

**CUMBERLAND COUNTY SCHOOL DISTRICT
BENCHMARK ASSESSMENT CURRICULUM PACING GUIDE**

School: Cumberland County High	Subject: Integrated Science	Grade: 9
Benchmark Assessment 1		
Instructional Timeline: 11 weeks		
Topic(s): Introduction to science, SI units, conversions, Law of Conservation of Matter, Periodic Table, Atomic Structure, Formation of Bonds		
KCAS Standards	Learning Target (I Can Statement)	Key Vocabulary
<p>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. 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.] [Assessment Boundary: Assessment does not include complex chemical</p>	<p>1.1 I can safely use laboratory equipment and exercise lab safety.</p> <p>1.2 I can accurately measure data and express it in the correct units.</p> <p>1.3 I can apply my knowledge of SI units to solve unit conversion problems.</p> <p>2.1 I can describe the organization of matter and define the parameters of each level.</p> <p>2.2 I can develop an experiment to prove or disprove the Law of Conservation of Matter.</p> <p>2.3 I can describe what occurs during a chemical reaction.</p> <p>2.4 I can interpret a chemical reaction equation to illustrate conservation of mass during chemical reactions.</p> <p>2.5 I can use the IUPAC symbols of the most common elements</p> <p>3.1 I can define the atom</p>	<p>SI units Gram Liter Meter Kilo Centi Milli Matter IUPAC symbol Chemical Reaction Atom Nucleus of Atom Proton Electron Electron cloud Neutron Period Group Valence electron Bonds Ionic bond Covalent bond Metal Non-metal Metalloid Atomic radius Electronegativity</p>

<p><i>reactions.]</i></p> <p>HS- 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>[Clarification Statement: Examples of chemical reactions could include the reaction of sodium and chlorine, of carbon and oxygen, or of carbon and hydrogen.] [Assessment Boundary: Assessment is limited to chemical reactions involving main group elements and combustion reactions.]</i></p>	<p>3.2 I can describe the structure of the atom.</p> <p>3.3 I can explain the organization of the periodic table</p> <p>3.4 I can use the periodic table to predict valence electrons of elements and the number of bonds formed as a result.</p> <p>3.5 I can use the IUPAC symbols of the most common elements</p> <p>3.6 I can draw simple Bohr models (atomic number 1-20).</p> <p>4.1 I can predict the types and number of bonds an element will form based on its location in the periodic table.</p> <p>4.2 I can apply my knowledge of the periodic table trends(atomic radius, electro-negativity, and ionization energy), to make predictions about chemical reactions.</p> <p>4.3 I can explain the formation of bonds during a simple chemical reaction.</p> <p>4.4 I can create Lewis dot structures for given compounds.</p> <p>4.5 I can balance chemical equations and describe why this balance is important.</p> <p>4.6 I can predict chemical formulas of ionic compounds based on location on the period table.</p>	<p>Ionization energy Lewis model Bohr model Stability Chemical Equation Reactant Product</p>
---	--	--

**CUMBERLAND COUNTY SCHOOL DISTRICT
BENCHMARK ASSESSMENT CURRICULUM PACING GUIDE**

School: Cumberland County High	Subject: Integrated Science	Grade: 9
Benchmark Assessment 2		
Instructional Timeline: 9 weeks		
Topic(s): Chemical reactions, Bulk Properties, Nuclear Chemistry		
KCAS Standards	Learning Target (I Can Statement)	Key Vocabulary
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.] [Assessment Boundary: Assessment does not include calculating the total bond energy changes during a chemical reaction from the bond energies of reactants and products.]	<p>5.1 I can describe what occurs during a chemical reaction</p> <p>5.2 I can develop a model to demonstrate the energy changes during a reaction and classify reactions as endothermic or exothermic.</p> <p>5.3 I can explain what is occurring when a reaction reaches equilibrium</p> <p>5.4 I can describe what conditions would cause more product to be produced at equilibrium.</p> <p>5.5 I can explain the effect of change in temperature or concentration of reactants on the reaction rate.</p> <p>5.6 I can identify reactions as the six main types of chemical reactions (synthesis, decomposition, combustion, single displacement, double displacement, neutralization).</p> <p>6.1 I can design and conduct an investigation to determine the relationship between the bulk properties and the inter-molecular forces of given materials.</p> <p>6.2 I can describe how the structure of materials is important to the use humans have developed for them.</p> <p>7.1 I can describe the process of nuclear decay</p> <p>7.2 I can classify nuclear radiation as alpha or beta particles or gamma rays.</p>	<p>reactants</p> <p>products</p> <p>endothermic</p> <p>exothermic</p> <p>equilibrium</p> <p>chemical energy</p> <p>synthesis reaction</p> <p>decomposition reaction</p> <p>combustion reaction</p> <p>single-displacement reaction</p> <p>double-displacement reaction</p> <p>polar molecule</p> <p>melting point</p> <p>boiling point</p> <p>solubility</p> <p>conductivity</p> <p>surface tension</p> <p>acid</p> <p>base</p> <p>indicator</p> <p>neutralization</p> <p>radioactivity</p> <p>nuclear radiation</p> <p>alpha particle</p> <p>beta particle</p> <p>gamma ray</p> <p>neutron emission</p>

