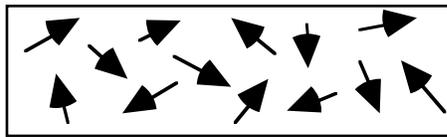


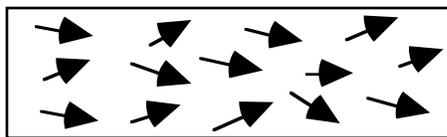
Magnetism : Notes/W.S.-20

Magnetism is due to the motion of electrons in atoms. There are two types of electron motions that can make an atom into a little magnet. They are; the spinning of electrons and the movement of electrons as they orbit the nucleus. Usually these motions cancel out, so that the material is non-magnetic. But in the case of the metals; iron, nickel and cobalt, the electronic motion doesn't always cancel out.

But these metals are not normally magnetic. The reason for this is that if many atoms align themselves so that their magnetic field points in one direction (called a **domain**, which is like a tiny magnet within the metal), then other domains will form that will point in other directions, so that the overall field is still zero. If enough domains in a piece of iron point in the same direction, then we have a magnet. If the domains point in all directions we have an unmagnetized piece of iron.



Unmagnetized Iron



Magnetized Iron

Making a Magnet

We can turn a piece of iron into a magnet using two different methods. A piece of iron that is "stroked" by a magnet will become magnetized. This is due to the domains being lined up. Another way to line up the domains is by having a strong electric current flow nearby. An unmagnetized piece of iron may also become magnetized gradually by being in the presence of a magnetic field such as the Earth's magnetic field. Nickel and cobalt can be magnetized to a lesser degree.

A magnet can be demagnetized by heating it, by hitting it with a hammer or by dropping it. It can also be demagnetized by having an electric current flow nearby in the right direction.

A permanent magnet is one that can remain a magnet for a long time. Certain alloys such as Alnico, an alloy of iron that contains aluminum, nickel and cobalt makes a good strong permanent magnet. Soft iron such as that found in nails can be magnetized readily but will also lose their magnetism readily.

Questions:

- 1) What particle in the atom is responsible for magnetism?
- 2) What is a domain?
- 3) What is the difference between an unmagnetized piece of iron and a magnetized piece of iron?
- 4) How can you make a magnet out of a piece of iron? (give two ways)
- 5) How can you ruin a magnet? (give two ways)
- 6) What is a permanent magnet? Name an alloy that is used to make permanent magnets.

Answers: 1) It's the electron, 2) It is a part of iron where all the atoms have their magnetic fields pointing in the same direction., 3) In unmagnetized iron, the domains point in random directions, but in a magnet the domains all point in the same direction., 4) Stroke the piece of iron with a magnet or have a current flow near the iron., 5) Heat it or hit with a hammer., 6) It is a magnet that will maintain its magnetism for a long time. Alnico is an alloy used to make strong permanent magnets.