Name:_____ Points:___/10

SMITH - INDUSTRIAL SCIENCE B – 3RD PERIOD - OFF-SITE LEARNING PACKET DAY 9

Chapter 10 Magnetism
Lesson 1 – History and Introduction

Lesson Objectives

- **define bellwork vocabulary (magnetite, Gauss)** with 100% accuracy
- **state the origin of the word magnetism** with 100% accuracy
- **define the force exerted by a magnetic with respect to distance of separation** with 100% accuracy

Text Covered:

History of Magnetism

The tem *magnetism* comes from the region of Magnesia, a province of Greece, where certain stones were found by the Greeks more than 2000 years ago. These stones, called lodestones, had the unusually property of attracting pieces of iron. Magnets were first fashioned into compasses and used for navigation by the Chinese in the twelfth century.

In the sixteenth century, William Gilbert, Queen Elizabeth's physician, made artificial magnets by rubbing pieces of iron against lodestone, and suggested that a compass always points north and south because the Earth has magnetic properties. Later, in 1750, John Mitchell in England found that magnetic poles obey the inverse-square law, and his results were confirmed by Charles Coulomb. The subjects of magnetism and electricity developed almost independently of each other until 1820, when a Danish physicist named Hans Christian Oersted discovered in a classroom demonstration that an electric current affects a magnetic compass. He saw that magnetism was related to electricity. Shortly thereafter, the French physicist Andre-Marie Ampere proposed that electric currents are the source of all magnetic phenomena.

Coulomb

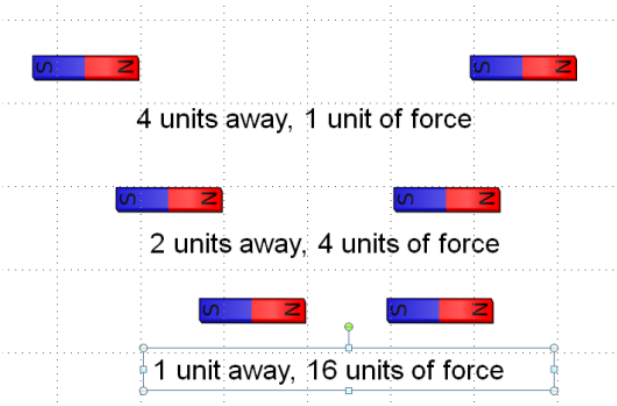
Mitchell

Oersted

Ampere

Magnetic Poles

Anyone who has played around with magnets knows they exert forces on one another. Magnetic forces are similar to electric forces, for they can both attract and repel without touching, depending on which ends of the two magnets are held near one another. And similar to what we find with electric forces, the strength of the magnetic interaction depends on the distance between the two magnets. Whereas electric charges produce electric forces, regions called magnetic poles give rise to magnetic forces.



Suspend a bar magnet at its center by a piece of string and you've got a compass. One end, called the north-seeking pole, points northward, and the opposite end, called the south-seeking *pole,* points southward. More simply, these are called the north and south poles. In a simple bar magnet these poles are located at the two ends. A common horseshoe magnet is simply a bar magnet bent into a U shape. Its poles are also at its two ends.

When the north pole of one magnet is brought near the north pole of another magnet, they repel each other. The same is true of a south pole near a south pole. If opposites poles are brought together, however, attraction occurs. We find that

Like poles repel each other; opposite poles attract.

This rule is similar to the rule for the forces between electric charges, where like charges repel one another and unlike charges attract. But there is a very important difference between magnetic poles and electric charges. Whereas electric charges can be isolated, magnetic poles cannot. Electrons and protons are entities by themselves. A cluster of electrons need not be accompanied by a cluster of protons, and vice versa. The north and south poles of a magnet are like the head and tail of the same coin.

If you break a bar magnet in half, each half still behaves as a complete magnet. Break the pieces in half again, and you have four complete magnets. You can continue breaking the pieces in have and never isolate a single pole. Even when your piece is one atom thick, there are two poles. This suggests that atoms themselves are magnets.

http://upload.wikimedia.org/wikipedia/commons/4/40/Nomos_Magnisias.png
http://upload.wikimedia.org/wikipedia/commons/9/94/PSM_V59_D346_William_Gilbert.png
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http://clipartist.info/openclipart.org/SVG/torisan/bar_magnets-800px.png

Guided Reading Questions: **(10 pts)**

History of Magnetism

1. Where does the word magnetism come from?

2. What were the stones that found by the Greeks that attracted iron called?

3. Who were the first to use compasses for navigation?

4. What contribution was William Gilbert known for?

5. What contribution was John Mitchell known for?

6. What contribution was Hans Christian Oersted known for?

7. What contribution was Andre-Marie Ampere known for?

Magnetic Poles

8. Magnets exert _____ on each other.

9. Do magnets have to touch each other to exert forces on each other?

10. Can you separate either a north pole or a south pole, or do magnets always come with both poles?

Lesson Notes:

Magnetism and Electromagnetic Induction

History

- term comes from the region of Magnesia, a province of Greece
  - originally called lodestones
  - attracted iron
- Chinese (12th century) were the first to use magnets as compasses
- William Gilbert (16th century)
  - made artificial magnets
  - suggested that a compass always points north and south because the Earth has magnetic properties
- John Mitchell (1750, England)
  - found that magnetic poles obey the inverse-square law
- Hans Christian Oersted (1820)
  - electric currents affected magnets
- Andre-Marie Ampere (French, 1820's)
  - electric currents are the source of magnetism

Magnetic Poles

- magnets exert forces on one another
- magnetic forces are similar to electric forces:
- they both attract and repel
- strength of force between them is inversely proportional to the square of the distance between the two magnets

$$F_{magnetic} \approx \frac{1}{d^2}$$

- the poles of a magnet are called north and south
- derived from Earth's magnetic poles
- Like poles repel each other; opposite poles attract
- the poles of a magnet cannot be separated
- atoms themselves are magnets

Vocabulary:

magnetite – a naturally occurring mineral that has magnetic properties, also called lodestone

Gauss - the cgs unit of magnetic field