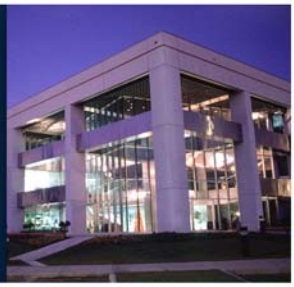
# Classroom Visit Pre/Post Materials




NATIONAL HIGH MAGNETIC FIELD LABORATORY
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FLORIDA STATE UNIVERSITY
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NATIONAL SCIENCE FOUNDATION

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# The National High Magnetic Field Laboratory

## What is the NHMFL?

- The National High Magnetic Field Laboratory is a working science research laboratory utilizing state-of-the-art high magnetic field research systems. It is a world leader in magnet-related research and technology.

- The laboratory is one of nine in the world and the only one in North and South America. It was established in 1990 by the National Science Foundation and the State of Florida and is operated by the Florida State University, the University of Florida, and Los Alamos National Laboratory.
- The NHMFL brings together distinguished scientists and technicians from many disciplines including physics, chemistry, biology, geology, engineering, and materials science.
- Research at the NHMFL has implications and applications in medicine, energy, communications, electronics, the environment, transportation, and materials research and development.
- The laboratory is committed to enhancing science education with extensive educational programming at all levels.

## How will your students benefit from the visit and the suggested activities?

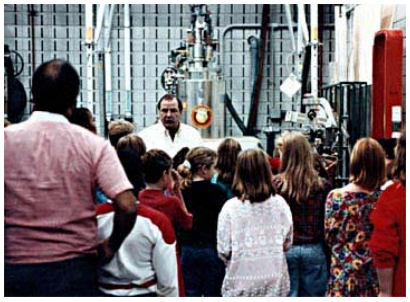
- Students will hear firsthand about what is done at a science research laboratory.
- Students will learn about diverse career opportunities in science and scientific research.

## Pre-Visit Activities

The suggested pre-visit activities introduce students to basic ideas about the topic and the processes of science. Activities are correlated to the Sunshine State Standards and also include reading and writing extensions.

## Post-Visit Activities

The suggested post-visit activities are designed to reinforce and expand upon what was learned by your students during the visit. The activities encourage students to analyze their ideas and spark further interest in science.



## The NHMFL Education Website

You and your students are encouraged to visit the NHMFL education Website before and after your visit:

http://education.magnet.fsu.edu

# Pre-Outreach Activity: What Do We Already Know?

## Teacher Background:

A simple, yet effective learning strategy, a K-W-L chart, is used to help students clarify their ideas. The chart itself is divided into three columns:

| **K** | **W** | **L** |
|---|---|---|
| What we **K**now | What we **W**ant to know | What we **L**earned |
| | | |

## Materials:

- Chart Paper
- Markers

## Activity Instructions:

1. Copy the K-W-L chart and pass out so that each student has their own sheet. Explain how the chart is to be filled out, then brainstorm with the class and have the students list everything that the they know about magnets and magnetism. There are no right or wrong answers.

2. Next have the students list everything that they want to know about magnets and magnetism. You may need to provide prompts such as:

*If magnet experts were here, what questions would you ask them?*

*If you were a scientist, what would you like to discover about magnets?*

3. Keep the chart accessible so that you and the students can enter ideas, new information, and new questions, at any time. The class can return to the K-W-L chart after completing the activities. As students learn the answers to their questions, list the answers in the L column of the chart

