Long Branch Public Schools

General Experimental Science Pacing Guide

Marking Period 1

Day	Unit	Topic	Desired Outcome	NGSS	ELA Common Core Standards: Reading	Writing	S & L	Math	21st Century	Technology
Opening Day 1 Opening Day 2			Rules, Procedures, Syllabus, Pre-Test (Benchmark 1), Safety							
1 2 3	Unit 1	Intro to Experimental Science			RST.9-10.7 RST.11-12.1 RST.11-12.7	WHST.9-12.5 WHST.9-12.7 WHST.11-12.8	SL.11-12.5		9.1	8.1 & 8.2
4 5 6 7	Unit 2	States of Matter and Properties	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. [Clarification Statement: Emphasis is on the idea that a chemical reaction is a system that affects the energy change. Examples of models could include molecular-level drawings and diagrams of reactions, graphs showing the relative energies of reactants and products, and representations showing energy is conserved.]	HS-PS1-4	RST.9-10.7 RST.11-12.1	WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
8 9 10	Unit 3	Atoms and Elements	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. [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.]	HS-PS1-1	RST.9-10.7 RST.11-12.1	WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
11	Summative Unit Assessment									
12 13 14 15	Unit 4	The Structure of Matter	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. [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.]	HS-PS1-1	RST.9-10.7 RST.11-12.1	WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
16 17 18 19	Unit 5	Mixtures Solutions and Solubility	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. [Clarification Statement: Emphasis is on understanding the strengths of forces between particles, not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.]	HS-PS1-3	RST.9-10.7 RST.11-12.1	WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
20	Summative Unit Assessment									
21	Research Simulation Task									

Marking Period 2

Day	Unit	Topic	Desired Outcome	NGSS	ELA Common Core Standards: Reading	ELA Common Core Standards: Writing	ELA Common Core Standards: S & L	Math	21st Century	Technology
1 2 3 4 5	Unit 6	Acids and Bases				WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5		9.1	8.1 & 8.2
6	Summative Unit Assessment									
7	Unit 7	Chemical Reactions	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. [Clarification Statement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.]	HS-PS1-2	RST.9-10.7 RST.11-12.1	WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
8			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. [Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.]	HS-PS1-5	RST.9-10.7 RST.11-12.1	WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
9 10 11			Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. [Clarification Statement: Emphasis is on using mathematical ideas to communicate the proportional relationships between masses of atoms in the reactants and the products, and the translation of these relationships to the macroscopic scale using the mole as the conversion from the atomic to the macroscopic scale. Emphasis is on assessing students' use of mathematical thinking and not on memorization and rote application of problem-solving techniques.]	HS-PS1-7	RST.9-10.7 RST.11-12.1	WHST.9-12.2 WHST.9-12.5 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
12	Summative Unit Assessment									
13	Unit 8	Biochemistry	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules. [Clarification Statement: Emphasis is on using evidence from models and simulations to support explanations.]	HS-LS1-6	RST.11-12.1	WHST.9-12.2, WHST.9-12.5, WHST.9-12.7, WHST.11-12.8, WHST.9-12.9	SL.11-12.5	MP.4, HSF-IF.C.7, HSF-BF.A.1	9.1	8.1 & 8.2
14 15 16 17			Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy. [Clarification Statement: Emphasis is on the conceptual understanding of the inputs and outputs of the process of cellular respiration.]	HS-LS1-7						
18	Summative Unit Assessment									
19	Research Simulation Task									
20	Midterm Review									
21	Midterms									
22	Midterms									

Marking Period 3

Day	Unit	Topic	Desired Outcome	NGSS	ELA Common Core Standards: Reading	ELA Common Core Standards: Writing	ELA Common Core Standards: S & L	Math	21st Century	Technology
1 2 3 4	Unit 9	Forces and Pressure	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.* [Clarification Statement: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.]	HS-PS2-3	RST.11-12.1 RST.11-12.7	WHST.9-12.2 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3 HSA-SSE.A.1 HSA-SSE.B.3 HSA-CED.A.1 HSA-CED.A.2	9.1	8.1 & 8.2
5	Summative Unit Assessment									
6	Unit 10	Motion	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. [Clarification Statement: Examples of data could include tables or graphs of position or velocity as a function of time for objects subject to a net unbalanced force, such as a falling object, an object rolling down a ramp, or a moving object being pulled by a constant force.]	HS-PS2-1	RST.11-12.1 RST.11-12.7	WHST.9-12.2 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3 HSA-SSE.A.1 HSA-SSE.B.3 HSA-CED.A.1 HSA-CED.A.2 HSA-CED.A.4 HSF-IF.C.7 HSS-ID.A.1	9.1	8.1 & 8.2
7			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. [Clarification Statement: Emphasis is on the quantitative conservation of momentum in interactions and the qualitative meaning of this principle.]	HS-PS2-2	RST.11-12.1 RST.11-12.7	WHST.9-12.2 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5		9.1	8.1 & 8.2
8 9			Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.* [Clarification Statement: Examples of evaluation and refinement could include determining the success of the device at protecting an object from damage and modifying the design to improve it. Examples of a device could include a football helmet or a parachute.]	HS-PS2-3	RST.11-12.1 RST.11-12.7	WHST.9-12.2 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5		9.1	8.1 & 8.2
10	Summative Unit Assessment									
11	Unit 11	Work and Energy	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). [Clarification Statement: Examples of phenomena at the macroscopic scale could include the conversion of kinetic energy to thermal energy, the energy stored due to position of an object above the earth, and the energy stored between two electrically-charged plates. Examples of models could include diagrams, drawings, descriptions, and computer simulations.]	HS-PS3-2	RST.11-12.1	WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
12 13 14			Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.* [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.]	HS-PS3-3	RST.11-12.1	WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
15	Summative Unit Assessment									
16 17 18 19	Unit 12	Heat and Temperature	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). [Clarification Statement: Emphasis is on analyzing data from student investigations and using mathematical thinking to describe the energy changes both quantitatively and conceptually. Examples of investigations could include mixing liquids at different initial temperatures or adding objects at different temperatures to water.]	HS-PS3-4	RST.11-12.1	WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
20	Summative Unit Assessment									
21 22	**Various State Testing on Various Day in Marking Period 3**									

