1. *Scientific Inquiry*

1. Student will develop scientific inquiry as a critical habit of mind for scientific literacy.
Enduring Knowledge (Scientific Questioning): Students raise scientifically oriented questions that can be answered through observations, experimentation and/or research.
Enduring Knowledge (Predicting and Hypothesizing): Scientists' explanations about what happens in the world come partly from what they observe and partly from what they think.
Enduring Knowledge (Designing Experiments): Students design investigations that control variables, generate adequate data/observations to provide reasonable explanations and can be reproduced by other scientists.
Enduring Knowledge (Conducting Experiments): Students follow an experimental design and use scientific tools (including measurement tools) appropriately and accurately.
Enduring Knowledge (Applying Results): Students synthesize the results of an investigation by generating new questions related to the results of the investigation stating a general rule regarding the understandings learned from the investigation, or applying the understandings learned to similar situations.

I (Introduce), R (Reinforce/Expand), A (Apply)

	K	1	2	3	4	5	6	7	8	9	10	11	12
The Student:													
Demonstrates their understanding of scientific questioning by: R-(K-12)-3,7,8,13 W-(K-12)-3 M(N&O)-(K-12)-1,2													
• Developing a question by completing the prompt, "I wonder?"	I	R	A	A	A	A	A	A	A	A	A	A	A
• Demonstrating a "questioning mind" through extended; intentional (purposeful) interactions with materials or people; Experiments with possibilities.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Posing observational questions that compare things in terms of number, shape, texture, size, weight, color, motion, etc. (e.g., How fast does a Lady Beetle move compared to a Bess Beetle?)		I	R	A	A	A	A	A	A	A	A	A	A
• Investigating and completing questions to identify a variable that can be changed (e.g., What will happen if…? or I wonder if I change…?).		I	R	A	A	A	A	A	A	A	A	A	A
• Generating new questions that could be explored at the end of an investigation.		I	R	A	A	A	A	A	A	A	A	A	A
• Identifying at least one variable that affects a system and using that variable to generate an experimental question that includes a cause and effect relationship.			I	R	A	A	A	A	A	A	A	A	A

1. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Distinguishing between observational, experimental, and research questions (e.g., Observational- How does a cricket chirp? Experimental- Does the amount of light affect how a cricket chirps? Research- Do all crickets chirp? Why do crickets chirp?)				I	R	A	A	A	A	A	A	A	A
• Identifying multiple variables that affect a system and using the variables to generate experimental questions that include cause and effect relationships.						I	R	A	A	A	A	A	A
• Developing questions that reflect prior knowledge.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Refining and focusing broad ill-defined questions.				I	R	A	A	A	A	A	A	A	A
• Framing testable questions showing evidence of observations and prior knowledge to illustrate cause and effect.				I	R	A	A	A	A	A	A	A	A
• Developing a testable question appropriate to the scientific domain being investigated.				I	R	A	A	A	A	A	A	A	A
Demonstrates their understanding of experimental design by: W(K-12)-3,6 R(K-12)-3, M(G&M) (K-12)-7, M(DSP) (K-12) 1,2,3													
• Explaining the process of an investigation before & during the process.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Using procedures that are safe & humane.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Writing a plan related to a question that includes:													
A. What the experiment will do.		I	R	A	A	A	A	A	A	A	A	A	A
B. What will be observed, measured &/or compared.		I	R	A	A	A	A	A	A	A	A	A	A
• Recording major steps sequentially.		I	R	A	A	A	A	A	A	A	A	A	A
• Write a plan related to the question that includes:													
A. A list of materials needed		I	R	A	A	A	A	A	A	A	A	A	A
B. A diagram with important elements labeled that supports procedures & illustrates the set-up		I	R	A	A	A	A	A	A	A	A	A	A
C. A procedure that lists steps sequentially		I	R	A	A	A	A	A	A	A	A	A	A
D. Appropriate timing between observations and/or number of trials needed.				I	R	A	A	A	A	A	A	A	A
• Writing a plan related to the question & prediction that includes:													
A. A list of materials needed that specifies quantities						I	R	A	A	A	A	A	A

1. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
B. A procedure that lists significant steps sequentially and describes which variable will be manipulated or changed & which variables will remain the same.						I	R	A	A	A	A	A	A
C. An appropriate format for recording data		I	R	A	A	A	A	A	A	A	A	A	A
D. A strategy for conducting multiple trials					I	R	A	A	A	A	A	A	A
• Write a plan related to the question, hypothesis, and prediction that includes:													
A. A diagram labeled using scientific terminology that supports procedures and illustrates the setup.				I	R	A	A	A	A	A	A	A	A
B. A procedure that lists significant steps that identify manipulated (independent) and responding (dependent) variables				I	R	A	A	A	A	A	A	A	A
C. A control for comparing data when appropriate.					I	R	A	A	A	A	A	A	A
D. Identification of tools and procedures for collecting data and reducing error.				I	R	A	A	A	A	A	A	A	A
• Write a plan that includes:													
A. Procedures that incorporate appropriate protection (e.g., no food in lab area.)		I	R	A	A	A	A	A	A	A	A	A	A
B. Appropriate tools, units of measurement and degree of accuracy.			I	R	A	A	A	A	A	A	A	A	A
C. Components that reflect current scientific knowledge and available technology.						I	R	A	A	A	A	A	A
D. Use of scientific terminology that supports the identified procedures.						I	R	A	A	A	A	A	A
Demonstrate their ability to <u>conduct experiments:</u> R(K-12)-3,15,8,7 W(K-12)-2,3,6,7,8 OC 1,2 M(DSP) (K-12)-1,2,6													
• Using more than one of the senses to make observations.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Describing obvious features of an object or event	I	R	A	A	A	A	A	A	A	A	A	A	A
• Representing data in a variety of ways including words, numbers, symbols, and pictures.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Drawing scientifically:													
A. Recording shapes and prominent features.	I	R	A	A	A	A	A	A	A	A	A	A	A

1. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
B. Spatially organizing and differentiating significant parts observed.	I	R	A	A	A	A	A	A	A	A	A	A	A
C. Adding essential information to a diagram provided by a teacher.	I	R	A	A	A	A	A	A	A	A	A	A	A
D. Use simple equipment and non-standard measurement tools to gather data and extend the senses.	I	R	A	A	A	A	A	A	A	A	A	A	A
E. Following teacher guidance to complete steps while investigating a question.	I	R	A	A	A	A	A	A	A	A	A	A	A
F. Selecting an appropriate perspective (e.g., cross section, top view, side view) and recording precise proportions.					I	R	A	A	A	A	A	A	A
• Following a simple plan	I	R	A	A	A	A	A	A	A	A	A	A	A
• Describing observations using senses rather than feelings.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Recording observations. (e.g., similarities & differences)	I	R	A	A	A	A	A	A	A	A	A	A	A
• Recording relative drawing including focus on finer details.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Labeling significant aspects of a scientific drawing/diagram.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Creating a title for a scientific drawing or diagram.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Clearly describing evidence.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Recording data at various points during the investigation.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Recording the sequence of events.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Choosing appropriate measure meant for the task.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Collecting data and recording accurately.	I	R	A	A	A	A	A	A	A	A	A	A	A
• Accurately quantifying observations using appropriate measurement tools.					I	R	A	A	A	A	A	A	A
• Using technology to collect, quantify, organize, and store observations (e.g., use of probe).					I	R	A	A	A	A	A	A	A
• Collecting significant data through completing multiple trials.					I	R	A	A	A	A	A	A	A
• Evaluating and revising procedures as investigation progresses.					I	R	A	A	A	A	A	A	A

1. Continued	K
Demonstrates their ability to explain data by: R-12-4 **R-(K-12)-3,15,8,17 W-(K-12)3,11,10 OC-(K-12)-2**	
• Explaining observations with the support of material props, photographs, drawings or diagrams.	I
• Providing a reasonable explanation that accurately reflects data.	I
• Identifying differences between proposed predictions and experimental data.	I
• Explaining data using correct scientific terminology.	
• Using experimental results to support or refute original hypothesis.	
• Considering all data when developing an explanation/conclusion.	
• Using additional resources (e.g. books, journals, data-bases, interview, etc.) to strengthen an explanation	I
• Identifying problems/flaws with the experimental design.	
• Preparing a conclusion statement/summary.	
• Using scientific concepts, models, and terminology to report results, discuss relationships, and propose new explanations.	
• Documenting and explaining changes in experimental design.	
• Sharing conclusion/summary with appropriate audience beyond the research group.	
• Using mathematical analysis as an integral component of the conclusion.	
• Proposing, synthesizing, and evaluating alternative explanations for experimental results.	
• Citing experimental evidence within explanation.	
• Including logically consistent position to explain observed phenomena.□ **I R A A A A**	

Representing

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Demonstrates their understanding of scientific questioning by Representing Data and Analysis by: **R-(K-12)-3 W-(K-12)6,7,8 OC(K-12)-2, M(DSP) (K-12)-1,2,3,6**	
• Classifying objects and phenomena into sets and subsets and justifying groupings.	
• Displaying and labeling data for separate trials/observations.	
• Determining an appropriate representation (graph or table or chart or diagram) to represent their findings most accurately.	
• Including in tables a title, labeled rows and columns and may necessary keys.	
• Including in graphs a title labels scale and recording data correctly.	

1. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Determining an appropriate representation (line graph in addition to prior examples) to represent their findings accurately.				I	R	A	A	A	A	A	A	A	A
• Selecting a scale that is appropriate for range of data to be plotted, labels units and presents data in an objective way.				I	R	A	A	A	A	A	A	A	A
• Including clearly labeled keys and symbols when necessary.				I	R	A	A	A	A	A	A	A	A
• Using correct scientific terminology to label representations.				I	R	A	A	A	A	A	A	A	A
• Organizing a piece of data (measurement or observation) or a group representation (e.g. pictograph, bar graph, or chart).	I	R	A	A	A	A	A	A	A	A	A	A	A
• Organizing a collection of data into a table or a graph template.		I	R	A	A	A	A	A	A	A	A	A	A
• Creating a title for a table or graph.		I	R	A	A	A	A	A	A	A	A	A	A
• Representing independent variable on the "X" axis and dependent variable on the "Y" axis.				I	R	A	A	A	A	A	A	A	A
• Using technology to enhance a representation.		I	R	A	A	A	A	A	A	A	A	A	A
• Using color, texture, symbols and other graphic strategies to clarify trends/patterns within a representation.		I	R	A	A	A	A	A	A	A	A	A	A
• Representing data quantitatively to the appropriate level of precision through the use of mathematical calculations.				I	R	A	A	A	A	A	A	A	A
• Developing the skill of drawing a "best fit" curve from data.					I	R	A	A	A	A	A	A	A
• Recording accurate data, free of bias controls.				I	R	A	A	A	A	A	A	A	A

2. Physical Science (Time, Space, and matter)

Enduring Knowledge: All living and non-living things are composed of matter having characteristic properties that distinguish one substance from another.
Enduring Knowledge: When matter undergoes a chemical change it turns into a new and different sub stance whose properties are different that the original. No matter how substances interact with one another, the total mass of the system remains the same.
Enduring Knowledge: The nucleus of some atoms is unstable and may spontaneously decay.
Enduring Knowledge: Everything is constantly moving; motion is relative, but the motion of an object can be described and predicted by tracing and measuring its position over time.
Enduring Knowledge: Force is an influence that can to change the motion of an object.
Enduring Knowledge: Energy is necessary for change to occur. It is the ability of matter to bring about change.

- *** There are many forms of energy.**
- *** The total energy in the universe is constant.**
- *** Energy can be transformed and transferred, but not destroyed. (Conservation of Energy).**
- *** Energy transfers and transformations exhibit the characteristics of systems with inputs, processes and outputs as well as connections to other systems.**

I (Introduce), R (Reinforce/Expand), A (Apply)

	K	1	2	3	4	5	6	7	8	9	10	11	12
The Student:													
Demonstrates an understanding of properties of matter by: PS1(K-2)-1, PS1(3-4)-1, PS1(5-6)-1, PS1 (7-8)-1, PS1 (9-11)-1 M(G&M)-1,6,7													
• identifying, comparing, and sorting objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight).	I	R	A	A	A	A	A	A	A	A	A	A	A
• recording observations/data about physical properties.	I	R	A	A	A	A	A	A	A	A	A	A	A
• using attributes of properties to state why objects are grouped together (e.g., things that roll, things that are rough).		I	R	A	A	A	A	A	A	A	A	A	A
• identifying, comparing, and sorting objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight, temperature, flexibility).		I	R	A	A	A	A	A	A	A	A	A	A
• citing evidence (e.g., prior knowledge, data) to support conclusions about why objects are grouped/not grouped together.				I	R	A	A	A	A	A	A	A	A
• comparing the masses of objects of equal volume made of different substances.							I	R	A	A	A	A	A

2. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• measuring mass and volume of both regular and irregular objects and using those values as well as the relationship D=m/v to calculate density.							I	R	A	A	A	A	A
• utilizing appropriate data (related to chemical and physical properties), to distinguish one substance from another or identify an unknown substance.										I	R	A	A
• determining the degree of change in pressure of a given volume of gas when the temperature changes incrementally (doubles, triples, etc.).										I	R	A	A
• explaining the states of a substance in terms of the particulate nature of matter and the forces of interaction between particles.										I	R	A	A
• quantitatively determining how volume, pressure, temperature and amount of gas affect each other (PV=nRT) in a system.										I	R	A	A
Demonstrates an understanding of properties of matter by: PS1(K-2)POC-2, PS1(3-4)-2, PS1(5-6)-2, PS1 (7-8)-2, PS1 (9-11)-2													
• recognizing that different substances have properties, which allow them to be identified regardless of the size of the sample.							I	R	A	A	A	A	A
• classifying and comparing substances using characteristic properties (e.g., solid, liquid, gas).		I	R	A	A	A	A	A	A	A	A	A	A
• identifying an unknown substance given its characteristic properties.							I	R	A	A	A	A	A
• classifying and comparing substances using characteristic properties (e.g., solid, liquid, gas; metal, non-metal).							I	R	A	A	A	A	A
• using given data (diagrams, charts, narratives, etc.) and advances in technology to explain how the understanding of atomic structure has changed over time.										I	R	A	A
Demonstrates an understanding of properties of matter by: PS1 (9-11)-3													
• identifying and explaining the basis for the arrangement of the elements within the periodic table(e.g. trends, valence electrons, reactivity, electro negativity, ionization).										I	R	A	A
• predicting the relative physical and chemical properties of an element based on its location within the Periodic Table.										I	R	A	A
Students demonstrate an understanding of physical changes by: PS1 (3-4)–1													
• observing and describing physical changes (e.g. freezing, thawing, torn piece of paper).		I	R	A	A	A	A	A	A	A	A	A	A

Demonstrates an understanding of States of Matter by:PS1 (K-2) POC –2, PS1 (3-4) –2, PS1 (5-6) – 4, PS1 (7-8) – 4, PS1 (9-11)– 4, PS1 (Ext)– 4	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
• describing properties of solids and liquids.		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• identifying and comparing solids and liquids.		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• making logical predictions about the changes in the state of matter when adding or taking away heat (e.g., ice melting, water freezing).			**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• describing properties of solids, liquids, and gases.		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• making logical predictions about the changes in the state of matter when adding or taking away heat (e.g., ice melting, water boiling or freezing, condensation/evaporation).				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• differentiating among the characteristics of solids, liquids, and gases.			**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• predicting the effects of heating and cooling on the physical state, volume and mass of a substance.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• creating diagrams or models that represent the states of matter at the molecular level.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• explaining the effect of increased and decreased heat energy on the motion and arrangement of molecules.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• observing the physical processes of evaporation and condensation, or freezing and melting, and describe these changes in terms of molecular motion and conservation of mass.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
Demonstrates an understanding of conservation of matter by: PS1 (K-2)–3, PS1 (3-4)–3, PS1 (5-6)–3, PS1 (7-8) –3													
• using simple tools (e.g. balance scale, see-saw) to explore the property of weight.		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• measuring the weight of objects to prove that all matter has weight.			**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• using measures of weight to prove that the whole equals the sum of its parts.					**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• showing that the weight of an object remains the same despite a change in its shape.					**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• explaining that regardless of how parts of an object are arranged, the mass of the whole is always the same as the sum of the masses of its parts.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• citing evidence to conclude that the amount of matter before and after undergoing a physical or a chemical change in a closed system remains the same.							**I**	**R**	**A**	**A**	**A**	**A**	**A**

