# Magnetic Forces

**How do magnetic poles interact?**

# Magnetic Forces

**Magnetic force** is-

- Magnetic force is –
- Magnetic forces-
- Magnetic force-

# Magnetic Forces

All magnets have two-

- One end of a magnet is –
- The other end is-
- The direction of the magnetic force between two magnets –

# Magnetic Fields

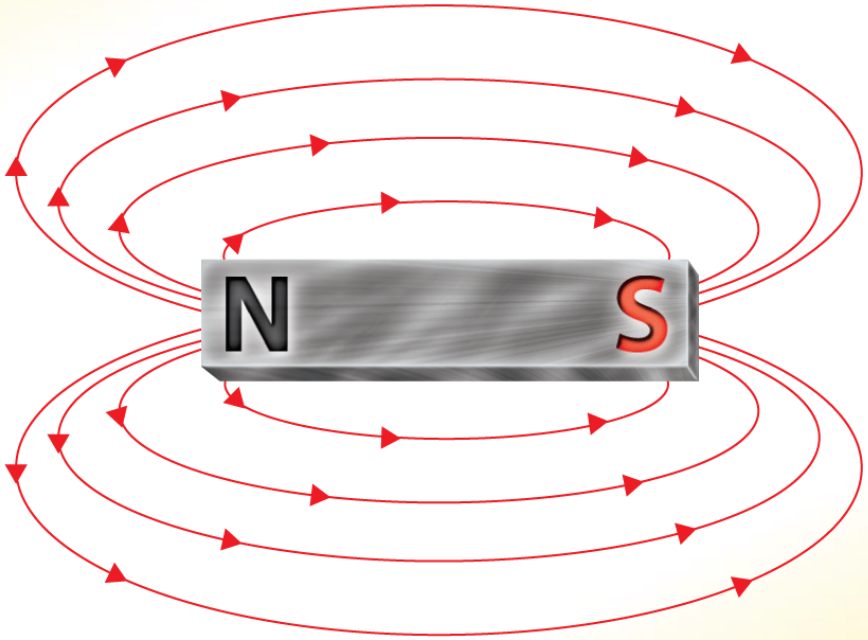
**How can a magnetic field affect a magnet that enters the field?**

