

**Physical Science: Magnetism and Electricity**  
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**Grades: 4-5**

**Overview:**

Students will develop an understanding that electricity in circuits can produce light, heat, sound, and magnetic effects. They will also comprehend that magnets attract and repel each other, as well as other kinds of materials.

**Major Focus**

**Academic Expectations:**

- 2.2 Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events.
- 2.3 Students identify and analyze systems and the ways their components work together or affect each other.
- 2.4 Students use the concept of scale and scientific models to explain the organization and functioning of living and nonliving things and predict other characteristics that might be observed.
- 2.5 Students understand that under certain conditions nature tends to remain the same or move toward a balance.
- 2.6 Students understand how living and nonliving things change over time and the factors that influence the changes.

**Core Content:**

SC-E-1.3.3 Electricity in circuits can produce light, heat, sound, and magnetic effects. Electrical circuits require a complete conducting path through which an electrical current can pass.

SC-E-1.3.4 Magnets attract and repel each other, and magnets attract certain kinds of other materials (e.g. Iron).

SC-M-1.3.5 Electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced.

**Program of Studies:**

S-4-PS-6 Students will understand that magnets attract and repel each other as well as certain kinds of other materials.

S-4-PS-7 Students will understand that electrical currents move through electrical circuits. Electricity in circuits can produce light, heat, sound, and magnetic effects,

S-5-PS-5 Students will observe how electrical circuits transfer electrical energy.

**National Standards:**

NSS4\_2.10 Electricity in circuits can produce light, heat, sound, and magnetic effects. Electrical circuits require a complete loop through which an electrical current can pass.

NSS4\_2.11 Magnets attract and repel each other and certain kinds of other materials.

NSS8\_2.10 Electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced.

**Organizer:** Electricity in circuits can produce light, heat, sound and magnetic effects. Magnets attract and repel each other and other kinds of materials.

**Essential Questions:**

1. What are the properties of magnets?
2. What does the magnetic force of the Earth do?
3. Can electricity produce light, heat, and sound?
4. Can electricity produce magnetic effects?

**Culminating Performance:**

Throughout the electricity and magnetism unit, students will compile a learning log/journal. The learning log/journal will contain detailed descriptions of each activity, diagrams of each type of circuit, results, conclusions, and personal reactions.

## Electricity and Magnetism Learning Log/Journal Rubric

Name \_\_\_\_\_

Date \_\_\_\_\_

<b>Scoring Criteria</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Student included a detailed description of each activity.				
Student included diagrams of each type of circuit.				
Student accurately recorded and described results and conclusions from each activity.				
Student included personal reactions for each activity.				
Student actively participated in daily activities and discussions.				

### Scoring Key

- 4 points**      correct, complete, detailed
- 3 points**      partially correct, complete, detailed
- 2 points**      partially correct, partially complete, and lacks some detail
- 1 point**      incorrect or incomplete, needs assistance

**Enabling Knowledge:**

- Electricity in circuits can produce light, heat, sound, and magnetic effects. Electrical circuits require a complete conducting path through which an electrical current can pass.
- Magnets attract and repel each other, and magnets attract certain kinds of other materials (e.g. iron)
- Electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced.