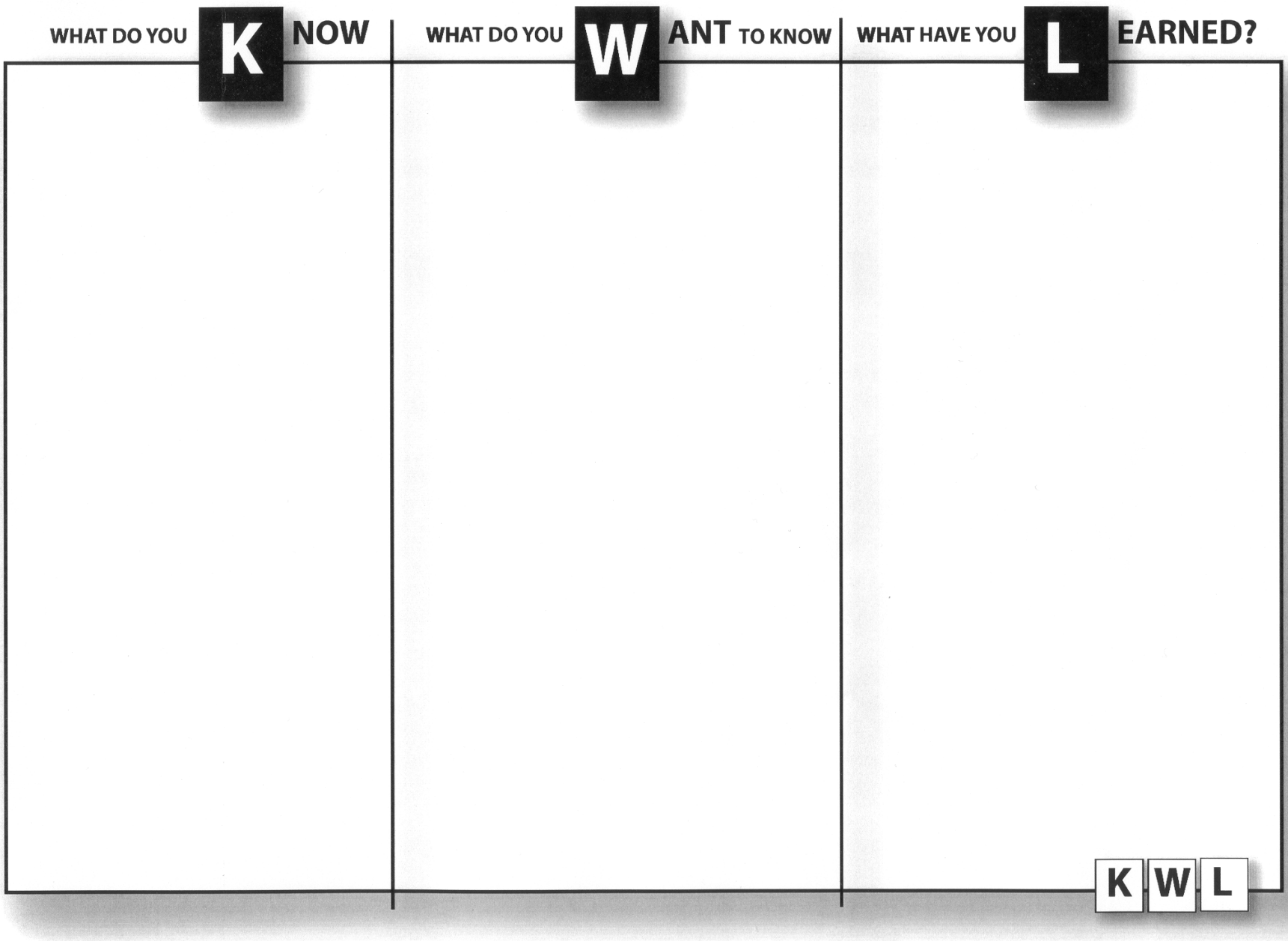
4. K-W-L charts are useful in identifying misconceptions that students have about magnets and magnetism. Once the misconceptions are identified, have students design a way to test their ideas, reflect on what they observe, and refine the original conclusion.

5. Periodically, return to the K-W-L chart during the activities to check off items from the W column and to add to the L column. Students may want to add items to the W column to further their explorations.

## Standards:

Grades 3-5: SC.C.2.2.1, SC.H.2.2.1
Grades 6-8: LA.C.1.3.1, SC.H.1.3.5, SC.H.2.3.1

NAME_____
TOPIC_____
TEACHER_____



# Pre-Outreach Activity: What Is A Magnet?

## Teacher Background:

We know essentially what magnets do. Magnets attract and repel. Materials with magnetic qualities have domains made up of billions of atoms that are configured in certain ways. Materials with strong magnetic characteristics have atoms with magnetic polarities mostly aligned. Each magnet has a north and a south pole, the regions where the magnetic force created by the magnet is strongest. Like poles repel and opposites attract. Magnetism is the force of attraction and repulsion of the magnets.

This activity is designed to provide opportunities for your students to explore and discover through *hands-on* experiences the properties of magnets and magnetism:

- Each magnet has a north and a south pole.
- Like poles repel.
- Opposite poles attract.
- Magnets attract some materials and not others.

## Materials:

- Magnets
- Compasses
- A variety of classroom objects, not all metal.
- K-W-L Chart

## Standards:

Grades 3-5: LA.A.1.2.2, LA.A.1.2.3, LA.A.2.2.1, LA.A.2.2.5, LA.A.2.2.6, LA.A.2.2.7, LA.A.2.2.8, LA.B.1.2.3, LA.B.2.2.1, SC.A.1.2.1, SC.B.1.2.1, SC.C.1.2.1, SC.C.2.2.1, SC.C.2.2.4, SC
Grades 6-8: LA.A.1.3.3, LA.A.2.3.1, LA.A.2.3.4, LA.A.2.3.5, LA.A.2.3.6, LA.B.1.3.1, LA.C.3.3.3 LA.E.1.3.5, SC.C.2.3.1, SC.C.2.3.2, SC.2.3.3, SC.H.1.3.1, SC.H.1.3.2, SC.H.1.3.3, SC.H.1.3.4, SC.H.1.3.6, SC.H.1.3.7, SC.H.2.3.1, SC.H.3.3.5, SC.H.3.3.6

## Activity Instructions:

1. Review the K-W-L chart with your students.

2. Distribute magnets, compasses, and the variety of objects to students. Each student should have at least two magnets. Students can share compasses and the other materials.

