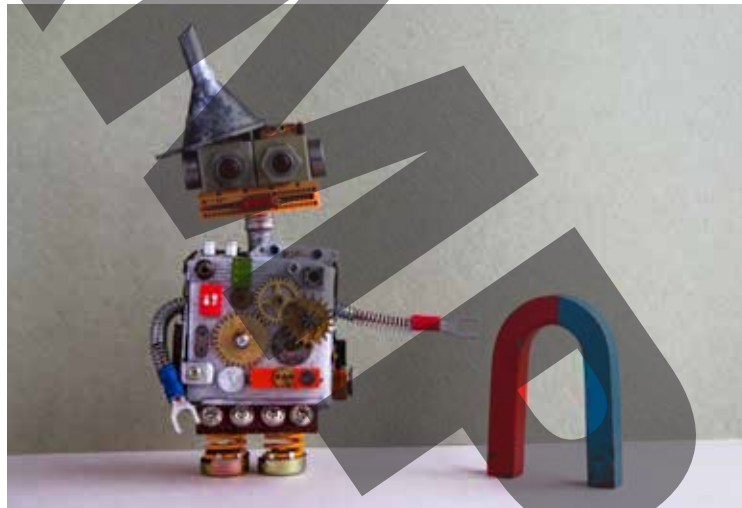


# Surprising Science for Kids:



# More Magnetic Adventures!

KIT-515

# Welcome to Surprising Science for Kids: More Magnetic Adventures! Grades 4-8

Your **More Magnetic Adventures!** kit includes everything you need to perform hands-on experiments and dynamic demonstrations related to magnetism.

We believe the best way to learn about science is to have fun! The activities in this guide will ignite students' curiosity and make them eager to explore on their own.



## Included in this kit:

- 10 Ceramic Ring Magnets
- 4 Ceramic Bar Magnets
- 6 Wooden Sticks
- 1 Jumbo Paper Clip
- 1 Magnaprobe
- 6 Rubber Bands
- String
- 1 Craft Stick
- 10 Washers
- Sealed Iron Filings
- 2 Plastic Cups
- Pencil

## You will also need:

- Scissors
- Ruler
- Pen or Pencil

## SAFETY TIPS

Parental supervision is suggested for younger children.

**NEVER** put a magnet into your mouth, ears, or nose! Swallowing a magnet is very dangerous. Store your magnets safely.

Always handle your magnets gently. They are brittle and can break if they are dropped or allowed to pull together quickly.

Magnets can pinch fingers if they are caught between two magnets. Use caution when handling.

Magnets can ruin things like televisions, tablets, cell phones, computers, and other types of electronic equipment. Don't leave your magnets close to these things!

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# NGSS Correlations

## PS2: Motion and Stability: Forces and Interactions

### Grade 5

#### (5-PS2-1)

Support an argument that gravitational force exerted by Earth on objects is directed down.

### Grades 6-8

#### (MS-PS2-3)

Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects.

#### (MS-PS2-5)

Forces that act at a distance (electric and magnetic) can be explained by fields that extend through space and can be mapped by their effect on a test object (a ball, a charged object, or a magnet, respectively).

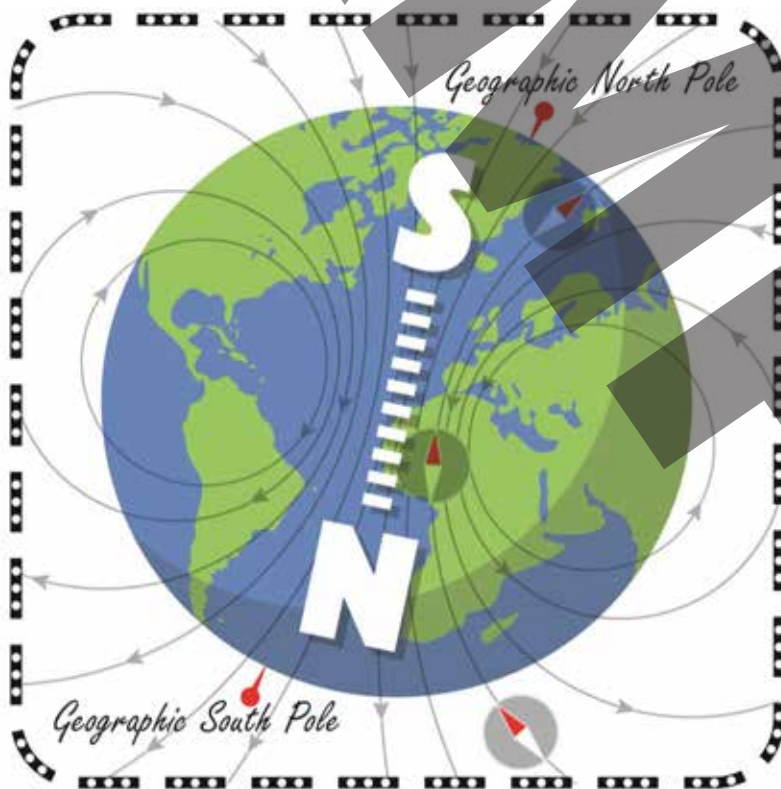
# About Magnets

*continued*

Not all magnets are man-made. Some minerals are naturally magnetic, such as this mineral, called magnetite. It can come in many shapes and colors.



