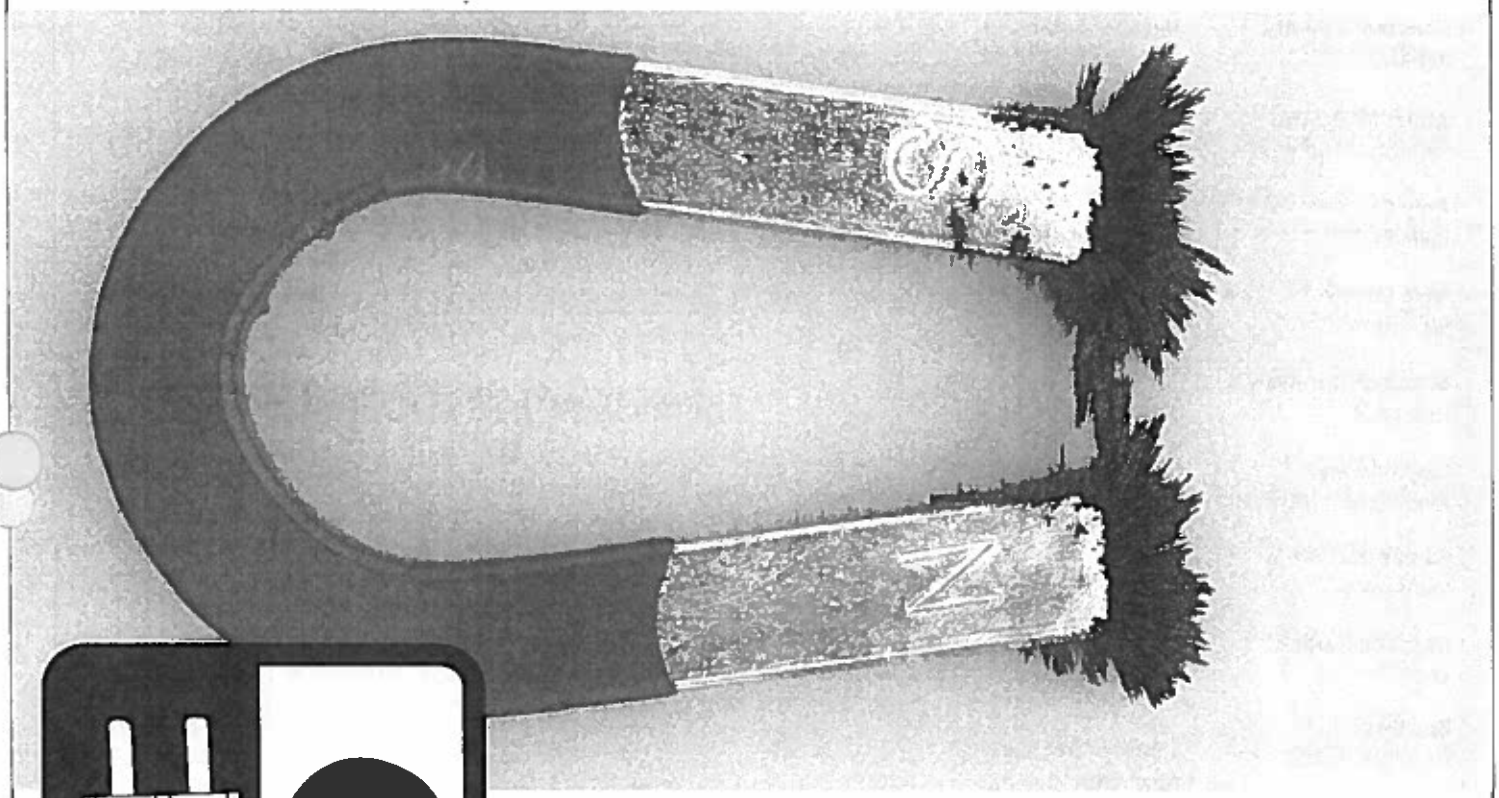
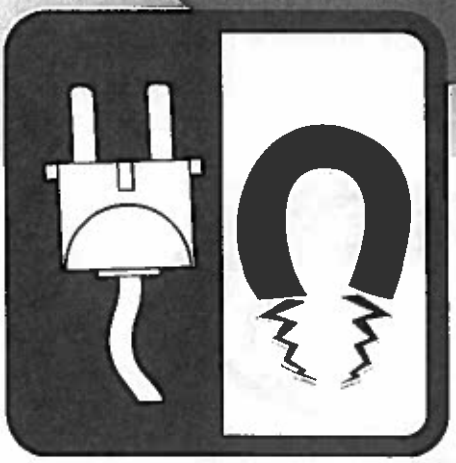
Wonders of Magnets

Hands-on, center-based experiments that explore the basics of magnets and magnetism.





Grade Levels:

Pri Primary

Elem Elementary

Subject Areas:

Science

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Energy Data Used in NEED Materials

NEED believes in providing teachers and students with the most recently reported, available, and accurate energy data. Most statistics and data contained within this guide are derived from the U.S. Energy Information Administration. Data is compiled and updated annually where available. Where annual updates are not available, the most current, complete data year available at the time of updates is accessed and printed in NEED materials. To further research energy data, visit the EIA website at www.eia.gov.

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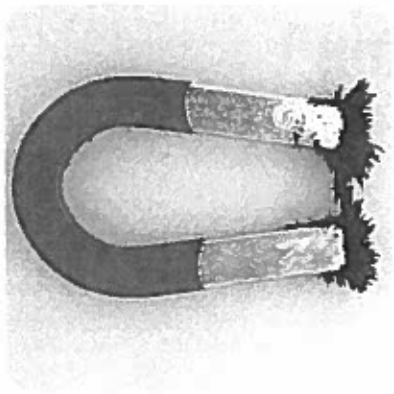

Wonders of Magnets

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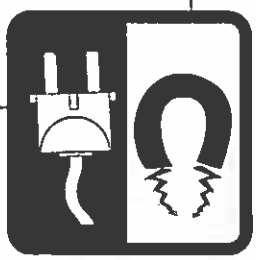


Standards Correlation Information

www.NEED.org/curriculumcorrelations

Next Generation Science Standards

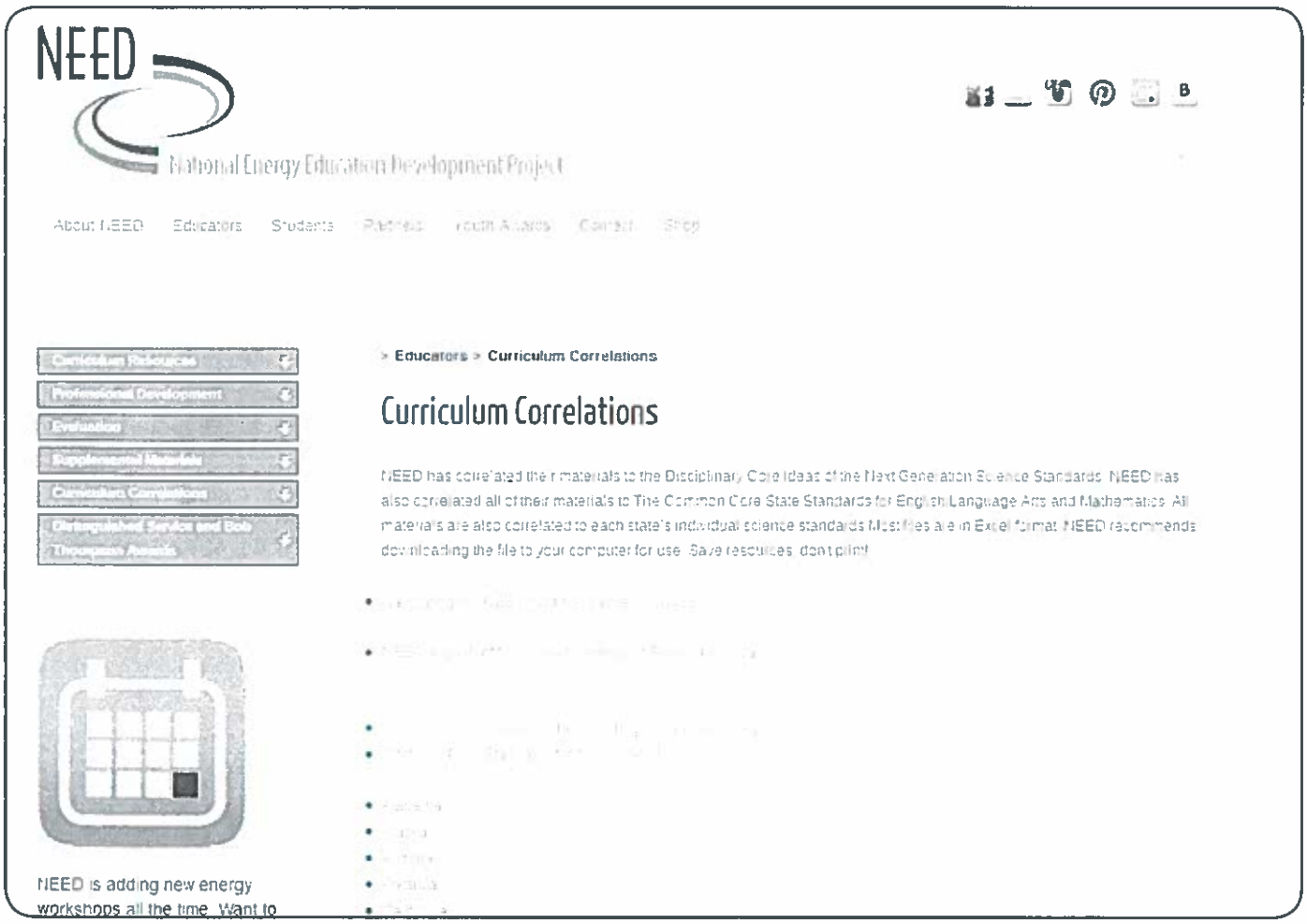
- This guide effectively supports many Next Generation Science Standards. This material can satisfy performance expectations, science and engineering practices, disciplinary core ideas, and cross cutting concepts within your required curriculum. For more details on these correlations, please visit NEED's curriculum correlations website.

