical energy.

A) ICP.6.1 Explain that objects that carry a net charge will exert an electric force on other objects that may be attractive or repulsive.
B) ICP.6.2 Explain that when charge is transferred from one object to another, the amount lost by one object equals the amount gained by the other, consistent with the principal of conservation of charge.

C) ICP.6.3 Using the example of electrolysis and its application in batteries, explain the relationship between chemical reactions and electrical energy.
D) ICP.6.4 Define and describe the relationships between voltage, current, resistance and power in open and closed electrical circuits.
E) ICP.6.5 Describe the differences in current flow in parallel and in series circuits.
F) ICP.6.6 Explain that some objects, called magnets, exert magnetic forces with no direct contact.
G) ICP.6.7 Using the examples of motors and generators, explain that electrical energy can be transformed into mechanical energy and vice versa.

8) Society (Energy production, environment, economics)- Understand the impact of energy production and use on society and the environment.

A) ICP.8.1 Describe how energy needs have changed throughout history and how energy needs are met in modern society.
B) ICP.8.2 Describe the benefits and risks of the development of non-renewable forms of such as coal, oil, natural gas and uranium fission sources.
C) ICP.8.3 Describe the benefits and risks of the development of renewable forms of energy such as solar energy, wind-energy, geothermal energy, fusion energy and biofuels.
D) ICP.8.4 Describe how efficient use of renewable and non-renewable energy sources is essential to maintaining an acceptable environment.
E) ICP.8.5 Describe how the availability of energy resources is essential to the development of an economically viable society.
F) ICP.8.6 Contrast the dependence on and use of energy and other natural resources in the economies of industrial nations, of developing nations and of undeveloped nations.
G) ICP.8.7 Describe the energy needs of a modern urban city, and compare and contrast these needs with those of a modern rural community.

MICHIGAN CITY HIGH SCHOOL Integrated Chemistry and Physics					
	Ongoing/All Year	**1st Quarter**	**2nd Quarter**	**3rd Quarter**	**4th Quarter**
	Course Title	**Assessment Type**	**Assessment Type**	**Assessment Type**	**Assessment Type**
	Standard	**Standard** Bundle # 1 - Properties of Matter / States of Matter 3.1, 5.1, 3.2, 3.3, 3.4 - 4 weeks (Ch 2-3) Bundle # 2 – Chemical Energy, Reactions, and Bonding 5.2, 5.3, 7.2, 7.3, 5.4 - 5 weeks (Ch 4-5)	**Standard** Bundle #2- Chemical Energy, Reactions, and Bonding 5.5, 5.6, 5.7, 4.3 - 6 weeks (Ch 6-7) Bundle # 3 –Nuclear Energy - 2 weeks (Ch 10)	**Standard** Bundle # 4- Motion and Energy of Macroscopic Objects - 5 weeks (Ch 11-12) Bundle # 5- Energy Transport / Heat - 2 weeks (Ch 15-16) Bundle #6- Waves 2 weeks (Ch 17)	**Standard** Bundle # 6- Waves - 2 weeks (Ch 18) Bundle #7- Electrical Energy / Magnetism - 5 weeks (Ch 20-21) Bundle #8- Society -1.5 weeks (Ch 21)
		Best Practice Methods • Cooperative Learning • Similarities and Differences • Choice • Frequent and immediate feedback • Graphic Organizers • Summarizing • Analysis and Evaluation • Hypothesize	**Best Practice Methods** • Cooperative Learning • Similarities and Differences • Choice • Frequent and immediate feedback • Graphic Organizers • Summarizing • Analysis and Evaluation • Hypothesize	**Best Practice Methods** • Cooperative Learning • Similarities and Differences • Choice • Frequent and immediate feedback • Graphic Organizers • Summarizing • Analysis and Evaluation • Hypothesize	**Best Practice Methods** • Cooperative Learning • Similarities and Differences • Choice • Frequent and immediate feedback • Graphic Organizers • Summarizing • Analysis and Evaluation • Hypothesize

Benchmarks #1– Integrated Chemistry Physics – Macroscopic as a Model for Microscopic

Properties of Matter: Understand how the energies and motions of atoms and molecules at the microscopic level can be used to understand and predict the macroscopic properties of matter of gases, liquids and solids.

