Magnetism is a force that works at a distance to attract or repel certain objects. The objects most commonly affected by magnetism are other magnets, iron, steel, and certain other metals. A magnet attracts an object by pulling the object to it. The magnet repels an object by pushing it away or resisting it.

A magnetic field is the area around the magnet where the force is in effect. The magnetic field is made up of invisible lines created by the movement of electrically charged particles. These are called magnetic field lines. Objects are attracted or repelled along these lines of force.

All magnetic field lines come together at two points called poles. All magnets have two poles - a north pole and a south pole. One pole has a positive charge and the other pole has a negative charge. The north pole on a magnet will always attract the south pole of another magnet. The south pole will always attract the north pole. Poles that are the same ("like poles") will always repel each other. It is the magnetic force that attracts and repels. The force is stronger when magnetic objects are closer together. The force weakens when magnetic objects are farther apart.
Force: Magnetism

List some examples of how magnets are used in daily life.

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Draw or find a picture of one way magnets are used in daily life.
Experiment: Magnetic Field Lines

This demonstration shows the magnetic fields for three different types of magnets.

Materials
- Horseshoe magnet, bar magnet, and ring magnet
- Iron filings
- Notebook paper
- Small paper cup

Procedure
Make a paper tray by folding up about one inch on each edge of the paper. Place the magnets on a table a few inches apart. Place the paper tray on top of the three magnets. Pour the iron filings in a paper cup. Gently sprinkle the iron filings on the paper over the magnets.

Where is the greatest concentration of iron filings on each of the magnets? _________________________________________________________________

Describe what else you see.
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Draw a diagram of the pattern made by the iron filings for each magnet.

<table>
<thead>
<tr>
<th>Horseshoe magnet</th>
<th>Bar magnet</th>
<th>Ring magnet</th>
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Experiment: Repelling Force

This demonstration shows the magnetic force of repulsion.

Materials
- Two or more ring magnets
- Pencil
- Modeling clay

Procedure
Stand a pencil on its eraser on a table. Form a ball of modeling clay around the base of the pencil to keep it standing on the table. Now place two ring magnets on the pencil with like poles facing each other. Be careful when handling the magnets because they can break. Place the first ring magnet over the pencil so that it sits on the modeling clay. Place the second ring magnet over the pencil. If the second magnet touches the first, remove the second magnet and turn it over.

What do you observe? ____________________________________

Place one hand on top of the pencil. Use the other hand to push the second magnet down against the first one. Quickly release the magnet.

What happens? _________________________________________

If you have more ring magnets, continue to stack them like-poles together.

Explain why the magnets seemed to float.
_______________________________________________________
_______________________________________________________
_______________________________________________________
_______________________________________________________
Experiment: Attracting Force

This demonstration shows the magnetic force of attraction.

Materials
- Bar magnet
- String
- Paper clip
- Steel ball bearing

Procedure
Lay the bar magnet on the edge of a table so that one end of the magnet hangs out over the edge of the table. Tie one end of the string to the paper clip. Hold the other end of the string. Let the paper clip dangle several inches away from the magnet. Keep the paper clip as still as possible. Slowly move the paper clip closer to the magnet until they touch.

What happened just before the magnet and paper clip touched?

Lay the ball bearing on a table. You might need to lay the paper clip to one side of the ball bearing to keep it from rolling off the table. Lay the magnet on the table several inches from the ball bearing. Be sure it is on the opposite side of the ball bearing from the paper clip. Slowly push the magnet closer to the ball bearing until they touch.

What happened just before the magnet and ball bearing touched?

Explain why the paper clip and ball bearing had that reaction to the magnet.
ANSWERS TO Force – Magnetism

ANSWERS:
p. 2
Answers will vary. Here are some samples:
- Magnets hold paper to metal surfaces.
- Magnets are used and scrap yards to move metal.
- Magnetic tape is used in audio and video cassettes.
- Magnetic surfaces are used in computer hard disk drives.
- Magnets are used as clasps for purses and cases.
- Magnetic strips are used on credit, debit, and ATM cards.
- Magnets are used in speakers and microphones.
- Magnets are sometimes used in electric motors, generators and transformers.
- A compass uses a magnetized pointer and Earth’s magnetic field to point to north.

p. 3
The greatest concentration of iron filings should be around the magnets’ poles.
Students should see some iron filings arranged in magnetic field lines.
Diagrams will vary.

p. 4
The second ring magnet should appear to float above the first magnet.
When pressed down and released, the second ring magnet should shoot upward.
The magnets seemed to float because the repelling magnetic force was greater than the gravitational pull.

p. 5
The paper clip should jump toward the magnet just before they touch.
The ball bearing should roll quickly toward the magnet just before they touch.
When the paper clip and the ball bearing entered the magnetic field, the attraction force drew them immediately to the magnet.