Common Core State Standards

- This guide has been correlated to the Common Core State Standards in both language arts and mathematics. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED curriculum correlations website.

Individual State Science Standards

- This guide has been correlated to each state's individual science standards. These correlations are broken down by grade level and guide title, and can be downloaded as a spreadsheet from the NEED website.



Teacher Guide

Background

Teacher demonstrations and center-based explorations introduce students to the basic concepts of magnetism. Students explore the concepts of magnetic force with a variety of magnets and experiments, making predictions, recording observations and data, and drawing conclusions.

★Concepts

- In most materials, electrons spin around. These spinning electrons are in pairs that have each electron spinning in an opposite direction, which has a cancelling effect. These pairs of electrons are scattered throughout the materials.
- In magnets, not all of the pairs of spinning electrons cancel each other. These electrons line up to form a magnetic field.
- Because of the magnetic field, magnets are special materials that are attracted to each other and other materials such as iron.
- Like poles of magnets repel each other, opposite poles of magnets attract each other.
- Magnets come in a variety of shapes and sizes.
- Some objects can be magnetized by contact with a magnet.
- The needle of a compass is magnetized.
- The Earth is a giant magnet with North and South Poles.

✓Procedure

Preparation

- Familiarize yourself with the guide and the equipment you will be using. Make copies of the student worksheets and unit exam pages. Prepare copies of the masters to project for the class.
- Collect the materials needed for each center using the list on the right.
- Using a permanent marker, mark the N and S poles of the magnets and label one magnet of each set with the number 1 and one with the number 2.
- Make a day-by-day schedule for the unit according to the skill level of your students and the time you can allot to the activities each day. Each activity is explained in detail beginning on the next page, with the materials needed and estimated time for completion.
- Set up five identical centers with all of the materials needed for each set of activities. Divide your students into five groups. Each day, set out the materials the students will need to conduct the day's scheduled activities. Make sure the magnets are stored separately from the other materials. The paper clips and darning needles can become magnetized upon repeated contact with the magnets, and the compass can be ruined. Make sure students keep magnets away from computer monitors, television screens, cell phones, and student identification cards.

Grade Levels

- Primary, grades 1-2
- Elementary, grades 3-4

Time

Five 45-minute classes

Materials Needed

- Tape
- Water
- 5 Pieces of cloth
- Paper
- 5 Pennies, dimes, nickels, and quarters
- Aluminum foil
- Construction paper
- 5 Compasses
- 10 Bar magnets
- 10 Sets of horseshoe magnets
- 30 Rectangular magnets with holes
- 5 Glass marbles
- 5 Wooden discs (extra may be necessary)
- 5 Boxes of paper clips
- 5 Sets of metal samples (steel, aluminum, brass, and copper)
- 15 Shallow plastic cups or containers
- 5 Darning needles (extra may be necessary)
- 1 Box of iron filings
- Plastic bubble wrap
- 5 Wooden dowels
- 5 Wooden rectangles
- 5 Plastic buttons or disks

Background Information: Magnets and Magnetism

Everything in the universe is made of atoms—they are the building blocks of the universe. Atoms are so small that millions of them would fit on the head of a pin. Atoms are made of even smaller particles. The center of an atom is called the nucleus. It is made of particles called protons and neutrons. The protons and neutrons are very small, but electrons are much, much smaller. Electrons spin around the nucleus in shells or energy levels, a great distance from the nucleus. If the nucleus were the size of a tennis ball, the atom would be the size of the Empire State Building. Atoms are mostly empty space.

If you could see an atom, it would look a little like a tiny center of balls surrounded by giant invisible clouds (or energy levels). The electrons would be on the surface of the clouds, constantly spinning and moving to stay as far away from each other as possible. Electrons are held in their energy levels by an electrical force.

The protons and electrons of an atom are attracted to each other. They both carry an electrical charge. Protons have a positive charge (+) and electrons have a negative charge (-). The positive charge of the protons is equal to the negative charge of the electrons. Opposite charges attract each other. When an atom is in balance, it has an equal number of protons and electrons. The neutrons carry no charge and their number can vary.

When electrons move around the nucleus of an atom, they also spin. Because any moving electrical charge can induce or create a magnetic field, there are as many mangnetic fields in an atom as there are electrons. In most atoms, the fields are canceled out because there are as many electrons spinning in one direction as there are spinning in the other direction. However, that is not always the case.

Magnetic substances, such as iron, respond to magnets because they have tiny areas like micromagnets that have electrons spinning in a similar direction. These micromagnets are also called domains. When the domains are all aligned in an object, the object is magnetic. Magnets have magnetic fields that move away from the north pole of the magnet and toward the south pole. When two magnets are brought together, the north pole is attracted to the south pole because the magnetic field of the first magnet can naturally flow into the south pole of the second magnet. If the north ends of each magnet are brought together, they repel because the magnetic fields are pushing against each other.

Metals that can be magnetized include iron, nickel, and cobalt. Steel is made of iron and other metals. The Earth is a magnet with North and South Poles, because its core is iron. Scientists believe that the Earth's poles have reversed several times in the past, but they don't know why.

Activity 1: Magnets Attract Each Other and Some Other Materials

✪ Objective

- Students will be able to make a list of materials attracted to magnets.

🕒 Time

45 Minutes

Materials *FOR EACH CENTER*

- 2 Bar magnets
- 2 Horseshoe magnets
- Glass marble
- Wood disk
- Plastic button
- Metal paper clip
- Samples of steel, aluminum, brass, and copper
- Piece of paper
- Piece of cloth
- Cup of water
- Penny, nickel, dime, and quarter

✔ Procedure

1. Introduce magnets as the topic of exploration. Ask students to make a list of what they already know about magnets. Many students may assume magnets attract all metals. Record student thoughts on the board, and take note of misconceptions to address following the activities.
2. Distribute the student worksheets to the students and have them write their names on the sheets.
3. Go to *Magnets 1-4*. Preview the questions and steps for the experiments with the students. For younger students, review one worksheet at a time, then have the students complete that worksheet before moving to the next worksheet. Emphasize that students must make predictions BEFORE they begin to conduct the experiment.
4. Assign students to the centers and monitor them as they conduct the experiments.
5. Review the following concepts: like poles repel, opposite poles attract; magnets attract only some metals, not all.

Activity 2: Magnetic Force

Objective

▪Students will be able to explain that some magnets are stronger than others, and describe a scenario demonstrating this idea.