ICP.3.1 Describe how we use macroscopic properties of matter to model microscopic processes.
ICP.5.1 Recognize and describe physical properties of matter and use these to differentiate between pure substances and mixtures.
ICP.3.2 Study the characteristics of solids, liquids, and gases and their changes of state and interpret them in terms of a molecular model which describes their energies and motions.
ICP 3.3 Understand how thermal energy (the microscopic motions of the atoms and/or molecules) is related to the macroscopic concept of temperature. Examine the differences in these concepts by measuring the temperature changes, and determining specific heat capacity, of water as it is heated or cooled.
ICP.3.4 Understand how the microscopic kinetic molecular theory, explains observations of macroscopic gas behavior in terms of temperature, volume, pressure, and the number of particles (using the mole concept).

Declarative Knowledge		Procedural Knowledge	
Concepts	1. The properties of matter can distinguish the types of matter / Chemical and physical properties. 2. Solids, liquids, and gases. 3. The gas laws. 4. Phase changes / macroscopic concept of temperature	Processes	Scientific Method Reading Process Students will understand steps of a problem solving method. Students will to make conversions using dimensional analysis. Students will be able to perform calculations using significant figures.
Organizing Ideas	1. Students will understand and be able to explain how physical properties can be used to differentiate among substances; solutions, and heterogeneous mixtures. 2. **3.** Students will be able to identify chemical and physical changes in matter. 4. Students will recognize and describe that heat transfer associated with a phase change as either exothermic or endothermic. 5. Students will understand and be able to explain how electromagnetic attractive forces within and between substances determine their physical state. 6. Students will understand and identify solutions as homogeneous mixtures containing a solute in a solvent. The ratio of solute to solvent can be expressed		

	as concentration in a number of ways. 7. Students will understand that Antoine Lavoisier determined a quantitative method for measuring matter in demonstrating the Law of Conservation of Mass.	

Vocabulary	Phase changes Significant figures Types of solutions Solution Mixture Heterogeneous Homogeneous Pure substance Suspension Colloid Solvent Solution States of matter Endothermic Sublimation Exothermic Heat of fusion Density Manipulated Boiling Solute Solution concentration Physical and chemical properties Liquid Condensation Matter Gas Evaporation	Electromagnetic Plasma Heat of vaporization Vaporization Molarity Types of mixtures Attractive forces Precision Melting point Variable Physical and chemical changes Heat of fusion Density Manipulated Boiling point	Skills	Determining density Read thermometers Determining heat of fusion Converting using dimensional analysis Reading and making graphs Designing tables/charts Problem Solving • List the given • List the unknown • Analyze • Calculate • Check your work

Benchmarks #2 – Integrated Chemistry/Physics – Chemical Energy, Reactions, and Bonding

Chemical Energy, Reactions, and Bonding- Describe how energy is produced and absorbed in chemical reactions.

A) ICP.5.3 Understand that the atomic number is unique to each element and is the number of protons in the nucleus of the element.
B) ICP.7.2 Differentiate between protons, neutrons, and electrons and determine the number of these subatomic particles in each atom.
C) ICP 5.2 Use the periodic table to understand important patterns in properties of elements. Recognize that the pattern of properties of the elements correlates most closely with the configuration of the electrons in each element. ICP.5.4 Use the concept of the mole to relate number of moles and the mass of a sample of a pure substance of known chemical composition.
D) ICP.5.5 Using conservation principles write and balance chemical equations.
E) ICP.5.6 Identify key indicators of a chemical change and classify simple types of chemical reactions. Differentiate between covalent, ionic, hydrogen and Van der Waals bonding, and write formulas for and name compounds of each type.
F) ICP.5.7 Explain that in exothermic chemical reactions chemical energy is converted into other forms such as thermal, electrical, light, and sound energy.
G) ICP.4.3 Explain that electrons can absorb energy and can release energy, and that electrons in atoms do this at specific energies.