Demonstrates an understanding of the structure of matter by: PS1 (5-6) – 5, PS1 (7-8) – 5,PS1 (9-11)– 4, PS1 (Ext)– 4	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
• distinguishing between solutions, mixtures, and "pure" substances, i.e. compounds and elements.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• using models or diagrams to show the difference between atoms and molecules.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• classifying common elements and compounds using symbols and simple chemical formulas.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• interpreting the symbols and formulas of simple chemical equations.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• using symbols and chemical formulas to show simple chemical rearrangements that produce new substances (chemical change).										**I**	**R**	**A**	**A**
• explaining that when substances undergo physical changes, the appearance may change but the chemical makeup and chemical properties do not.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• explaining that when substances undergo chemical changes to form new substances, the properties of the new combinations may be very different from those of the old.										**I**	**R**	**A**	**A**
• comparing the three subatomic particles of atoms (protons, electrons, neutrons) and their location within an atom, their relative mass, and their charge.					**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• writing formulae for compounds and developing basic (excluding transition elements) models using electron structure.										**I**	**R**	**A**	**A**
• explaining or modeling how the electron configuration of atoms governs how atoms interact with one another (e.g. covalent, hydrogen and ionic bonding).										**I**	**R**	**A**	**A**
• writing an electron configuration to include *s, p, d*, and *f* orbitals and relating to atomic interactions.											**I**	**R**	**A**
• specific reactants (e.g. Ba + Cl_2) write the balanced equation and determine the products, type of compound formed (ionic or molecular), and the properties of the compound (e.g. solubilities, electrolytic, etc).											**I**	**R**	**A**
Demonstrates an understanding of energy by: PS2 (K-2)-4,5,6 PS2 (3-4)-4,5,6 PS2 (5-6)- 6 PS2 (7-8)- 6 PS2 (9-11)-5,6,7 PS2 (Ext)– 5-6													
• describing observable effects of light using a variety of light sources.		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• experimenting and describe how vibrating objects make sound (e.g., guitar strings, seeing salt bounce on a drum skin).				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**

Demonstrates an understanding of energy by: (cont.)	K	1	2	3	4	5	6	7	8	9	10	11	12
• identifying the sun as a source of heat energy.			I	R	A	A	A	A	A	A	A	A	A
• experimenting to identify and classify different pitches and volumes of sounds produced by different objects.				I	R	A	A	A	A	A	A	A	A
• using data to explain what causes sound to have different pitch or volume				I	R	A	A	A	A	A	A	A	A
• describing or showing that heat can be produced in many ways (e.g. electricity, friction, burning).				I	R	A	A	A	A	A	A	A	A
• drawing, diagramming, building, and explaining a complete electrical circuit.					I	R	A	A	A	A	A	A	A
• using experimental data to classify a variety of materials as conductors or insulators					I	R	A	A	A	A	A	A	A
• differentiating among the properties of various forms of energy.						I	R	A	A	A	A	A	A
• explaining how energy may be stored in various ways (e.g. batteries, springs, height in terms of potential energy).						I	R	A	A	A	A	A	A
• describing sound as the transfer of energy through various materials (e.g. solids, liquids, gases).						I	R	A	A	A	A	A	A
• using a real world example to explain the transfer of potential energy to kinetic energy.							I	R	A	A	A	A	A
• constructing a model to explain the transformation of energy from one form to another. (e.g. an electrical circuit changing electrical energy to light energy in a light bulb).							I	R	A	A	A	A	A
• explaining that while energy may be stored, transferred, or transformed, the total amount of energy is conserved.				I	R	A	A	A	A	A	A	A	A
• describing the effect of changing voltage in an electrical circuit.						I	R	A	A	A	A	A	A
• describing or diagraming the changes in energy (transformation) that occur in different systems (eg. chemical = exo and endo thermic reactions, biological = food webs, physical = phase changes).										I	R	A	A
• explaining the Law of Conservation of Energy as it relates to the efficiency (loss of heat) of a system.										I	R	A	A
• Identifying, measuring, calculating and analyzing qualitative and quantitative relationships associated with energy transfer or energy transformation.											I	R	A
• quantitatively determining the efficiency of a given system.											I	R	A
• demonstrating when a shadow will be created using sunny versus cloudy days.		I	R	A	A	A	A	A	A	A	A	A	A

Demonstrates an understanding of energy by: (cont.)	K	1	2	3	4	5	6	7	8	9	10	11	12
• investigating observable effects of light using a variety of light sources (e.g., light travels in a straight line until it interacts with an object, blocked light rays produce shadows).				I	R	A	A	A	A	A	A	A	A
• predicting, describing, and investigating how light rays are reflected, refracted, or absorbed.				I	R	A	A	A	A	A	A	A	A
• describing that the sun warms land and water.		I	R	A	A	A	A	A	A	A	A	A	A
• describing that objects change in temperature by adding or subtracting heat.			I	R	A	A	A	A	A	A	A	A	A
• describing how heat moves from warm objects to cold objects until both objects are the same temperature.				I	R	A	A	A	A	A	A	A	A
• showing that heat moves from one object to another causing temperature change (e.g., when land heats up it warms the air).				I	R	A	A	A	A	A	A	A	A
Demonstrate an understanding of heat energy by: PS2 (5-6) – 7, PS2 (7-8) – 7													
• identifying real world applications where heat energy is transferred and showing the direction that the heat energy flows.					I	R	A	A	A	A	A	A	A
• designing a diagram, model, or analogy to show or describe the motion of molecules for a material in a warmer and cooler state.							I	R	A	A	A	A	A
• explaining the difference among conduction, convection and radiation and creating a diagram to explain how heat energy travels in different directions and through different materials by each of these methods.							I	R	A	A	A	A	A
Demonstrates an understanding of physical, chemical, and nuclear changes by: PS2 (9-11) –6, PS2 (Ext)– 6													
• writing simple balanced chemical equations to represent chemical reactions and illustrate the conservation of matter.										I	R	A	A
• identifying whether a given chemical reaction or a biological process will release or consume energy (endothermic and exothermic) based on the information provided (e.g. given a table of energy values for reactants and products or an energy diagram).										I	R	A	A
• explaining and/or modeling how the nuclear make-up of atoms governs alpha and beta emissions creating changes in the nucleus of an atom results in the formation of new elements.										I	R	A	A
• explaining the concept of half-life and using the half-life principal to predict the approximate age of a material.										I	R	A	A

Demonstrates an understanding of physical, chemical, and nuclear changes by: (cont.)	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
• differentiating between fission and fusion in nuclear reactions and their relation to element changes and energy formation.										**I**	**R**	**A**	**A**
• using chemical equations and information about molar masses to predict quantitatively the masses of reactants and products in chemical reactions.											**I**	**R**	**A**
• using quantitative heat flow or calorimetric investigations to determine the energy released or consumed in the process.											**I**	**R**	**A**
• qualitatively and/or quantitatively predicting reactants and products in a prescribed investigation. (e.g. Acid-base. Redox).											**I**	**R**	**A**
Demonstrates an understanding of electromagnetism by: PS2 (9-11) –7													
• explaining through words, diagrams, models, or electrostatic demonstrations the principle that like charges repel and unlike charges attract.										**I**	**R**	**A**	**A**
• explaining through words, charts, diagrams, and models the effects of distance and the amount of charge on the strength of the electrical force present.										**I**	**R**	**A**	**A**
• describing the relationship between moving electric charges and magnetic fields.										**I**	**R**	**A**	**A**
Demonstrates their understanding of Gravitational Force by: PS3(K-2)-7													
• Observing and describing that different objects fall to the earth unless something is holding then up.		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• Predicting of effect of gravitational forces between pairs of objects (i.e., earth and object's on the surface, earth and moon, earth and sun).									**I**	**R**	**A**	**A**	**A**
• Describing the effects of gravitational force on objects in the Solar System, and identifying evidence that the force of gravity is relative to the mass of objects and their distance apart.									**I**	**R**	**A**	**A**	**A**