Time

45 Minutes

Materials *FOR EACH CENTER*

▪2 Bar magnets
▪2 Horseshoe magnets
▪Box of paper clips

Procedure

1. Review the concepts from Activity 1.
2. Go to *Magnets 5-8*. Preview the questions and steps for the experiments with the students. For younger students, review one worksheet at a time, then have the students complete the worksheet before moving to the next worksheet. Emphasize that students must make predictions BEFORE they begin to conduct the experiment.
3. Assign students to the centers and monitor them as they conduct the experiments.
4. Review the following concepts: different magnets have different amounts of force; different areas of magnets have different amounts of force.

Activity 3: Changing Magnet Force

Objective

▪Students will be able to list materials that may change or block magnetic force.

Time

45 Minutes

Materials *FOR EACH CENTER*

▪2 Bar magnets
▪2 Horseshoe magnets
▪Box of paper clips
▪Plastic cups or containers for water
▪Plastic bubble wrap
▪Water
▪Construction paper
▪Aluminum foil
▪Wood rectangle

Procedure

1. Review concepts from Activities 1 and 2.
2. Go to *Magnets 9-12*. Preview the questions and steps for the experiments with the students. For younger students, review one worksheet at a time, then have the students complete that worksheet before moving to the next worksheet. Emphasize that students must make predictions BEFORE they begin to conduct the experiment.
3. Cut the bubble wrap into five pieces—one for each center. Provide several pieces of construction paper and lengths of aluminum foil for each center. Explain to the students that it may be easier to simply fold the bubble wrap, construction paper, and aluminum foil, rather than cutting them into pieces.
4. Assign students to the centers and monitor them as they conduct the experiments.
5. Review the following concepts: placing magnets together can change the force of the magnets; placing things between magnets can block the force of the magnets; changing temperature does not change the force of magnets.

Activity 4: Fun With Magnets

Objectives

- Students will be able to make a magnet and describe the steps they took to create their magnet.
- Students will be able to use their magnet to demonstrate magnetic fields, and to make magnets move.

Time

45 Minutes

Materials *FOR EACH CENTER*

- 1 Bar magnet
- 1 Darning needle
- 1 Compass
- 1 Wooden or plastic disk
- 1 Plastic container for water
- 5 Rectangular magnets with holes
- 1 Wooden dowel
- Water
- Tape

Materials *FOR TEACHER DEMO*

- 1 Plastic box of iron filings
- 1 Bar magnet
- 1 Horseshoe magnet
- 1 Rectangular magnet
- Masters of pages 9-10

Procedure

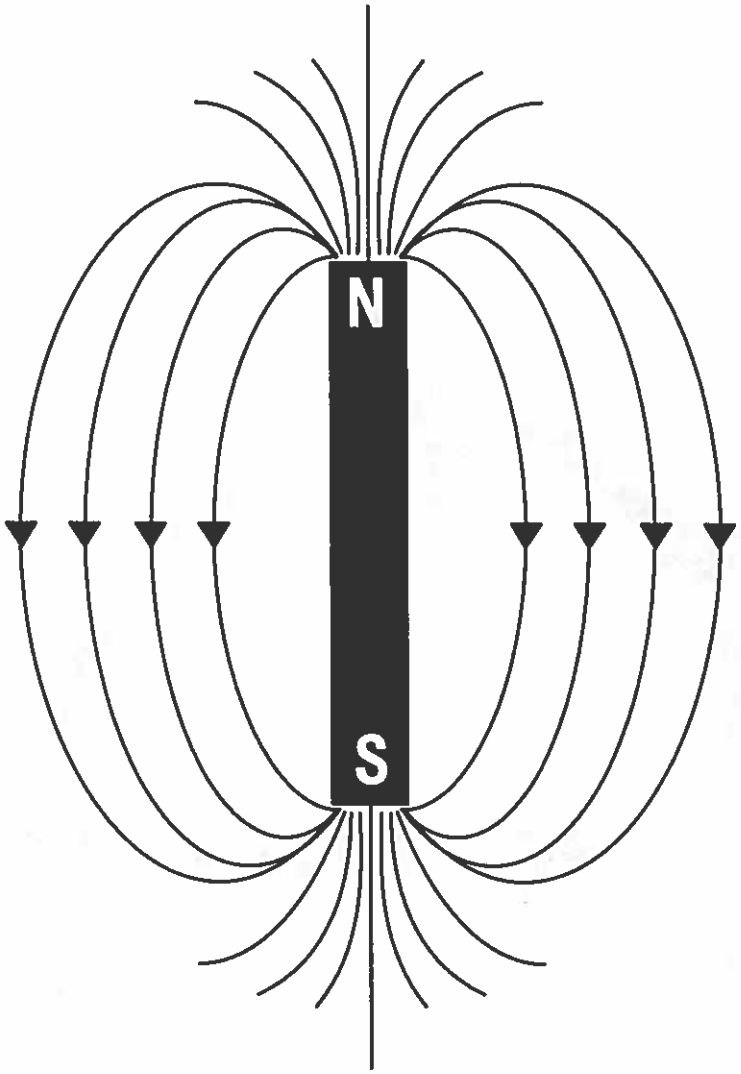
1. Go to *Magnets 13-14*. Preview the questions and steps for the experiments with the students. For younger students, review one worksheet at a time, then have the students complete that worksheet before moving to the next worksheet.
2. Assign students to the centers and monitor them as they conduct the experiments.
3. Use the masters on pages 9-10 to show magnetic force fields. Discuss the fact that the Earth has a magnetic force field like a bar magnet because it has an iron core, which is why we talk about the North and South Poles of the Earth. This is why a compass points to the North Pole. The needle of the compass is a magnet.
4. Use the box of iron filings to demonstrate the magnetic fields of the small bar magnet, horseshoe magnet, and rectangular magnet to the students. A very strong overhead projector can be effective, but it may be better to have the students observe in small groups. Lay the box flat on a table and gently shake it to spread the filings. Place one magnet at a time on the box and magnetic force field lines will develop inside the box. Allow the students to observe. Shake the box each time you place a magnet on it.
5. Review the following concepts: a metal needle can be magnetized by contact with a magnet; a compass needle is a magnet; the Earth is a giant magnet with North and South Poles.

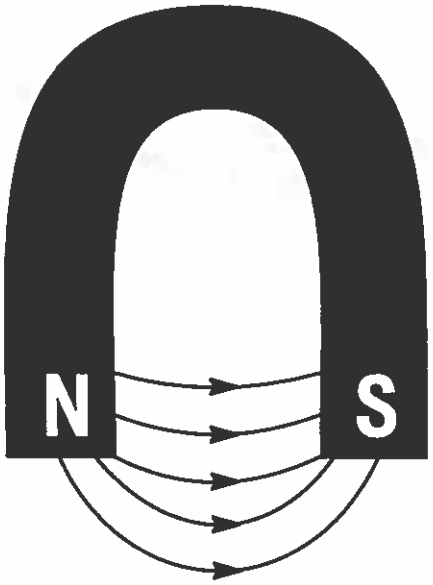
NOTE: If you wish to have each student create his/her own magnet in *Magnets 13* you will need to gather extra disks and needles.

Evaluation

1. Have each student complete the self-assessment and group-assessment on page 25.
2. Evaluate the effectiveness of the unit using the *Unit Exam* on pages 26-28.
3. Have each student design a product that uses magnets.
4. Evaluate the unit using the *Evaluation Form* on page 31 and return it to NEED.