Declarative Knowledge		Procedural Knowledge	
Concepts	1. Atomic particles- protons, neutrons, electrons 2. Atomic structure 3. The periodic table / periodic properties 4. Chemical bonding 5. The mole 6. Chemical Reactions 7. Energy changes in reactions.	Processes	Scientific Method Problem Solving List the given List the unknown Analyze Calculate Check your work
Organizing Ideas	1. Students will understand and be able to explain the subatomic particles of an atom. 2. Students will be able to explain how the subatomic particles fit together in an atom. 3. Students will understand that the Periodic Table is arranged by increasing atomic number. 4. Students will be able to calculate the numbers of protons, neutrons, and electrons from the Periodic Table. 5. Students will be able to recognize and give examples of isotopes. 6. Students will be able to understand and predict how electrons are shared in forming covalent bonds. 7. Students will understand, explain, and predict how ions can be formed leading to the formation of ionic bonds. 8. Students will be able to classify types of chemical reactions.		

	9. Students will be able to use balanced chemical equations to show the relationships between atoms, moles, and particles of reactants and products.		
	Details	1. Subatomic particle charges 2. Subatomic particles are protons, neutrons, and electrons 3. Classify an element by its family and period 4. Predict properties of elements by location on Periodic Table 5. Mass number equals number of protons and neutrons 6. Atomic number equals number of	Skills

		protons and electrons 7. Average atomic mass is a weighted of all naturally occurring isotopes of an element 8. Isotopes of an element have the same number of protons and different number of neutrons 9. Identify metals and nonmetals based on their properties 10. Determine proper ionic charges 11. Characterize anions and cations 12. Octet rule application 13. Assemble and identify compounds	

		14. Balance Chemical Equations 15. Classify types of chemical reactions	
Vocabulary	Proton Electron cloud Orbital Period Metals Valence electrons Conductor Energy Neutron Group/family Electron configuration Periodic law Nonmetals Noble gases Conductor Periodic Electron Halogens Ground state Electron dot diagram Atomic theory Nucleus Isotope Metalloid Atomic number Transition metals Atomic mass Electron Octet rule metals Covalent bond Nonmetals Dot diagram		

	Ions Polyatomic ions Anions Charge Cations Chemical formula Ionic bond Metallic bonds Valence electrons Compounds Subscripts Balanced chemical equation Molecules Combination/synthesis reaction Reactants Decomposition reaction Products Single replacement reaction Coefficient Double replacement reaction Yield/produces Combustion reaction Moles		

Benchmarks #3 – Integrated Chemistry/Physics – Nuclear Reactions

3) Nuclear Energy (fission/fusion)- Describe how the stability of nuclei in terms of the binding energies of their constituent protons and neutrons explains the energy production processes of fission and fusion.

A.) ICP.7.1 Demonstrate how historical models and experiments supported the development of our current understanding of the atom and its nucleus.
B.) ICP.7.2 Differentiate between protons, neutrons, and electrons and determine the number of these subatomic particles in each atom.
C.) ICP.7.3 Understand that the stability of nuclei depends on the numbers of neutrons and protons.
D.) ICP.7.4 Understand that fission results from large, less stable nuclei decomposing to form smaller, more stable nuclei.
E.) ICP.7.5 Understand that fusion results from two smaller nuclei combining to form one larger nucleus.
F.) ICP 7.6 Understand that the energy radiated from the sun derives from the fusion process.
G.) ICP.7.7 Describe the various forms of emission that are typical of radioactive decay.
H.) ICP 7.8 Relate the fission process to the human development and use of the fission process in war (uncontrolled) and in peace (controlled).

Declarative Knowledge		Procedural Knowledge	
Concepts	1. Nuclear reactions involve changes in the nucleus of an atom and its stability. 2. Half life and radioactive decay. 3. Fission and fusion and their applications.	Processes	Problem Solving Writing Process Scientific Research
Organizing Ideas	1. Students will know and explain that the nucleus of a radioactive isotope is unstable and may spontaneously decay, emitting particles and/or electromagnetic substances. 2. Students will be able to use half-lives to estimate the age of materials that contain radioactive substances. 3. Students will differentiate between fission and fusion. 4. Students will understand that Marie and Pierre Curie made radium available to researchers all over the world, which led to an increased study of radioactivity.		
	Details	1. Calculating half-lives 2. Calculating frequency and	Skills

			wavelength of radiation 3. Compare and contrast fission and fusion 4. Significant figures	
Vocabulary	Radioactive, fusion Fission Isotope Radioactive decay Decay Unstable Half-lives Radioactive substances Alpha decay Frequency Velocity Reflection Hertz Crest Median	Beta decay Gamma radiation Particles Electromagnetic radiation Radiocarbon dating Electromagnetic spectrum Wavelength Amplitude Radio waves Infrared radiation Ultraviolet radiation Gamma rays Microwaves X-rays Visible light		

Benchmarks #4 – Integrated Chemistry/Physics – Motion and Energy of Macroscopic Objects

Motion and Energy of Macroscopic Objects- Describe and explain the motion of macroscopic objects in terms of Newton's laws and use the concepts of kinetic and potential energy to describe motion.

