SCIENCE GRADE LEVEL 4	**YEAR AT A GLANCE** **Student Learning Outcomes by Unit** **2016-2017**

UNIT: **Magnetism & Electricity** **Dates:**	**Overarching/general themes:** **Magnets and magnetic interactions; attraction and repulsion; circuits – open, closed, parallel, series; electromagnet**	
Networks A & B - 9/8 to 11/30 **Networks C & F - 3/21 to 6/13** **Networks D & E - 12/7 to 3/14**	**Textual References** **Magnetism & Electricity** **Teacher's Guide (FOSS)**	**To Demonstrate Proficiency by the End of the Unit Students Will:**
4 Sessions, 1-2 weeks	**Investigation 1** The Force	• Observe magnetic interactions by sorting objects based on whether or not they are affected by a magnet. Use evidence from this experiment to write a claim about whether or not objects are made of iron. • Measure the force of attraction between magnets by recording and organizing the results of investigations in the science notebook. (PS-4) • Produce clear and coherent writing and science talk in which the development and organization are appropriate to a scientific audience. Observations/inferences may include: magnetic interactions are caused by the magnetic force; magnets display forces of attraction and repulsion that decrease with distance; magnetism can be induced in a piece of steel that is close to or touching a magnet.
4 Sessions, 1-2 weeks	**Investigation 2** Making Connections	• Recognize that electricity flows through pathways called circuits that require a complete loop through which an electrical current can pass by building a "test circuit" and closing the circuit with test objects. (PS-6) • Identify and classify objects and materials that conduct electricity and objects and materials that are insulators of electricity by predicting, testing, and sorting test objects based on their ability to conduct electricity. Use precise language and scientific vocabulary to explain this distinction in a notebook. (PS-7) • Demonstrate that a switch is a device used to open and close circuits by constructing a circuit that can be opened (incomplete electric pathway) and closed (complete pathway), and illustrating the components of these circuits with technical drawings. (PS-6) • **Close Reading: FOSS Science Stories, *Making Static***
3 Sessions, 1-2 weeks	**Investigation 3** Advanced Connections	• Observe the functioning of different kinds of circuits by comparing the brightness of bulbs in both series and parallel circuits, and documenting their findings with words and technical drawings. • Determine the defining characteristics of series (only one pathway for current flow is a series circuit--components "share" the electric energy) and parallel circuits (two or more pathways for current flow) by assembling each type, and writing informative texts to convey ideas in notebooks. Use precise language and concrete details in the writing, and illustrations to aid comprehension. (PS-6) • Provide examples of how energy can be transferred from one form to another by analyzing and solving circuitry problems. Routinely write and draw in a science notebook, over short time frames, to document their solutions to these problems. (PS-5) • Demonstrate that electricity can produce light, heat, and sound by arranging circuits so that the components (light bulb, motor, etc) each have a direct pathway to the energy source. Analyze circuits to determine the energy transfers taking place then write a claim and support that point of view with reasons and evidence. (PS-5, PS-6) • **CWA: *Which circuit will light two bulbs?***

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3 Sessions, 1-2 weeks	**Investigation 4** Current Attractions	• Observe the interaction between an electromagnet and objects by constructing an electromagnet and describing the process and results of the investigation in their notebook. • Compare the strength of different electromagnet designs by systematically investigating ways to strengthen electromagnets (changing the number of winds of wire around the core, etc). Compare the strength of different electromagnet designs by conducting experiments with multiple trials, averaging results, and displaying results in a graph. • Recognize that a core of iron or steel becomes an electromagnet when electricity flows through a coil of insulated wire surrounding it by building an electromagnet and describing their investigation using precise language and illustrations in a notebook.
3 sessions, 1-2 weeks	**Investigation 5** Click It	• Identify that technology is the application of science by designing and describing electromagnets. (TE-2.2) • Explore the behavior of an electromagnet under different conditions by solving circuitry problems, collecting and interpreting data, and describing findings using words and pictures. • Apply knowledge of electromagnets by placing an electromagnet in a complete circuit to make a telegraph. In this telegraph system, a switch can serve as a key. • Recognize that a code is a symbolic system used for communication by encoding and decoding clicks produced by a telegraph, and documenting their coded information in their notebook.