Magnetic Fields of Force





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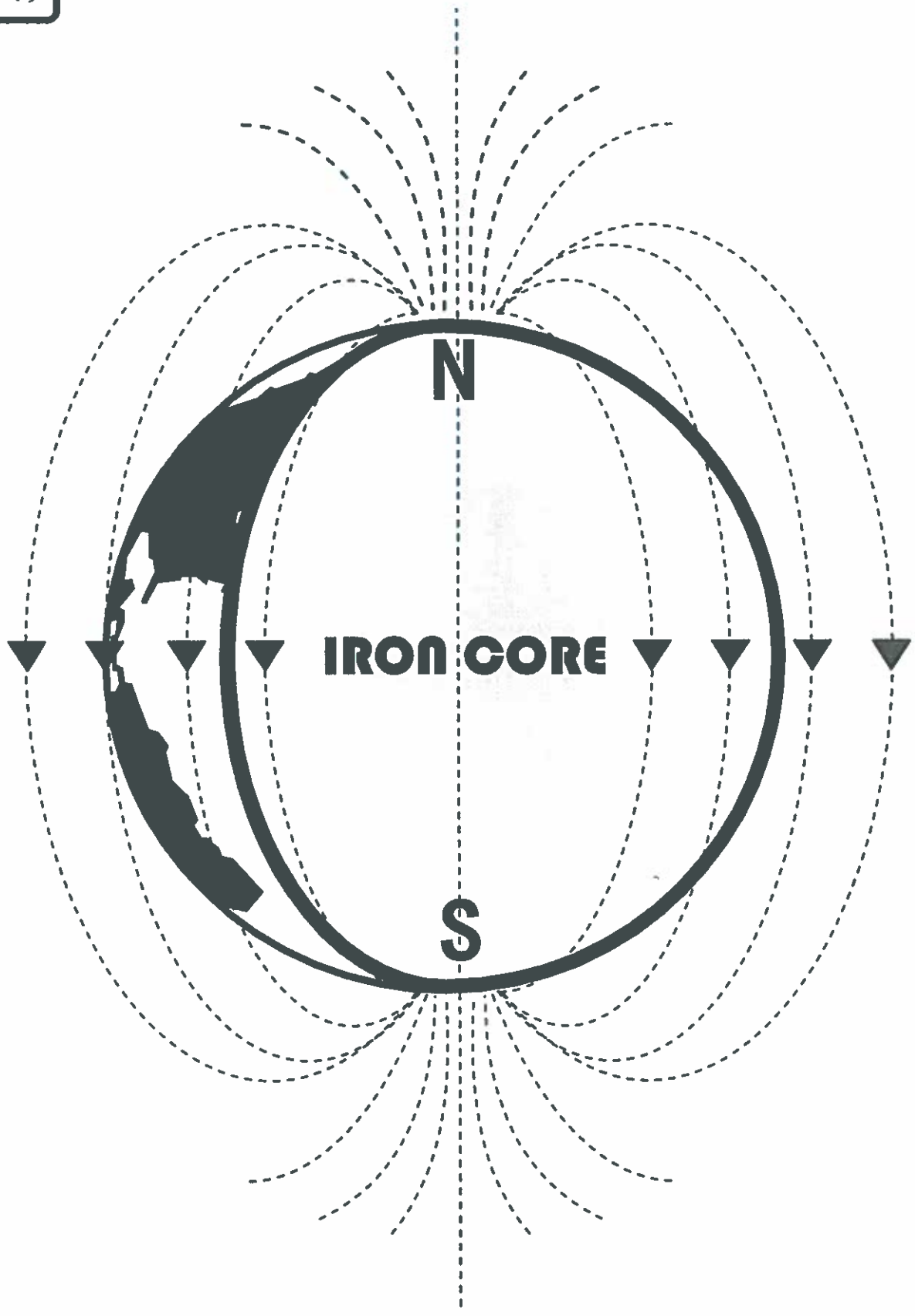
Earth's Magnetic Field



Magnets 1

Question

How do bar magnets behave when their poles are in the same position or opposite position?

PREDICTIONS		RESULTS	
1. attract	repel	1. attract	repel
2. attract	repel	2. attract	repel
3. attract	repel	3. attract	repel
4. attract	repel	4. attract	repel
5. attract	repel	5. attract	repel

1.

2.

3.

4.

5.

Conclusion

Explain when magnets attract and repel each other. Use your results above to help you.

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Magnets 2

Question

How do horseshoe magnets behave when their poles are the same position or opposite position?

Procedure

Step 1: PREDICT: Look at Picture 1. Predict what will happen below.

Step 2: EXPERIMENT 1: Place the magnets together like in Picture 1. Circle your observation below under results.

Step 3: PREDICT: Look at Picture 2. Predict what will happen.

Step 4: EXPERIMENT 2: Place the magnets together like in Picture 2. Circle your observation below under results.

Step 5: PREDICT: Look at Picture 3. Predict what will happen.

Step 6: EXPERIMENT 3: Place the magnets together like in Picture 3. Circle your observation below under results.

Step 7: PREDICT: Look at Picture 4. Predict what will happen.

Step 8: EXPERIMENT 4: Place the magnets together like in Picture 4. Circle your observation below under results.

Step 9: PREDICT: Look at Picture 5. Predict what will happen.

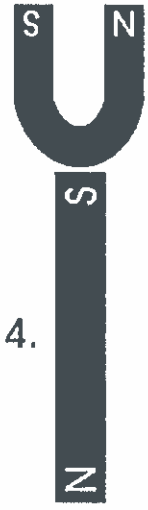
Step 10: EXPERIMENT 5: Place the magnets together like in Picture 5. Circle your observation below under results.

	PREDICTIONS		RESULTS	
Picture 1:	attract	repel	attract	repel
Picture 2:	attract	repel	attract	repel
Picture 3:	attract	repel	attract	repel
Picture 4:	attract	repel	attract	repel
Picture 5:	attract	repel	attract	repel

1.

2.

3.

4. 

5.

Conclusion

Describe how horseshoe magnets attract and repel other horseshoe and bar magnets. Use the results above to help you.

Magnets 3

Question

Which materials will a magnet attract?

Procedure

Step 1: PREDICT: Predict which materials the magnets will attract in the Prediction column.

Step 2: EXPERIMENT 1: Touch the N pole of Bar Magnet 1 to each material. Record your data in the Result column.

Step 3: EXPERIMENT 2: Touch the S pole of Bar Magnet 1 to each material. Record your data in the Result column.

	PREDICTIONS		RESULTS			
			N POLE		S POLE	
Paper	yes	no	yes	no	yes	no
Glass	yes	no	yes	no	yes	no
Wood	yes	no	yes	no	yes	no
Plastic	yes	no	yes	no	yes	no
Cloth	yes	no	yes	no	yes	no
Metal	yes	no	yes	no	yes	no
Water	yes	no	yes	no	yes	no

Piece of Paper | Glass Marble | Wood Disk | Plastic Disk | Piece of Cloth | Metal Paperclip | Cup of Water

Conclusion

Do magnets attract all materials? What do they attract? Use your results above to help you.

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Magnets 4

Question

Are all metals attracted to magnets?

Procedure

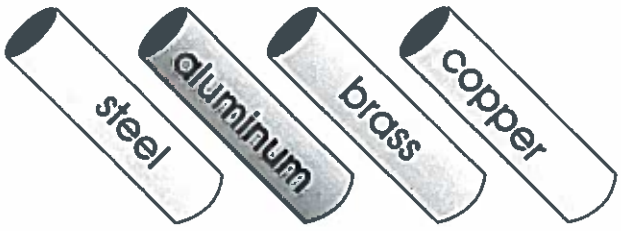
Step 1: PREDICT: Look at the four samples of metal. Predict which metals the magnets will attract in the predictions column.

Step 2: EXPERIMENT 1: Touch the bar magnet to each metal. Record your data in the results column.

Step 3: PREDICT: Look at the coins. Predict which coins will be attracted to the magnet in the predictions column.

Step 4: EXPERIMENT 2: Touch the bar magnet to the coins. Record your data in the results column.

	PREDICTIONS		RESULTS	
Copper	yes	no	yes	no
Brass	yes	no	yes	no
Aluminum	yes	no	yes	no
Steel	yes	no	yes	no
Penny	yes	no	yes	no
Nickel	yes	no	yes	no
Dime	yes	no	yes	no
Quarter	yes	no	yes	no



Conclusion

What metals are magnets attracted to?

Are any of the coins made of steel? Use your results above to help you.

Magnets 5

Question

How many paper clips can each magnet pole lift.

Procedure

Step 1: PREDICT: Predict how many paper clips the N pole of Bar Magnet 1 can lift? Record your prediction.

Step 2: EXPERIMENT 1: Put the paper clips in a pile. Place the N pole of Bar Magnet 1 into the paper clips as shown in the picture. Slowly lift it. Record the number of paper clips lifted by the magnet as Trial 1 under results. Repeat and record as Trial 2.

Step 3: PREDICT: Predict how many paper clips the S pole of Bar Magnet 1 can lift. Record your prediction.

Step 4: EXPERIMENT 2: Conduct 2 trials with the S pole of Bar Magnet 1. Record your results.