A) ICP.1.1 Measure the motion of objects to understand the relationships between distance, velocity, and acceleration and deepen understanding through graphical analysis of the time dependence of acceleration, velocity and distance.
B) ICP.1.2 Describe and apply Newton's three laws of motion. By experimentation, determine the relationships among the variables in Newton's laws and how all three laws relate mass, acceleration and force as a triad of proportional variables, leading to the definitions of momentum and energy.
C) ICP.1.3 Describe how Newton's law of universal gravitation, together with the laws of motion, explains the motions of objects on earth and of the moon, planets and stars.
D) ICP.1.4 Describe the kinetic and potential energies of macroscopic objects, and use measurements to develop an understanding of these forms of energy.

<table>
<tr><td colspan="2">Declarative Knowledge</td><td colspan="2">Procedural Knowledge</td></tr>
<tr><td>Concepts</td><td>1. The motion of an object can be described by its position, velocity, and acceleration.
2. Speed, velocity, and acceleration
3. Forces
4. Newton's Laws of Motion
5. Universal Gravitational
6. Kinetic / potential energy</td><td>Processes</td><td>Reading Process
Scientific Method</td></tr>
<tr><td>Organizing Ideas</td><td>1. Students will understand and use vector analysis to describe motion and change in position using a frame of reference.
2. Students will understand and calculate average speed is equal to total distance over time.
3. Students will understand and calculate that acceleration is a change in velocity over time.
4. Students will be able to describe and demonstrate Newton's Laws of Motion.
5. Students will understand that the force of gravity proportional to the masses of the objects and the distance between them.
6. Students will be able to compare and contrast kinetic and potential energy.</td><td></td><td></td></tr>
<tr><td></td><td>Details</td><td>1. Vector analysis
2. Vector addition and subtraction
3. Formulas for average speed</td><td>Skills</td></tr>
</table>

			and velocity 4. Plotting distance-speed graphs 5. Plotting distance-time graphs 6. Using graphs to determine average speed and average velocity 7. Calculate speed and acceleration using different frames of references 8. Force 9. Friction 10. Relate Newton's laws to everyday examples. 11. Law of gravitation. 12. Kinetic vs. potential energy.	
Vocabulary	Frame of reference Motion Speed Velocity Free fall Acceleration due to gravity Terminal velocity Graph slope Position Average velocity Delta symbol	Acceleration Distance Time Distance-time graph Distance-speed graph Vector, magnitude Direction Scalar Graph scale Rate Head of vector		

	Change in velocity kinetic / potential energy Inertia Force Net force Normal force Frictional force Static friction Sliding friction Rolling friction Fluid friction Gravity Acceleration due to gravity Mass Vectors	Tail of vector Delta symbol		

Benchmark #5: Int Chem/Physics- Energy Transport / Heat- Describe how vibrations and waves transport energy.

Describe how vibrations and waves transport energy.

A) ICP 3.3 Understand how thermal energy (the microscopic motions of the atoms and/or molecules) is related to the macroscopic concept of temperature. Examine the differences in these concepts by measuring the temperature changes, and determining specific heat capacity, of water as it is heated or cooled.
B) ICP.4.1 Using conservation of energy, calculate the thermal energy released or absorbed by an object and distinguish between exothermic and endothermic changes.
C) ICP.5.7 Explain that in exothermic chemical reactions chemical energy is converted into other forms such as thermal, electrical, light, and sound energy.
D) ICP.4.2 Differentiate between conduction, convection, and radiation and identify them as types of energy transfer.