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UNIT: Motion & Design **Dates:**	**Overarching/general themes: Physics of motion; engineering/technological design; technical two-view and three-view drawings; design process; cost analysis; friction; kinetic and potential energy; effect of gravity on motion**	
Networks A & B - 12/7 to 3/14 **Networks C & F - 9/8 to 11/30** **Networks D & E - 3/21 to 6/13**	**Textual References** **Motion & Design** **Teacher's Guide (STC)**	**To Demonstrate Proficiency by the End of the Unit Students Will:**
2 Sessions, 1 week	**Investigation 1-2** Technological design and technical drawings	• Recognize that a force is any push or pull on an object, and that an unbalanced force is needed to make a resting object move, to bring a moving object to rest, or to change the direction of a moving object. • Assemble a K'nex vehicle from technical two- and three-view drawings, and document different ways to make it move. • Observe how an object moves and describe its motion (and changes in motion) by using words and pictures to describe the movement of a K'nex vehicle, and recording all new vehicle designs by drawing.
3-4 Sessions, 2 weeks	**Investigation 3-5** Forces push and pull	• Describe how a force can change the speed of an object (greater forces can change the speed of an object faster than smaller forces) by measuring the time it takes a vehicle to move a given distance, collecting and organizing data in their notebook, and describing the results using words and pictures. (PS-5) • Demonstrate the relationship between the mass of an object and the force needed to change its speed (the speed of the lighter vehicle will change more than the speed of the heavier vehicle) by applying the same force to a lighter vehicle and a heavier vehicle. They will collect and analyze data from this experiment, and synthesize this information to write an argument on this topic, and support their claim with reasons and evidence. • **Close Reading: STC Reading: *Lunar Rover Making Tracks On The Moon***
7-10 Sessions, 3-4 weeks	**Investigation 6-12** Forces and energy	• Give examples of how energy can be transferred from one form to another. Describe the relationship between the amount of stored energy and the amount of kinetic energy associated with a vehicle by collecting and organizing data, and analyzing this data, predicting the effect of an applied force on how a vehicle moves, and using this information to support a claim about the energy being transformed. (PS-1, PS-5) • Discover that a spinning propeller exerts a force that pushes air back and moves a vehicle forward by constructing a propeller-driven vehicle, and describe the process by which the propeller makes the vehicle move. • Identify that friction is a force that opposes motion, and occurs when two surfaces rub together, by identifying sources of friction on their vehicle, and documenting their work in their notebook. • Recognize that air resistance is a force that can slow the speed of a moving vehicle by conducting an experiment and analyzing the data in their notebook. • **CWA: *Can you make this K'nex vehicle travel farther?***
5-7 Sessions, 2-3 weeks	**Investigation 13-17** Evaluating technological designs	• Identify materials used to accomplish a design task by designing, building, testing, and modifying vehicles to meet design requirements. Consider many design requirements and concerns, such as friction, intended performance, cost, type of energy available, results of previously collected data, etc. Record and compare the distance a vehicle travels under various conditions in order to help design vehicles to meet design requirements. (TE-1.1, TE-1.2) • Recognize that engineers develop, modify, and improve designs to meet specific requirements by completing design challenges, and communicating the results of their investigation through record sheets, written observations, drawings, and/or class discussions. (TE-1.1, TE-1.2)

SCIENCE GRADE LEVEL 4	**YEAR AT A GLANCE** **Student Learning Outcomes by Unit** **2016-2017**