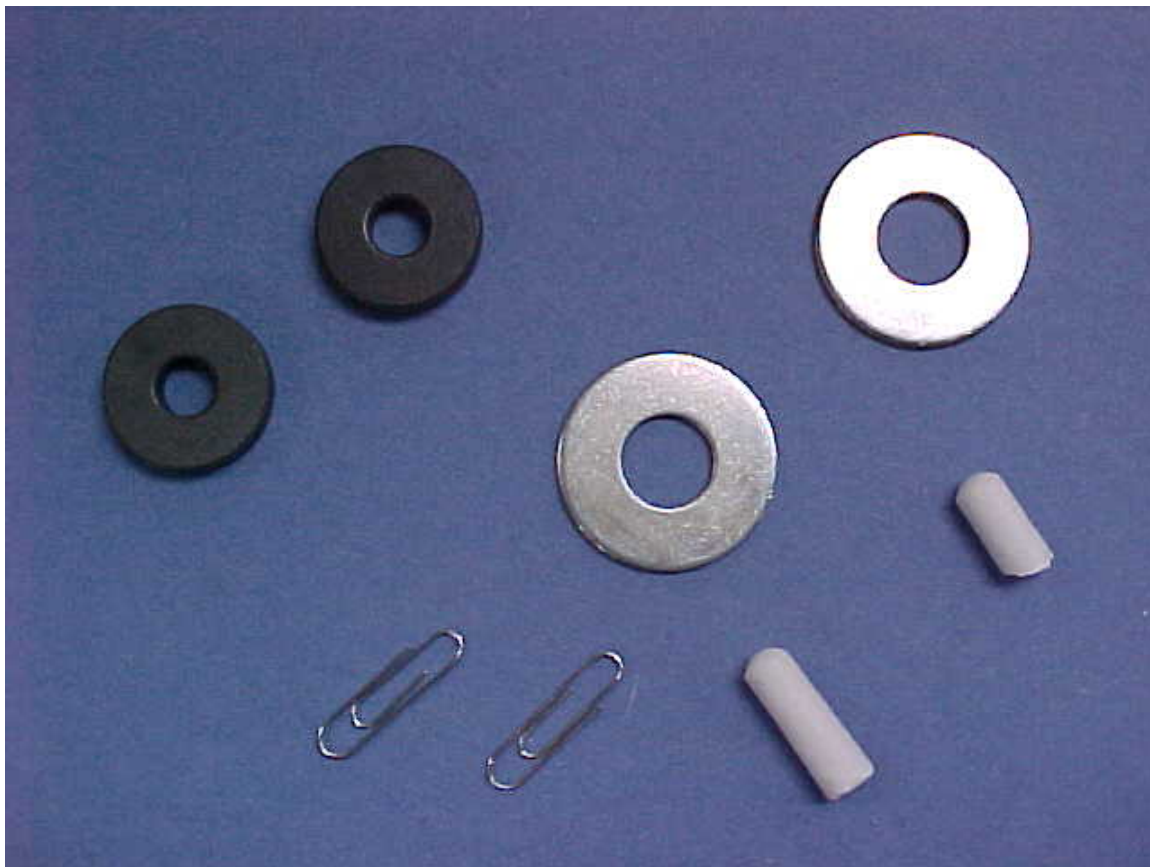
**Enabling Skills and Processes:**

- identifying similarities and differences
- summarizing and note-taking
- cooperative learning
- generating and testing hypothesis
- technology (Microsoft Word)
- language skills (use of descriptive and figurative language, word usage, spelling, writing, reading)
- organizing information
- speaking skills (appropriate forms, conventions, and styles to communicate information)

## Activity 1: Magnetism

### Essential Question:

What are the properties of magnets?



**Core Content:** SC-E-1.3.4

### Materials:

**(For each student)**

- 1 doughnut-shaped magnet

**(For each group of 4-5 students – 1 bag of mystery items, consisting of...)**

- 2 steel nails
- 2 aluminum nails
- 2 soda straws
- 2 sponges
- 2 pieces of chalk
- 2 paper clips
- 2 pieces of copper
- 2 steel screws

- 2 pieces of cardboard
- 2 rubber bands
- 2 brass rings
- 2 popsicle sticks
- 2 plastic spoons
- 2 pieces of aluminum foil

**Objective:**

Students will explore and comprehend the properties of magnets.

**Procedure:**

1. Distribute a single magnet to each student.
2. Allow students to explore the classroom to see which objects the magnets stick to and which objects they do not. (5-10 minutes)
3. Distribute a “Mystery Bag” to each group of 4-5 students.

**Activity:**

1. The group leader will dump the objects from the bag onto the table.
2. Each student will select 3 items from the bag they think will stick to their magnet.
3. Each student will select 3 items from the bag they think will not stick to their magnet.
4. Each student will test to see if his or her selections were accurate.
5. Discuss the results.
  - a. What did your magnet stick to?
  - b. Were you surprised by any of the results?
  - c. What items did not stick to your magnets?
6. Discuss that not all metal objects stick to magnets. Magnets stick to objects made of iron or metal alloys (mixtures) that have iron in them, such as steel. Copper is a metal, but copper doesn't stick. Aluminum and brass are metals, but they don't stick. If the magnet sticks, the object is iron or steel.