Declarative Knowledge		Procedural Knowledge	
Concepts	1. Law of conservation of energy. 2. Thermal energy and matter. 3. heat 4. Exothermic and endothermic	Processes	Scientific Method Writing Process Scientific Research
Organizing Ideas	1. Energy exists in different forms and is conserved when converted from one form to another. 2. Students will understand and explain that whenever the amount of energy in one place or form diminishes, the amount in other places or forms increases by the same amount. 3. Students will understand and explain the types and transformations of energy. 4. Students will understand the concepts of heat and thermodynamics.		
	Details	1. Law of Conservation of Energy 2. The relationship between potential and	Skills

		kinetic energy 3. The difference between renewable and nonrenewable energy 4. Use the correct formulas to calculate work, power, efficiency, and mechanical 5. advantage 6. Classification of simple machines 7. Si	

		gnifica nt figures	
Vocabulary	Energy- mechanical, thermal, chemical, electrical, electromagnetic, nuclear power Work Simple machines Mechanical advantage Pulley load Wedge Kinetic Energy Renewable energy Distance Fulcrum Energy conversion Lever Efficiency Nonrenewable Input work Potential energy Output work		

Benchmark #6: Mechanical Energy and Propagation of Energy by Waves

Mechanical Energy and Propagation of Energy by Waves- Explain that waves transmit energy, come in two forms, transverse and longitudinal, and occur throughout nature.

Energy Transport- Describe how vibrations and waves transport energy.

A) ICP 2.1 Identify properties of objects that vibrate, using Newton's laws to understand the motion. Understand that vibrating objects can give rise to mechanical waves.
B) ICP.2.2 Identify properties of waves including frequency, wavelength, amplitude, energy, and wave speed.
C) ICP 2.3 Describe how energy is propagated by waves without the transfer of mass using examples such as water waves, earthquakes, and sound waves.
D) ICP.2.4 Apply the properties of waves to wave phenomena including reflection, and refraction, as well as the transmission and loss of energy.
E) ICP.4.4 Describe the relationships between velocity, frequency, wavelength, and energy in electromagnetic waves. Describe the regions of the electromagnetic spectrum.
F) ICP 4.5 Understand that from diffraction we know that visible light is an electromagnetic wave.

Declarative Knowledge		Procedural Knowledge	
Concepts	1. Students will recognize and explain that waves are described by their velocity, wavelength, frequency or period, and amplitude. 2. Students will understand and explain that waves can superpose on one another, bend around corners, reflect off surfaces, be absorbed by materials they enter, and change direction when entering a new material.	Processes	Scientific Method Writing Process Scientific Research
Organizing Ideas	1. Students will understand and describe types and properties of mechanical waves. 2. Students will be able to describe how electromagnetic, waves are produced, how they travel, and their functions. 3. Students will be able to identify how energy is propagated by waves without the transfer of mass. 4. Students will understand how sound is transmitted.		
	Details	1. Types of mechanical waves, including their properties. 2. Re	Skills

			flection, refraction, diffraction, interference. 3. Waves and sound. 4. Optics / light	
Vocabulary	Mechanical wave period hertz wavelength interference	Periodic motion frequency amplitude reflection refraction sound optics light		

Benchmark #7: Electrical Energy Propagation and Magnetism- Describe how the movement and transfer of changed particles results in the transfer of electrical energy.

A) ICP.6.1 Explain that objects that carry a net charge will exert an electric force on other objects that may be attractive or repulsive.
B) ICP.6.2 Explain that when charge is transferred from one object to another, the amount lost by one object equals the amount gained by the other, consistent with the principal of conservation of charge.
C) ICP.6.3 Using the example of electrolysis and its application in batteries, explain the relationship between chemical reactions and electrical energy.
D) ICP.6.4 Define and describe the relationships between voltage, current, resistance and power in open and closed electrical circuits.
E) ICP.6.5 Describe the differences in current flow in parallel and in series circuits.
F) ICP.6.6 Explain that some objects, called magnets, exert magnetic forces with no direct contact.
G) ICP.6.7 Using the examples of motors and generators, explain that electrical energy can be transformed into mechanical energy and vice versa.