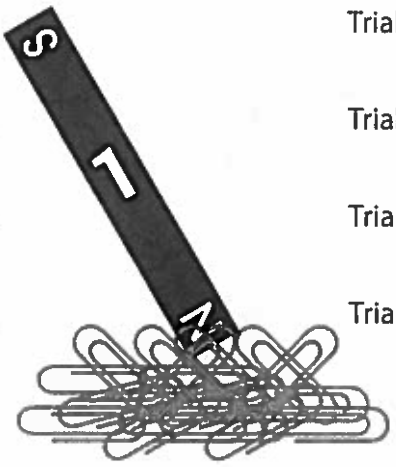
Step 5: PREDICT: Predict how many paper clips the N pole of Bar Magnet 2 can lift. Record your prediction.

Step 6: EXPERIMENT 3: Conduct 2 trials with the N pole of Bar Magnet 2. Record your results.

Step 7: PREDICT: Predict how many paper clips the S pole of Bar Magnet 2 can lift. Record your results.

Step 8: EXPERIMENT 4: Conduct 2 trials with the S pole of Bar Magnet 2. Record your results.

PREDICTIONS	RESULTS	
Bar Magnet 1 – N pole _____	Trial 1 _____	Trial 2 _____
Bar Magnet 1 – S pole _____	Trial 1 _____	Trial 2 _____
Bar Magnet 2 – N pole _____	Trial 1 _____	Trial 2 _____
Bar Magnet 2 – S pole _____	Trial 1 _____	Trial 2 _____



Conclusion

Does one end of a bar magnet have a stronger attraction than the other? Use your results to help you.

Magnets 6

Question

How many paper clips can a horseshoe magnet lift?

Procedure

Step 1: PREDICT: Predict how many paper clips Horseshoe Magnet 1 can lift.

Step 2: EXPERIMENT 1: Place Horseshoe Magnet 1 into the paper clips as shown in the picture. Slowly lift it. Record the number of paper clips lifted by the magnet as Trial 1 under results. Repeat the experiment twice more with Horseshoe Magnet 1 and record as Trials 2 and 3.

Step 3: PREDICT: Predict how many paper clips Horseshoe Magnet 2 can lift.

Step 4: EXPERIMENT 2: Conduct 3 trials with Horseshoe Magnet 2. Record your results.

PREDICTION	RESULTS		
Horseshoe Magnet 1 _____	Trial 1 _____	Trial 2 _____	Trial 3 _____
Horseshoe Magnet 2 _____	Trial 1 _____	Trial 2 _____	Trial 3 _____

Conclusion

What did you learn?

Magnets 7

Question

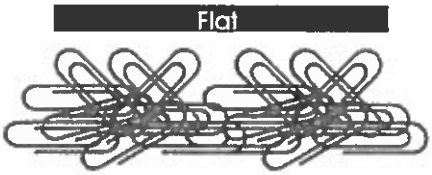
Can a bar magnet lift more paper clips with its side or with its face?

Procedure

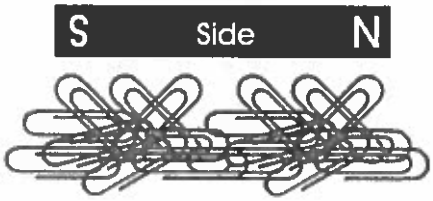
Step 1: PREDICT: What will happen if you place a bar magnet flat on a line of paper clips, as shown in Picture 1? How many paper clips will it lift? Record your prediction.

Step 2: EXPERIMENT 1: Form the paper clips into a line as long as the bar magnet. Place the magnet flat on the pile and slowly lift it. Record the number of paper clips lifted by the magnet.

PICTURE 1



PICTURE 2



Step 3: PREDICT: What will happen if you place a bar magnet on its side in the paper clips, as shown in Picture 2? How many paper clips will it lift? Record your prediction.

Step 4: EXPERIMENT 2: Form the paper clips into a line as long as the bar magnet. Place the magnet on its side on the pile and slowly lift it. Record the number of paper clips lifted by the magnet.

PREDICTIONS	RESULTS
Bar Magnet Flat _____	Bar Magnet Flat _____
Bar Magnet Side _____	Bar Magnet Side _____

Conclusion

Is the face of a magnet stronger than the side? Use your results above to help you explain.

Magnets 8

Question

How is the middle of the magnet different from the ends of the magnet?

Procedure

Step 1: PREDICT: What will happen if you place a paper clip across the middle of a magnet, as shown in Picture 1 with the arrow? Write what you think will happen.

Step 2: EXPERIMENT 1: Place a bar magnet on its side on the table. Place a paper clip across the middle of the magnet like in Picture 1. Do this three times. Record what happened.

Step 3: PREDICT: What will happen if you place a paper clip across the end of a magnet, as shown in Picture 1? Write what you think will happen.

Step 4: EXPERIMENT 2: Place a paper clip across one end of the magnet like in Picture 1. Record what happened.

Step 5: PREDICT: What will happen if you cover the ends of a bar magnet with your hands, like in Picture 2? How many paper clips will it lift? Record your prediction below.

Step 6: EXPERIMENT 3: Cover the ends of a bar magnet with your hands. Touch the middle of the magnet to a pile of paper clips. How many did it lift? Record your data.

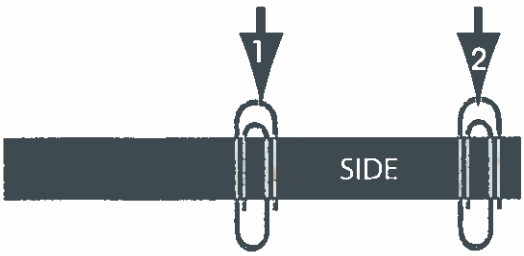
PREDICTIONS _____

_____

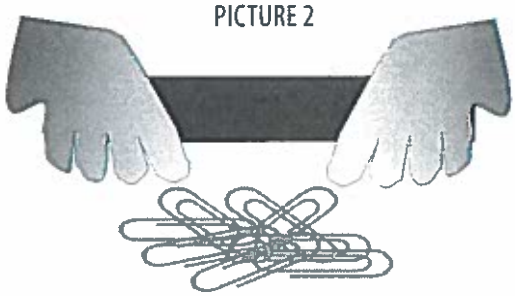
RESULTS _____

_____

PICTURE 1



PICTURE 2



Conclusion

Is one part of a magnet stronger than another? Use your results above to help you explain.

Magnets 9

Question

What happens when you use two magnets together to lift paper clips?

Procedure

Step 1: PREDICT: What will happen if you place two bar magnets together with opposite poles touching, like in Picture 1? How many paper clips will the magnets lift? Record your prediction.

Step 2: EXPERIMENT 1: Place two bar magnets with flat sides and opposite poles together, like in Picture 1. Place one end in the paper clips and slowly lift. Record your result.

Step 3: PREDICT: What will happen if you place two bar magnets together with the same poles touching? How many paper clips will they lift? Record your prediction.

Step 4: EXPERIMENT 2: Place two bar magnets together with the same poles together. Place one end in the paper clips and slowly lift. Record your result.

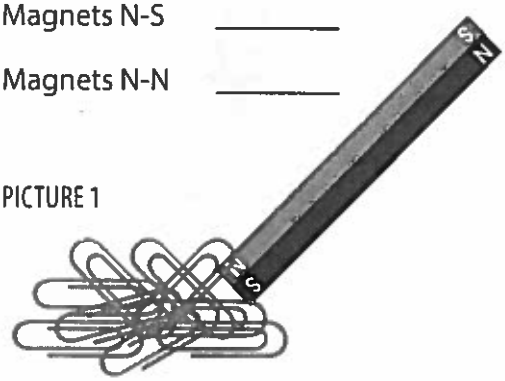
Step 5: PREDICT: What will happen if you place two horseshoe magnets with opposite poles touching, like in Picture 2? How many paper clips will the magnets lift? Record your prediction.

Step 6: EXPERIMENT 3: Place two horseshoe magnets with opposite poles together, like in Picture 2. Place the ends of the magnets in the paper clips and slowly lift. Record your result.

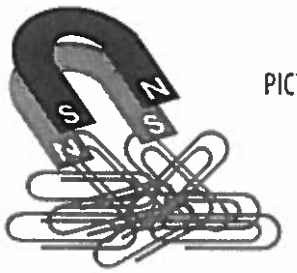
Step 7: PREDICT and EXPERIMENT: Repeat Steps 5 and 6 with the same ends of the horseshoe magnets together. Record your prediction and your result.