3. Give students ample time to explore and play with the materials freely.

4. Challenge the students to test what they previously listed in the K column of the K-W-L chart, reflect on what they observe, and refine the original preconceptions if needed.

5. Challenge the students to discover the types of materials that magnets attract. The students can prepare a chart listing the objects that are attracted to magnets and those that are not.

6. Challenge and guide the students to use the compass to discover the polarity of the magnets in terms of north and south poles.

7. Introduce the terms *attract, repel, like,* and *opposite* in a discussion of how magnets interact with each other.

8. Challenge your students to feel and describe the force of magnetism. Introduce the term *magnetic force* to describe the forces of repulsion and attraction.

# Post-Visit Activity #2:
# Which Way Is North?

## Teacher Background:

Early scientists and travelers noticed a particular quality of a rock found in Magnesia, in northern Greece. This rock became known as lodestone. Observations showed that it would attract iron and repel like stones. The observation of magnetic properties led to the further discovery that the lodestone always pointed in the same direction. Using the North Star as a point of reference, it became clear that the lodestone had a definite north-south orientation. Early explorers took compass needles and lodestones (to keep the needles magnetized) with them.

## Materials:

- Needle or sewing pin
- Wand magnet
- Coffee stirrers (cut in half)*
- Petri dish
- Water
- Compass

** Encourage students to try other materials such as styrofoam, balsa wood, cork, etc.*

## Activity Instructions:

1. You can temporarily magnetize a needle by stroking it with a magnet. Be sure to stroke it in the same direction, with the same end of the magnet. This will magnetize the needle.

Grades 3-5: SC.C.2.2.1, SC.H.2.2.1
Grades 6-8: LA.C.1.3.1, SC.H.1.3.5, SC.H.2.3.1

2. Once the needle is magnetized, it needs to be free floating without obstructions so that it can point north. To do this, push the needle through the middle of the coffee stirrer, so that the resulting item looks like an X.

3. Fill a petri dish with water.

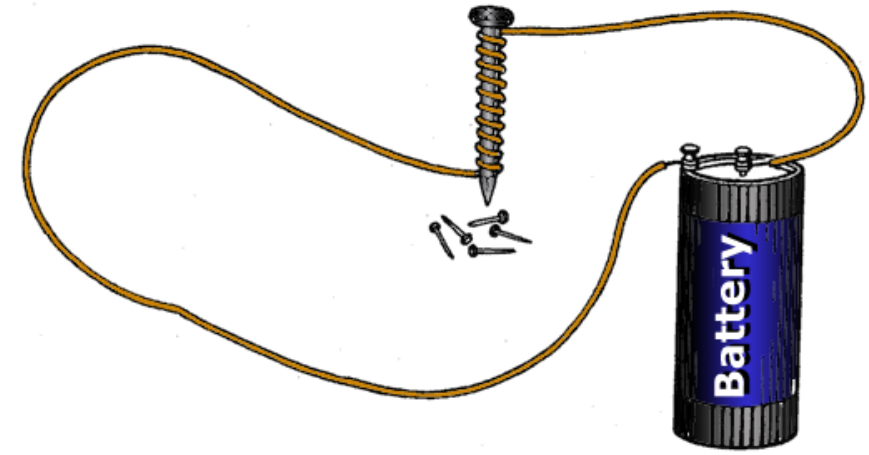
4. Gently place the needle on the surface of the water. It should float, and slowly orient itself in a north-south direction. The needle itself will point north-south, and the coffee stirrer will point east-west. Be careful not to get water inside the coffee stirrer. If the needle sinks, the compass will not work.

## Standards:

Grades 3-5: LA.A.1.2.2, LA.A.1.2.3, LA.A.2.2.6, LA.A.2.2.7, LA.C.1.2.3, LA.C.3.2.1, LA.B.1.2.3, LA.B.2.2.1, SC.A.1.2.1, SC.B.1.2.1, SC.C.1.2.1, SC.C.2.2.1, SC.C.2.2.4,
Grades 6-8: LA.B.1.3.1, LA.B.1.3.2, LA.B.1.3.3, LA.B.2.3.1, LA.B.2.3.2, LA.B.1.3.3, LA.B.1.3.4, SC.C.1.3.1, SC.C.2.3.1, SC.C.2.3.2, SC.H.1.3.1, SC.H.1.3.2, SC.H.1.3.4, SC.H.1.3.5, SC.H.1.3.7, SC.H.3.3.5, SC.H.3.3.6, SS.A.1.3.1, SS.A.1.3.2, SS.A.1.3.3,

# FCAT Sample
# Practice Questions

1. Ricardo built the circuit shown below using a battery, copper wire, and an iron nail The iron nail has become magnetized by the battery and is attracting more nails.




