Magnetism and Electricity (PHYSICAL SCIENCE)

Full Option Science System (FOSS)

Eight to Ten Weeks

Students explore permanent magnetism, electric circuits (series and parallel), and electromagnetism through free exploration and systematic investigations. They observe and compare electric and magnetic phenomena, and organize their observations on a graph.

The student goals for Magnetism and Electricity are

1. Observe the interaction of permanent magnets with a variety of common materials.
2. Discover that magnets display forces of attraction and repulsion.
3. Measure the change in force between two magnets as the distance between them changes.
4. Identify materials that are conductors and insulators.
5. Understand and construct simple open, closed, parallel, and series circuits.
6. Lean how to make an electromagnet.
7. Experience the relationship between the number of turns of wire around an electromagnet core and the strength of the magnetism.
8. Use their knowledge of electromagnets to make a telegraph.
9. Acquire vocabulary associated with magnetism and electricity.
10. Exercise language, math, and social studies skills in the context of magnetism and electricity investigations.
11. Develop and refine the manipulative skills required for making investigations.
12. Use scientific thinking processes to conduct investigations and build explanations: observing, communicating, comparing, and organizing.

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GOAL/OBJECTIVE: Students will experiment with magnets to examine the interaction of magnets with common materials, discover magnetic force and measure the force of attraction between magnets.

ABACUS CORRELATED OBJECTIVE (S):

THEME/CONTENT	STATE / NATIONAL **STANDARDS**	**ACTIVITIES** EXAMPLES OF THE TYPE OF WORK STUDENTS SHOULD BE ABLE TO DO TO MEET THE STANDARDS AND CUMULATIVE PROGRESS INDICATORS	REFERENCES FOR CROSS-CONTENT **CONNECTIONS**/ TEACHER'S NOTES	LINKED **RESOURCES** MULTIMEDIA BIBLIOGRAPHY WEB LINKS
THEME: **Magnetic and Electricity (FOSS)** **Investigation – 1: The Force** CONTENT: **Magnets** • Properties • Magnetism • Magnetic Forces • Induced magnetism • Temporary magnets • Graph • Intersection	STATE **5.1** A 1, 2, 3, 4 B 1, 2 C 1, 2 **5.3** B 1, 2 D 1 **5.4** B 1 **5.7** A 2 NATIONAL A Inquiry B Physical E Technology F Per. & Soc. Perspective G History and Nature	**Part 1:** Investigating Magnets and Materials • Use a magnet to detect objects that contain iron. • Explore magnetic interactions – attract and repel. • Record results and observations on student sheet 3. • Read FOSS Science Stories page 1 through 4. • Write glossary terms. **Part 2:** Investigating More Magnetic Properties • Explore how magnets interact with other objects. • Observe and share observations on induced magnetism and temporary magnets. • Work on Student Sheet 4. • Read FOSS Science Stories page 5 **Part 3:** Breaking the Force • Investigate changes in the force of attraction between 2 magnets. • Measure the force of attraction between 2 magnets in relation to the distance between them. • Record data on graph, Student Sheet 4. **Part 4:** Detecting the Force of Magnetism • Explore ways to detect magnetic force, using compasses and iron filings. • Record results on Student Sheet 6. **Assessment:** Teacher's Guide – Investigation 1 - page 3	**Readings FOSS:** **Part 1** Magnets Get Stuck **Part 2** Magnificent Magnetic Modules. **Part 4** • How Magnets interact. **Reference Readings:** • What Makes A Magnet – Franklin Branley • Martas' Magnets – Wendy Pfeffer **Extension:** Teacher's Guide – Investigation 1 - page 35 & 36.	**WEB:** www.fosweb.com

GOAL/OBJECTIVE: Students will assemble circuits, identify flow of current & discover insulators & conductors.

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THEME: **Magnetic and Electricity (FOSS)** **Investigation – 2: Making Connection** CONTENT: • D. Cell / battery • Electricity receiver • Circuits - Closed, open • Filament • Insulators & conductors • Switch • Schematic charge	STATE **5.1** A 1, 2, 3, 4 B 1, 2 C 1, 2 **5.2** A 1 B 1 **5.3** D 1 **5.4** B 1 C 1, 2 **5.7** B 3 NATIONAL A Inquiry B Physical E Technology F Per. & Soc. Perspective G History and Nature	**Part 1:** Lighting A Bulb • Build and compare simple circuits. • Identify components of an electricity circuit. • Complete the circuit diagram and explanation on Student Sheet 7 – The Flow of Electricity. **Part 2:** Making a Motor Run • Demonstrate and illustrate evidence of the flow of electricity. • Compare closed & open circuit – Response Sheet 9 • Draw a Schematic diagram Student Sheet – 8 • Complete Response Sheet - 9 **Part 3:** Finding Insulation & Conductors • Build a circuit to identify conductors and insulators. • Read FOSS Science Stories page 8 & 9 • Complete Student Sheet 10. **Part 4:** Investigating Mystery Circuits • Work with mystery boards to check for conductors and the flow of electricity through a circuit. • Work on Student Sheet 11 & 12. • Read FOSS Science Stories page 10 **Assessment:** Teacher's Guide, **Investigation – 2:** page 3	**Readings FOSS:** **Part 3** • Making Static. • Benjamin Franklin. **Part 4** • Two Reference Sources about Edison. **Reference Readings:** Discovering Electricity – Rae Bains **Extension:** Teacher's Guide – Investigation 2 - page 30, 31, 32	**WEB:** www.fosweb.com **VIDEO** • Benjamin Franklin. – Scientist & Inventor. • Thomas Edison & the Electric Light.