PREDICTIONS		RESULTS	
Two Bar Magnets N-S	_____	Two Bar Magnets N-S	_____
Two Bar Magnets N-N	_____	Two Bar Magnets N-N	_____
Two Horseshoe Magnets N-S	_____	Two Horseshoe Magnets N-S	_____
Two Horseshoe Magnets N-N	_____	Two Horseshoe Magnets N-N	_____

PICTURE 1



PICTURE 2



Conclusion

What did you learn?

Magnets 10

Question

How does temperature affect a magnet?

Procedure

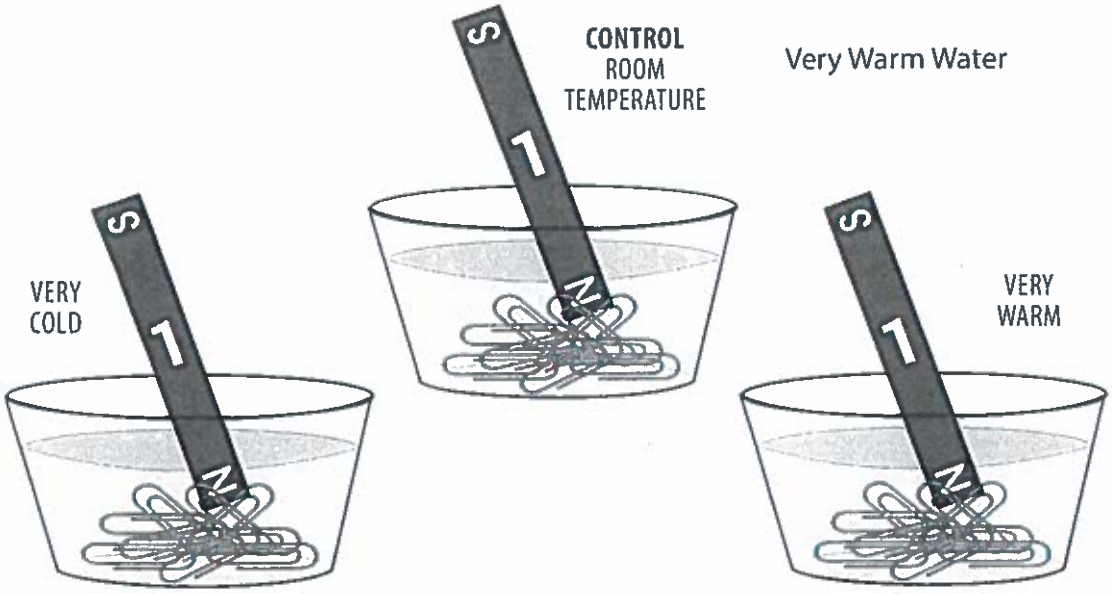
Step 1: CONTROL: Place the paper clips in a container of room temperature water. Place the N pole of Bar Magnet 1 into the paper clips and slowly lift. Record the number of paper clips the magnet lifts.

Step 2: PREDICT: How many paper clips will a magnet lift in cold water? Record your prediction.

Step 3: EXPERIMENT 1: Place the paper clips in a container of very cold water. Place the N pole of Bar Magnet 1 into the paper clips and slowly lift. Record your data.

Step 4: EXPERIMENT 2: Repeat Steps 2 and 3 with a container of very warm water. Record your data.

PREDICTIONS		RESULTS	
Very Cold Water	_____	Room Temperature Water	_____
Very Warm Water	_____	Very Cold Water	_____
		Very Warm Water	_____



Conclusion

Does temperature affect a magnet? Use your results above to help you explain.

Magnets 11

Question

Can you block the force of magnets?

Procedure

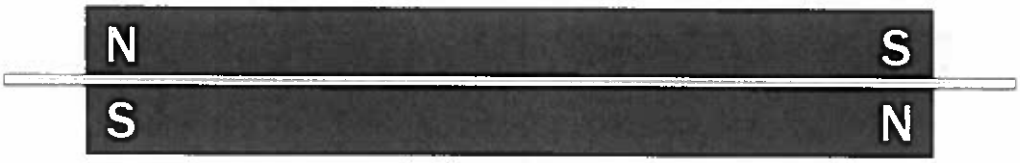
Step 1: PREDICT: How many pieces of paper must you place between two bar magnets to stop the force of one magnet from lifting the other?

Step 2: EXPERIMENT 1: Place Bar Magnet 1 flat on the table. Place a piece of paper over the magnet. Place Bar Magnet 2 on top of the paper over Bar Magnet 1 with the opposite poles together, like in the picture. Slowly lift the top magnet. Add paper one piece at a time until the bottom magnet will not lift. Record your data.

Step 3: OBSERVE: Examine the bubble wrap, aluminum foil, and wood. PREDICT: How many pieces of plastic, aluminum foil, or wood must you place between two bar magnets to stop the force of one magnet from lifting the other?

Step 4: EXPERIMENT 2: Repeat Step 2 with pieces of plastic bubble wrap, aluminum foil, and wood. Record your data.

PREDICTIONS		RESULTS	
Pieces of Paper	_____	Pieces of Paper	_____
Pieces of Plastic Bubble Wrap	_____	Pieces of Plastic Bubble Wrap	_____
Pieces of Aluminum Foil	_____	Pieces of Aluminum Foil	_____
Pieces of Wood	_____	Pieces of Wood	_____



Conclusion

Is one material better than another at blocking the force of a magnet? Use your results above to help you explain.

Magnets 12

Question

Can you block the force of magnets with paper clips?

Procedure

Step 1: PREDICT: Look at Picture 1. If you place another bar magnet on top of the one shown, with opposite poles together, will the top magnet be able to lift the bottom magnet when a paper clip is placed in this position? Record your prediction.

Step 2: EXPERIMENT 1: Place Bar Magnet 1 flat on the table. Place a paper clip on it as shown in Picture 1. Place Bar Magnet 2 on top of Bar Magnet 1 with opposite poles together and lift. Record your data.

Step 3: PREDICT and EXPERIMENT 2: Repeat Steps 1 and 2 with three paper clips using Picture 2 as a guide.

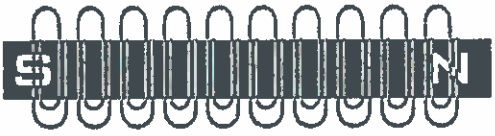
Step 4: PREDICT and EXPERIMENT 3: Repeat Steps 1 and 2 with 10 paper clips using Picture 3 as a guide.

	PREDICTIONS			RESULTS	
Picture 1:	yes	no	Picture 1:	yes	no
Picture 2:	yes	no	Picture 2:	yes	no
Picture 3:	yes	no	Picture 3:	yes	no

PICTURE 1

PICTURE 2

PICTURE 3



Conclusion

Do paper clips block the force of magnets? Use your results above to explain.

Magnets 13

Question

Can you make a magnet?

IMPORTANT HINT: *A compass points to the Earth's North Pole because its needle is a magnet.*

WARNING: KEEP THE COMPASS FAR AWAY FROM THE MAGNETS.

Procedure

Step 1: Place the needle across the middle of the plastic disk and tape it, like in the picture.

Step 2: Fill the plastic container with water. Carefully place the plastic disk on the surface of the water so that it floats.

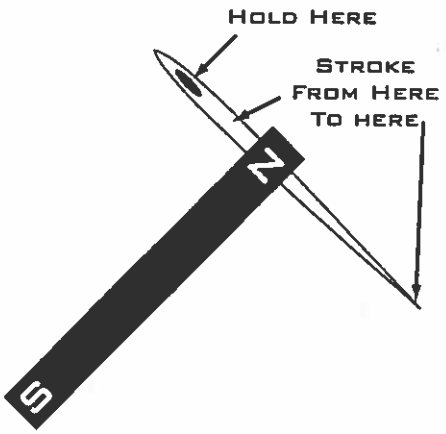
Step 3: Compare the direction of your needle with the direction of the compass needle.

Step 4: Remove the needle from the disk and hold it very carefully between your thumb and index finger.

Step 5: With your other hand, stroke a bar magnet down the needle from your finger to the end of the needle using the picture below as a guide. Do not stroke up the needle, only down. Stroke the needle 10 times.

Step 6: Tape the needle onto the disk again and place it in the container of water.

Step 7: Compare the direction of your needle with the direction of the compass needle.



Conclusion

How can you make a magnet?

Magnets 14

Question

Can you make a magnet float in the air?