UNIT: Animal Studies **Dates:**	**Overarching/general themes:** **Animal structure, habitat, survival needs, behavior relative to humans, respect for and care of living things**	
Networks A & B - 3/21 to 6/13 **Networks C & F - 12/7 to 3/14** **Networks D & E - 9/8 to 11/30**	**Textual References** **Animal Studies** **Teacher's Guide (STC)**	**To Demonstrate Proficiency by the End of the Unit Students Will:**
1-2 Sessions, 1 week	**Investigation 1-2** The nature of a habitat	• Discover that one way that scientists learn about animals is through close observation over an extended period of time by conducting their own long-term animal observations, and documenting their findings using domain specific vocabulary, details, and clarifying illustrations. Recognize that when scientists conduct animal behavior research, they follow guidelines to ensure the accuracy of results and the safety of the animals. • Identify that a habitat is the place where an animal finds the resources—food, water, shelter, and space—necessary to survive and reproduce by constructing several animal habitats to maintain animals outside their natural habitats. • Use the classroom habitats to complete animal research questions, and as a source for writing routinely over extended periods of time. Compare these habitats to describe how each type of animal has specific needs, such as type of food, amount of water, and range of temperature, and infer how changes in the environment (drought, cold) have caused some plants and animals to die or move to new locations (migration). (LS-7)
6-8 Sessions, 2-3 weeks	**Investigations 3-8** Structures, behaviors and adaptation	• Describe how certain behaviors and body structures enable animals to survive in a particular habitat by completing descriptive writing about and illustrations of the structures of frogs, fiddler crabs, and millipedes in their notebooks. They will recognize that humans are one of the only animals that can significantly change their behaviors to live in a variety of habitats, and that some behaviors are instinctive (e.g., turtles burying their eggs), while others are learned. (LS-8, LS-10) • Give examples of how inherited characteristics may change over time as adaptations to changes in the environment that enable organisms to survive by observing and describing structural characteristics and behaviors of the dwarf African frog, fiddler crab, and millipede. (LS-6)
3-4 Sessions, 1-2 weeks	**Investigations 9-11** Structures, behaviors and environment	• Develop animal research questions and answer them through behavioral observation and research. They will record observations in an animal log or science notebook, and compare and contrast the habitats, structures, and behaviors of the dwarf African frog, fiddler crab, millipede, and human. • Describe how organisms meet some of their needs in an environment by using behaviors (patterns of activities) in response to information (stimuli) received from the environment by collecting, analyzing, and drawing conclusions from animal behavior observations and data. (LS-8) • **CWA: *Could an African dwarf frog survive in a fiddler crab's habitat?***

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Networks A & B - 3/21 to 6/13 **Networks C & F - 12/7 to 3/14** **Networks D & E - 9/8 to 11/30**	**Textual References** **Animal Studies** **Teacher's Guide (STC)**	**To Demonstrate Proficiency by the End of the Unit Students Will:**
6-10 Sessions, 3-4 weeks	**Investigations 12-17** Survival in a particular habitat	• Support conclusions about animal behaviors and habitat needs with reasons that are based on observation and experience. Throughout the unit, students will communicate ideas through writing and discussion. • Predict, observe, and record the results of a simple experiment to test an animal's response to a sudden change in its habitat. • Enhance understanding of the interaction between an animal and its habitat by reading non-fiction texts, and providing references to details and/or examples as appropriate when explaining inferences drawn from the text or explaining what the text says explicitly. (LS-9) • Apply knowledge about plants and animals to what they know about themselves by making a drawing and/or writing a sentence about a similarity and a difference between both themselves and a plant; and themselves and an animal. • Care for plants and animals outside their natural environments to develop a positive attitude toward living things. • **Close reading: STC reading selection *What Makes Beavers Special***

SCIENCE GRADE LEVEL 4	**YEAR AT A GLANCE** **Student Learning Outcomes by Unit** **2016-2017**

UNIT: Rocks and Minerals **Dates:**	Overarching/general themes: Rock and Mineral types and properties; geologists' field tests; identification; formation; classification – metamorphic, sedimentary, igneous	
Networks A & B - 9/8 to 11/30 **Networks C & F - 12/7 to 3/14** **Networks D & E - 3/21 to 6/13**	**Textual References** **Rocks and Minerals** **BPS-developed Unit**	**To Demonstrate Proficiency by the End of the Unit Students Will:**
9 Sessions over 2 weeks; Teachers choose a timeframe within the dates identified for each network, usually while waiting for unit delivery.	Teacher Guide written by BPS teachers.	• Explain that rocks are composed of earth materials called minerals that cannot be physically broken apart any further. (ES-1) • Identify the physical properties of minerals (hardness, color, luster, cleavage, and streak), and explain how minerals can be tested for these different physical properties by using these properties to seriate minerals. (ES-2) • Identify the three categories of rocks based on how they are formed, and explain the natural and physical processes that create these rocks by observing and classifying different rock samples. (ES-3)