GOAL/OBJECTIVE: Students will assemble and compare series & parallel circuits, and test different circuit designs.

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THEME: **Magnetic and Electricity (FOSS)** **Investigation – 3 Advanced Connections.** CONTENT: **Circuits:** • Series • Parallel • Components	STATE **5.1** A 1, 2, 3, 4 B 1, 2 C 1, 2 **5.3** D 1 **5.4** B 1 C 1, 2 **5.7** B 3 NATIONAL A Inquiry B Physical E Technology F Per. & Soc. Perspective G History and Nature	**Part 1:** Building Series Circuits • Find ways to operate more than one component in a circuit. • Assemble a series circuit to make 2 bulbs shine brightly with 2 D Cells. • Record reasons on Student Sheet 15 • Read FOSS Science Stories pages 12 through 15. **Part 2:** Building Parallel Circuits • Find another way to operate two components in a circuit. • Assemble a parallel circuit to make 2 bulbs glow with 1 D Cell. • Record Reasons on Student Sheet 15 • Complete Response Sheet - 16 • Read FOSS Science Stories page 16. **Part 3:** Solving the String of Lights Problem: • Simulate the research and development department of decorative light manufacturers. • Test circuit designs. • Build long strings of light. • Complete Student Sheet 17 **Assessment:** Teacher's Guide Investigation 3 - page 3	**Readings FOSS:** **Part 1** Illuminating Team Work **Part 2** • A true Pioneer Latimer Lewis Howard **Reference Readings:** Electricity – John & Janet Clemence **Extension:** Teacher's Guide – Investigation 3 - page 27 & 28	**WEB:** www.fosweb.com

GOAL/OBJECTIVE: Students will construct an electromagnet; examine the effect of the turns of the wire on the strength

of the magnet. Students will design and conduct an experiment to discover other ways to develop the strength of an electromagnet.

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THEME: **Magnetic and Electricity (FOSS)** **Investigation – 4 Current Attractions** CONTENT: **Circuits:** • Electromagnet and Electromagnetism. • Core. • Coil. • Changing the strength of an electromagnet.	STATE **5.1** A 1, 2, 3, 4 B 1, 2 C 1, 2 **5.3** B 1 D 1 **5.4** B 1 C 1, 2 **5.7** A 2 B 3 NATIONAL A Inquiry B Physical E Technology F Per. & Soc. Perspective G History and Nature	**Part 1:** Building an Electromagnet • Discover that when current flows through an insolated wire wound around a steel core, the steel core becomes a magnet. • Find the placement of the wire on the rivet that makes the strongest electromagnet. • Read FOSS Science Stories page 17 through 19. **Part 2:** Changing Number of Winds • Experiment to find the relation between the number of turns of wire and the strength of the magnet. • Graph, and predict the results on Student Sheet – 18 • Complete Response Sheet – 19. • Read FOSS Science Stories page 20 through 23. **Part 3:** Investigating More Electromagnets • Investigate other ways to change the strength of an electromagnet. • Design & conduct an experiment. • Read FOSS Science Stories page 24 & 25. • Record answers on Student Sheet 20. **Assessment:** Teacher's Guide – Investigation 4 page 3	**Readings FOSS:** **Part 1** • From Rags to Science – Michael Faraday. **Part 2** • How Electro Magnetism stopped a war. **Part 3** • Magnets and electricity in your life. **Reference Readings:** Electricity & Magnetism – Peter Adamczyk & Paul Francis Law **Extension:** Teacher's Guide Investigation 4 page 23	**WEB:** www.fosweb.com

GOAL/OBJECTIVE: Students will apply knowledge of circuitry and electromagnets to assemble a telegraph that helps to communicate.

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THEME: **Magnetic and Electricity (FOSS)** **Investigation – 5 Click It.** CONTENT: **Circuits:** • Technology • Telegraph • Code	STATE **5.1** A 1, 2, 3, 4 B 1, 2 C 1, 2 **5.3** B 1 D 1 **5.4** B 1 C 1, 2 **5.7** A 2 B 3 NATIONAL A Inquiry B Physical E Technology F Per. & Soc. Perspective G History and Nature	**Part 1:** Reinventing the Telegraph. • Build a telegraph. • Share experience. • Invent a code. • Use then telegraph to send a single word message. • Use Student Sheet 21. **Part 2:** Sending Messages • Connect two telegraphs to communicate with one another. • Develop procedural codes. • Use Student Sheet 22. • Read FOSS Science Stories page 26 through 29. **Part 3:** Choosing Your Own Investigation: • Review magnet and electricity. • Identify, design & conduct an investigation. • Present results of the project. **Assessment:** Teacher's Guide investigation 5 page 3	**Readings FOSS:** **Part 2** • Horse Gets Clicking - Samuel Horse **Reference Readings:** Experiments With Magnets – Helen J. Challand **Reference Readings:** Electricity – John & Janet Clemence **Extension:** Teacher's Guide investigation – 5 page 26 & 27	**WEB:** www.fosweb.com