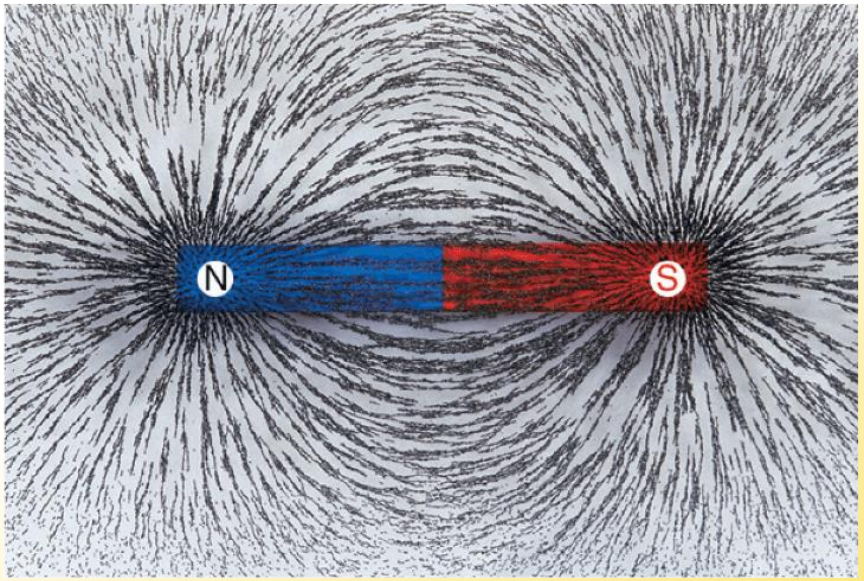
# Magnetic Fields

A **magnetic field-**

# Magnetic Fields

A magnetic field -

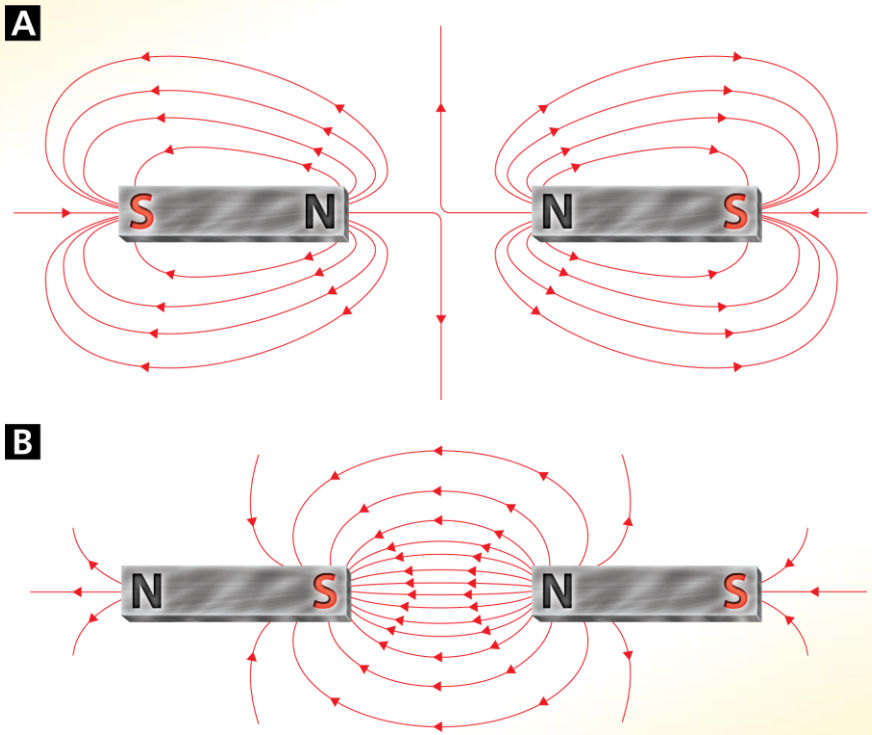


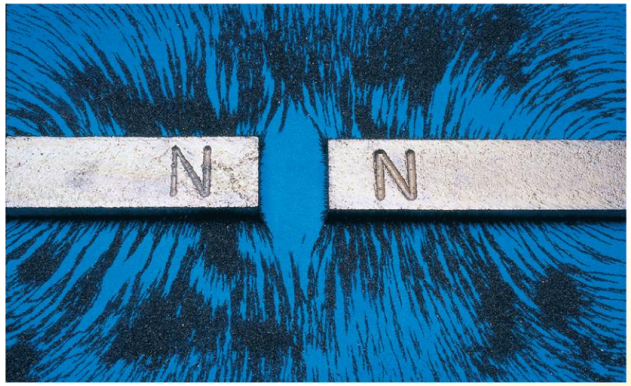



# Magnetic Fields

A. When like poles of two magnets come together –

B. When opposite poles of magnets come together –



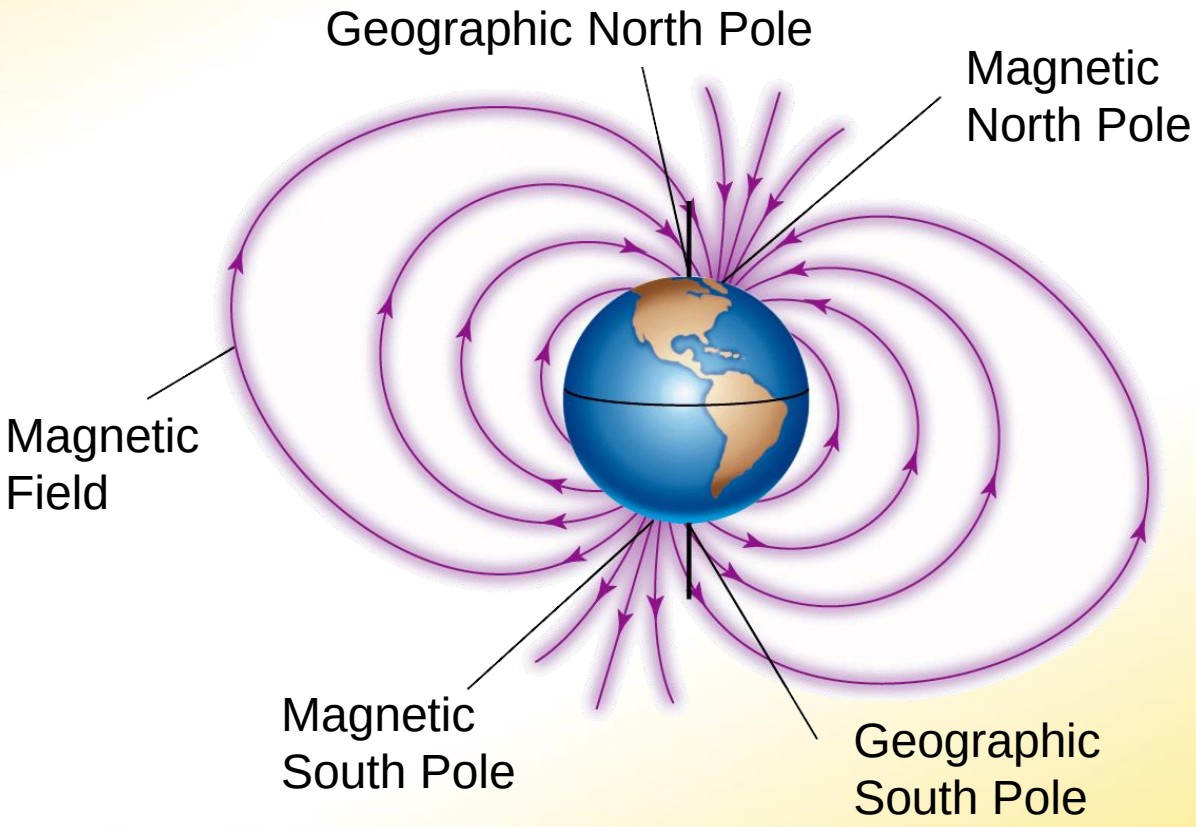

# Magnetic Fields

## Magnetic Field Around Earth

Earth is like a giant magnet surrounded by a magnetic field. The area surrounding Earth that is –

# Magnetic Fields

Earth is -



# Magnetic Materials

**Why are some materials magnetic while others are not?**

# Magnetic Materials

A property of electrons called “spin” causes electrons to act like tiny magnets.

