

Science Benchmark: 05 : 03

Earth and some Earth materials have magnetic properties. Without touching them, a magnet attracts things made of iron and either pushes or pulls on other magnets.

Standard 03:

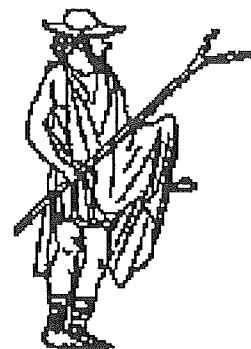
Students will understand that magnetism can be observed when there is an interaction between the magnetic fields of magnets or between a magnet and materials made of iron.

Shared Reading

Magnetism - It's sooo Attractive!

If you want to have some fun, find a couple of magnets and a handful of paper clips. Give them to a child and watch that child's face as he/she plays with the "magical" metal for the first time. Do you remember your own amazement the first time you discovered the special *properties* of magnets? You were probably startled to discover that magnets could *attract* other objects to them. Do you recall how puzzling it was when you turned one magnet the other way and could not keep them together? An unknown force caused them to *repel* each other. Welcome to the world of magnetism! This amazing *magnetic force* is the push or pull of a magnet on other magnetic material. Another characteristic is each magnet has a North and South Pole. When the North pole of the magnet is brought near the South pole of another magnet, they attract each other. If like poles, for example the North pole and North pole, are brought together, they repel each other. All magnets show properties of magnetic attraction and repulsion.

Natural magnets were the first magnets to be discovered. They are made of minerals and are naturally magnetized by Earth's magnetic field. There is an old folk tale about a Greek Shepherd named Magnus who climbed a mountain to rescue a lamb. He found that the iron nails in his sandals made his feet stick to the mountain because he was walking on a lodestone, a natural magnet. There are stories about Chinese Emperors using magnets thousands of years ago. About 1269 A.D., a man named Petris Peregrinis found that a lodestone could transfer its magnetic power to an ordinary iron needle. All he had to do was rub the natural magnet several times against the needle in one direction. Little did he know he was working with a force that would be used constantly in today's world.



Greek Shepherd



Chinese Emperor

attract - to draw objects together

magnetic force - the power of a magnet to push or pull other magnetic material

natural magnet - a mineral made magnetic by Earth's magnetic field

properties - qualities or characteristics

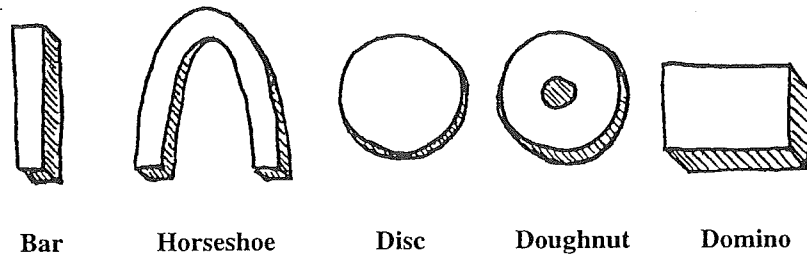
repel - to push objects apart

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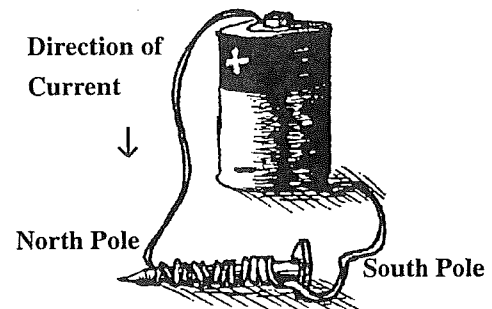
A *permanent magnet* keeps its magnetism after it has been magnetized. Iron and nickel are the most common materials that magnets are made from. You can make a permanent magnet from a steel nail by taking a magnet and rubbing the nail in the same direction several times. Now the nail will pick up pins or staples or other small items made of iron. If it doesn't, you may need to rub the needle more. If you want to demagnetize most magnets, you can hit them or heat them.

Permanent magnets are often named for their shape. Common shapes include: bar, horseshoe, disk, doughnut and domino magnets. In disk or domino-shaped magnets, the flat surfaces are the poles. A horseshoe magnet is simply a bar magnet that has been bent into a "U" shape. When a magnet is broken or cut, each piece has a north and south magnetic pole. No matter what shape a magnet may be, it has a north and south pole.

Shapes of Magnets



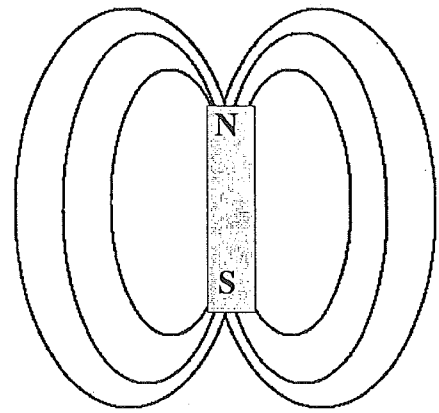
A *temporary magnet* is one that does not keep its magnetism. A temporary magnet can still be a very strong magnet. An example of this is an *electromagnet*, the strongest of all magnets. Look at the picture of the electromagnet. It uses electricity to produce a strong magnetic force. The strength of this temporary magnet depends on the number of loops in the wire and the power of the battery. More loops and stronger currents produce more intense magnetic fields. The iron core of this temporary magnet is magnetized only while the electric current is flowing.



