Magnetism and Electricity Unit Design - Grade 4

The **Magnetism and Electricity Module** consists of five sequential investigations, each designed to introduce or reinforce concepts in physical science, particular with the forces associated with magnetism & electricity. Strong math alignment with NECAP also is fostered..

RI Statements of Enduring Knowledge - (Established Goals):
PS1 -All living and nonliving things are composed of matter having characteristics properties that distinguish one substance from another (independent of size or amount of substance).
PS 2 Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed.

PS 3 The motion of an object is affected by forces.

Related Rhode Island GSE's (Understandings)	**RI Assessment Targets** Assessment Evidence
PS1 (3-4)-1 **Students demonstrate an understanding of characteristic properties of matter by…** **1a** identifying, comparing, and sorting objects by similar or different physical properties (e.g., size, shape, color, texture, smell, weight, temperature, flexibility). **1b** citing evidence (e.g., prior knowledge, data) to support conclusions about why objects are grouped together. **PS2 (3-4)–4** **Students demonstrate an understanding of energy by…** **4d** building a complete circuit; drawing and labeling diagrams of electrical circuits; and explaining what makes a complete circuit. **4e** using experimental data to classify a variety of materials as conductors or insulators.	***PS1 (K-4) – INQ–1*** *Collect and organize data about physical properties in order to classify objects or draw conclusions about objects and their characteristic properties (e.g., temperature, color, size, shape, weight, texture, flexibility).* Investigation 1, Part 1, pp. 8-17 Investigation 2, Part 3, pp. 20-25 ***PS2 (K-4) SAE –4*** *Given a specific example or illustration (e.g., simple closed circuit, rubbing hands together), predict the observable effects of energy (i.e., light bulb lights, a bell rings, hands warm up (e.g., a test item might ask, "what will happen when…?)* Investigation 2, Parts 1-2, pp. 8-19 Investigation 3, Parts 1-2, pp. 10-21

PS3 (K-2)–8 **Students demonstrate an understanding of (magnetic) force by…** **8a** observing and sorting objects that are and are not attracted to magnets. **PS3 (3-4)-8** **Students demonstrate an understanding of (magnetic) force by…** **8a** using prior knowledge and investigating to predict whether or not an object will be attracted to a magnet. **8b** describing what happens when like and opposite poles of a magnet are placed near each other. **8c** exploring relative strength of magnets (e.g., size of magnets, number of magnets, properties of materials).	***PS3 (K-4) INQ+SAE-8*** *Use observations of magnets in relation to other objects to describe the properties of magnetism (i.e., attract or repel certain objects or has no effect)* Investigation 1, Part 1, pp. 8-17 Science Stories, pp. 6-8

Investigation-Time (45 min periods)	Investigation	Focus Questions (Essential Questions)	Big Ideas (Understandings)
1.1-(2)	Investigating Magnets and Materials	• What kind of materials do magnets stick to? • What happens when you bring two or more magnets together?	• Only iron sticks to a magnet. • Two magnets attract or repel when they interact. • The magnetic force causes magnetic interactions. • A force is a push or a pull.
1.2-(2)	Investigating More Magnetic Properties	• How do magnets interact with other objects? • Does an iron object have to touch a magnet? • Does magnetic force go through all materials?	• Magnetism can be induced only in iron or steel (or a few other metals.) • The magnetic force acts through space and most materials. • The magnetic force of attraction between two magnets decreases with distance.
1.3-(2)	Breaking the Force	• How can we measure the force of attraction between two magnets?	• The greater the distance between two magnets, the less the magnetic force. • Magnetic fields act right through cardboard.
1.4-(2)	Detecting the Force of Magnetism	• Can you figure out where two magnets are taped in a box without looking?	• Compasses, iron filings, and iron objects can detect a magnetic field.