Demonstrates an understanding of motion by: **PS3 (K-2) –7, PS3 (3-4)–7, PS3 (5-6)–8, PS3 (7-8) – 8,**	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
• showing how pushing/pulling moves or does not move an object.		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• predicting the direction an object will or will not move if a force is applied to it.		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• predicting the direction and describing the motion of objects (of different weights, shapes, sizes, etc.) if a force is applied to it.				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• describing change in position relative to other objects or background.				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• using data or graphs to compare the relative speed of objects.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• measuring distance and time for a moving object and using those values as well as the relationship s=d/t to calculate speed and graphically represent the data.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• solving for any unknown in the expression s=d/t given values for the other two variables.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• differentiating among speed, velocity and acceleration.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
Demonstrates an understanding of force by: PS3 (K-2) –7													
• showing that different objects fall to earth unless something is holding them up.		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
Demonstrates an understanding of force (e.g., push-pull, gravitational) by: PS3 (3-4)–7													
• investigating and describing that different amounts of force can change direction/speed of an object in motion.				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• conducting experiments to demonstrate that different objects fall to earth unless something is holding them up.				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
Demonstrates an understanding of force (e.g., friction, gravitational, magnetic) by: PS3 (5-6)–8, PS3 (7-8) – 8													
• recognizing that a force is a push or a pull.							**I**	**R**	**A**	**A**	**A**	**A**	**A**

Demonstrates an understanding of force (e.g., friction, gravitational, magnetic) by:	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
• explaining that changes in speed or direction of motion are caused by forces.							I	R	A	A	A	A	A
• showing that electric currents and magnets can exert a force on each other.							I	R	A	A	A	A	A
• making and testing predictions on how unbalanced forces acting on objects change speed or direction of motion, or both.							I	R	A	A	A	A	A
• describing or graphically representing that the acceleration of an object is proportional to the force on the object and inversely proportional to the object's mass.							I	R	A	A	A	A	A
• differentiating between mass and weight.							I	R	A	A	A	A	A
Demonstrates an understanding of forces and motion by: PS3 (9-11)- 8, PS3 (Ext)- 8, PS3 (9-11)–9													
• predicting and/or graphing the path of an object in different reference planes and explain how and why (forces) it occurs.										I	R	A	A
• using modeling, illustrating, graphing explain how distance and velocity change over time for a free falling object.										I	R	A	A
• using a quantitative representation of how distance and velocity change over time for a free falling object.											I	R	A
• using a quantitative representation of the path of an object which has horizontal and free fall motion.											I	R	A
• by modeling, illustrating, graphing, and quantitatively explaining the path of an object, which has horizontal and free fall motion. e.g. football, projectile.											I	R	A
• explaining through words, charts, diagrams, and models the effects of distance and the amount of mass on the gravitational force between objects (e.g. Universal Gravitation Law).										I	R	A	A
• using Newton's Laws of Motion and the Law of Conservation of Momentum to predict the effect on the motion of objects.										I	R	A	A
Demonstrate an understanding of (magnetic**) force by: PS3 (K-2)–8, PS3 (3-4)–8,**													
• observing and sorting objects that are and are not attracted to magnets.		I	R	A	A	A	A	A	A	A	A	A	A
• using prior knowledge and investigating to predict whether or not an object will be attracted to a magnet.				I	R	A	A	A	A	A	A	A	A

Demonstrates an understanding of (magnetic) **force by: (cont.)**	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
• describing what happens when like and opposite poles of a magnet are placed near each other.				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• exploring relative strength of magnets (e.g., size of magnets, number of magnets, properties of materials).				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
Demonstrates an understanding of waves by: PS3 (5-6) – LA, PS3 (9-11)–10													
• investigate how vibrations in materials (e.g. pebble in a pond, jump rope, slinky) set up wavelike disturbances that spread away from the source.							**I**	**R**	**A**	**A**	**A**	**A**	**A**
• investigating examples of wave phenomena (e.g. ripples in water, sound waves, seismic waves).										**I**	**R**	**A**	**A**
• comparing and contrasting electromagnetic waves to mechanical waves.										**I**	**R**	**A**	**A**
• qualifying the relationship between frequency and wavelength of any wave.										**I**	**R**	**A**	**A**
Demonstrates an understanding of the visible spectrum of light by: PS3 (7-8) - LA													
• experiment how light from the sun is made up of a mixture of many different colors of light (e.g. using prisms, spectrometers, crystals).				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• representing in words, diagrams, or other models the visible spectrum as a part of the electromagnetic spectrum (consisting of visible light, infrared, and ultraviolet radiation) and composed of all colors of light										**I**	**R**	**A**	**A**
• differentiating between electromagnetic and mechanical waves.										**I**	**R**	**A**	**A**

3. Life Science and the Human body													
Enduring Knowledge: All living organisms and their component cells have identifiable characteristics that allow for survival. **Enduring Knowledge: Energy enters an ecosystem in the form of sunlight and flows through the system to each cell. Matter interacts, changes and recycles in an ecosystem. Populations of organisms survive by maintaining interdependent relationships with one another and by utilizing biotic and abiotic resources from the environment.)** **Enduring Knowledge: All Living Things exhibit patterns of similarity in their structures, behaviors and biochemistry.** **Enduring Knowledge: All Living Things exhibit patterns of similarity in their structures, behaviors and biochemistry.** **Enduring Knowledge: The human body is unique in its heredity, body systems and development and can be affected by the environment.**													
				I (Introduce), R (Reinforce/Expand), A (Apply)									
The Student:	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Demonstrates an understanding of classification of organisms by: LS1(K-2)-1, LS1(3-4)-1													
• Distinguishing between living and non-living things.	**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• Identifying and sorting based on a similar or different external features.		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• Observing and recording the external features that make up living things (e.g. roots, stems, leaves, flowers, legs, antennae, tail, shell).		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• Citing evidence to distinguish between living and non-living things.		**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• Identifying, sorting and comparing based on similar and/or different external features.				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• Recording and analyzing observations/data about external features (e.g., within a grouping, which characteristics are the same and which are different).				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• Citing evidence (e.g., prior knowledge, data) to draw conclusions explaining why organisms are grouped/not grouped together (e.g. mammal, bird, and fish).				**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
Demonstrates understanding of biodiversity by: LS1 (5-6) – 1, LS1 (7-8) – 1													
• Recognizing that organisms have different features and behaviors for meeting their needs to survive (e.g., fish have gills for respiration, mammals have lungs, bears hibernate).								**I**	**R**	**A**	**A**	**A**	**A**

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Giving examples of adaptations or behaviors that are specific to a niche (role) within an ecosystem.								I	R	A	A	A	A
• Explaining how organisms with different structures and behaviors have roles that contribute to each other's survival and the stability of the ecosystem.								I	R	A	A	A	A
Demonstrates understanding of structure and function-survival requirements by: LS1 (K-2)-2, LS1 (3-4)-2, LS1 (5-6) – 2, LS1 (7-8) – 2, LS1 (9-11)-1, LS1 (Ext)-1													
• Observing that plants need water, air, food, and light to grow; observing that animals need water, air, food and shelter to grow.		I	R	A	A	A	A	A	A	A	A	A	A
• Observing that plants need water, air, food, light and space to grow and reproduce; observing that animals need water, air, food, and shelter/space to grow and reproduce.				I	R	A	A	A	A	A	A	A	A
• Describing structures or behaviors that help organisms survive in their environment (e.g., defense, obtaining nutrients, reproduction, and eliminating waste).						I	R	A	A	A	A	A	A
• Observing and describing (e.g., drawing, labeling) individual cells as seen through a microscope targeting cell membrane, cell wall, nucleus, and chloroplasts.								I	R	A	A	A	A
• Observing, describing and charting the growth, motion, responses of living organisms								I	R	A	A	A	A
• Explaining the relationships between and amongst the specialized structures of the cell and their functions (e.g. transport of materials, energy transfer, protein building, waste disposal, information feedback, and even movement).										I	R	A	A
• Explaining that most multicellular organisms have specialized cells to survive, while unicellular organisms perform all survival functions. (e.g. nerve cells communicate with other cells, muscle cells contract, unicellular are not specialized).										I	R	A	A
• Describing how the malfunction of cell organelles can lead to disease (e.g. "leaky" lysosomes and rheumatoid arthritis)											I	R	A