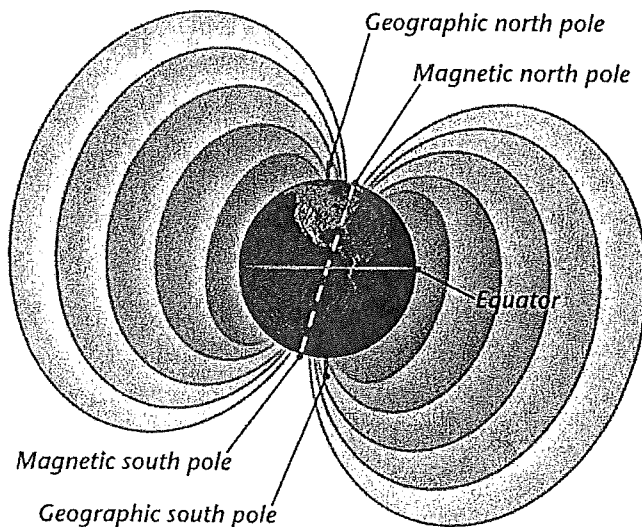
An Electromagnet

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- electromagnetism** - the magnetism produced when an iron core is magnetized by an electric current passing through a wire that is coiled around the iron core
 - permanent magnet** - an object that keeps its magnetism after it has been magnetized
 - temporary magnet** - a magnet that does not keep its magnetism

If you shake iron filings around a bar magnet, they will line up in a pattern called a *magnetic field*. A magnetic field is an area around a magnet where the magnetic force exists. A magnetic field can be thought of as a set of imaginary lines called lines of force. We think of these lines going out from the North pole of a magnet, arching around and returning to the magnet at its South pole. The lines lie closest to each other near the poles where the magnetic field is the strongest.



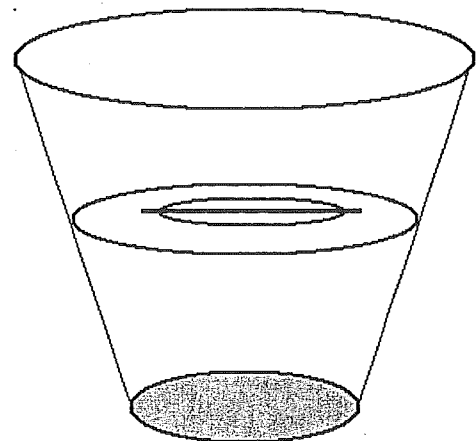
Magnetic Field



Earth has a magnetic field like a bar magnet. Scientists hypothesize that Earth's core is made of nickel and iron. This may be responsible for Earth's magnetic field.

A *compass* is a free swinging magnet that points north. A bar magnet with a string tied to the middle will always rotate until one end points north and the other end points south. To make a compass, a magnet may be rubbed on a needle to magnetize it. The needle is placed on a thin piece of styrofoam in a cup of water. The needle will rotate so that one end points north.

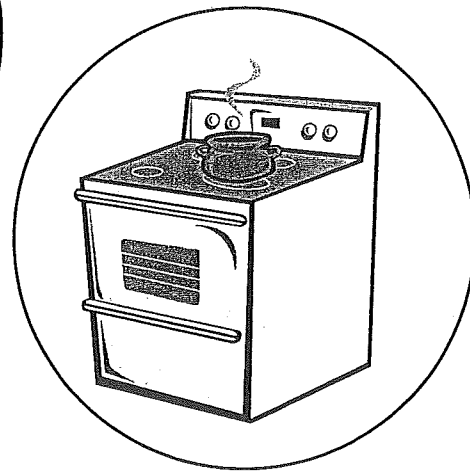
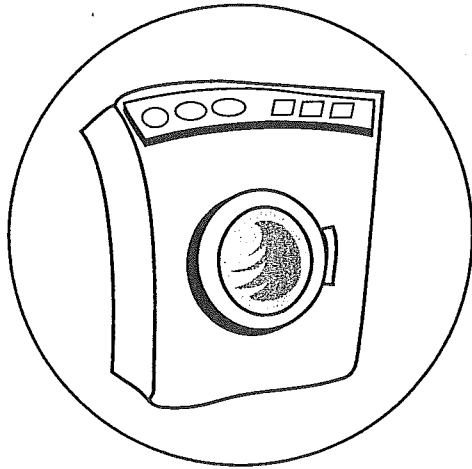
A compass can be effected by a magnet placed near it. If a strong bar magnet is placed next to a compass, it will line up along one of the bar magnet's field lines instead of Earth's.



compass - an instrument used to determine geographic direction on Earth

magnetic field - area around a magnet where the magnet has power to attract magnetic material

Magnets are used constantly in today's homes. All electric motors use electromagnets that run everything from refrigerators and washing machines to electric trains and robots. Audio and videotape players have electromagnets called heads that record and read the tape. TV picture tubes use an electromagnet to help form the screen images. Magnets are essential in business and industry, and are used in everything from cranes and construction machinery to copy machines and computers. Magnets help produce electric power in generators, and are used in radar systems and navigation. Medical science uses magnets for diagnosing diseases with a technique known as magnetic resonance imaging (MRI). In every aspect of our society we depend on this amazing force called magnetism.



Science Language Students Need to Understand and Use

1. **attract:** to draw objects together
2. **compass:** an instrument used to determine geographic direction on Earth
3. **electromagnetism:** the magnetism produced when an iron core is magnetized by an electric current passing through a wire that is coiled around an iron core
4. **magnetic field:** the area around a magnet where the magnet has power to attract magnetic material
5. **magnetic force:** the power of a magnet to push or pull other magnetic material
6. **natural magnet:** a mineral made magnetic by Earth's magnetic field
7. **permanent magnet:** an object that keeps its magnetism after it has been magnetized
8. **properties:** qualities or characteristics
9. **repel:** to push objects apart
10. **temporary magnet:** a magnet that does not keep its magnetism