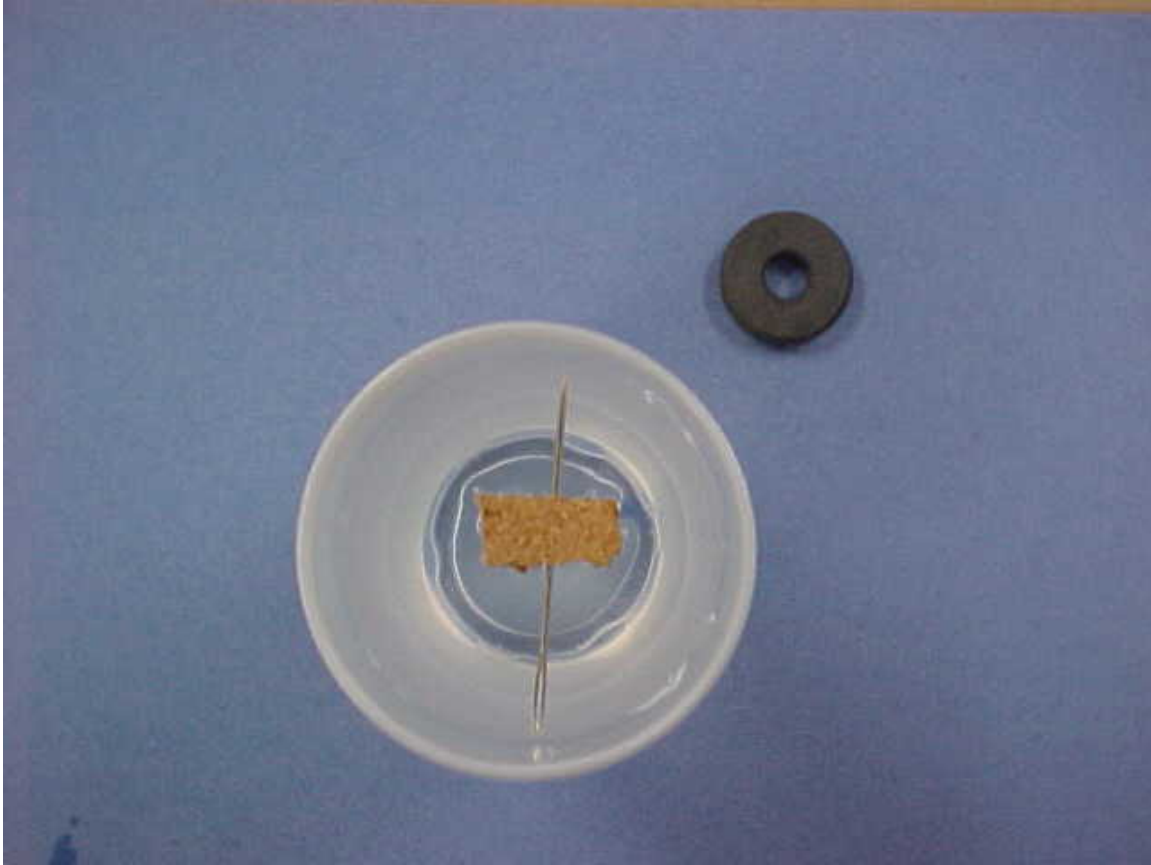
**Assessment:**

Teacher observation, large-group, and small-group discussions.

## Activity 2: Magnetism

### Essential Question:

What does the magnetic force of the earth do?



**Core Content:** SC-E-1.3.3

### Materials:

(For each group of 4-5 students)

- Sewing Needle
- Magnet
- Cork
- Cup of Water

### Objective:

Students will make their own compass to develop an awareness of the Earth's natural, magnetic force.

**Procedure:**

1. Stroke the sewing needle 100 times on a strong magnet. (Always stroke in the same direction, do not rub the needle back and forth and be careful not to prick yourself.)
2. Fill a cup with water.
3. Place the cork into the water.
4. Carefully balance the needle on the floating cork.
5. Gently turn the cup a little bit and watch the needle.

**Activity:**

1. Class group will ride a bus to Clay Hill Memorial Forest.
2. Each class will be divided into four separate groups.
3. Each group will make their own compass.
4. Each student will be given a packet and a pencil to write down observations.
5. Each group will take a hike to “Little Angel Springs” while hiking each student in the group will record directions and observations during the hike.
6. Students can also make observations about magnetic iron in the area by looking and observing rocks and minerals.
7. While returning to the bus, each group can use their compass to locate the correct direction to return to the bus.

**Assessment:**

Teacher observation, large-group, and small group discussions, and completion of packets.



### Activity 3: Electrical Circuits

#### Essential Question:

Can electricity produce light, heat, and sound?



**Core Content:** SC-E-1.3.3  
SC-E-1.3.5

#### Materials:

(For each group of 4-5 students)

- 1 electric motor
- 1 D-cell
- 1 small light-bulb
- 2 short pieces of wire (15-cm, 20-gauge)
- 1 small audio speaker

#### Objective:

Students will produce light, heat, and sound with electricity by building circuits.

**Procedure:**

1. Distribute materials to each group.
2. Identify and discuss each item with students.
3. Discuss safety: D-cells are safe for students to use without fear of being shocked. The amount of electricity in the cell is very small.

**Activity:**

1. Have each group set up a circuit using the D-cell and the light-bulb. When the circuit is completed correctly, the light-bulb illuminates. Discuss with students that they have used electricity to produce light.
2. Each group should try to make their light-bulb glow for approximately one minute. Have students take turns touching the light-bulb. The bulb should be warm to the touch. Discuss with students that they have used electricity to produce heat.
3. Have each group set up a circuit using the D-cell and the electric motor or audio speaker. When the circuit is completed correctly, the motor will run or the speaker will produce static noise. Discuss with students that they have used electricity to produce sound.