Declarative Knowledge		Procedural Knowledge	
Concepts	1. Electrical charge 2. Conservation of charge 3. Relationship between chemical reactions and electrical energy 4. Electric current and Ohm's Law 5. Circuits 6. Magnetism 7. Motors / generation of electricity	Processes	Scientific Method Writing Process Scientific Research
Organizing Ideas	1. Energy exists in different forms and is conserved when converted from one form to another. 2. Students will understand and explain that whenever the amount of energy in one place or form diminishes, the amount in other places or forms increases by the same amount. 3. Students will understand and explain the types and transformations of energy. 4. Students will understand and explain that mechanical energy in a system is the sum of both potential and kinetic energy. 5. Students will relate electric current and how it applies to Ohm's Law. 6. Students will be able to construct circuit diagrams. 7. Students will explain how magnetism works and how it is used in the generation of electricity.		

	Details	1. Law of Conservation of Energy 2. The relationship between potential and kinetic energy 3. The difference between renewable and nonrenewable energy 4. Use the correct formulas to calculate current, voltage, Ohm's Law. 5. Draw a circuit diagram 6. Magnetic fields 7. Electromagnetism 8. Electrical	Skills

		transmission and generation 9. Significant figures	
Vocabulary	Energy- mechanical, thermal, chemical, electrical, electromagnetic, nuclear power Electromagnetic waves Electric field Electromagnetic spectrum Electric circuit Magnetic force Pole Field Electromagnetic Transformer Electric charge Electric field Electric current Conductor Insulator Ohm's Law		

Benchmark #8: Society (Energy production, environment, economics)- Understand the impact of energy production and use on society and the environment.

<table>
<tr><td colspan="4">A.) ICP.8.1 Describe how energy needs have changed throughout history and how energy needs are met in modern society.
B.) ICP.8.2 Describe the benefits and risks of the development of non-renewable forms of such as coal, oil, natural gas and uranium fission sources.
C.) ICP.8.3 Describe the benefits and risks of the development of renewable forms of energy such as solar energy, wind-energy, geothermal energy, fusion energy and biofuels.
D.) ICP.8.4 Describe how efficient use of renewable and non-renewable energy sources is essential to maintaining an acceptable environment.
E.) ICP.8.5 Describe how the availability of energy resources is essential to the development of an economically viable society.
F.) ICP.8.6 Contrast the dependence on and use of energy and other natural resources in the economies of industrial nations, of developing nations and of undeveloped nations.
G.) ICP.8.7 Describe the energy needs of a modern urban city, and compare and contrast these needs with those of a modern rural community.</td></tr>
<tr><td colspan="2">Declarative Knowledge</td><td colspan="2">Procedural Knowledge</td></tr>
<tr><td>Concepts</td><td>1. Energy Usage and needs.
2. Renewable vs. Nonrenewable energy
3. Availability of energy resources</td><td>Processes</td><td>Problem Solving
Writing Process
Scientific Research</td></tr>
<tr><td>Organizing Ideas</td><td>1. Students will understand society's need and usage of energy over time.
2. Students will be able to compare and contrast renewable and nonrenewable energy sources, and be able to apply their knowledge to understand energy conservation.</td><td></td><td></td></tr>
<tr><td></td><td>Details</td><td>Energy Usage and needs.
Renewable vs. Nonrenewable energy
Availability of energy resources</td><td>Skills</td></tr>
<tr><td>Vocabulary</td><td>Energy</td><td></td><td></td></tr>
</table>

	Electricity Renewable Nonrenewable Efficiency Conservation Fossil fuels		

Integrated Chemistry/Physics Assessment Planning

Essential Outcome #1 Properties of Matter: Macroscopic as a Model for Microscopic- Understand how the energies and motions of atoms and molecules at the microscopic level can be used to understand and predict the macroscopic properties of matter of gases, liquids and solids.
Summative Assessment: Selected response – properties of substances, identify chemical and physical changes, recognize and describe phase changes and exothermic vs. endothermic changes, explain how electromagnetic forces determine physical state, identify solutions as homogeneous or heterogeneous mixtures. Written response – Ratio of concentration can be expressed in a number of ways, demonstrate the law of conservation of mass.

