

Chapter 18 - Electromagnetism

18-1: Magnets and Magnetism

Essential Questions

- What are the properties of magnets?
Describe four kinds of magnets.
- Why are some materials magnetic, while others are not?
- What are two examples of the effect of Earth's magnetic field?

Properties of Magnets

- Magnet: any material that attracts iron objects
- magnetism – force of attraction or repulsion
 - not all objects are affected by the force of magnetism
 - ex. *wood, glass, paper, plastic*
 - common metals affected by magnetism are *iron, nickel, and cobalt*

Magnetic Poles

- poles – two ends of a magnet
 - every magnet has two poles
 - north (N) pole
 - south (S) pole

Magnetic Forces

- Force of attraction or repulsion magnets generate

Properties of Magnets

- like magnetic poles repel each other
- opposite magnetic poles attract each other
 - if a *north pole* and a *south pole* are brought together, they will *attract* each other

Magnetic Fields

- magnetic field – area around a magnet where magnetic forces can act
 - a magnetic field is made up of magnetic lines of force

Magnetic Fields

- magnetic lines of force – lines that show the shape of a magnetic field
 - the magnetic lines of force are closest together at the poles of the magnet
 - this is where the magnet is strongest

The Cause of Magnetism

- In magnetic materials (iron, cobalt, nickel), groups of atoms are in domains
- North and south poles of atoms line up to create a magnetic field
- Dropping a magnet, exposing it to a strong magnetic field or high temperatures may demagnetize an object

Making a Magnet

- materials that are not natural magnets can be magnetized

Making a Magnet

- magnetic induction – process by which a material can be made into a magnet

Making a Magnet

- some materials are easy to magnetize
 - ex. iron

Cutting a Magnet

- even if you break a magnet in half, each half will have a north pole and a south pole

Kinds of Magnets

- some magnets occur in nature
- these magnets are called *natural magnets or ferromagnets*
 - ex. magnetite (also called *lodestone*)

Kinds of Magnets

- a material that is easily magnetized tends to lose its magnetism quickly
- a magnet made of this kind of material is called a *temporary magnet*

Kinds of Magnets

- materials that are hard to magnetize will also stay magnetized for a long time
- These are called *permanent magnets*

The Earth as a Magnet

- William Gilbert
 - a British scientist
 - the Earth has north and south poles like a bar magnet

The Earth as a Magnet

- the Earth has a North Magnetic Pole and a South Magnetic Pole
 - the North Magnetic Pole is located near the geographic South Pole
 - the South Magnetic Pole is located near the geographic North Pole

The Earth as a Magnet

- the *North Magnetic Pole* is like the *south pole* of a bar magnet
- the *South Magnetic Pole* is like the *north pole* of a bar magnet

The Earth as a Magnet

- the Earth is surrounded by a magnetic field which extends far into space
- magnetosphere – region of the Earth's magnetic field

The Earth as a Magnet

- the magnetosphere traps charged particles from the sun
- when these particles enter the atmosphere, an *aurora* is formed
- *auroras* are also called the *northern lights* (aurora borealis) and *southern lights* (aurora australis)