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Identify various specialized cells and common unicellular organisms in diagrams, photographs and/or microscopic slides.											I	R	A
• Observing and describing (e.g., drawing, labeling) individual cells as seen through a microscope targeting cell membrane, cell wall, nucleus, and chloroplasts.							I	R	A	A	A	A	A
Demonstrates understanding of differentiation by: LS1 (5-6) –4, LS1 (7-8)–4, LS1 (9-11)-1, LS1 (Ext)-1													
• Identifying cells as the building blocks of organisms.							I	R	A	A	A	A	A
• Recognizing and illustrating (e.g. flow chart) the structural organization of an organism from a cell to tissue to organs to organ systems to organisms.							I	R	A	A	A	A	A
• Explaining that specialized cells perform specialized functions. (e.g., muscle cells contract, nerve cells transmit impulses, skin cells provide protection).							I	R	A	A	A	A	A
• Explaining how each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole.						I	R	A	A	A	A	A	A
• Comparing the role of various sub-cellular structures in unicellular organisms to comparable structures in multicellular organisms (e.g. oral groove, gullet, food vacuole in Paramecium compared to digestive systems in multicellular organisms).										I	R	A	A
• Describing the origin and nature of stem cells and their potential for curing disease.										I	R	A	A
Demonstrates an understanding of the molecular basis for heredity by: LS1 (9-11) –2, LS1 (Ext) –2													
• Describing the DNA structure and relating the DNA sequence to the genetic code.										I	R	A	A
• Explaining how DNA may be altered and how this affects genes/heredity (e.g. substitution, insertion, or deletion)..										I	R	A	A
• Describing how DNA contains the code for the production of specific proteins.										I	R	A	A

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
Demonstrates an understanding of reproduction by: LS1 (K-2)–3, LS1 (3-4)–3, LS1 (5-6) –3, LS1 (7-8)–3,													
• Observing and scientifically drawing (e.g. recording shapes, prominent features, relative proportions, organizes and differentiates significant parts observed) and labeling the stages in the life cycle of a familiar plant and animal.		I	R	A	A	A	A	A	A	A	A	A	A
• Sequencing the life cycle of a plant or animal when given a set of pictures.		I	R	A	A	A	A	A	A	A	A	A	A
• Observing changes and recording data to scientifically draw and label the stages in the life cycle of a familiar plant and animal.				I	R	A	A	A	A	A	A	A	A
• Sequencing the life cycle of a plant or animal when given a set of data/pictures				I	R	A	A	A	A	A	A	A	A
• Comparing the life cycles of 2 plants or 2 animals when given a set of data/pictures.				I	R	A	A	A	A	A	A	A	A
• Defining reproduction as a process through which organisms produce offspring.						I	R	A	A	A	A	A	A
• Describing reproduction in terms of being essential for the continuation of a species.						I	R	A	A	A	A	A	A
• Investigating and comparing a variety of plant and animal life cycles.						I	R	A	A	A	A	A	A
• Explaining reproduction as a fundamental process by which the new individual receives genetic information from parent(s).							I	R	A	A	A	A	A
• Describing forms of asexual reproduction that involve the genetic contribution of only one parent (e.g., binary fission, budding, vegetative propagation, regeneration).							I	R	A	A	A	A	A
• Describing sexual reproduction as a process that combines genetic material of two parents to produce a new organism (e.g., sperm/egg, pollen/ova)							I	R	A	A	A	A	A
Demonstrates understanding of structure and function-survival requirements by: LS1 (K-2)–4, LS1 (3-4)–4													
• Identifying the specific functions of the physical structures of a plant or an animal (e.g. roots for water; webbed feet for swimming).		I	R	A	A	A	A	A	A	A	A	A	A

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Identifying and explaining how the physical structure/characteristic of an organism allows it to survive and defend itself (e.g. of a characteristic – the coloring of a fiddler crab allows it to camouflage itself in the sand and grasses of its environment so that it will be protected from predators).			I	R	A	A	A	A	A	A	A	A	A
• Analyzing the structures needed for survival of populations of plants and animals in a particular habitat/environment (e.g. populations of desert plants and animals require structures that enable them to obtain/conserve/ retain water).			I	R	A	A	A	A	A	A	A	A	A
Demonstrates an understanding of energy flow in an ecosystem by: LS2 (K-2)–5, LS2 (3-4) –5, LS2 (5-6) –6, LS2 (7-8) –6													
• Caring for plants and/or animals by identifying and providing for their needs; experimenting with a plant's growth under different conditions, including light and no light.		I	R	A	A	A	A	A	A	A	A	A	A
• Identifying sources of energy for survival of organisms (i.e. light or food).			I	R	A	A	A	A	A	A	A	A	A
• Identifying the sun as the major source of energy for life on earth and sequencing the energy flow in an ecosystem.							I	R	A	A	A	A	A
• Describing the basic processes and recognizing the substances involved in photosynthesis and respiration.							I	R	A	A	A	A	A
• Explaining the transfer of the sun's energy through living systems and its effect upon them.							I	R	A	A	A	A	A
• Describing the basic processes and recognizing the names and chemical formulas of the substances involved in photosynthesis and respiration.							I	R	A	A	A	A	A
• Explaining the relationship between photosynthesis and respiration.							I	R	A	A	A	A	A
Students demonstrate an understanding of equilibrium in an ecosystem by: LS2 (5-6) –5, LS2 (7-8) –5, LS2 (9-11)-3, LS2 (Ext)-3, LS3 (3-4) –7													
• Identifying and defining an ecosystem and the variety of relationships within it (e.g., predator/prey, consumer/ producer/decomposer, host/parasite, catastrophic events).						I	R	A	A	A	A	A	A
• Identifying which biotic (e.g., bacteria, fungi, plants, animals) and abiotic (e.g., weather, climate, light, water, temperature, soil composition, catastrophic events) factors affect a given ecosystem							I	R	A	A	A	A	A

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Analyzing how biotic and abiotic factors affect a given ecosystem.							I	R	A	A	A	A	A
• Predicting the outcome of a given change in biotic and abiotic factors in an ecosystem.							I	R	A	A	A	A	A
• Using a visual model (e.g., graph) to track population changes in an ecosystem.							I	R	A	A	A	A	A
• Defining and giving an example of equilibrium in an ecosystem.										I	R	A	A
• Describing ways in which humans can modify ecosystems and describe and predict the potential impact (e.g. human population growth; technology; destruction of habitats; agriculture; pollution; and atmospheric changes).										I	R	A	A
• Describing ways in which natural events (e.g. floods and fires) can modify ecosystems and describe and predict the potential effects.										I	R	A	A
• Researching and citing evidence of global warming to describe the potential impact on both the living and physical systems on Earth.											I	R	A
• Investigating and reporting on a case study of ecosystem disruption caused by a natural event (e.g. Mississippi River delta region and hurricanes).											I	R	A
• Explaining what plants or animals might do if their environment changes (e.g., changing food supply or habitat due to fire, human impact, sudden weather-related changes).						I	R	A	A	A	A	A	A
• Explaining how the balance of the ecosystem can be disturbed (e.g., how does overpopulation of a species affect the rest of the ecosystem).						I	R	A	A	A	A	A	A
Demonstrates an understanding of food webs in an ecosystem by: LS2 (K-2)–6, LS2 (3-4)–6, LS2 (7-8)–2													
• Acting out or constructing simple diagrams (pictures or words) that shows a simple food web.			I	R	A	A	A	A	A	A	A	A	A
• Using information about a simple food web to determine how basic needs (e.g. shelter and water) are met by the habitat/environment.			I	R	A	A	A	A	A	A	A	A	A