Describe Assessment & Timeline:	Method	Testing Knowledge	Testing Reasoning/ Analysis	Testing Performance	Testing Product
Target a, b, c: Physical properties, chemical and physical changes, Timeline: 2 weeks	Selected response Extended response	X	X		
Target d, e: Phase Changes Timeline: 1 weeks	Extended response		X	X	
Target f: Gas laws Timeline: 1 week	Selected response Calculation problem	X	x	x	

Integrated Chemistry/Physics Assessment Planning

Essential Outcome #2 : **Chemical Energy, Reactions, and Bonding- Describe how energy is produced and absorbed in chemical reactions.**					
Summative Assessment: Selected response – Identify and explain subatomic particles, calculate number of protons, neutrons, electrons, recognize isotopes. Written response – How subatomic particles fit together in and atom, explain arrangement of periodic table, explain contributions of Dalton, Thomson, Rutherford, and Bohr to atomic theory.					
Describe Assessment & Timeline	Method	Testing Knowledge	Testing Reasoning/ Analysis	Testing Performance	Testing Product
Target a, b: Identify subatomic particles and how they fit together, calculate protons, neutrons, and electrons Timeline: 2 weeks					
Target c: Periodic table Timeline: 2 weeks					
Target d, e: The mole, write and balance equations Timeline: 3 weeks					
Target f: Types of chemical bonds Timeline: 2 weeks					
Target f-h: Types of chemical reactions, energy in reactions Timeline: 2 weeks					

Integrated Chemistry/Physics Assessment Planning

Essential Outcome #3 : **Nuclear Energy (fission/fusion)- Describe how the stability of nuclei in terms of the binding energies of their constituent protons and neutrons explains the energy production processes of fission and fusion.**					
Summative Assessment:					
Describe Assessment & Timeline	Method	Testing Knowledge	Testing Reasoning/ Analysis	Testing Performance	Testing Product
Target a, b, c: The radioactive nucleus, nuclear decay Timeline: 2 weeks					
Target d, e, f, g, h: fission and fusion Timeline: 2 weeks					

Integrated Chemistry/Physics Assessment Planning

Essential Outcome #4 : **Motion and Energy of Macroscopic Objects- Describe and explain the motion of macroscopic objects in terms of Newton's laws and use the concepts of kinetic and potential energy to describe motion.**					
Summative Assessment:					
Describe Assessment & Timeline:	Method	Testing Knowledge	Testing Reasoning/ Analysis	Testing Performance	Testing Product
Target a: Motion of objects- speed, velocity, acceleration Timeline: 2 weeks					
Target b-c: Newton's Laws Timeline: 2 weeks					
Target d: Energy- forms, conversion, conservation Timeline: 2 weeks					

Integrated Chemistry/Physics Assessment Planning

Essential Outcome #5 : **Energy Transport / Heat- Describe how vibrations and waves transport energy.**					
Summative Assessment:					
Describe Assessment & Timeline:	Method	Testing Knowledge	Testing Reasoning/ Analysis	Testing Performance	Testing Product
Target a-b: heat, temperature Timeline: 1 week					
Target c-d: thermodynamics Timeline: 1 week					

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Essential Outcome #6 : **Mechanical Energy and Propagation of Energy by Waves- Explain that waves transmit energy, come in two forms, transverse and longitudinal, and occur throughout nature.**					
Summative Assessment:					
Describe Assessment & Timeline:	Method	Testing Knowledge	Testing Reasoning/ Analysis	Testing Performance	Testing Product
Target a-b: mechanical waves and their properties, examples of mechanical waves Timeline: 2 weeks	Selected response Written response	X	X		
Target c-d: Energy propagation of waves, behavior of waves Timeline: 1 week					
Target e-f: Electromagnetic Spectrum / Light Timeline 3 weeks					

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Essential Outcome #7: **Electrical Energy Propagation and Magnetism- Describe how the movement and transfer of changed particles results in the transfer of electrical energy.**					
Summative Assessment:					
Describe Assessment & Timeline:	Method	Testing Knowledge	Testing Reasoning/ Analysis	Testing Performance	Testing Product
Target a, b, c: Electric Charge Timeline: 1.5 weeks	Selected response	X			
Target d, e: Electric Current, circuits Timeline: 1.5 weeks					
Target f, g: Magnetism Timeline: 2 weeks					

Essential Outcome #8 : **Society (Energy production, environment, economics)- Understand the impact of energy production and use on society and the environment.**					
Summative Assessment:					
Describe Assessment & Timeline:	**Method**	**Testing Knowledge**	**Testing Reasoning/ Analysis**	**Testing Performance**	**Testing Product**
Target A-G: Natural resources, energy consumption, conservation, types of energy Timeline: 1.5 weeks	Selected response Written Response	X			