

# MAGNETISM AND ELECTRICITY MODULE MATRIX

## SYNOPSIS

## SCIENCE CONTENT

## THINKING PROCESSES

### 1. THE FORCE

Students work with permanent magnets to discover that iron is the only everyday material that sticks to magnets. They investigate variables that influence the force of attraction between two magnets and look for ways to detect the presence of a magnet.

- Magnets stick to metal objects made of iron.
- 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.

- Observe magnetic interactions and sort objects based on whether they are affected by a magnet.
- Measure the force of attraction between magnets.
- Record and organize results of investigations.

### 2. MAKING CONNECTIONS

Students investigate current electricity and circuits, the pathways through which electricity flows. They find that some materials permit the flow of electricity (conductors), and some don't (insulators).

- Electricity flows through pathways called circuits.
- A switch is a device used to open and close circuits.
- An open circuit is an incomplete electric pathway; a closed circuit is a complete pathway.
- Materials that allow electricity to flow are conductors; those that do not are insulators.

- Build a test circuit and test objects for conductivity.
- Predict conductivity of materials.
- Sort materials based on whether they conduct electricity.

### 3. ADVANCED CONNECTIONS

Students explore series and parallel circuits and compare the functioning of the components in each circuit.

- A circuit with only one pathway for current flow is a series circuit. Components "share" the electric energy.
- A circuit with two or more pathways for current flow is a parallel circuit. Components each have a direct pathway to the energy source.

- Observe the functioning of different kinds of circuits.
- Compare the brightness of lamps in different kinds of circuits.
- Determine the defining characteristics of series and parallel circuits.
- Analyze and solve circuitry problems.

### 4. CURRENT ATTRACTIONS

Students learn how to use electricity to make an electromagnet. They explore the variables that influence the strength of the magnetism produced by their electromagnets.

- A core of iron or steel becomes an electromagnet when electricity flows through a coil of insulated wire surrounding it.
- There are a number of ways to change the strength of an electromagnet, including changing the number of winds of wire around the core.

- Observe the interaction between an electromagnet and objects.
- Systematically investigate ways to strengthen electromagnets.
- Compare the strength of electromagnets.
- Organize data.
- Conduct multiple trials, average results, and display results in a graph.

### 5. CLICK IT

Students use all the concepts they have learned to build a telegraph system that enables them to send and receive messages. The last part of the investigation asks students to use their inquiry skills to design, conduct, and report their own investigations.

- An electromagnet placed in a complete circuit can be used to make a telegraph.
- A switch can serve as a key in a telegraph system.
- A code is a symbolic system used for communication.
- Technology is the application of science.

- Explore the behavior of an electromagnet under different conditions.
- Solve circuitry problems.
- Encode and decode clicks produced by a telegraph.

**Language Extension**

- Write a creative story about life from a magnet's point of view.

**Math Extension**

- Problem of the week.

**Science Extensions**

- Make a water compass.
- Conduct more force investigations.
- Explore different magnets.

**Language Extensions**

- Make posters about safe electricity use.
- Write about life without electricity.
- Read *Dear Mr. Henshaw*.

**Math Extension**

- Problem of the week.

**Social Studies Extension**

- Research historical sources of energy.

**Science Extension**

- Examine the inside of a lightbulb.

**Language Extension**

- Research inventors who have contributed to electricity use in everyday life.

**Math Extension**

- Problem of the week.

**Science Extensions**

- Find out how houses are wired.
- Interview an electrician.
- Build a flashlight; make a burglar alarm.

**Language Extension**

- Write short stories describing encounters (real or imaginary) with electromagnets.

**Math Extension**

- Problem of the week.

**Science Extensions**

- Make a rheostat.
- Detect magnetism around current wires.
- Compare magnets to electromagnets.

**Language Extension**

- Read up on codes; create a code.

**Math Extension**

- Problem of the week.

**Science Extensions**

- Build a cardboard telegraph.
- Make an electric quiz board.
- Build a model motor.

See the Science Stories folio.

- *Magnus Gets Stuck*
- *Magnificent Magnetic Models*
- *How Magnets Interact*

See the Science Stories folio.

- *Making Static*
- *A Fictional Interview with Benjamin Franklin*
- *Two Reference Sources about Edison*

See the Science Stories folio.

- *Illuminating Teamwork: A Story of the Edison Pioneers*
- *A True Pioneer: Lewis Latimer*

See the Science Stories folio.

- *From Rags to Science: A Story of Michael Faraday*
- *How Electromagnetism Stopped a War*
- *Magnets and Electricity in Your Life*

See the Science Stories folio.

- *Morse Gets Clicking: A Story of Samuel Morse*

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Check the FOSS website for interactive simulations, to communicate with a scientist, for teaching tips, and to talk with other classes using FOSS.

Home/School Connection: Students look for magnets at home. They imagine inventing something that uses magnets, and describe it with pictures and words.

Home/School Connection: Students inventory electrical fixtures and appliances in their homes and develop a list of rules and practices for using electricity safely.

Home/School Connection: Students are invited to look inside broken electric and electronic appliances and devices, like radios, tape players, and remote controls, to see some really advanced circuits.

Home/School Connection: Students read a short piece about electricity and the purpose of fuses and circuit breakers. They locate the box at home that contains them.

Home/School Connection: Students will need some extra time at home to work on presenting their projects to the class.