Investigation-Time (45 min periods)	Investigation	Focus Questions (Essential Questions)	Big Ideas (Understandings)
2-(4)	Making Connections		• A closed circuit is a pathway that allows electricity to flow; an open circuit does not. • Conductors are materials that allow the flow of electricity; insulators are materials that do not allow the flow of electricity. • A switch is a device that opens and closes a circuit.
2.1-(2)	Lighting a Bulb	• How can you get electricity from a source to a receiver? • Where do connections need to be made? • How does electricity flow through a circuit?	• A D cell is a source of electric energy. • A bulb is an energy receiver that produces light. • A circuit is a pathway through which electric current flows.
2.2-(2)	Making a Motor Run	• How can you get electricity from a source to a receiver? • How is the motor circuit like the light bulb circuit? How is it different? • What does a switch do in a circuit?	• A motor is an energy receiver that produces motion. • A switch is a device that opens and closes a circuit. • A schematic diagram is a representation of a circuit that is used for recording and communicating with others.
2.3-(1)	Finding Conductors and Insulators	• Can any of the test objects complete a circuit? • How much of the classroom environment is made of conductors?	• Materials that allow the flow of electricity are conductors. • Materials that do not allow the flow of electricity are insulators. • All metals are conductors.
2.4-(1)	Investigating Mystery Circuits	• Can you use your knowledge of electricity to discover which paper fasteners are connected by wires?	• Students can demonstrate their knowledge of circuits by identifying hidden connections on a mystery board.
3	Advanced Connections		• An electrical circuit is a pathway along which electricity flows. • A series circuit has only one pathway while a parallel circuit has two or more pathways.
3.1-(2)	Building Series Circuits	• Can you get two bulbs to light at the same time? • Can you make two lights bright in a series circuit?	• A circuit with only one pathway for current flow is a series circuit. • Components in a series circuit “share” the electric energy. • Cells in series must be oriented in the same direction in order to work.
3.2-(2)	Building Parallel Circuits	• Can you light two bulbs brightly with just one battery? • How many different ways can you wire a parallel circuit?	• A parallel circuit splits into two or more pathways before coming back together at the battery. • Components in a parallel circuit each have a direct pathway to the energy source.
3.3-(2)	Solving the String-of- Lights Problem	• Which design is better for manufacturing long strings of tree lights – series or parallel?	• A parallel circuit will allow the rest of the bulbs to remain lighted when one bulb burns out.

Investigation-Time (45 min periods)	Investigation	Focus Questions (Essential Questions)	Big Ideas (Understandings)
4	Current Attractions		• Electromagnetism is magnetism created by current flowing through a conductor. • Electromagnetism can be turned on and off..
4.1-(1)	Building an Electromagnet	• Can you make an electromagnet that turns on and off?	• A magnet can be made by winding an insulated wire around an iron core and running current through the wire. • The magnetism produced by an electromagnet can be turned on and off.
4.2-(2)	Changing Number of Winds	• How does the number of winds of wire around a core affect the strength of the magnetism?	• The greater the number of winds around the iron core, the stronger the magnetism produced. • A graph can be used to make predictions.
4.3-(1)	Investigations More Electromagnets	• How can the strength of an electromagnet be changed?	• There are many ways to change the strength of an electromagnet, including tighter coils, number of D-cells, different wire gauge. • Wire used to make an electromagnet must be insulated. • All wire coils must be wound in the same direction.
5-(2-3)	Click It		• Science is knowledge of the natural world; technology is using scientific knowledge to modify the world to solve human problems. • Electromagnetism is magnetism created by current flowing through a conductor.
5.1-(2)	Reinventing the Telegraph	• Can you use your knowledge of electricity and electromagnetism to reinvent the telegraph?	• People learn about the natural world through scientific practices and use that knowledge to meet human needs such as communication. • A code is a symbolic system for communication.
5.2-(1)	Sending Messages Long-Distance	• Can you connect two telegraph systems to send messages back and forth to another group?	• Connecting two telegraphs for two-way communication requires two complete circuits.