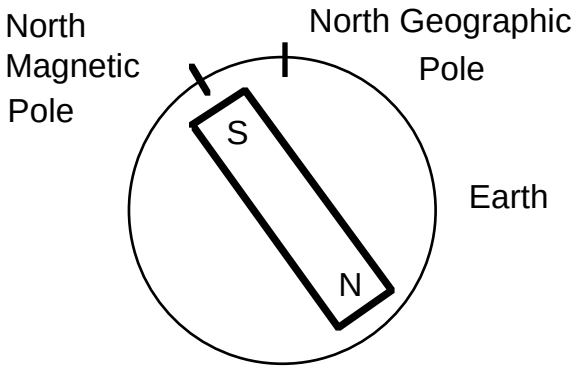
Magnetism : Notes/W.S.-10

The first natural magnets were discovered in an area of ancient Greece called Magnesia. They were made of a type of rock called lodestone. Lodestone contains a magnetic mineral called magnetite which has the chemical formula Fe_3O_4. A lodestone is a natural magnet which can pick up small pieces of iron.

If a piece of lodestone is suspended from a string, it will always orient itself until one end points North. This was the first compass. People thought that one end was attracted to the North star. But In about 1600, William Gilbert suggested that the Earth itself acted like it had a big magnet inside. Note that the North magnetic pole acts like it is the south pole of a magnet.



It is now believed that the Earth's core contains molten iron and nickel. A current is produced in the core which produces the magnetic field.

Properties of Magnets

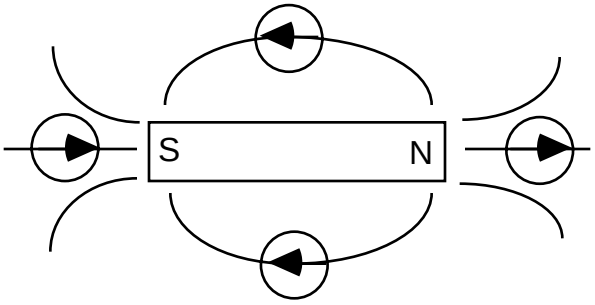
Modern magnets will attract iron, cobalt, and nickel objects. Iron is attracted the most strongly of the three. They will also attract some alloys of these metals. Magnets will not attract wood, plastic, or anything that is non-metallic. Some steels (an iron-nickel alloy) are also not attracted to magnets.

Law of Attraction and Repulsion

Magnets will attract other magnets. Each magnet has two poles, north and south. Like poles will repel. Unlike poles will attract. All magnets are surrounded by a magnetic field. The field can be detected by a compass which is really just another magnet or by using iron filings. We

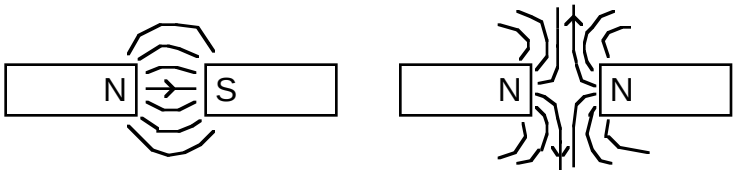
represent the field by drawing lines. The direction of these field lines is from north to south. A compass needle will show the direction. It will always point to the south pole.

The Bar Magnet



When drawing the field lines, make sure that they don't cross. The lines also form loops. The strength of the field is strongest at a point where there are many lines.

The field lines are shown below for two unlike poles attracting and two like poles repelling. This can be seen using iron filings.



attraction repulsion

Problems.

1) What is lodestone? What mineral does it contain?

2)a) Who suggested that the Earth acts like it has a large magnet inside?

b) How is the Earth's magnetic field produced?

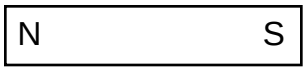
3)a) Which metal is most strongly attracted to a magnet?

b) Name two other metals that are attracted to magnets.

c) Find these three metals on the periodic table. What do you notice?

4)a) How can you show that a magnetic field exists around a magnet? Give two ways.

b) Draw the field lines around the magnet below. Show the direction of the field.



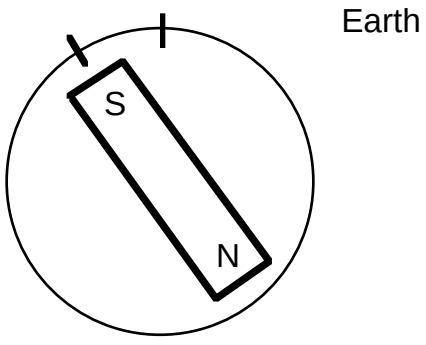
c) Draw the field lines between the two magnets.

d) Where is the field strongest for a magnet?

e) Why can field lines never cross?

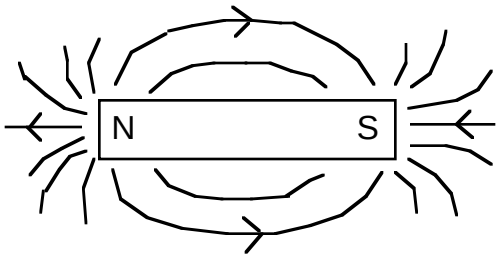
5) State the Law of Attraction and Repulsion for magnets.

6) Draw the field lines for the Earth. Give the direction.

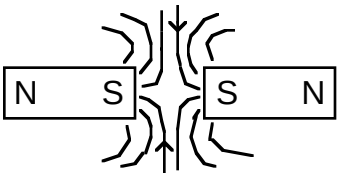


Answers:

1) It is a rock that is a natural magnet. It contains the mineral magnetite., 2)a) Gilbert, b) It is produced by currents in the molten iron-nickel core of the Earth., 3)a) iron, b) nickel, cobalt, c) They are close together in the table. This is due to similarities in their electronic structures which leads to them being magnetic., 4)a) Use a compass, or iron filings.,
b)



c)



d) The strength of the field is strongest where the lines are close together which is near the ends., e) Lines can't cross as this would mean a compass would point in two directions which is not possible., 5) Unlike poles attract and like poles repel., 6)