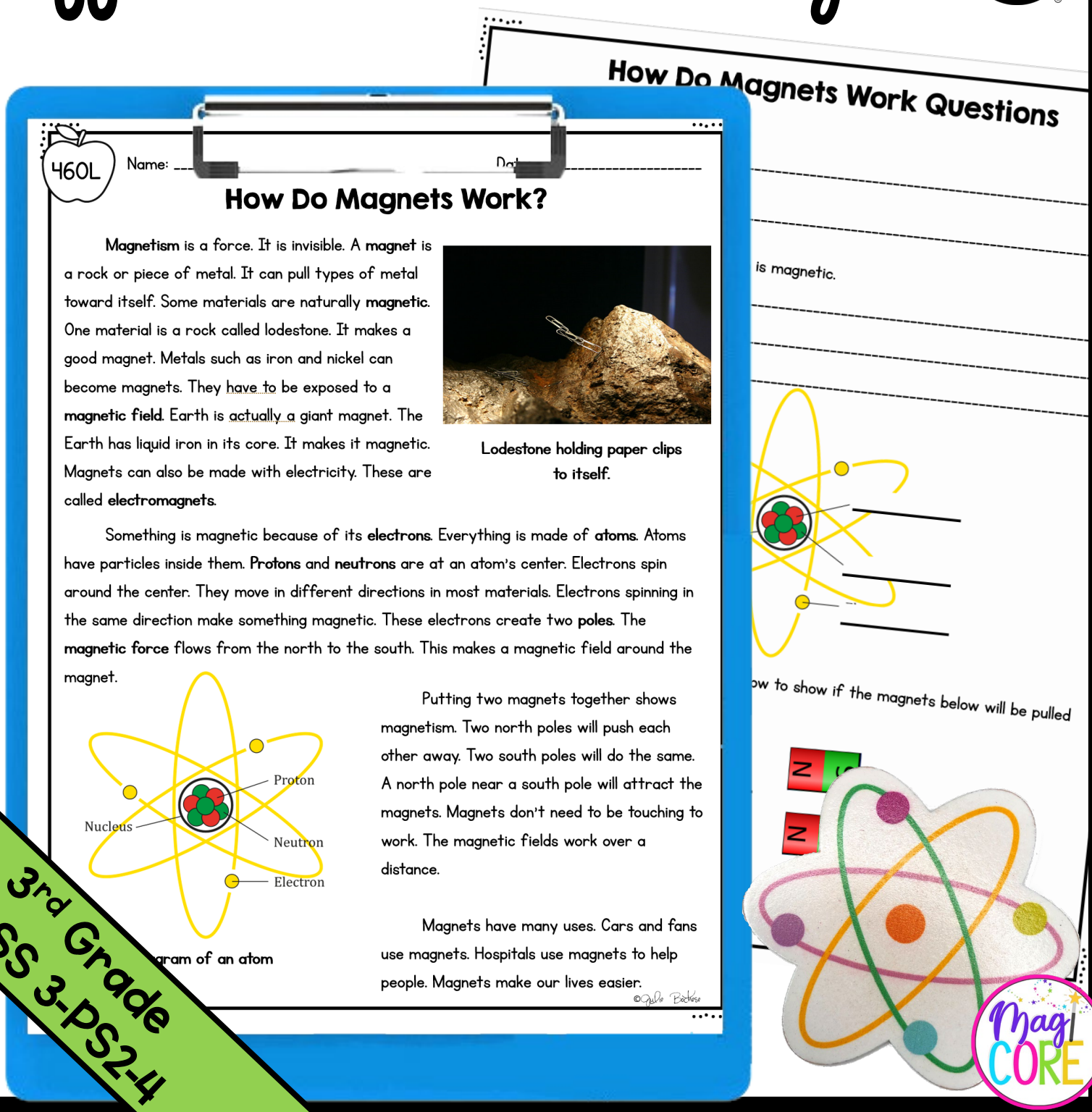
Magnetic Design Solution

Differentiated Passages

LEXILE



460L Name: _____ Date: _____

How Do Magnets Work?

Magnetism is a force. It is invisible. A **magnet** is a rock or piece of metal. It can pull types of metal toward itself. Some materials are naturally **magnetic**. One material is a rock called lodestone. It makes a good magnet. Metals such as iron and nickel can become magnets. They have to be exposed to a **magnetic field**. Earth is actually a giant magnet. The Earth has liquid iron in its core. It makes it magnetic. Magnets can also be made with electricity. These are called **electromagnets**.

Lodestone holding paper clips to itself.

