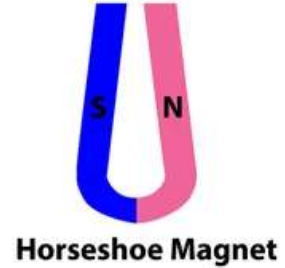
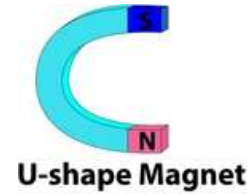


Physics Honors: Magnetism

Poles/Polarization

- Magnets have two different ends, called poles
- If you break a magnet in half, each half will still be polarized (have a north pole and south pole)
- There is no such thing as a mono-pole. Magnets always have two poles



shutterstock.com • 1583693431

Poles

- Like charged particles, opposite poles of magnets attract, and similar poles repel
- Magnets can be temporary. A strong magnet will polarize an object. This is called magnetism by induction

ATTRACTION



REPULSION

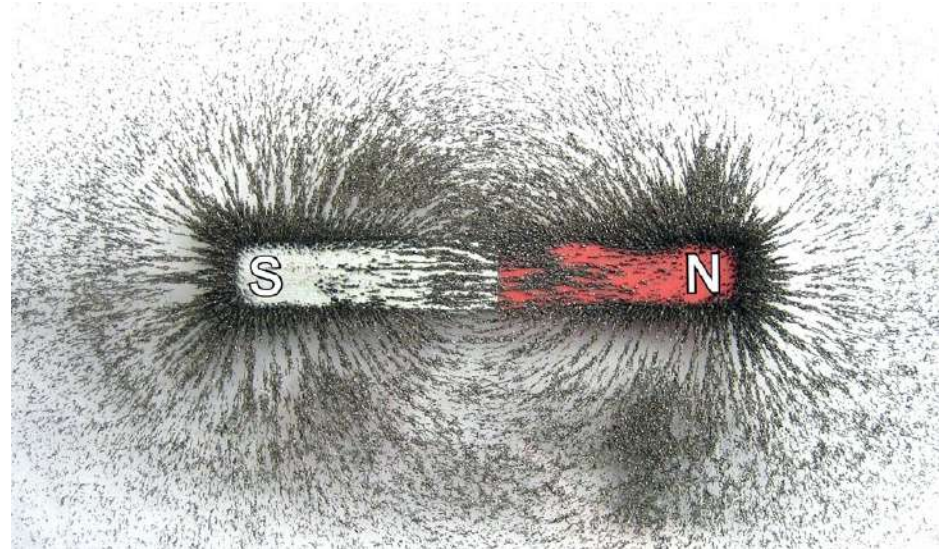
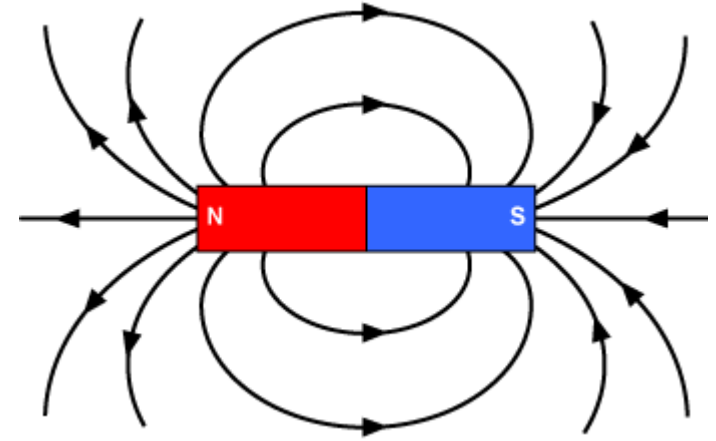


OR



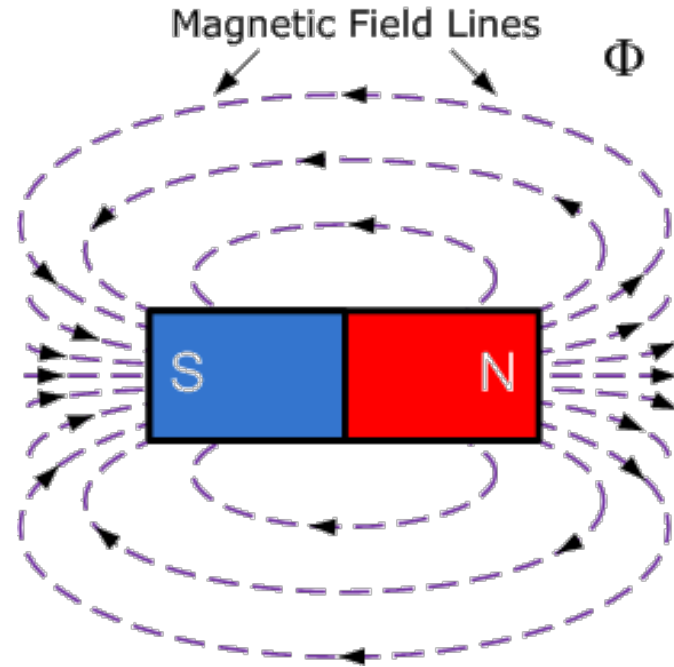
Magnetic Fields

- Magnetic fields exist in the space where magnets would experience a force.
- You can draw field lines much like you would for electrostatics. Draw the lines for the way the north pole on a compass would point if placed in that magnetic field