<p>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>[Clarification Statement: Emphasis is on student reasoning that focuses on the number and energy of collisions between molecules.]</i> <i>[Assessment Boundary: Assessment is limited to simple reactions in which there are only two reactants; evidence from temperature, concentration, and rate data; and qualitative relationships between rate and temperature.]</i></p> <p>Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.* <i>[Clarification Statement: Emphasis is on the application of Le Chatlier's Principle and on refining designs of chemical reaction systems, including descriptions of the connection between changes made at the macroscopic level and what happens at the molecular level. Examples of</i></p>	<p>7.3 I can describe the processes of nuclear fission and fusion</p> <p>7.4 I can compare nuclear reaction rates and release of energy to chemical reactions.</p>	<p>half-life strong nuclear force weak nuclear force nuclear fusion nuclear fission background radiation mutation</p>
---	--	---

designs could include different ways to increase product formation including adding reactants or removing products.]

[Assessment Boundary: Assessment is limited to specifying the change in only one variable at a time. Assessment does not include calculating equilibrium constants and concentrations.]

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.] *[Assessment Boundary: Assessment does not include Raoult's law calculations of vapor pressure.]*



Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.*

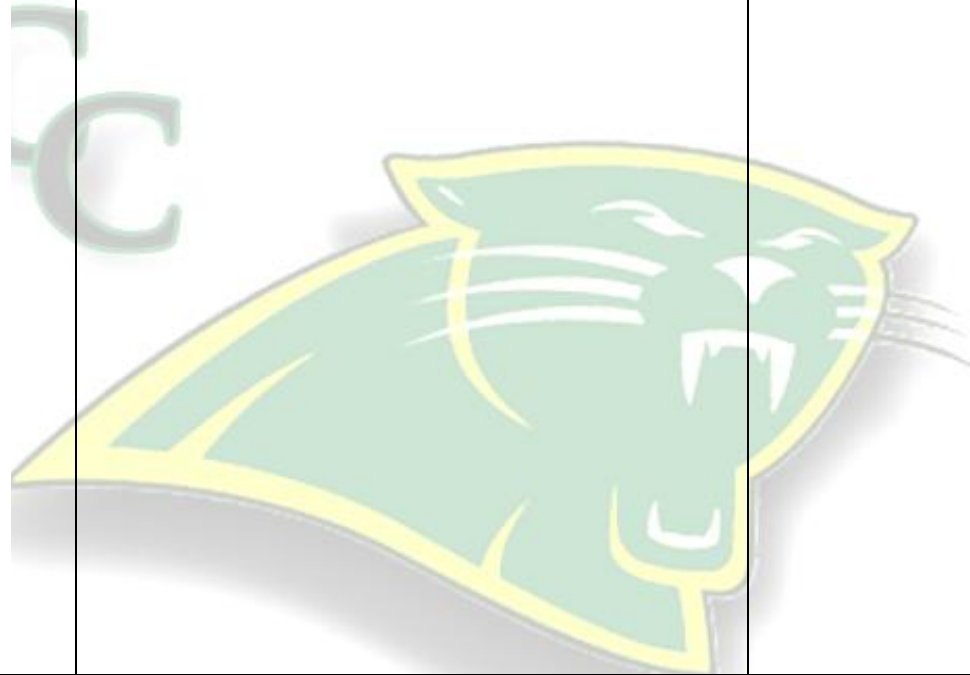
[Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.]

[Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.]

Develop models to illustrate the changes in the composition of the nucleus of the atom and



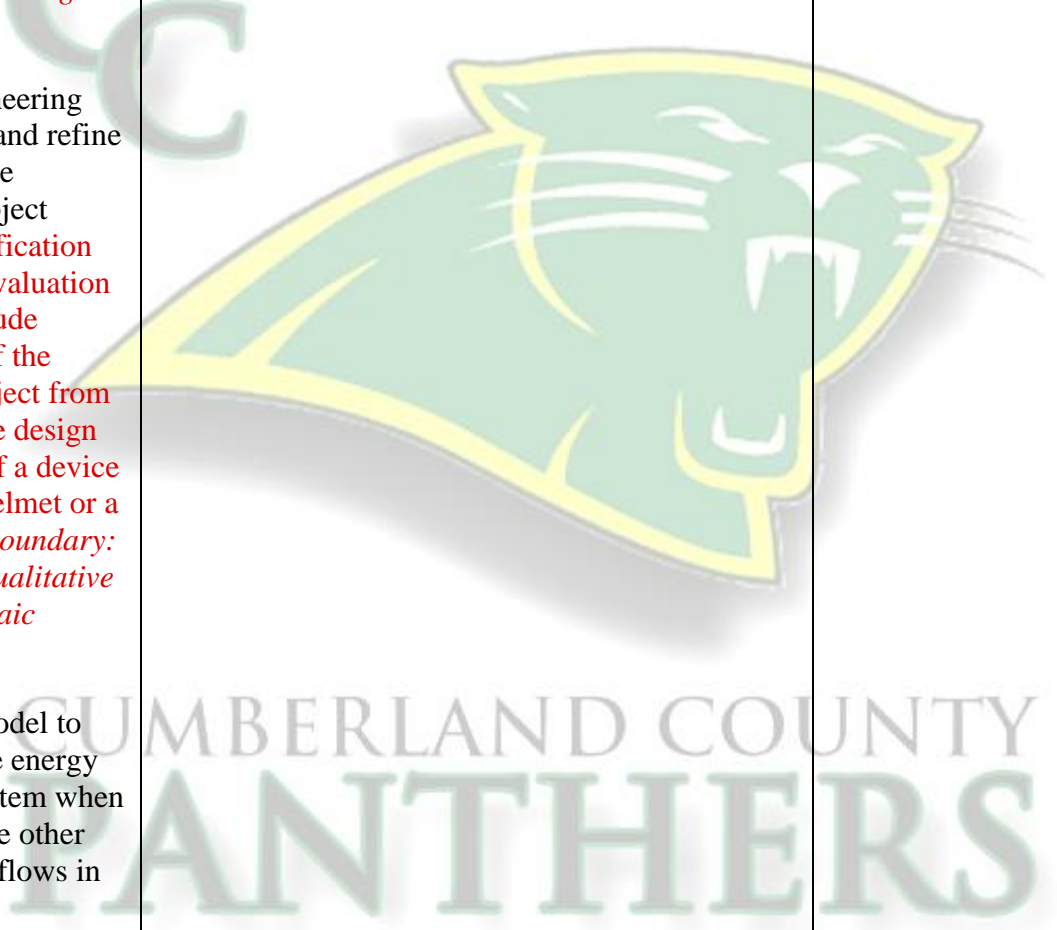
the energy released during the processes of fission, fusion, and radioactive decay. [Clarification Statement: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.] [Assessment Boundary: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.]