Something is magnetic because of its **electrons**. Everything is made of **atoms**. Atoms have particles inside them. **Protons** and **neutrons** are at an atom's center. Electrons spin around the center. They move in different directions in most materials. Electrons spinning in the same direction make something magnetic. These electrons create two **poles**. The **magnetic force** flows from the north to the south. This makes a magnetic field around the magnet.

...gram of an atom

Putting two magnets together shows magnetism. Two north poles will push each other away. Two south poles will do the same. A north pole near a south pole will attract the magnets. Magnets don't need to be touching to work. The magnetic fields work over a distance.

Magnets have many uses. Cars and fans use magnets. Hospitals use magnets to help people. Magnets make our lives easier.

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How Do Magnets Work Questions

is magnetic.

...ow to show if the magnets below will be pulled

3rd Grade
NGSS 3-PS2-4

MagCORE

ABOUT LEXILE LEVELS

MagiCore Learning, LLC is a certified Lexile® Partner. These texts are officially measured and approved by Lexile and MetaMetrics® to ensure appropriate rigor and differentiation for students.

The Lexile Framework® for Reading measures are scientific, quantitative text levels. When the Lexile of a text is measured, specific, measurable attributes of the text are considered, including, but not limited to, word frequency, sentence length, and text cohesion. These are difficult attributes for humans to evaluate, so a computer measures them.

Common Core State Standards uses Lexile level bands as one measure of text complexity. Text complexity ranges ensure students are college and career ready by the end of 12th grade. Lexile measures help educators scaffold and differentiate instruction as well as monitor reading growth.

Grade Band	Lexile® Bands Aligned to Common Core Expectations
K-1	N/A
2-3	420L-820L
4-5	740L-1010L
6-8	1185L-1385L

Keep in mind when using any leveled text that many students will need scaffolding and support to reach text at the high end of their grade band. According to Appendix A of the Common Core Standards, "It is important to recognize that scaffolding often is entirely appropriate. The expectation that scaffolding will occur with particularly challenging texts is built into the Standards' grade-by-grade text complexity expectations, for example. The general movement, however, should be toward decreasing scaffolding and increasing independence both within and across the text complexity bands defined in the Standards."

Magnetic Design Solution

3rd grade

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Each passage set includes two differentiated passages on a third-grade level (one at the beginning of the band, one towards the end) and a question set geared towards comprehension and science mastery. The first question is differentiated to include a fill-in-the-blank diagram (lower complexity) or an open-ended diagram (higher complexity).

How to Use This Resource

This resource was created with the NGSS Science Standards in mind. It includes seven differentiated passages aligned to the following standard:

3-PS2-4 Magnetic Design Solution

Define a simple design problem that can be solved by applying scientific ideas about magnets. (Engineering and Technology)

Clarification Statement: Examples of problems could include constructing a latch to keep a door shut and creating a device to keep two moving objects from touching each other.

Assessment Boundary: None

Here are some suggestions for using these passages:

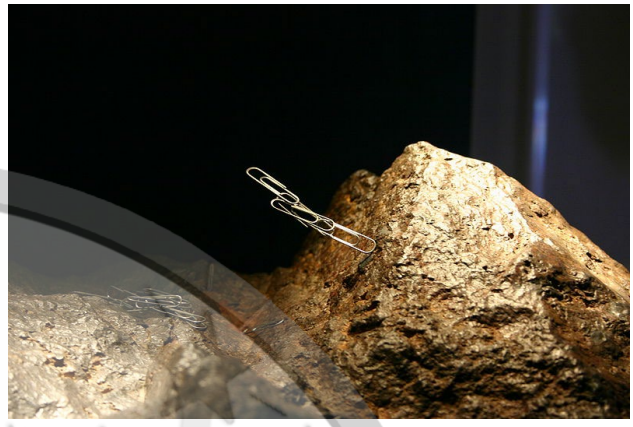
- Use as independent work after you have taught an overview of this standard. Assign the different levels based on the passage students can read and comprehend independently.
- Use as a reading center to reinforce key comprehension and science concepts at the same time!
- Use as a homework or review packet.
- Use as an intervention for students who need to revisit science concepts.

460L

Name: _____ Date: _____

How Do Magnets Work?

Magnetism is a force. It is invisible. A **magnet** is a rock or piece of metal. It can pull types of metal toward itself. Some materials are naturally **magnetic**. One material is a rock called lodestone. It makes a good magnet. Metals such as iron and nickel can become magnets. They have to be exposed to a **magnetic field**. Earth is actually a giant magnet. The Earth has liquid iron in its core. It makes it magnetic. Magnets can also be made with electricity. These are called **electromagnets**.