- In many materials –
- Unpaired electrons-

# Magnetic Materials

In a few materials, such as iron, nickel, and cobalt, the unpaired electrons make a strong magnetic field.

- The fields combine –
- A **ferromagnetic material, such as iron -**

# Magnetic Materials

## Nonmagnetized Materials

The fact that a material is -

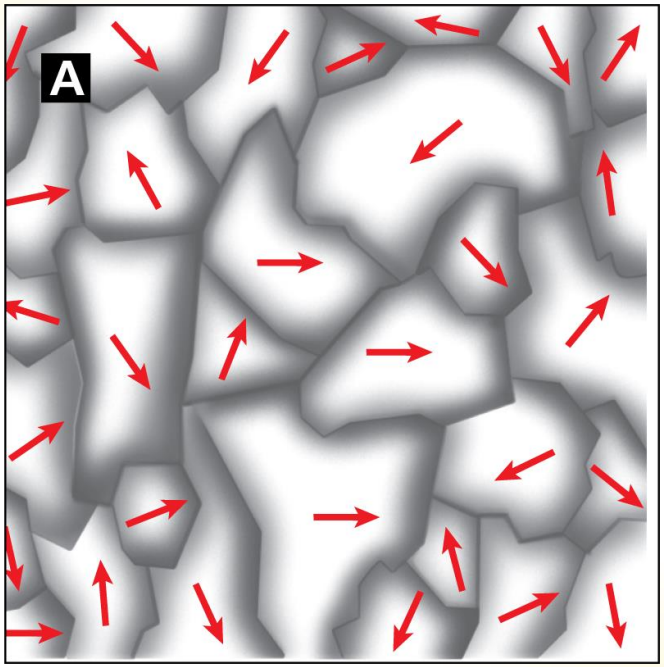
If the domains of a ferromagnetic material are aligned randomly -

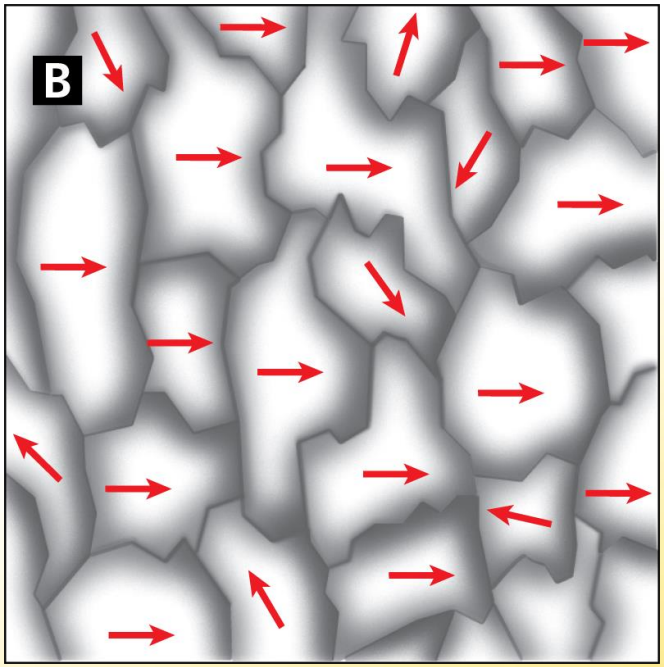
# Magnetic Materials

A magnetic field can magnetize ferromagnetic materials.

A. Before magnetization -

B. Domains aligned -



## Assessment Questions

1. Where does the magnetic field of a magnet have the strongest effect on another magnet?
   a. the north pole
   b. the south pole
   c. both poles equally
   d. midway between the two poles

# Assessment Questions

2. How are the magnetic field lines drawn to show the interaction of two bar magnets that are lined up with their north poles near one another?
   a. Field lines begin at the north pole of each magnet and extend to the south pole of the other magnet.
   b. Field lines begin at each magnet's north pole and extend toward its south pole.
   c. Field lines extend from the north pole of one magnet to the north pole of the other magnet.
   d. Field lines cannot be drawn because the magnetic forces cancel one another.

# Assessment Questions

3. Why does a compass not point exactly toward the geographic north pole?
   a. Earth's magnetic field is constantly changing due to effects of the solar wind.
   b. The magnetic pole is near but not exactly at the geographic pole.
   c. Earth's magnetic field lines are too broad for a compass point exactly toward the pole.
   d. Daily variations in the magnetic field mean that compasses are not very accurate.

## Assessment Questions

4. What happens to a permanent magnet if its magnetic domains lose their alignment?
   a. The magnetic field reverses direction.
   b. It loses its magnetic field.
   c. It has several north poles and several south poles.
   d. It is no longer a ferromagnetic material.