CUMBERLAND COUNTY
PANTHERS

**CUMBERLAND COUNTY SCHOOL DISTRICT
BENCHMARK ASSESSMENT CURRICULUM PACING GUIDE**

School: Cumberland County High	Subject: Integrated Science	Grade: 9
Benchmark Assessment 3		
Instructional Timeline: 9 weeks		
Topic(s): Motion, Force, and Energy		
KCAS Standards	Learning Target (I Can Statement)	Key Vocabulary
<p>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. [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.] [Assessment Boundary: Assessment is limited to one-dimensional motion and to macroscopic objects moving at non-relativistic speeds.]</p> <p>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. [Clarification Statement: Emphasis is on the</p>	<p>7.1 I can define and solve for speed. 7.2 I can identify changes in motion which produce acceleration. 7.3 I can describe Newton’s First Law of motion and its relation to inertia. 7.4 I can describe Newton’s second law of motion and use it to calculate acceleration, force, and mass values. 7.5 I can use my knowledge of Newton’s Laws to interpret word problems. 8.1 I can describe examples of force and identify the appropriate SI units used to measure force 8.2 I can explain how the motion of an object is affected when balanced or unbalanced forces act on it. 8.3 I can calculate the momentum of an object and mathematically represent what happens when momentum is conserved during a collision. 8.4 I can design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision. 12.1 I can describe conversions of energy from one form to another. 12.2 I can calculate the change of energy in a system. 12.3 I can design, build, and refine a device that</p>	<p>distance displacement speed constant speed average speed velocity momentum acceleration force balanced force unbalanced force friction gravity inertia free fall terminal velocity potential energy kinetic energy mechanical energy convection conduction radiation specific heat</p>

<p>quantitative conservation of momentum in interactions and the qualitative meaning of this principle.] <i>[Assessment Boundary: Assessment is limited to systems of two macroscopic bodies moving in one dimension.]</i></p> <p>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.* [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.] <i>[Assessment Boundary: Assessment is limited to qualitative evaluations and/or algebraic manipulations.]</i></p> <p>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. [Clarification Statement: Emphasis is on explaining the</p>	<p>converts one form of energy to another.</p> <p>12.4 I can use a device to demonstrate that energy can be transferred due to an objects position.</p> <p>12.5 I can investigate the transfer of thermal energy.</p>	
--	---	---

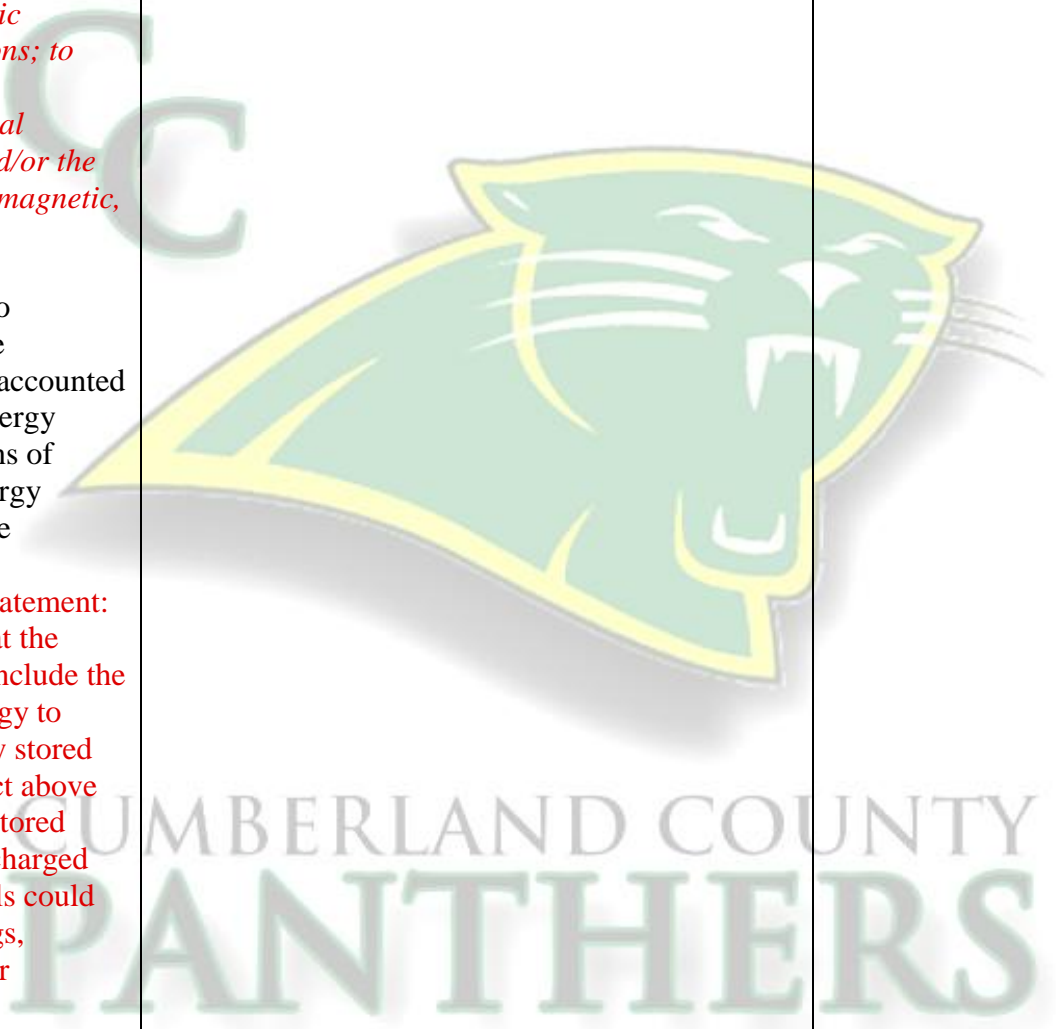
meaning of mathematical expressions used in the model.]
[Assessment Boundary: Assessment is limited to basic algebraic expressions or computations; to systems of two or three components; and to thermal energy, kinetic energy, and/or the energies in gravitational, magnetic, or electric fields.]

