Name: _____

Magnetism Guided Notes

Background: Electricity and magnetism seemed to be unrelated to each other until Hans Christian Oersted, discovered that a compass needle deflected when brought near _____ current. This led to new technologies; radio and television.

Magnetic Poles: Magnets are similar to electric charges in that they can attract and repel without _____. All magnets have north and south poles. A north pole of one magnet and a south pole of another magnet _____. Two north poles of different magnets brought together or two south poles of different magnets brought together _____. This is similar to how electric charges behave. However one important distinction can be made, where electrons can be moved away from protons and exist on their own, you will never find a magnet with just one pole. Magnets, no matter how big or small, always have a _____ and _____.

Magnetic Fields: Surrounding a magnet are three dimensional patterns known as magnetic fields. Iron filings can show the pattern of a magnets magnetic field. Lines that are closer together indicate _____ magnetic field strength. Magnetic field strength is strongest at the _____. A compass is a great tool that will also show the magnetic field of a magnet by aligning itself accordingly. Magnets are composed of atoms which contain electrons. These electrons move and spin which creates a magnetic field however, most substances aren't magnetic because the electrons within them spin in opposite or various directions so the magnetic forces cancel out. Within iron and a few other metals, the atoms produce magnetic fields that are strong enough to influence nearby atoms and as a result alignment occurs to create something called a _____. You can create a permanent magnet by placing pieces of iron in a strong magnetic field or rubbing a piece of iron with a magnet in the same _____.

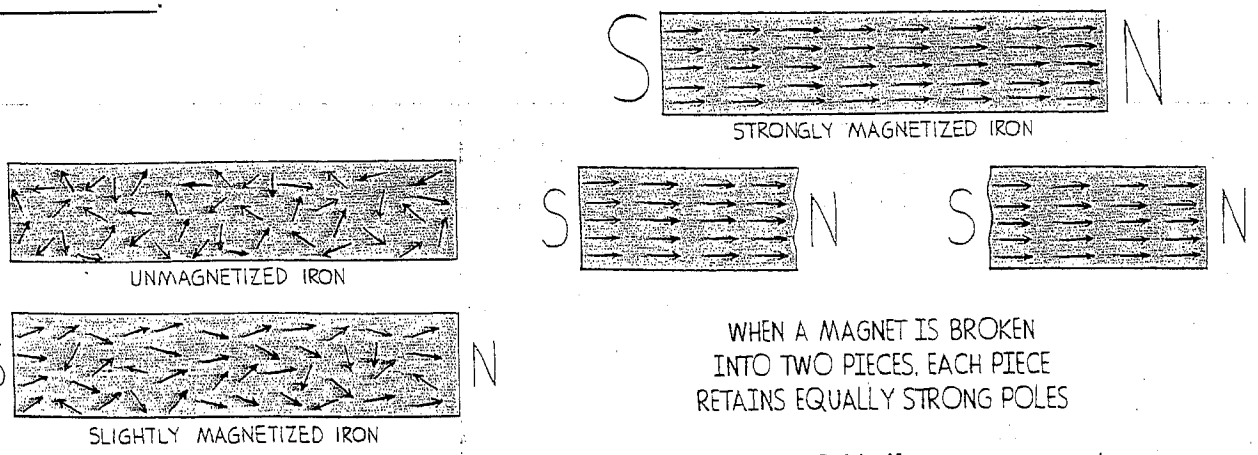


Figure 36.9 ▲ A piece of iron in successive stages of magnetism. The arrows represent domains, where the head is a north pole and the tail a south pole. Poles of neighboring domains neutralize one another's effects, except at the ends.

Electric Currents and Magnetic Fields: A moving charge produces a magnetic field. If you pass current through a wire, surrounded by several compasses, the compasses line up with the magnetic field. If you switch the direction of the current flow, the compasses completely flip which shows that the _____ has also changed. If wire is bent into a loop, the magnetic field is bunched up inside the loop. If you bend another loop to overlap the first loop of wire, the magnetic field strength is _____ as strong as with just the single loop of wire. This means, more wire loops, creates increased magnetic field intensity and we call this an _____. Electromagnets are used in all kinds of everyday devices from speakers to motors and generators, to

scrap yards to move heavy metal, and even MRI machines. As electromagnetic technology improves, so to does the promise for high-speed transportation!

Electromagnetic Induction: The process of creating voltage by changing the magnetic field around a conductor.

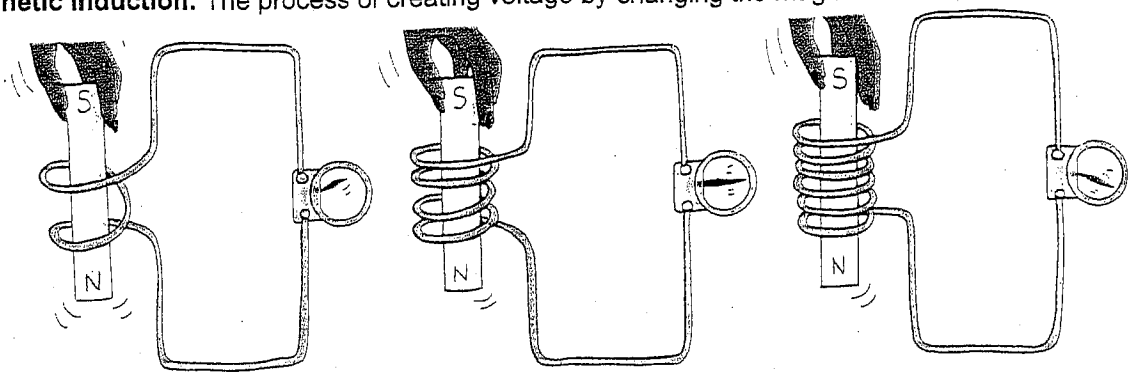
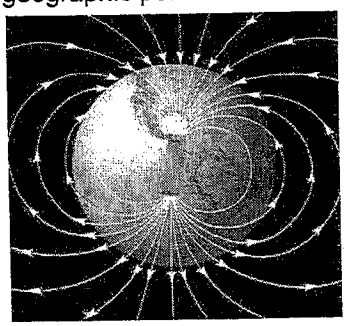


Figure 37.3 ▲
When a magnet is plunged into a coil of twice as many loops as another, twice as much voltage is induced. If the magnet is plunged into a coil with three times as many loops, then three times as much voltage is induced.

The Earth as a Magnet: A compass needle points northward because the Earth itself is a huge magnet. The magnetic poles of the Earth are not the same as the geographic poles! The magnetic pole in the Northern Hemisphere is located roughly 1800 km from the geographic north pole, somewhere in the Hudson Bay region of northern _____. The other pole is located south of Australia. Which geographic pole of the Earth is nearest the magnetic north pole of the Earth?



Scientists believe that the Earth behaves like a magnet because of _____ _____ in the molten part of Earth's interior. Rock samples have shown that the Earth's magnetic field has _____ itself over time but the reversal sequence is not regular. Lastly, charged particles are deflected by magnetic fields. Keeping in mind that the Earth is a giant magnet, this means charged particles from space are deflected by the Earth's magnetic field which helps to protect organisms on the planet. This also creates the aurora borealis and the aurora australis.

We've learned that a current carrying wire will deflect a magnetic compass and a magnet such as the Earth will deflect electrically charged particles. What law of physics tells you that if a current-carrying wire produces a force on a magnet, a magnet must produce a force on a current-carrying wire?