Marking Period 4

Day	Unit	Topic	Desired Outcome	NGSS	ELA Common Core Standards: Reading	Writing	S & L	Math	21st Century	Technology
1	Unit 13	Waves	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. [Clarification Statement: Examples of data could include electromagnetic radiation traveling in a vacuum and glass, sound waves traveling through air and water, and seismic waves traveling through the Earth.]	HS-PS4-1	RST.9-10.8 RST.11-12.1 RST.11-12.7 RST.11-12.8	WHST.9-12.2 WHST.11-12.8	SL.11-12.5	MP.2 MP.4 HSA-SSE.A.1 HSA-SSE.B.3 HSA.CED.A.4	9.1	8.1 & 8.2
2			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. [Clarification Statement: Emphasis is on how the experimental evidence supports the claim and how a theory is generally modified in light of new evidence. Examples of a phenomenon could include resonance, interference, diffraction, and photoelectric effect.]	HS-PS4-3	RST.9-10.8 RST.11-12.1 RST.11-12.7 RST.11-12.8	WHST.9-12.2 WHST.11-12.8	SL.11-12.5	MP.2 MP.4 HSA-SSE.A.1 HSA-SSE.B.3 HSA.CED.A.4	9.1	8.1 & 8.2
3			Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter. [Clarification Statement: Emphasis is on the idea that photons associated with different frequencies of light have different energies, and the damage to living tissue from electromagnetic radiation depends on the energy of the radiation. Examples of published materials could include trade books, magazines, web resources, videos, and other passages that may reflect bias.]	HS-PS4-4	RST.9-10.8 RST.11-12.1 RST.11-12.7 RST.11-12.8	WHST.9-12.2 WHST.11-12.8	SL.11-12.5	MP.2 MP.4 HSA-SSE.A.1 HSA-SSE.B.3 HSA.CED.A.4	9.1	8.1 & 8.2
4										
5	Summative Unit Assessment									
6	Unit 14	Sound and Light	Evaluate questions about the advantages of using a digital transmission and storage of information. [Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.]	HS-PS4-2	RST.9-10.8 RST.11-12.1 RST.11-12.7 RST.11-12.8	WHST.9-12.2 WHST.11-12.8	SL.11-12.5	MP.2 MP.4 HSA-SSE.A.1 HSA-SSE.B.3 HSA.CED.A.4	9.1	8.1 & 8.2
7			Evaluate questions about the advantages of using a digital transmission and storage of information. [Clarification Statement: Examples of advantages could include that digital information is stable because it can be stored reliably in computer memory, transferred easily, and copied and shared rapidly. Disadvantages could include issues of easy deletion, security, and theft.]	HS-PS4-5	RST.9-10.8 RST.11-12.1 RST.11-12.7 RST.11-12.8	WHST.9-12.2 WHST.11-12.8	SL.11-12.5	MP.2 MP.4 HSA-SSE.A.1 HSA-SSE.B.3 HSA.CED.A.4	9.1	8.1 & 8.2
8										
9										
10	Summative Unit Assessment									
11	Unit 15	Electricity	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. [Clarification Statement: Emphasis is on both quantitative and conceptual descriptions of gravitational and electric fields.]	HS-PS2-4	RST.11-12.1 RST.11-12.7	WHST.9-12.2 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3 HSA-SSE.A.1 HSA-SSE.B.3 HSA-CED.A.1 HSA-CED.A.2 HSA-CED.A.4 HSF-IF.C.7 HSS-ID.A.1	9.1	8.1 & 8.2
12			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. [Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.]	HS-PS3-5	RST.11-12.1	WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
13										
14										
15	Summative Unit Assessment									
16	Unit 16	Magnetism	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.	HS-PS2-5	RST.11-12.1 RST.11-12.7	WHST.9-12.2 WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3 HSA-SSE.A.1 HSA-SSE.B.3 HSA-CED.A.1 HSA-CED.A.2 HSA-CED.A.4 HSF-IF.C.7 HSS-ID.A.1	9.1	8.1 & 8.2
17			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. [Clarification Statement: Examples of models could include drawings, diagrams, and texts, such as drawings of what happens when two charges of opposite polarity are near each other.]	HS-PS3-5	RST.11-12.1	WHST.9-12.7 WHST.11-12.8 WHST.9-12.9	SL.11-12.5	MP.2 MP.4 HSN-Q.A.1 HSN-Q.A.2 HSN-Q.A.3	9.1	8.1 & 8.2
18										
19										
20	Summative Unit Assessment									
21										
22	**Final Exams**									
23										