APPROVED FACILITY SCHOOLS CURRICULUM GUIDE

SUBJECT: Physical Science GRADE: HS

Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
TIMELINE: Quarter 1			
Motion and Stability: Forces and Interactions 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. **I C M**	I can analyze data generated by the formula F=ma and use it to support the claim that Newton's Second Law of Motion describes a mathematical relationship between an object's net force, its mass, and its acceleration.	Application Analysis	Acceleration Mass Net force Newton's Second Law of Motion Velocity
Motion and Stability: Forces and Interactions 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. **I C M**	I can use charts, graphs, and equations to prove that the total momentum of a system of objects is unchanged when there is no net force on the system.	Comprehension Application Analysis	Balanced force Momentum Unbalanced force
Motion and Stability: Forces and Interactions 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. **I C M** **Engineering Design Connection:** HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. **I C M**	I can create a device that minimizes the force on an object during a collision, evaluate its effectiveness, and refine it to improve its effectiveness.	Application Synthesis Evaluation	Collision
Motion and Stability: Forces and Interactions 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. **I**	I can use charts, graphs, and equations to describe Newton's Law of Gravity to describe and predict the gravitational and electrostatic forces between objects.	Comprehension Application Synthesis	Gravitational constant Gravity Newton's Law of Gravitation

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SUBJECT: Physical Science GRADE: HS

Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
Matter and Its Interactions 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. I	I can create the patterns of the electrons in the outermost energy level of an atom. I can use the periodic table to predict properties of elements based on the pattern of their electrons in the outermost energy level.	Comprehension Application Synthesis	Electron configuration Ionization
Matter and Its Interactions HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. I	I can justify, using quantitative reason, that atoms, and therefore mass, are conserved during a chemical reaction.	Application Synthesis	Conservation Law of Conservation of Mass
Structure and Properties of Matter 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. I	I can compare and contrast the types of nuclear energy. I can solve radioactive decay problems using the formula. I can develop a model to show changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay.	Comprehension Analysis Comprehension Application Application Synthesis	Fission Fusion Radioactive decay
Motion and Stability: Forces and Interactions HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. I	I can use scientific and technical information to communicate a molecular model and explain why it is important in designed materials.	Comprehension Analysis	Atom Electron Electron Level Isomer9 Molecular Molecule Neutron Polymer Proton

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Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary

RESOURCES AND NOTES FOR QUARTER 1:

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SUBJECT: Physical Science GRADE: HS

Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
TIMELINE: Quarter 2			
Motion and Stability: Forces and Interactions 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. **M**	I can use charts, graphs, and equations to describe Coulomb's Law to describe and predict the electrostatic forces between objects.	Comprehension Application Synthesis	Coulomb's constant Coulomb's Law Electrostatic force
Motion and Stability: Forces and Interactions 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. **I C M**	I can construct a model and use it to conduct an investigation that demonstrates the relationship between electric currents and magnetic fields.	Knowledge Application Synthesis	Current Magnetic field
Energy 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. **I C M**	I can develop and use a model of two objects to demonstrate the forces and changes in energy between the objects.	Comprehension Application Synthesis	Energy Joule Mass
Energy 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. **I C M**	I can construct a mathematical model using charts, graphs, or equations that calculates the changing energy of one component of a system when the change in energy of other component(s) in a system are known.	Comprehension Application Synthesis	Kinetic energy Potential energy Power Thermal energy Watt

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SUBJECT: Physical Science GRADE: HS

Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
Energy 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. **I C M**	I can design, construct, and refine a device that converts energy to another form.	Application Analysis Synthesis Evaluation	
Energy 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. **I C M**	I can design, construct, and refine a device that converts energy to another form.	Application Analysis Synthesis Evaluation	
Energy 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). **I C M**	I can develop and use models to show that total energy of a system can be accounted for as a combination of energy of particle (object) motion and relative particle (object) position.	Comprehension Application Synthesis	
Energy HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). **I**	I can plan and conduct an experiment demonstrating the transfer of heat energy between objects and systems.	Application Analysis Synthesis	2nd Law of Thermodynamics Closed system

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Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
Waves and Their Applications in Technologies for Information Transfer HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. **I C M**	I can solve the equation wavelength=speed/frequency and all its forms. I can apply wave concepts to global challenges (tsunamis) I can solve the wave equation in all its forms.	Knowledge Comprehension Application Application Analysis Evaluation Knowledge Comprehension Application	Amplitude Crest Frequency Medium Trough Wave period Wavelength
Waves and Their Applications in Technologies for Information Transfer HS-PS4-2. Evaluate questions about the advantages of using a digital transmission and storage of information. **I C M**	I can critique the value of digital and physical information storage.	Application Analysis Evaluation	Digital transmission
Waves and Their Applications in Technologies for Information Transfer HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. **I C M**	I can evaluate evidence of radiation following the wave or particle model.	Application Analysis Evaluation	Electromagnetic Radiation Particle model Waves model