Even our Earth is one big magnet!



## Magnetic Field Lines

*The lines of force form closed loops that leave the north pole of a magnet and end at the south pole.*

*Magnetic poles are always in pairs.*

Some magnets are stronger than others. Strong magnets have strong magnetic fields and can attract objects from far away. Weaker magnets have weaker magnetic fields and they can only attract objects that are very close to them.

For instance, the magnets that stick to our refrigerators are very small, but there are also huge magnets that perform important work—such as the electromagnets attached to heavy machinery that pick up scrap metal in junkyards.

# Activity 1: Magnetic Pyramid

## Materials:

- 1 Ring Magnet
- 3 Bar Magnets
- String
- 6 Wooden Sticks
- 4 Rubber Bands

## Directions:

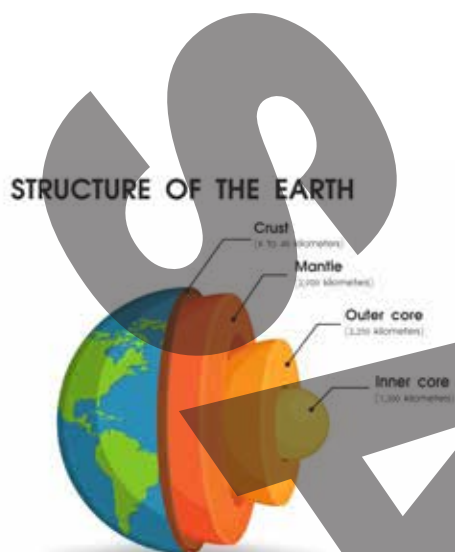
1. Make the base of the pyramid by creating a triangle with three wooden sticks. Wrap a rubber band at each corner where the sticks overlap.
2. Use two more sticks to make one side of the pyramid. Use a rubber band at each corner to connect the sticks to the base and to each other.
3. Use a secure double knot to tie the string to the ring magnet.
4. Tie the loose end of your string to the top of the pyramid. The ring magnet should hang about 1½ inches above the table.
5. Use a rubber band to connect the last stick to the base and top of the pyramid.



## Try these experiments with your Magnetic Pyramid!

Instructions	Observations: Draw and label a diagram and include arrows to describe the magnetic forces between the bar and ring magnets
Use magnetic forces to make the ring magnet spin and twirl without touching it. Take a bar magnet and wave it near the ring magnet without allowing the two magnets to touch.	
Place a bar magnet underneath the ring magnet. Slide and twist the bar magnet around to move the ring magnet.	
Place a bar magnet on the outside of each of the sticks in the base triangle. Swing the ceramic magnet and watch how it bounces in response to the three magnets.	
Create your own design to move the ring magnet. You can change the number of bar magnets, their position, or their distance. Try all three!	

## Activity 3: Magnetic Field Lines



Magnetic force, like other forces, are invisible to the eye, but exist nonetheless. On Earth, the flowing liquid metal that makes up the outer core creates electric currents, which, in turn, create magnetic fields.

If you look at the diagram on page 4, you can see the illustration of the magnetic field lines that form around the Earth.

As you may know, iron is a ferromagnetic material (something that is attracted to magnets). Iron filings are very small shavings of iron that look like a light powder. Since each piece is influenced by magnets, filings can be used to visualize the magnetic field.

When the iron filings are sprinkled, those very close to the magnet, where the magnetic force is the strongest, will cling to the magnet. Those filings a little further away, where the magnetic force is not as strong, will align themselves with the magnetic field lines (the lines of force that move from the north end of the magnet to the south in loops).

### Materials:

- Sealed Iron Filings
- 1 Bar Magnet
- 1 Ring Magnet

### Directions:

1. Shake the plastic container so the filings are evenly dispersed. Place a bar magnet on a flat surface with either the north or south side facing up. VERY slowly, lower the filings onto the bar magnets and observe what happens. Pay particular attention to the iron filings along the edges of the container. Repeat this process a few times, focusing on different areas of the iron filings. What are your observations?
2. While holding the iron filings above the magnet, so the case does not touch the magnet, slowly move the case from side to side. What did you observe?

# Activity 6: Puzzling Magnets

continued