Lodestone holding paper clips to itself.

Something is magnetic because of its **electrons**. Everything is made of **atoms**. Atoms have particles inside them. **Protons** and **neutrons** are at an atom's center. Electrons spin around the center. They move in different directions in most materials. Electrons spinning in the same direction make something magnetic. These electrons create two **poles**. The **magnetic force** flows from the north to the south. This makes a magnetic field around the magnet.

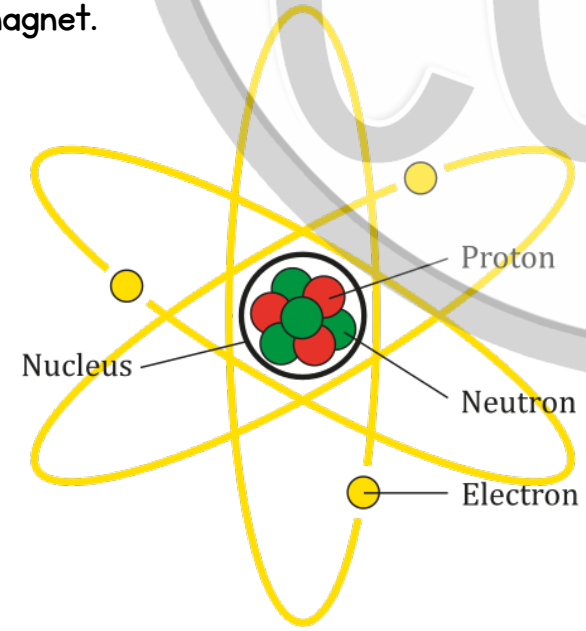


Diagram of an atom

Putting two magnets together shows magnetism. Two north poles will push each other away. Two south poles will do the same. A north pole near a south pole will attract the magnets. Magnets don't need to be touching to work. The magnetic fields work over a distance.

Magnets have many uses. Cars and fans use magnets. Hospitals use magnets to help people. Magnets make our lives easier.

©Julio Bochoso

How Do Magnets Work Questions

1. Define the following terms:
   - Magnet - _____
   - Lodestone - _____

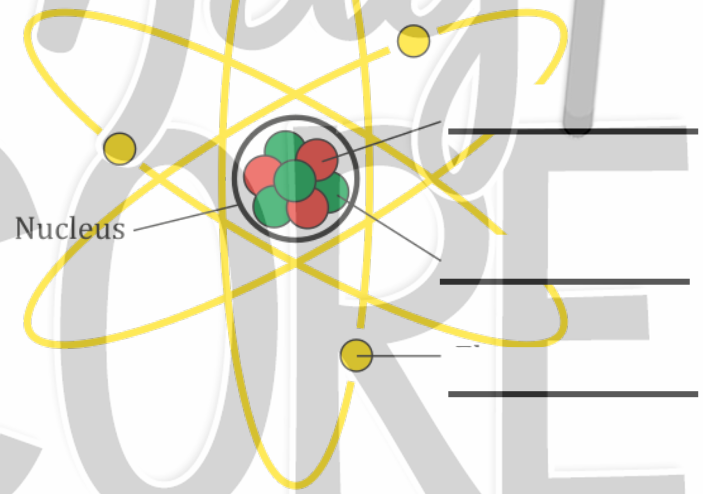
2. Describe how we know the Earth is magnetic.

