

TEACHER'S MANUAL

This Suitcase Program provides the materials and lesson plans for teachers of grades 6-8 with content and activities increasing in difficulty by grade level. Activities in this Suitcase Exhibit may assist in meeting the Tennessee State Standards.

ACTIVITIES

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TENNESSEE STATE STANDARDS FOR 6-8

6.PS3.1	Analyze the properties and compare the sources of kinetic, elastic potential, gravitational potential, electric potential, chemical, and thermal energy.
8.PS2.1	Design and conduct investigations depicting the relationship between magnetism and electricity in electromagnets, generators, and electrical motors, emphasizing the factors that increase or diminish the electric current and the magnetic field strength.
8.PS2.2	Plan and conduct an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
8.ETS1.1	Develop a model to generate data for ongoing testing and modification of an electromagnet, a generator, and a motor such that optimal design can be achieved.

For the entire activity and materials and to reserve a Suitcase Exhibit, please call 901.636.2362.

ACTIVITY I: Mapping Invisible Lines of Force

DURATION OF ACTIVITY: 60 minutes

LESSON OBJECTIVES

Students work with a compass to map the magnetic field of a bar magnet.

GUIDING QUESTION

What is the shape of a magnetic field?

TENNESSEE STATE STANDARDS

- 8.PS2.1 Design and conduct investigations depicting the relationship between magnetism and electricity in electromagnets, generators, and electrical motors, emphasizing the factors that increase or diminish the electric current and the magnetic field strength.
- 8.PS2.3 Create a demonstration of an object in motion and describe the position, force, and direction of the object.

MATERIALS INCLUDED

Cow magnet
Iron filings box
6" steel bar magnets
Compasses
Book **The Mystery of Magnets**
See Supplementary Materials for:
Diagrams #1-5
Compass placement diagram

MATERIALS PROVIDED BY TEACHER

Chart from previous activities
Sheets of 8 ½" x 11" white paper
Tape
Pencils

For the entire activity and materials and to reserve a Suitcase Exhibit, please call 901.636.2362.

ACTIVITY II: Now Showing in 3D: The Force Field

DURATION OF ACTIVITY: 45 minutes

LESSON OBJECTIVES

Students use magnets of different shapes and iron fillings to view the patterns of magnetic lines of force. They examine, in two and three dimensions, the magnetic fields of magnets as they attract or repel at the poles. A 3-D magnetic field visualizer allows students to see iron filing surround a magnet on all sides.

GUIDING QUESTIONS

How can we view magnetic fields as they surround an object?

TENNESSEE STATE STANDARDS

- 8.PS2.1 Design and conduct investigations depicting the relationship between magnetism and electricity in electromagnets, generators, and electrical motors, emphasizing the factors that increase or diminish the electric current and the magnetic field strength.
- 8.PS2.2 Conduct an investigation to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
- 8.PS2.3 Create a demonstration of an object in motion and describe the position, force, and direction of the object.

MATERIALS INCLUDED

Iron filings boxes
Ceramic rings magnets
Wand magnets
Cow magnets
3-D magnetic field visualizers

MATERIALS PROVIDED BY TEACHER

Chart from previous activities
Sheets of white paper

For the entire activity and materials and to reserve a Suitcase Exhibit, please call 901.636.2362.

ACTIVITY III: Permanent and Temporary Magnets

DURATION OF ACTIVITY: 45 minutes

LESSON OBJECTIVES

Students will make temporary magnets using permanent magnets. Some of the temporary magnets will retain their magnetism for a short time, others for a longer time.

GUIDING QUESTION

How can we make a magnetic object into a magnet?

TENNESSEE STATE STANDARDS

- 8.PS2.1 Design and conduct investigations depicting the relationship between magnetism and electricity in electromagnets, generators, and electrical motors, emphasizing the factors that increase or diminish the electric current and the magnetic field strength.
- 8.PS2.3 Create a demonstration of an object in motion and describe the position, force, and direction of the object.

MATERIALS INCLUDED

Cow magnets
Ceramic ring magnets
Lodestones
Paperclips
Large steel nails
Container of staples
Book **Magnet Science**
See Supplementary Materials for:
Illustration of Magnetic Domains

MATERIALS PROVIDED BY TEACHER

Chart from previous activities
Tape

For the entire activity and materials and to reserve a Suitcase Exhibit, please call 901.636.2362.

ACTIVITY IV: Electromagnets

DURATION OF ACTIVITY: 60 minutes

LESSON OBJECTIVES

Students discover electrical current produces a magnetic field. They make an electromagnet, determine how to strengthen its properties, and graph their results.

GUIDING QUESTION

What is the relationship between magnetism and electricity?

TENNESSEE STATE STANDARDS

- 8.PS2.1 Design and conduct investigations depicting the relationship between magnetism and electricity in electromagnets, generators, and electrical motors, emphasizing the factors that increase or diminish the electric current and the magnetic field strength.
- 8.PS2.2 Conduct an investigation to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.
- 8.ETS1.1 Develop a model to generate data for ongoing testing and modification of an electromagnet, a generator, and a motor such that an optimal design can be achieved.

MATERIALS INCLUDED

AA batteries
Battery tester
Magnetic jumper wires
Insulated wires
Jumper wires with clips
4 in. nails
Paperclips
Container of staples
Compasses
Books **Magnet Science**
Experiments with Magnets
The Mystery of Magnets
See Supplementary Materials for:
Diagram #1
Diagram of Magnetic Field of Earth

MATERIALS PROVIDED BY TEACHER

Chart from previous activities
Paper for student charts and graphs

For the entire activity and materials and to reserve a Suitcase Exhibit, please call 901.636.2362.

SUITCASE EXHIBIT INVENTORY CHECKLIST

School: _____

Check Out: _____

Return Date: _____

MoSH Check In:	Teacher Check In:	Item	Books/Videos/Posters	Teacher Return:
		A	Teacher's Manual	
		B	Book: The Mystery of Magnets	
		C	Book: Magnetism and Electricity	
		D	Book: Experiments with Magnets	
		E	Book: Science with Magnets	
		F	Book: Magnet Science	

SUITCASE EXHIBIT INVENTORY CHECKLIST

MoSH Check In:	Teacher Check In:	Item	Materials	Teacher Return:
		1	8 Horseshoe Magnets	
		2	14 6" Steel Bar Magnets	
		3	4 - Magnet on a Blue Post Magnets	
		4	12 Wand Magnets	
		5	30 Ceramic Ring Magnets	
		6	10 Cow Magnets	
		7	45 Magnetic Balls	
		8	13 Magnetic Pole Cards (6 Green "North" Cards, 6 Red "South" Cards & 1 "Earth")	
		9	Clear container for water with lid	
		10	5 (Magnetite) Loadstone Boxes	
		11	20 Poker Chips	
		12	8 Steel Screws	
		13	8 Brass Washers	
		14	8 Large Aluminum Nails	
		15	15 Large Galvanized Nails	
		16	8 Large Rubber Bands	
		17	12 Small Compasses	
		18	Bag of Paper Clips	
		19	80 Large Steel Washers	
		20	8 White Stone and 8 Hematite Samples	
		21	2 Spools of String	
		22	6 Rectangular Iron Filings Boxes	
		23	8 Pieces of Gold Colored Aluminum Foil	
		24	8 Pieces of Cloth	
		25	8 Pressed Wood Squares	
		26	8 Plastic Squares	
		27	5 3-D Magnetic Field Visualizers	
		28	15 Dowel Stands with 4 Magnets each	
		29	5 Ceramic Bar Magnets	
		30	4 Sets of Balance and Fulcrum Base	
		31	22 Plastic Cups	