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Waves and Their Applications in Technologies for Information Transfer HS-PS4-4. Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. **I C M**	I can evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.	Comprehension Analysis Evaluation	Reliability Validity
Waves and Electromagnetic Radiation 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. **I C M**	I can communicate, using technical information, how some devices use wave principles (behaviors and interactions) to transmit and capture information and energy.	Comprehension Application Analysis	Negative Interference Positive Interference Transmit
Structure and Properties of Matter HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. **I**	I can conduct an investigation to compare structures based on their electrical forces between particles. I can accurately report quantities using the appropriate measurement.	Application Analysis Application	Coulomb's Law Electrical force Electromagnetism
Chemical Reactions HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. **I** **Engineering Design Connection:** HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. **I C M**	I can revise a chemical equation by changing the reactants and products to increase the product at equilibrium. I can analyze the changes in a chemical equation based on the increased product at equilibrium.	Application Analysis	Endothermic Exothermic Le Chatalier's Principle Products Equilibrium Reactants

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Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary

RESOURCES AND NOTES FOR QUARTER 2 :

APPROVED FACILITY SCHOOLS CURRICULUM GUIDE

SUBJECT: Physical Science GRADE: HS

Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
TIMELINE: Quarter 3			
Matter and Its Interactions 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. **M**	I can create the patterns of the electrons in the outermost energy level of an atom. I can use the periodic table to predict properties of elements based on the pattern of their electrons in the outermost energy level.	Comprehension Application Synthesis	Ionization Electron configuration
Matter and Its Interactions HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. **M**	I can determine the force between two particles. I can plan an investigation to compare the structure of substances at the bulk scale to infer the strength of electrical forces between the particles of each substance.	Comprehension Application Application Analysis	Ions Vapor pressure Boiling point Melting point Surface tension
Matter and Its Interactions 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. **I C M**	I can model the release and absorption of energy from a chemical reaction. I can explain how the release or absorption of energy from a chemical reaction depends on the total bond energy. I can complete the multiple steps needed in order to construct a chemical reaction to determine the energy lost or gained.	Application Synthesis Analysis	Relative Energy Conservation of Energy

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Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
Motion and Stability: Forces and Interactions HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials. **M**	I can communicate scientific and technical evidence from sources to explain how the structure of a molecule relates to the function of a designed material.	Analysis Synthesis	Structural formula Linear Tetrahedral
Matter and Its Interactions 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. **I C M**	I can use information about the outermost electron states, trends on the periodic table, and patterns of chemical properties to construct and revise an explanation for the outcome of a simple chemical reaction.	Comprehension Synthesis	Chemical properties

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RESOURCES AND NOTES FOR QUARTER 3 :

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SUBJECT: Physical Science GRADE: HS

Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
TIMELINE: Quarter 4			
Matter and Its Interactions 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. **I C M**	I can use scientific principles and evidence to explain how temperature or concentration of reacting particles affects the rate of the reaction. I can use reason to quantitatively assess the rate at which a reaction occurs.	Synthesis Application Analysis	Concentration Reaction Rate Endothermic reaction Exothermic reaction
Energy HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). **M**	I can explain the second law of thermodynamics. I can construct an investigation to test the second law of thermodynamics.	Comprehension Synthesis	Closed system Entropy Isolated system Second Law of Thermodynamics
Matter and Its Interactions HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. **M**	I can change the design of a chemical system by changing the conditions to produce more products at equilibrium.	Application Analysis	Equilibrium Molar Mass Products Reactants
Chemical Reactions HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. **M**	I can use charts, graphs, or equations to represent the transfer and conservation of mass in a chemical reaction. I can support the claim that mass is conserved in a reaction.	Application Analysis Synthesis Evaluation	Conservation of Mass Mole

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Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary
Matter and Its Interactions 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. **M** **Engineering Design Connection:** HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts. **I C M**	I can create a model that shows the changes in the nucleus and the energy released during fission, fusion, and radioactive decay. I can use multiple sources of information from multiple formats to determine the difference between fission, fusion, and radioactive decay. I can create a physical model as well as a mathematical model for fission, fusion, and radioactive decay. I can evaluate fission and fusion as an energy solution in terms of cost, safety, reliability, and aesthetics, as well as the social, cultural, and environmental impacts of each.	Synthesis Analysis Synthesis Evaluation	Fission Fusion Half-life Radioactive decay

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Strand/Concept Student Expectation	Student Friendly Learning Objective	Level of Thinking	Academic Vocabulary

RESOURCES AND NOTES FOR QUARTER 4 :