Edgenuity

Warm-Up | Magnets and Magnetism

Lesson Question

What are the properties of magnets?

Lesson Goals

Determine how magnetic poles interact with each other.

Analyze the magnetic field around a magnet.

Examine how magnetic domains are aligned in a magnet.

Distinguish between temporary and permanent magnets.

Words to Know

Fill in this table as you work through the lesson. You may also use the glossary to help you.

magnetic domain	a cluster of atoms whose magnetic fields are aligned in the same direction
magnetic pole	the end of a magnet where the force is the strongest
dipole	a pair of equal and opposite magnetic or electric charges
magnetism	the force a magnet exerts to attract or repel other objects
ferromagnetic	a property of a material that allows it to be easily magnetized
magnetic field	a region where a magnetic force is exerted on electrical charges or objects containing certain metals

Physical Properties

- One physical property of a substance is whether it is magnetic.
- Substances that are magnetic will stick to magnets.

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Properties of Magnets

- Magnets are made from and attract **ferromagnetic** materials.
  - Easily [magnetized]
  - Contain iron, cobalt, or nickel
    - Steel is an iron alloy.
- Magnets either [repel] or attract other magnets.
- Magnets align with the Earth's north pole when allowed to move freely.

Magnetism

- **Magnetism** is the [force] exerted by a magnet.
  - Acts at a distance
- A **magnetic field** is a region where a magnetic force is exerted on electrical charges or [ferromagnetic] materials.

Magnetic Fields

- Magnetic fields are represented by field lines.
  - Exit north
  - Enter [south]
  - Form closed loops
  - Form a three-dimensional bubble

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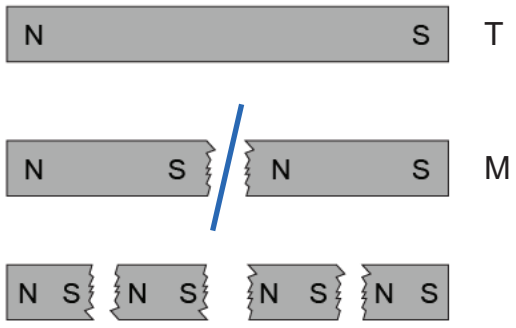
Magnetic Poles

- Magnetic poles are the ends of the magnet where the force is strongest.
- Opposite poles attract.
- Like poles repel.

Magnetic Dipoles

- A magnet is a dipole.
  - Equal and opposite poles are separated by a distance.
  - North and south poles always exist together.
    - Cannot have one pole without the other
- A broken magnet will result in new north and south poles on each piece.



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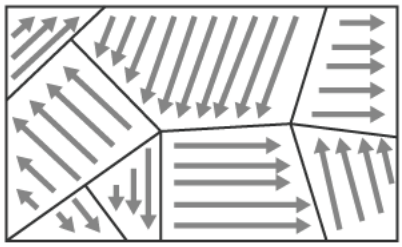
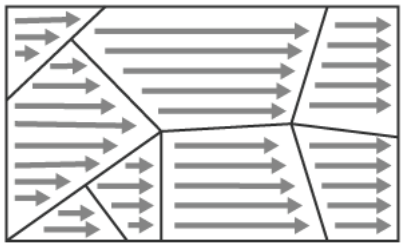
Magnetic Domains

- A **magnetic domain** is a [cluster] of atoms whose magnetic fields are aligned in the same direction.





- Magnetic domains in the absence of a magnetic field are randomly [oriented].
- Magnetic domains in the presence of a magnetic field are aligned.

Alignment of Magnetic Fields

- Ferromagnetic materials become magnetized by:
  - rubbing against a magnet.
  - being placed near a magnet.
  - passing [electricity] through or around it.
- Materials demagnetize when [heated], hit, or placed in a magnetic field with the opposite polarity.

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Permanent Magnets

- Permanent magnets are created by placing magnetically hard ferromagnetic material in a [strong] magnetic field.
- The magnetic domains in permanent magnets stay [aligned] over time, making the magnets difficult to demagnetize.
    - Naturally occurring
        - Lodestone
    - Manufactured
        - [Alnicos] Al, Ni, Co

Temporary Magnets

- Temporary magnets are created by placing magnetically soft [ferromagnetic] material in a magnetic field.
- The magnetic domains in temporary magnets easily align in a magnetic field and easily return to a [random] orientation once out of a magnetic field.
    - Temporary magnets maintain [magnetic] properties only as long as they remain in a magnetic field created by another magnet.

Summary | Magnets and Magnetism

Lesson Question

What are the properties of magnets?

Answer

(Sample answer) Magnets are dipoles. Magnets have magnetic fields, contain magnetic domains, and can be permanent or temporary based on how easily their domains lose alignment.

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Review: Key Concepts

- Magnets are dipolar, containing a north and south pole where the magnetic field is strongest.
  - Opposite poles attract and like poles [repel].
- A magnetic field is the area around a magnet where the magnet can exert a force on objects containing certain metals, even from a distance.
  - The field lines travel out from the [north pole], around the magnet, and back into the south pole.

Summary | Magnets and Magnetism

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Review: Key Concepts

- Magnetic domains are microscopic areas containing clusters of atoms whose magnetic fields are aligned in the same direction.
  - Permanent magnets have aligned domains that are difficult to change.
  - Temporary magnets have aligned domains that change as soon as they leave a magnetic field.

Use this space to write any questions or thoughts about this lesson.