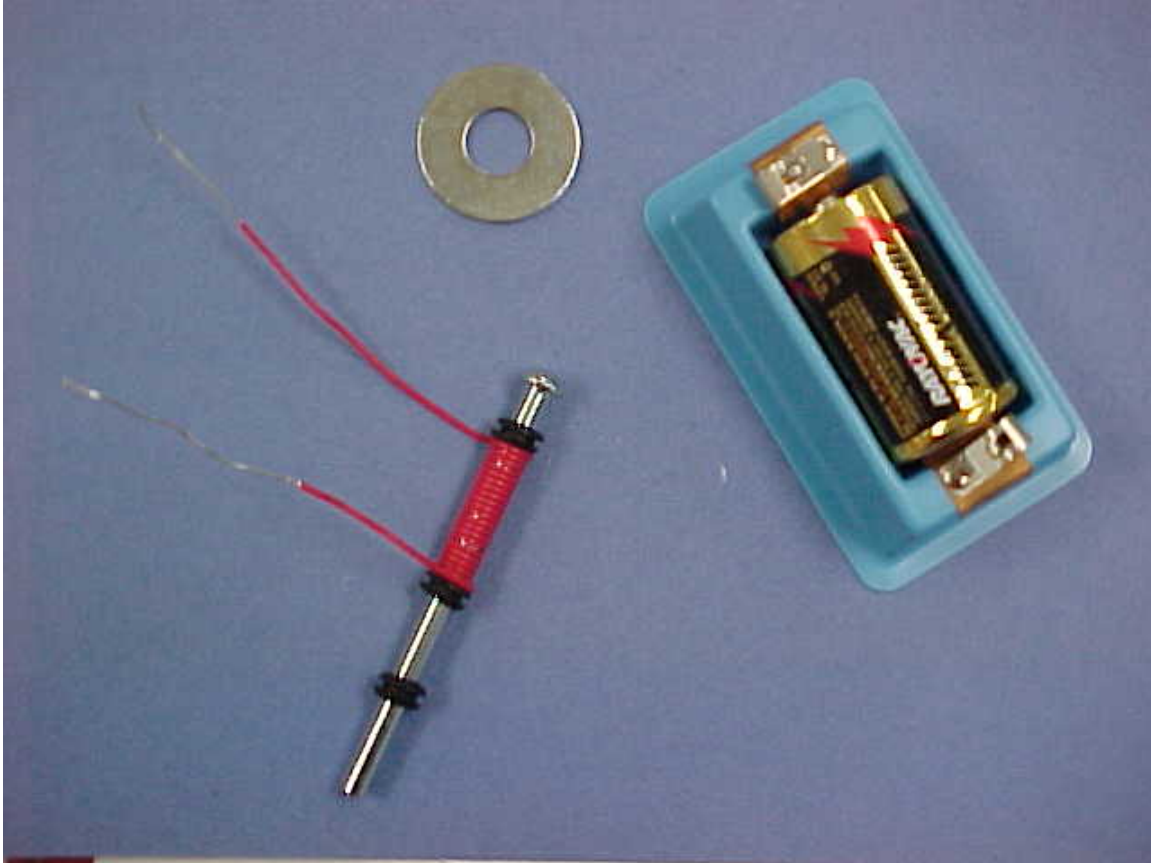
**Assessment:**

Teacher observation, group discussions, open-response question

## Activity 4: Electromagnet

### Essential Question:

Can electricity produce magnetic effects?



**Core Content:** SC-E-1.3.3  
SC-E-1.3.5

### Materials:

(For each group of 4-5 students)

- 1 rivet
- 1 wire 150-cm, 24 gauge, insulated
- 1 D-cell
- several small washers

### Objective:

Students will build an electromagnet to understand that magnetic effects can be produced with electricity.

**Procedure:**

1. Distribute materials to each group of students.
2. Explain to students that electromagnets consume electricity quickly. If an electromagnet is connected to a cell continuously, it can drain the power in a matter of minutes.
3. Model for students how the wire is coiled around the rivet, leaving two exposed ends to connect to the D-cell.

**Activity:**

1. Students will coil their wires around rivets.
2. Each exposed end of the wire will be connected to the positive and negative ends of the D-cell.
3. Touch the end of the rivet to small washers.
4. Did the rivet now attract the washers?
5. Explain to students they have just produced magnetic effects using electricity.
6. Allow students to brainstorm and test ideas of how to make the electromagnet stronger.

**Assessment:**

Teacher observation checklists, group discussions, open response question