Procedure

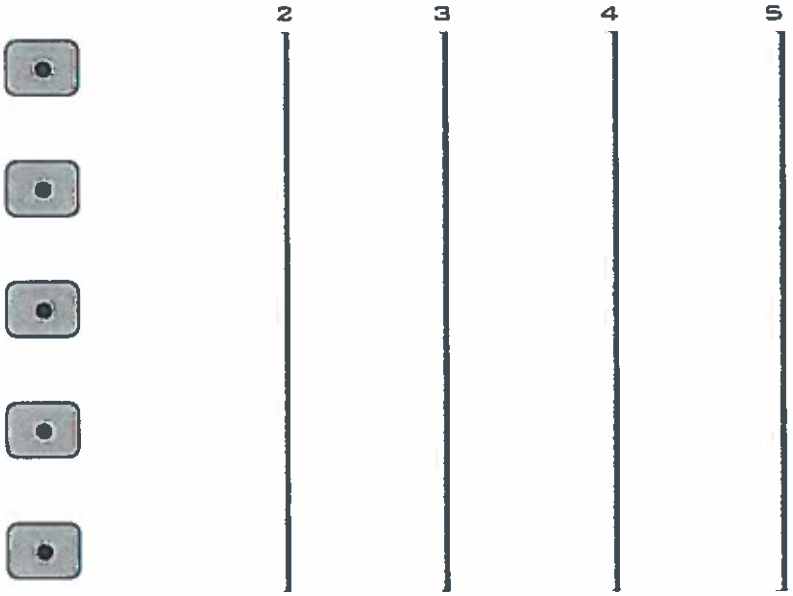
Step 1: Look at the six rectangular magnets with holes in the middle. They have no poles marked on them. Arrange the magnets in a line on the table so that their poles are opposite - north to south to north to south.

Step 2: Hold the wooden stick by one end so that it points straight up.

Step 3: Slide one magnet onto the stick, so that it rests on your fingers. Slide another magnet onto the stick so that it repels the first magnet; so that the like poles are together. Draw the two magnets on Stick 2 below, showing the distance between the two magnets.

Step 4: Slide a third magnet onto the stick so that it repels the second magnet. Draw the three magnets on Stick 3.

Step 5: Slide the other magnets onto the stick one at a time with each one repelling the one below it. Draw the magnets on Sticks 4 - 5.



Conclusion

What did you learn?

Think About It

How well did you work? Did you do your part in the group?
Fill in the circle that shows how you and your group worked.

YOUR WORK	YES	MOSTLY	NO
1. I did all of my work.	○	○	○
2. I followed directions.	○	○	○
3. I was careful.	○	○	○
4. I asked questions.	○	○	○
5. I listened to others.	○	○	○
6. I helped the group.	○	○	○

YOUR GROUP			
1. We worked together.	○	○	○
2. We helped each other.	○	○	○
3. We listened to each other.	○	○	○
4. We were careful.	○	○	○
5. We all helped clean up.	○	○	○

What you liked best: _____

_____

_____

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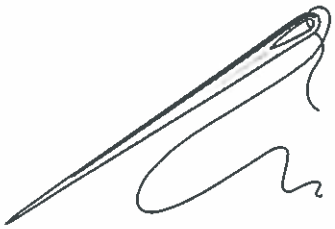
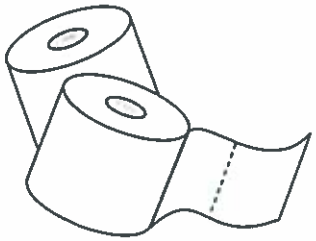
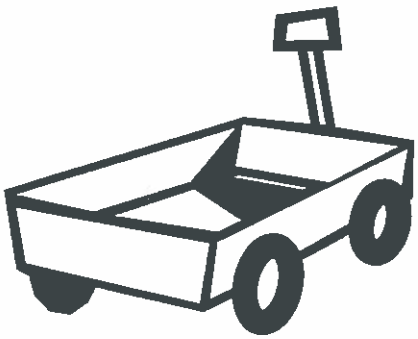
Unit Exam

NAME: _____

Circle the objects that a magnet **will not** attract.

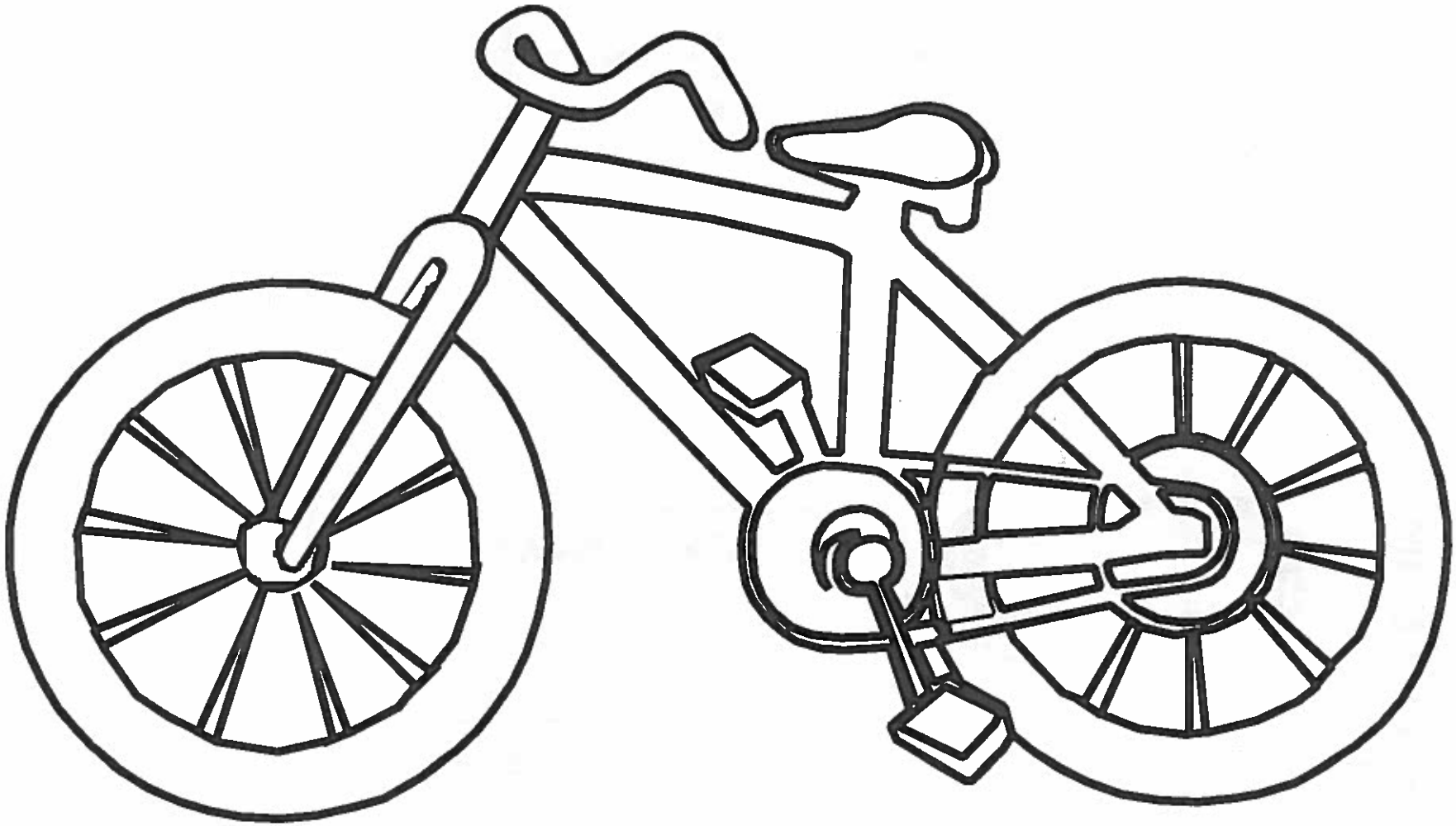






NAME: _____

Color the parts that a magnet might attract blue.
Color the parts that a magnet won't attract red.