_____

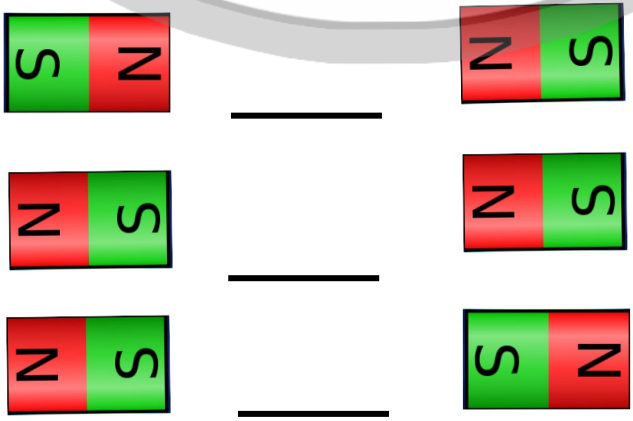
_____

_____

3. Label the parts of the atom.



4. Draw arrows between the magnets below to show if the magnets below will be pulled together or pushed apart.



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820L

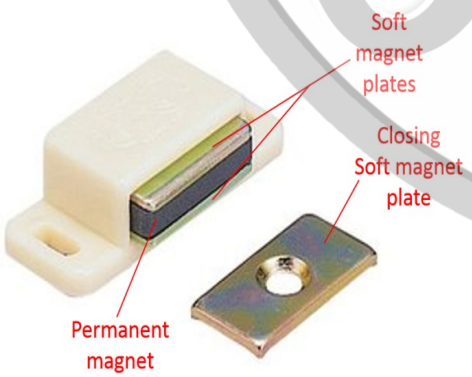
Name: _____ Date: _____

A Magnetic Solution

Have you ever closed a kitchen cabinet only to find it won't stay closed? You check out the **hinges**, but they seem fine. You shuffle items around inside the cabinet, thinking it's too full to stay shut. Maybe you even take some things out of the cabinet. Perhaps a bag of chips. You might think eating the chips is the only way to solve your cabinet problem. After you've crunched your way through half the bag, you realize there might be another **solution**.

Magnets!

A stubborn cabinet door can be kept shut by adding a **magnetic catch**. Magnetic door catches are a simple way of keeping a door shut once it's closed. There are usually three pieces involved in this solution – a metal plate, a magnet, and screws. The metal plate is often made of steel. It is fixed to the door using screws. The magnet part is screwed into the inside of the cabinet unit itself.



Magnetic cabinet latch

When the door is shut, the magnet and the metal plate line up perfectly. The metal plate is **attracted** to the magnet. This keeps the door from swinging open until you tug on the door's knob to open the cabinet. If you want the door to be easier to open, set the magnet part a little deeper into the cabinet. It won't touch the metal plate on the door in this case. The door should still stay shut because of the **magnetic field**. Larger doors will need bigger magnets or more of them to stay closed. Magnetic door catches are designed to be hidden. The cabinet will still have a nice, clean look.

Your chips should be safely tucked away inside the cabinet now... if you didn't eat them all!

©Ruth Backus

A Magnetic Solution Questions

1. Use the chart below to describe the problem and solution described in the article.

Problem	Solution

2. Describe how the magnet works to keep the door closed.

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3. Are there any other problems you could solve with a magnetic cabinet latch? Describe what the problem is and how it could be solved.

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480L

Name: _____ Date: _____

Getting Organized

"Clean your room!"

How many times has an adult said this?

One way to stop hearing this is to get organized. Your room gets messy because you have stuff. You use that stuff. You don't always have time to put it away. Getting organized is work at first. It will save you time in the end.

Magnets are great for organizing. Magnets work because **electrons** in their **atoms** spin in the same direction. This makes a **magnetic field**. That field flows between a magnet's **poles**. Opposite poles attract one another. This makes magnets keep things in place.

Magnets holding papers.

Magnets can be used in your room. Magnetic bars can be put on your wall. You can store toy cars and other metal items here. Steel cans can hold supplies such as paintbrushes. The steel cans can be stuck to magnets. Magnetic paint can turn walls into big magnets. Magnetic hooks can be used on the wall. You can hang your art. Metal sheets can be put up, too. This gives you another place that will hold your gear with magnets.

There are many ways to clean up. Magnets are a good choice. You won't have to hear "clean your room" ever again.

©Julie Bochese

Getting Organized Questions

1. Use the chart below to describe the problem and solution described in the article.

Problem	Solution
You need to clean your room and get all your toys off your floor.	

2. Describe how magnets can help you clean up your toys.

---

3. Are there any other ways you can think of to use magnets to help organize and clean up around the house? Describe them and how the magnets would work.

©Julia Bochoso

790L

Name: _____ Date: _____

Magnets at the Junkyard

People throw away a great deal of metal. Scrap metal can often be made into other items. The junkyard needs a way to sort through the trash it receives. This allows the junkyard to separate the metal from other kinds of garbage. Huge **magnets** are used for this job.

Scrap magnets are big, iron discs. They are attached to large machines called **cranes**. The scrap magnet hangs from a long arm that extends from the crane. It is then moved over the trash heap. This scrap magnet only attracts things that are **magnetic**. Metals such as iron, cobalt, and nickel are the most common metals that get picked up by the scrap magnet.

Unlike natural magnets, scrap magnets are **electromagnets**. This means they are made by running an electric current through coiled wire. The crane operator lowers the iron disc over the trash heap. Electricity powered by a battery is switched on. This **magnetizes** the iron disc. Scrap metal is attracted to the magnetized disc. The crane operator then drives the scrap magnet's load to a location. The collected metal drops from the scrap magnet when the electricity is switched off. Electromagnets like this are not **permanent**. They don't stay magnetic once the electricity is gone.