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 positions 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-PS3-4

Design, build, and refine a device



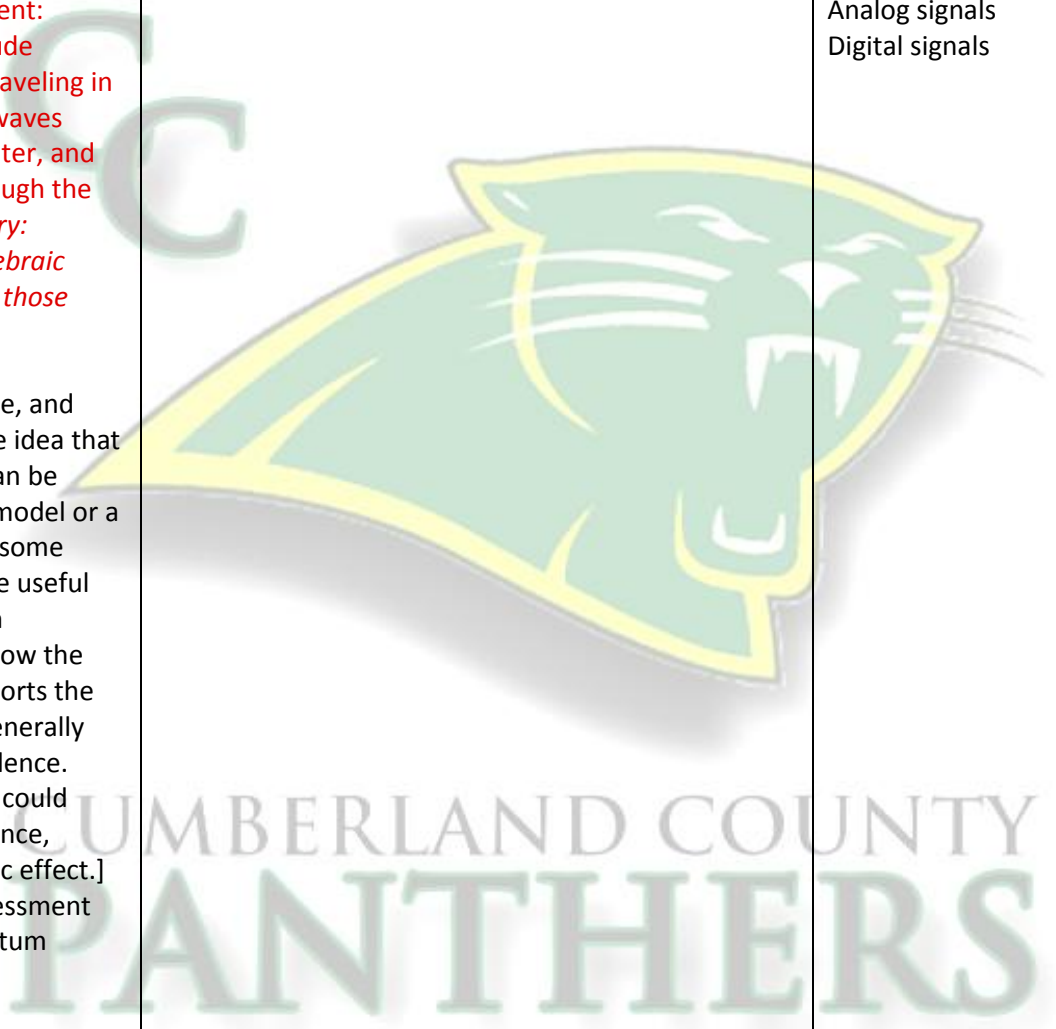
that works within given constraints to convert one form of energy into another form of energy.* [Clarification Statement: Emphasis is on both qualitative and quantitative evaluations of devices. Examples of devices could include Rube Goldberg devices, wind turbines, solar cells, solar ovens, and generators. Examples of constraints could include use of renewable energy forms and efficiency.] [Assessment Boundary: Assessment for quantitative evaluations is limited to total output for a given input. Assessment is limited to devices constructed with materials provided to students.]