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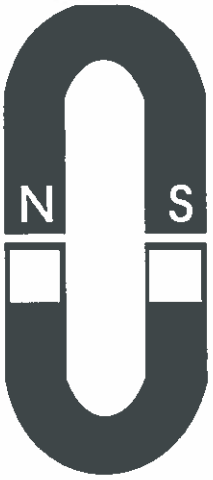
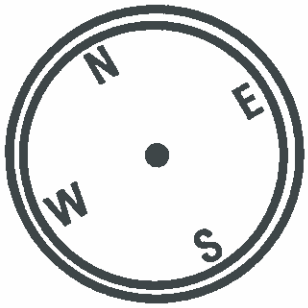
Unit Exam

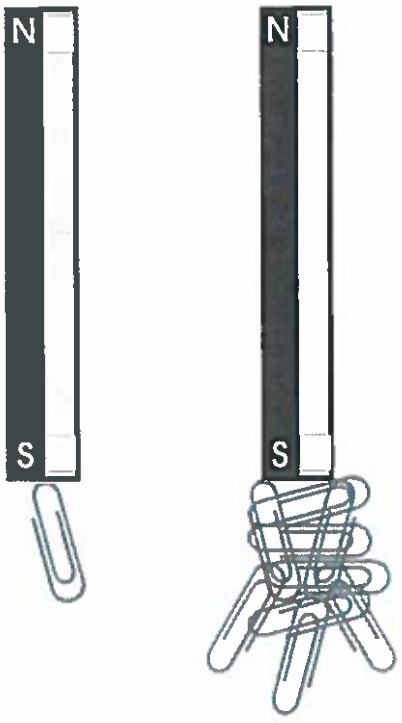
NAME: _____



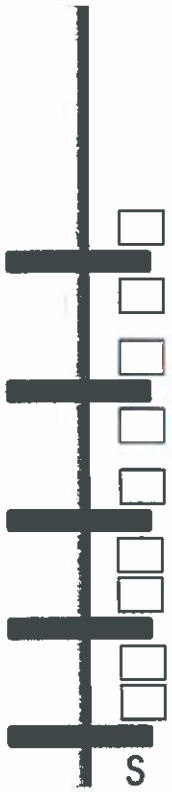
Write the poles of the magnets in the boxes.



Draw the needle for the compass.

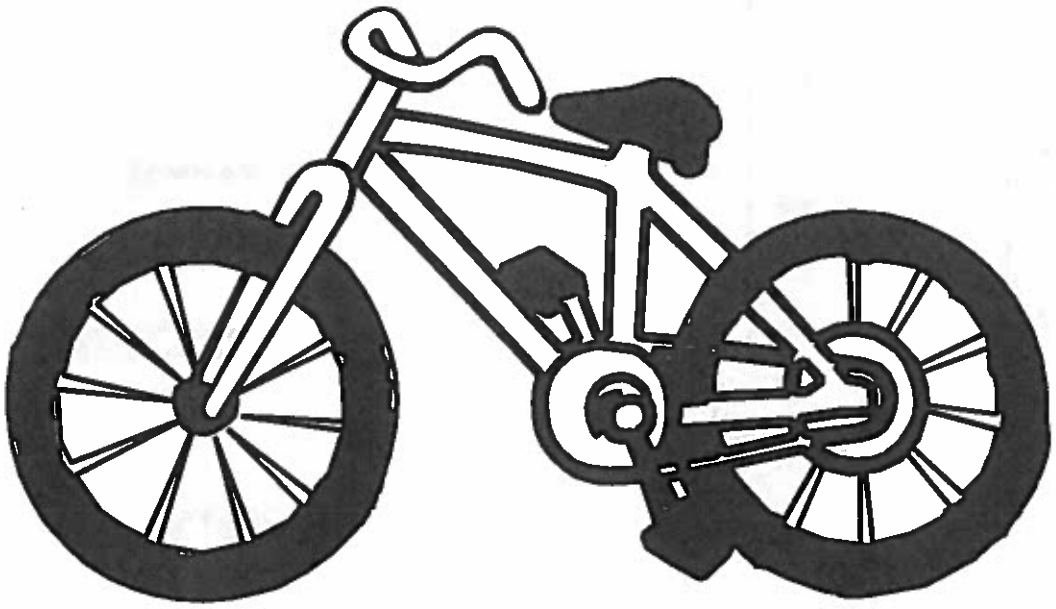


Write the poles of the magnets in the boxes.



Write the poles of the magnets in the boxes.

Answer Key



Darkened parts will not attract a magnet.
Light parts might - depending on the metal.

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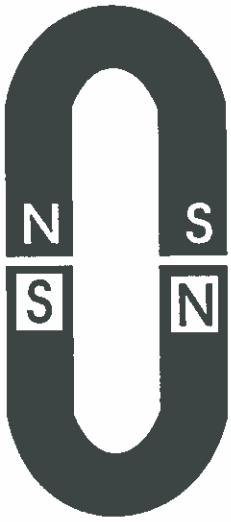
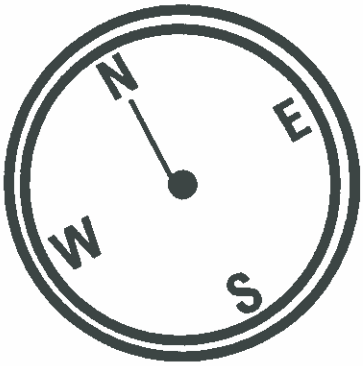
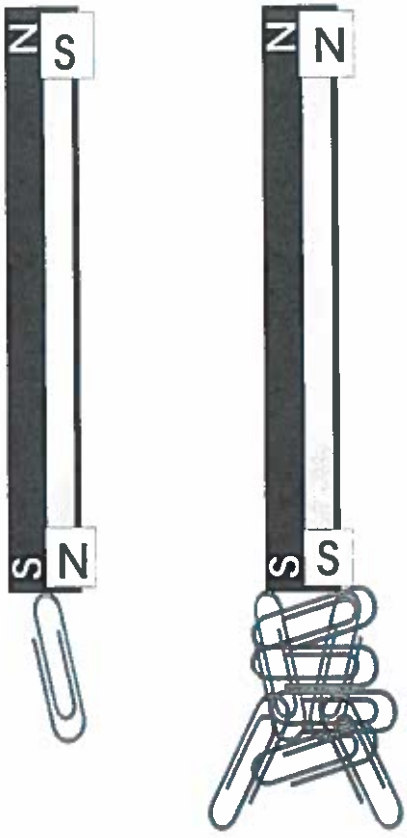
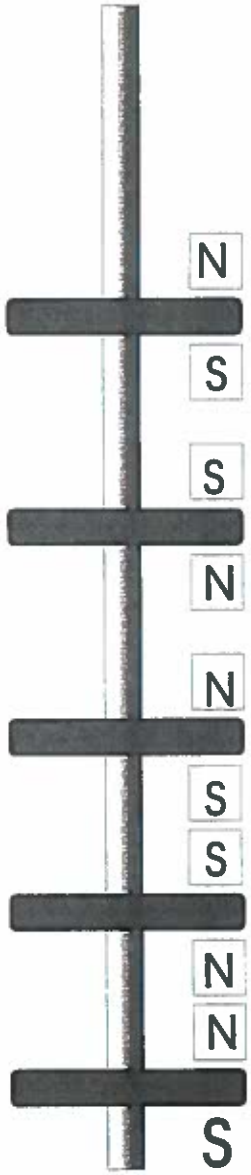
Answer Key









Wonders of Magnets Evaluation Form

State: _____ **Grade Level:** _____ **Number of Students:** _____

1. Did you conduct the entire unit?	❑ Yes	❑ No
2. Were the instructions clear and easy to follow?	❑ Yes	❑ No
3. Did the activity meet your academic objectives?	❑ Yes	❑ No
4. Was the activity age appropriate?	❑ Yes	❑ No
5. Were the allotted times sufficient to conduct the activities?	❑ Yes	❑ No
6. Was the unit easy to use?	❑ Yes	❑ No
7. Was the preparation required acceptable for the unit?	❑ Yes	❑ No
8. Were the students interested and motivated?	❑ Yes	❑ No
9. Was the energy knowledge content age appropriate?	❑ Yes	❑ No
10. Would you teach this unit again?	❑ Yes	❑ No

Please explain any 'no' statement below.

How would you rate the unit overall?	❑ excellent	❑ good	❑ fair	❑ poor
How would your students rate the unit overall?	❑ excellent	❑ good	❑ fair	❑ poor

What would make the unit more useful to you?

Other Comments:

Please fax or mail to: **The NEED Project**
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Manassas, VA 20110
FAX: 1-800-847-1820

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