**Ricardo's Circuit**

Which of the following forms of energy caused the nail to become magnetic?

**A** Heat
**B** Electrical
**C** Light
**D** Mechanical

2. Which of the following items will be attracted to Ricardo's nail?

**F** ball of clay
**G** plastic button
**H** piece of cloth
**I** scrap of metal

3. While hiking with her dad, Shanna gets lost and does not have a map with her. She remember that her car is to the north. Shanna floats a needle in some water to create a compass.

When completed, which of the following **best** describes what the compass will do.

**A** point north and south
**B** point east and west
**C** point up and down
**D** nothing

4. When Shanna gets home, she tries different things to see how they will affect her compass.

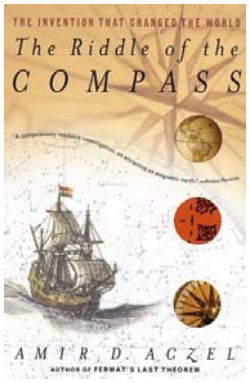
Which of the following will have the most affect on her compass?

**F** using a plastic needle instead of a metal needle
**G** using juice instead of water
**H** using more water
**I** using less water

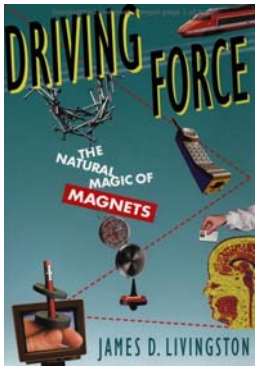
# Vocabulary List:

| | |
|---|---|
| Magnet | An object that is surrounded by a magnetic field and that has the property, either natural or induced, of attracting certain metals. All magnets have a North and South pole. |
| Magnetic field | A region around a magnet in which objects are affected by the magnetic force. |
| Attract | To cause to draw near by a force. |
| Repel | To push back or away by a force. |
| Permanent Magnets | A piece of magnetic material that retains its magnetism after it is removed from a magnetic field. |
| Temporary Magnets | A piece of magnetic material that demonstrates the properties of a permanent magnet only while in a magnetic field. |
| Electromagnet | Created when a temporary magnet is placed into a coil (solenoid) that is carrying current. |

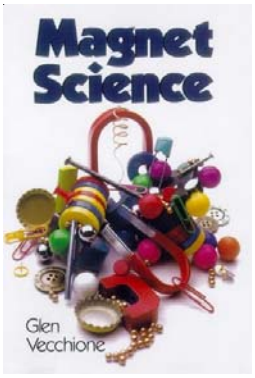
# References

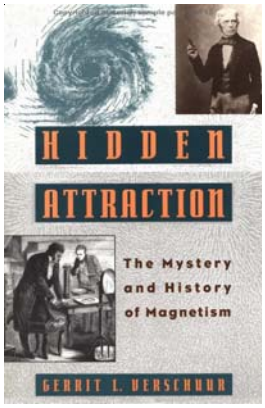

Aczel, Amir D. (2001). The Riddle of The Compass. Harcourt. This is the ultimate chronological tale of the compass, from its origins in China, to its roots in Italy, where claims are made that it was first created. The book also portrays the impact that this invention had on navigation, and how in the hands of Europe, the compass opened up the world for exploration and turned European kingdoms into economic empires.




Livingston, J.D. (1996). Driving Force: The Natural Magic of Magnets. Cambridge: Harvard University Press. A comprehensive reference on magnets, magnetism, and related ideas, this book can be used to understand the basics or go beyond to an explanation of quantum electrodynamics. This resource links magnetism with all science disciplines as well as current issues related to magnetism such as health concerns and high voltage wires. Practical applications of magnetism are explained, as are the historical experiments upon which current magnet science is based.




Vecchione, Glen. (1995). Magnet Science. Scholastic Inc. The perfect companion for magnet beginners, this book keeps things on a simple level while exploring the many uses of magnetism, and the fun that can be had with it. Activities contained within range from creating a magnet fishing game to building an electric motor. The perfect reference for the young inquiring mind.




Verschuur, G.L. (1993). Hidden Attraction: The Mystery and History of Magnetism. Oxford University Press. An invaluable teacher resource on the history of magnetism, this volume also includes practical applications of magnets and magnetism as well as information on magnet science in general. It is a comprehensive reference guide for any teacher or student of magnetism.

# Notes

# Center for Integrating Research and Learning

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