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Using information about organisms to design a habitat and explain how the habitat provides for the needs of the organisms that live there			I	R	A	A	A	A	A	A	A	A	A
• Explaining the way that plants and animals in that habitat depend on each other.			I	R	A	A	A	A	A	A	A	A	A
• Creating or interpreting a model that traces the flow of energy in a food web.							I	R	A	A	A	A	A
Demonstrates an understanding of matter and energy flow in an ecosystem by: LS2 (9-11)–4, LS2 (Ext)–4													
• Diagramming the energy flow in an ecosystem that compares the energy at different trophic levels. (e.g. What inferences can you make about energy "loss"& use?).										I	R	A	A
• Explaining how the chemical elements and compounds that make up living things pass through food webs and are combined and recombined in different ways (e.g. nitrogen, carbon cycles, O_2, & H_2O cycles).										I	R	A	A
• Explaining the energy transfer with cells in photosynthesis and cellular respiration, tracking ATP production and consumption.											I	R	A
Demonstrate an understanding of recycling in an ecosystem by: LS2 (5-6)-7, LS2 (7-8)-7													
• Explaining the processes of precipitation, evaporation, condensation as parts of the water cycle.		I	R	A	A	A	A	A	A	A	A	A	A
• Completing a basic food web for a given ecosystem.					I	R	A	A	A	A	A	A	A
• Diagramming or sequencing a series of steps showing how matter cycles among and between organisms and the physical environment.							I	R	A	A	A	A	A
• Developing a model for a food web of local aquatic and local terrestrial environments.							I	R	A	A	A	A	A
• Explaining the inverse nature or complementary aspects of photosynthesis/respiration in relation to carbon dioxide, water and oxygen exchange.							I	R	A	A	A	A	A

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Conducting a controlled investigation that shows that the total amount of matter remains constant, even though its form and location change as matter is transferred among and between organisms and the physical environment (e.g., bottle biology, mass of a closed system over time).							I	R	A	A	A	A	A
Students will evaluate potential bias from a variety of media sources in how information is interpreted by: LS2 (9-11)–5													
• Analyzing claims from evidence and sources and evaluate based upon relevance, and validity.										I	R	A	A
• Applying additional scientific data to develop logical arguments concerning environmental issues (e.g. tobacco company vs. cancer society articles on effects of smoking, government/big business vs. environmental perceptions of global climate change).										I	R	A	A
Demonstrates an understanding of classification of organisms by: LS3 (5-6) – 8, LS3 (7-8) – 8, LS3 (9-11) – 8													
• Stating the value of, or reasons for, classification systems.						I	R	A	A	A	A	A	A
• Following a taxonomic key to identify a given organism (e.g. flowering and non-flowering plants).						I	R	A	A	A	A	A	A
• Sorting organisms with similar characteristics into groups based on internal and external structures.							I	R	A	A	A	A	A
• Explaining how species with similar evolutionary histories/characteristics are classified more closely together with some organisms than others (e.g., a fish and human have more common with each other than a fish and jelly fish)							I	R	A	A	A	A	A
• Recognizing the classification system used in modern biology.							I	R	A	A	A	A	A
• Using data or models (charts, diagrams, table, narratives etc.) to analyze how organisms are organized into a hierarchy of groups and subgroups based on evolutionary relationships. (e.g. creating a taxonomic key to organize a given set of examples).										I	R	A	A

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
Demonstrate their understanding of the degree of genetic relationships among organisms by: LS3 (9-11)-6, LS3 (Ext) -6													
• Using given data (diagrams, charts, narratives, etc.) and advances in technology to explain how our understanding of genetic variation has developed over time.										I	R	A	A
• Describing how the Human Genome Project has contributed to our understanding of both human heredity and the commonality of DNA sequences among organisms.											I	R	A
Demonstrate an understanding of Natural Selection/evolution by: LS3 (5-6) –9, LS3 (7-8) –9, LS3 (9-11) –7, LS3 (Ext) –7, LS3 (9-11) –8													
• Explaining how a population's or species' traits affect their ability to survive over time.						I	R	A	A	A	A	A	A
• Researching or reporting on possible causes for the extinction of an animal or plant.						I	R	A	A	A	A	A	A
• Explaining how fossil evidence can be used to understand the history of life on Earth.						I	R	A	A	A	A	A	A
• Explaining that genetic variations/traits of organisms are passed on through reproduction and random genetic changes.							I	R	A	A	A	A	A
• Gathering evidence that demonstrates evolutionary relationships among organisms (e.g., similarities in body structure, early development, traits).							I	R	A	A	A	A	A
• Differentiating between acquired and inherited characteristics and giving examples of each.							I	R	A	A	A	A	A
• Explaining how natural selection leads to evolution (e.g., survival of the fittest).							I	R	A	A	A	A	A
• Describing how scientists' understanding of the way species originate or become extinct has changed over time.							I	R	A	A	A	A	A
• Investigating how information is passed from parents to offspring by encoded molecules (e.g. evidence from electrophoresis, DNA fingerprinting).										I	R	A	A

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Investigating how the sorting and recombination of genes in sexual reproduction results in a great variety of possible gene combinations in the offspring of any two parents. (e.g. manipulate models to represent and predict genotypes and phenotypes, Punnett Squares, probability activities).										I	R	A	A
• Citing evidence of how natural selection and its evolutionary consequences provide a scientific explanation for the diversity and unity of past and present life forms on Earth.(e.g. Galapagos Islands, Hawaiian Islands, Australia, geographic isolation, adaptive radiation).										I	R	A	A
• Distinguishing the stages of mitosis and meiosis and how each contributes to the production of offspring with varying traits.										I	R	A	A
• Researching and reporting on the contributions of key scientist in understanding evolution and natural selection (e .g. Darwin, Wallace, Mendel).										I	R	A	A
• **Trace** the evolution and migration of **Homo *sapiens***											I	R	A
• Illustrating that when an environment changes, the survival advantage /disadvantage of some characteristics may change.										I	R	A	A
• Distinguish between microevolution (on small scale within a single population –e.g., change in gene frequency within a population) and macroevolution (on a scale that transcends boundaries of a single species – e.g., diversity of all beetle species within the order of insects) and explain how macroevolution accounts for speciation and extinction.										I	R	A	A
• Recognizing patterns in molecular and fossil evidence, to provide a scientific explanation for Natural Selection and its evolutionary consequences (e.g. survival, adaptation).										I	R	A	A
• Explain punctuated equilibrium as a model of evolution and contrast it with a more gradual model of evolution.											I	R	A
Demonstrate an understanding of human body systems by: LS4 (K-2)-8, LS4 (3-4)-8, LS4 (5-6)-10, LS4 (7-8)-10, LS4 (9-11)-10, LS4 (Ext)-10													
• Identifying the five senses and using senses to identify objects in the environment	I	R	A	A	A	A	A	A	A	A	A	A	A

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Observing, identifying, and recording external features of humans and other animals.		I	R	A	A	A	A	A	A	A	A	A	A
• Identifying the senses needed to meet survival needs for a given situation.		I	R	A	A	A	A	A	A	A	A	A	A
• Showing connections between external and internal body structures (i.e., organs and systems) and how they help humans survive.					I	R	A	A	A	A	A	A	A
• Comparing and analyzing external features and characteristics of humans and other animals.					I	R	A	A	A	A	A	A	A
• Identifying the biotic factors (e.g., microbes, parasites, food availability, aging process) that have an effect on human body systems.						I	R	A	A	A	A	A	A
• Identifying the abiotic factors (e.g., drugs, altitude, weather, pollution) that have an effect on human body systems.						I	R	A	A	A	A	A	A
• Predicting and explaining the effects of biotic factors (e.g., microbes, parasites, food availability, aging process) on human body systems.							I	R	A	A	A	A	A
• Predicting and explaining the effect of abiotic factors (e.g., drugs, environmental conditions) on human body systems.							I	R	A	A	A	A	A
• Explaining how the roles of the immune, endocrine, and nervous systems work together to maintain homeostasis.										I	R	A	A
• Investigating the factors that affect homeostasis (e.g. positive and negative feedback).										I	R	A	A
• Investigating and reporting on a human disease • and its consequential disruption of homeostasis • (e.g. diabetes, cancer, AIDS).											I	R	A
Demonstrates an understanding patterns of human health/disease by: LS4 (5-6)-10, LS4 (7-8)-10													
• Identifying the biotic (e.g., microbes, parasites, food availability, aging process) and abiotic (e.g., radiation, toxic materials, carcinogens) factors that cause disease and affect human health.						I	R	A	A	A	A	A	A