**CUMBERLAND COUNTY SCHOOL DISTRICT
BENCHMARK ASSESSMENT CURRICULUM PACING GUIDE**

School: Cumberland County High	Subject: Integrated Science	Grade: 9
Benchmark Assessment 4		
Instructional Timeline: 9 weeks		
Topic(s): Electricity, magnetism, Waves & Electromagnetic Radiation, and Information Technology		
Kentucky Core Academic Standards	Learning Target (I Can Statement)	Key Vocabulary
<p>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. [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.] [Assessment Boundary: Assessment is limited to systems containing two objects.]</p> <p>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. [Assessment Boundary: Assessment is limited to designing and conducting investigations with provided materials and tools.]</p> <p>HS-PS4-1 Use mathematical representations to support a claim</p>	<p>9.1 Describe the effects of magnetic forces and magnetic fields.</p> <p>9.2 Describe how a moving electric charge creates a magnetic field</p> <p>9.3 Analyze factors that affect the strength and direction of electric forces and fields</p> <p>9.4 I can determine the changes in energy of two objects in an electric or magnetic field.</p> <p>9.5 I can develop a model of two objects in an electric or magnetic field.</p> <p>9.6 I can investigate if an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.</p> <p>11.1 I can describe the properties of waves.</p> <p>11.2 I can solve equations relating wave speed to wavelength and frequency.</p> <p>11.3 I can describe the evidence for the dual nature of electromagnetic radiation (particle vs. wave model).</p> <p>11.4 I can describe the effects of electromagnetic radiation on living tissue.</p> <p>11.5 I can describe the uses humans have developed for electromagnetic waves.</p> <p>13.1 I can identify advantages and disadvantages of using digital transmission and storage of data.</p>	<p>Wave</p> <p>Medium</p> <p>Mechanical wave</p> <p>Electromagnetic wave</p> <p>Transverse wave</p> <p>Longitudinal wave</p> <p>Crest</p> <p>Trough</p> <p>Amplitude</p> <p>Wavelength</p> <p>Period</p> <p>Frequency</p> <p>Wave speed</p> <p>Doppler effect</p> <p>Reflection</p> <p>Refraction</p> <p>Diffraction</p> <p>Interference</p> <p>Electric force</p> <p>Electric field</p> <p>Conductor</p> <p>Insulator</p> <p>Electrical potential energy</p> <p>Current</p> <p>Resistance</p> <p>Magnetic field</p> <p>Magnetic pole</p>

<p>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.] [Assessment Boundary: Assessment is limited to algebraic relationships and describing those relationships qualitatively.]</p> <p>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. [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.] [Assessment Boundary: Assessment does not include using quantum theory.]</p> <p>HS-PS4-4 Evaluate the validity and reliability of claims in published materials of the</p>	<p>13.2 I can describe how technology uses wave behavior and interactions.</p>	<p>Electromagnet Electric motor Telecommunication Analog signals Digital signals</p>
--	--	--



effects that different frequencies of electromagnetic radiation have when absorbed by matter.

HS-PS4-2

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

Communicate technical information about about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.* [Clarification Statement: Examples could include solar cells capturing light and converting it to electricity; medical imaging; and communications technology.] [Assessment Boundary: Assesments are limited to qualitative information. Assesments do not include band theory.]