Scrap magnets can lift several pounds to several tons. It depends on the size of the iron disc. The electric current used and the item being lifted are also factors. The size of the crane affects how much the scrap magnet can hold, too. Some scrap magnets are able to lift entire cars! Others pick up much smaller bits of metal. No matter what they are attracting, scrap magnets are an important part of junkyards.

©Julie Bochorse

Magnets at the Junkyard Questions

1. Use the chart below to describe the problem and solution described in the article.

Problem	Solution

2. Describe how magnets can help sort trash at the junkyard.

---

3. Can you think of any other places or problems that could benefit from trying this solution? Describe how magnets could help.

©Julia Bochoso

480L

Name: _____ Date: _____

The Curtain Challenge

People like to put up curtains. They make a home cozy. The fabric on curtains can show a favorite theme. This makes the rooms more personal.

Curtains can be a bother, though. Curtains can look messy. They are always being opened and closed to let light in or keep light out. Curtains can get damaged with handling. Holding back curtains can keep things neat.

There are many ways to hang curtains that allow for easy movement. Some people like hooks. These screw into the wall. The fabric is stuck behind the hook when the curtains are open. Unhooking frees the curtains. They can be closed again. This is a good solution. It damages the wall, though. The hook has to be screwed in place. Parents sometimes worry the hook sticks out too far. This could hurt a child.

Using rope to tie the curtains back is another way. This gets rid of screwing anything to the walls. Tying and untying the curtains gets annoying, though. Rope can also be rough on curtain fabric.

One easy **solution** is to use **magnets**. Attaching two magnets to the ends of soft rope or fabric makes a great curtain holder. Opposite **poles** of the magnets must face out. The magnets will attract one another. The curtains will be held in place. No screws have to be used. Nothing has to be tied or untied. Magnets also don't hurt anyone. The curtains won't be damaged either. Magnets can be fit to a person's interests.

Using magnets as a solution for curtains is safe. It is also cheap. They are easy to change. There will be no problem when deciding whether to leave the curtains opened or closed.

©Julie Bochese

The Curtain Challenge Questions

1. Use the chart below to describe the problem and solution described in the article.

Problem	Solution
Curtains are hanging down blocking the windows.	

2. Describe how magnets can be used to help with curtains.

---

3. Can you think of any other household items or problems that could benefit from trying this solution? Describe how magnets could help.

©Julia Bochoso

720L

Name: _____ Date: _____

Treasure Hunt

Your grandmother gave you a necklace that belonged to her mother. Before that, it belonged to her mother's mother. The necklace is an important part of your family's history. You're honored to own it and don't want to take it off. You wear it positively everywhere!

After a day at the beach, you notice the necklace is gone! It must have fallen off when you were playing volleyball. Or building sandcastles. Or having a seaweed fight with your brother. You just know your precious necklace is buried under the sand somewhere. How will you ever find it?

One tool that can be used to find the necklace is a **metal detector**. A metal detector is a hand-held device that looks like a long stick with a disc at the bottom. It can be waved slowly over the ground to search for metal. Metal detectors are actually **electromagnets**. A simple metal detector has a coil of wire in the disc part. Electricity flows through the coil. This creates a **magnetic field** around the disc. Sweeping the metal detector back and forth over the ground makes the magnetic field move with you. That magnetic field causes another magnetic field to form around pieces of metal buried in the ground.

This second magnetic field is picked up by the metal detector through a second coil of wire in the disc. The second coil is attached to a speaker. The metal detector makes a signal noise when metal is found. As you get closer to finding the metal, the magnetic field gets stronger. This causes the signal noise to get louder. You can narrow your search by listening to the signal noise.

©Julie Bochoso

You hit the beach with a metal detector. After a couple of minutes of sweeping back and forth in the spot you played volleyball, you get lucky. The metal detector beeps like crazy right where you remember nosediving to the sand to save the ball. You sift your fingers through the sand and are delighted to find your necklace! Because it was made of metal, it was attracted to the metal detector's electromagnet. Now you don't have to tell your grandmother you lost a family treasure. A magnet has saved the day!

©Julia Bachosa

Treasure Hunt Questions

1. Use the chart below to describe the problem and solution described in the article.

Problem	Solution

2. Describe how magnets work in metal detectors.

---

3. Can you think of any other problems a metal detector could help solve? How would the magnet be useful?

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