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Researching and reporting on how biotic (e.g., microbes, parasites, food availability, aging process) and abiotic (e.g., radiation, toxic materials, carcinogens) factors cause disease and affect human health.							I	R	A	A	A	A	A
Demonstrates an understanding of how humans are affected by environmental factors and/or heredity by: LS4 (9-11) –9, LS4 (Ext) –9													
• Researching scientific information to explain how such things as radiation, chemicals, and other factors can cause gene mutations or disease.										I	R	A	A
• Providing an explanation of how the human species impacts the environment and other organisms (e.g. reducing the amount of the earth's surface available to those other species, interfering with their food sources, changing the temperature and chemical composition of their habitats, introducing foreign species into their ecosystems, and altering organisms directly through selective breeding and genetic engineering).										I	R	A	A
• Using a computer simulation to study the effects of human activities on a particular environment (actual or model).										I	R	A	A
Demonstrates an understanding of human heredity by: LS4 (K-2) –9, LS4 (3-4) –9, LS4 (5-6)-11, LS4 (7-8)-11													
• Observing and comparing their physical features with those of parents, classmates and other organisms.		I	R	A	A	A	A	A	A	A	A	A	A
• Identifying that some behaviors are learned.		I	R	A	A	A	A	A	A	A	A	A	A
• Identifying similarities that are inherited from a biological parent.					I	R	A	A	A	A	A	A	A
• Identifying that some behaviors are learned and some behaviors are instinctive.					I	R	A	A	A	A	A	A	A
• Differentiating between inherited and acquired traits.						I	R	A	A	A	A	A	A
• Observing, recording and comparing differences in inherited traits (e.g. connected earlobe, tongue rolling).						I	R	A	A	A	A	A	A
• Recognizing that characteristics of an organism result from inherited traits of one or more genes from the parents and others result from interactions with the environment.							I	R	A	A	A	A	A

3. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Tracing a genetic characteristic through a given pedigree (e.g., genealogical chart, Queen Victoria – hemophilia or hypothetical example) to demonstrate the passage of traits.							I	R	A	A	A	A	A
• Identifying that genetic material (i.e. chromosomes and genes) is located in the cell's nucleus.							I	R	A	A	A	A	A
Demonstrate an understanding of patterns of human development by: LS4 (7-8) -12							I	R	A	A	A	A	A
• Identifying and sequencing the stages of human embryonic development.							I	R	A	A	A	A	A
• Describing the changes from one stage of embryonic development to the next.							I	R	A	A	A	A	A
• Comparing and contrasting embryonic development in various life forms (e.g., humans, frogs, chickens, sea urchins).							I	R	A	A	A	A	A
• Comparing the patterns of human development after birth to life stages of other species							I	R	A	A	A	A	A

4. Earth Science (Universe, Earth and Environment)													
Enduring Knowledge: The universe, earth and all earth systems have undergone change in the past, continue to change in the present and predicted to continue changing in the future.													
									I (Introduce), R (Reinforce/Expand), A (Apply)				
The Student:	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Demonstrate an understanding of earth materials by: ESS1 (K-2)–1, ESS1 (3-4) –1													
• Describing, comparing, and sorting rocks and soils by similar or different physical properties (e.g., size, shape, color, texture, smell, weight).		I	R	A	A	A	A	A	A	A	A	A	A
• Recording observations/data about physical properties.		I	R	A	A	A	A	A	A	A	A	A	A
• Using attributes of properties to state why objects are grouped together (e.g., rocks that are shiny or not shiny).		I	R	A	A	A	A	A	A	A	A	A	A
• Describing, comparing, and sorting rocks, soils, and minerals by similar or different physical properties (e.g., size, shape, color, texture, smell, weight, temperature, hardness, composition).				I	R	A	A	A	A	A	A	A	A
• Recording and analyzing observations/data about physical properties (e.g., within a grouping, which characteristics are the same and which are different).				I	R	A	A	A	A	A	A	A	A
• Citing evidence (e.g., prior knowledge, data) to support why rocks, soils, or minerals are classified/not classified together.				I	R	A	A	A	A	A	A	A	A
• Identifying the four basic materials of the earth (water, soil, rocks, air).				I	R	A	A	A	A	A	A	A	A
Demonstrates an understanding of processes and change over time within earth systems by: ESS1 (5-6)–1, ESS1 (7-8)–1, ESS1 (9-11)– 1, ESS1 (K-2) –2, ESS1 (3-4)–2, ESS1 (5-6)–2 , ESS1 (7-8)–2, ESS1 (9-11)–2													
• Identifying and describing the layers of the earth..					I	R	A	A	A	A	A	A	A
• Plotting location of volcanoes and earthquakes and explaining the relationship between the location of these phenomena and faults.									I	R	A	A	A
• Citing evidence and developing a logical argument for plate movement using fossil evidence, layers of sedimentary rock, location of mineral deposits, and shape of the continents.									I	R	A	A	A

4. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Plotting the location of mountain ranges and recent earthquakes and volcanic eruptions to identify any existing patterns.									I	R	A	A	A
• Conducting tests on how different soils retain water (e.g., how fast does the water drain through?).		I	R	A	A	A	A	A	A	A	A	A	A
• Conducting investigations and using observational data to describe how water moves rocks and soils.				I	R	A	A	A	A	A	A	A	A
• Diagramming, labeling and explaining the processes of the water cycle including evaporation, precipitation, and run-off, condensation, transpiration, and groundwater.						I	R	A	A	A	A	A	A
• Explaining how condensation of water vapor forms clouds which affects climate and weather.						I	R	A	A	A	A	A	A
• Developing models to explain how humidity, temperature, and altitude affect air pressure and how this affects local weather.						I	R	A	A	A	A	A	A
• Identifying composition and layers of earth's atmosphere.						I	R	A	A	A	A	A	A
Demonstrates an understanding of how the use of scientific tools helps to extend senses and gather data by: ESS 1(K-2)–3, ESS 1(3-4) –3													
• Using scientific tools to extend senses and gather data about weather (e.g., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).		I	R	A	A	A	A	A	A	A	A	A	A
• Explaining how the use of scientific tools helps to extend senses and gather data about weather (i.e., weather/wind vane: direction; wind sock: wind intensity; anemometer: speed; thermometer: temperature; meter sticks/rulers: snow depth; rain gauges: rain amount in inches).					I	R	A	A	A	A	A	A	A
• Selecting appropriate tools for a given task and describing the information they will provide.					I	R	A	A	A	A	A	A	A

4. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
Demonstrate an understanding of processes and change over time within earth systems by: ESS1 (5-6)–3, ESS1 (7-8)–3, ESS1 (9-11)–3, ESS1 (Ext.)–3, ESS1 (K-2) –4, ESS1 (3-4) –4, ESS1 (5-6)–4, ESS1 (7-8)–4, ESS1 (K-2) –5, ESS1 (3-4) –5													
• Describing events and the effect they may have on climate (e.g. El Nino, deforestation, glacial melting, and an increase in greenhouse gases).						I	R	A	A	A	A	A	A
• Evaluating slow processes (e.g. weathering, erosion, mountain building, sea floor spreading) to determine how the earth has changed and will continue to change over time.									I	R	A	A	A
• Evaluating fast processes (e.g. erosion, volcanoes and earthquakes) to determine how the earth has changed and will continue to change over time.									I	R	A	A	A
• Investigating the effect of flowing water on landforms (e.g. stream table, local environment).									I	R	A	A	A
• Explaining how heat (produced by friction, radioactive decay and pressure) affects the Rock Cycle.									I	R	A	A	A
• Explaining how convection circulations of the mantle initiate the movement of the crustal plates which then cause plate movement and seismic activity.									I	R	A	A	A
• Explaining how the physical and chemical processes of the Earth alter the crust (e.g. seafloor spreading, hydrologic cycle, weathering, element cycling).									I	R	A	A	A
• Describe how interaction of wind patterns, ocean currents, and mountain ranges results in the global pattern of latitudinal bands of rain forests and deserts.											I	R	A
• Use computer modeling/ simulations to predict the effects of an increase in greenhouse gases on earth systems (e.g. earth temperature, sea level, atmosphere composition).											I	R	A
• Observing and recording seasonal and weather changes throughout the school year.		I	R	A	A	A	A	A	A	A	A	A	A
• Investigating local landforms and how wind, water, or ice have shaped and reshaped them (e.g. severe weather).					I	R	A	A	A	A	A	A	A

4. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Using or building models to simulate the effects of how wind and water shape and reshape the land (e.g., erosion, sedimentation, deposition, glaciation).					I	R	A	A	A	A	A	A	A
• Identifying sudden and gradual changes that affect the Earth (e.g. sudden change = flood; gradual change = erosion caused by oceans).					I	R	A	A	A	A	A	A	A
• Explaining how differential heating and convection affect Earth's weather patterns.						I	R	A	A	A	A	A	A
• Describing how differential heating of the oceans affects ocean currents which in turn • influence weather and climate.						I	R	A	A	A	A	A	A
• Explaining the relationship between differential heating/convection and the • production of winds.						I	R	A	A	A	A	A	A
• Analyzing global patterns of atmospheric movements to explain effects on weather.						I	R	A	A	A	A	A	A
• Predicting temperature and precipitation changes associated with the passing of various fronts.						I	R	A	A	A	A	A	A
• Observing, recording, and summarizing local weather data.						I	R	A	A	A	A	A	A
• Observe how clouds are related to forms of precipitation (e.g., rain, sleet, snow).						I	R	A	A	A	A	A	A
• Observing, recording, comparing, and analyzing weather data to describe weather changes or weather patterns.						I	R	A	A	A	A	A	A
• Describing water as it changes into vapor in the air and reappears as a liquid when it's cooled.						I	R	A	A	A	A	A	A
• Explaining how this cycle of water relates to weather and the formation of clouds.						I	R	A	A	A	A	A	A
Demonstrate an understanding of processes and change over time by: ESS1 (9-11)—4, ESS1 (5-6)—5, ESS1 (7-8)—5													
• Describing various dating methods to determine the age of different rock structures.									I	R	A	A	A

4. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Calculating the age of a rocks from various regions using radioactive half life (given its constituent elements, isotopes and rate of decay) and using those values to provide evidence for geologic relationships between/among the regions.											I	R	A
• Investigating local landforms and comparing them with models created in the classroom.									I	R	A	A	A
• Analyzing samples of rock to determine the relative age of the rock structure.									I	R	A	A	A
• Representing the processes of the rock cycle in words, diagrams, or models.									I	R	A	A	A
• Citing evidence and developing a logical argument to explain the formation of a rock, given its characteristics and location. (e.g. classifying rock type using identification resources).									I	R	A	A	A
Demonstrates an understanding of properties of earth materials by: ESS1 (K-2) –6, ESS1 (3-4)-6													
• Identifying which materials are best for different uses (e.g., soils for growing plants, sand for the sand box).		I	R	A	A	A	A	A	A	A	A	A	A
• Determining and supporting explanations of their uses (e.g., best soils to grow plants, best building material for a specific purpose, determining which rock size will best prevent erosion).				I	R	A	A	A	A	A	A	A	A
Demonstrate an understanding of temporal or positional relationships between or among the Earth, sun, and moon by: ESS2 (K-2) –7, ESS2 (3-4)-7, ESS2 (5-6)-8, ESS2 (7-8) -8													
• Observing that the sun can only be seen in the daytime, but the moon can be seen sometimes at night and sometimes during the day.			I	R	A	A	A	A	A	A	A	A	A
• Observing that the sun and moon appear to move slowly across the sky.			I	R	A	A	A	A	A	A	A	A	A
• Observing that the moon looks slightly different from day to day.			I	R	A	A	A	A	A	A	A	A	A
• Observing that the sun, moon, and stars appear to move slowly across the sky			I	R	A	A	A	A	A	A	A	A	A
• Observing that the moon looks slightly different from day to day, but looks the same again in about 4 weeks.					I	R	A	A	A	A	A	A	A

4. Continued	K	1	2	3	4	5	6	7	8	9	10	11	12
• Recognizing that the rotation of the Earth on its axis every 24 hours produces the day/night cycle.			I	R	A	A	A	A	A	A	A	A	A
• Using models to describe the relative motion/position of the Earth, sun and moon.					I	R	A	A	A	A	A	A	A
• Explaining night/day, seasons, year, and tides as a result of the regular and predictable motion of the Earth, sun, and moon. using a model of the Earth, sun and moon to recreate the phases of the moon.									I	R	A	A	A
• Using or creating a model of the Earth, sun and moon system to show rotation and revolution.									I	R	A	A	A
• Explaining night/day, seasons, year, and tides as a result of the regular and predictable motion of the Earth, sun, and moon.					I	R	A	A	A	A	A	A	A
• Using a model of the Earth, sun and moon to recreate the phases of the moon.									I	R	A	A	A
Demonstrate an understanding of characteristics of the solar system by: ESS2 (3-4)-8, ESS2 (5-6)-6, ESS2 (7-8) -6													
• Identifying and comparing the size, location, distances, and movement (e.g. orbit of planets, path of meteors) of the objects in our solar system.					I	R	A	A	A	A	A	A	A
• Comparing the composition, atmosphere, and surface features of objects in our solar system.					I	R	A	A	A	A	A	A	A
• Recognizing that: the sun is the center of our solar system; the Earth is one of several planets that orbits the sun; and the moon orbits the Earth.			I	R	A	A	A	A	A	A	A	A	A
• Recognizing that it takes approximately 365 days for the Earth to orbit the sun.					I	R	A	A	A	A	A	A	A
Demonstrate an understanding of how technological advances have allowed scientists to re-evaluate or extend existing ideas about the solar system by: ESS2 (7-8) -7													
• Identifying major discoveries from different scientists and cultures and describing how these discoveries have contributed to our understanding of the solar system (e.g. timeline, research project, picture book).									I	R	A	A	A

Demonstrates an understanding of temporal or positional relationships between or among the Earth, sun, and moon and the stars by: ESS2 (Ext.) -X	**K**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
• Explaining their role in navigation, beginning with ancient civilizations, advancing through 19th century mathematical celestial navigation, to current Global Positioning Systems.											**I**	**R**	**A**
Demonstrate an understanding of gravitational relationships between or among objects of the solar system by: ESS2 (5-6) –8, ESS2 (7-8) -8													
• Defining the Earth's gravity as a force that pulls any object on or near the Earth toward its center without touching it.					**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• Describing the relationship between mass and the gravitational force between objects.									**I**	**R**	**A**	**A**	**A**
• Describing the relationship between distance and the gravitational force between objects.									**I**	**R**	**A**	**A**	**A**
• Explaining that the sun's gravitational pull holds the Earth and other planets in their orbits, just as the planet's gravitational pull keeps their moons in orbit									**I**	**R**	**A**	**A**	**A**
Demonstrates understanding of processes and change over time within the system of the universe (Scale, Distances, Star Formation, Theories, Instrumentation) by: ESS3 (K-2) –9, ESS3 (3-4) –9													
• Observing that there are more stars in the sky than can easily be counted, but they are not scattered evenly and not all the same in brightness.			**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• Recognizing that throughout history people have identified patterns of stars that we call constellations.					**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
Demonstrate an understanding of the structure of the universe by: ESS3 (5-6)–9, ESS3 (7-8)–9													
• Describing the apparent motion/position of the objects in the sky. (e.g. constellations, planets).					**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• Identifying the sun as a medium-sized star located near the edge of a disk-shaped galaxy of stars.					**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**
• Describing the universe as containing many billions of galaxies, and each galaxy contains many billions of stars.					**I**	**R**	**A**	**A**	**A**	**A**	**A**	**A**	**A**

Demonstrates an understanding of the origins and evolution of galaxies and the universe by: ESS3 (9-11)–5, ESS3 (Ext.)–5	K	1	2	3	4	5	6	7	8	9	10	11	12
• Using appropriate prompts (diagrams, charts, narratives, etc.) students will explain how scientific knowledge regarding the structure of the universe has changed over time due to advances in technology which accumulates new evidence to redefine scientific theories and ideas.									I	R	A	A	A
• **Comparing** the processes involved in the life cycle of stars (e.g. gravitational collapse, thermonuclear fusion, nova) and evaluate supporting evidence.											I	R	A
Demonstrate an understanding of the formation of the universe by: ESS3 (9-11)–6													
• using data (diagrams, charts, narratives, etc.) to explain how the "Big Bang" theory has developed over time citing evidence to support its occurrence (Doppler Effect/red shift).									I	R	A	A	A