Magnetic Flux

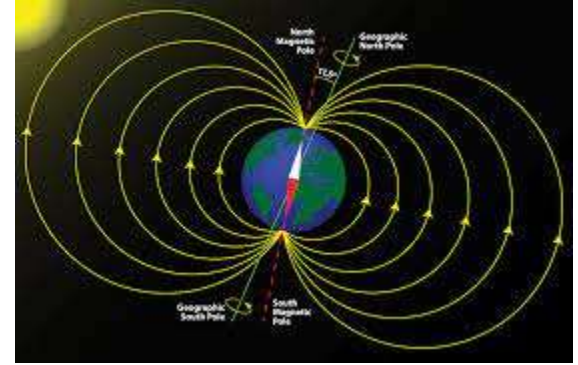
- Magnetic flux is the number of magnetic field lines passing through a surface perpendicular to the lines
- The flux per unit area is proportional to the strength of the magnetic field.
- Magnetic flux is most concentrated at the poles.



Earth's Magnetic Field

Earth has a magnetic field that is caused by the liquid iron core. It can be thought of as a giant bar magnet located in the center of the Earth

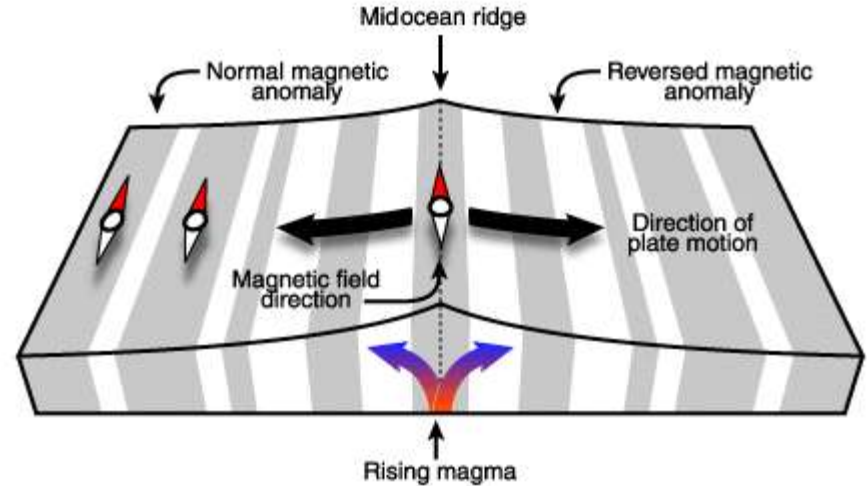
Earth's magnetic field core is 11 degrees off from its geographic north pole.



Seafloor Spreading and Tectonic Plates

The Earth's magnetic field switches polarity between every 10,000 and 50 million years.

This reversal of polarity has led to several scientific discoveries, including evidence for tectonic plates and seafloor spreading



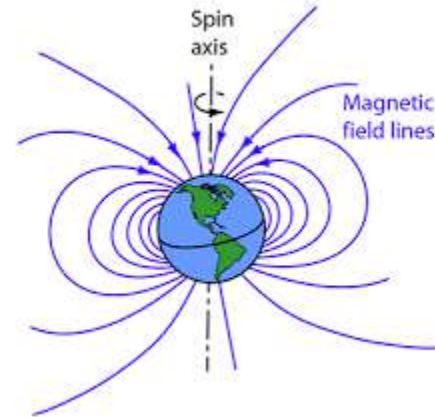
Northern Lights



The Earth's magnetic fields are also responsible for aurora borealis (Northern Lights)

Highly energized particles are thrown off the sun, and fly toward Earth at millions of miles per second

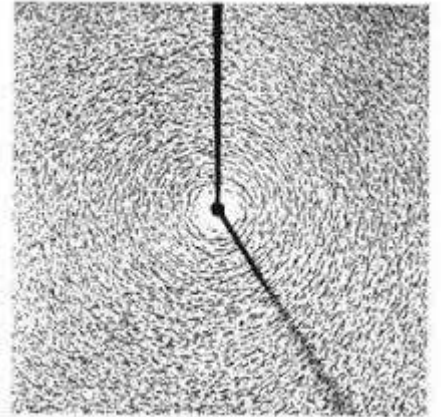
Earth's magnetic field deflects most particles, however, some particles become trapped in the field. They accelerate toward the earth, and are excited, which lights them up, which is what we see at the aurora.



Electromagnetism

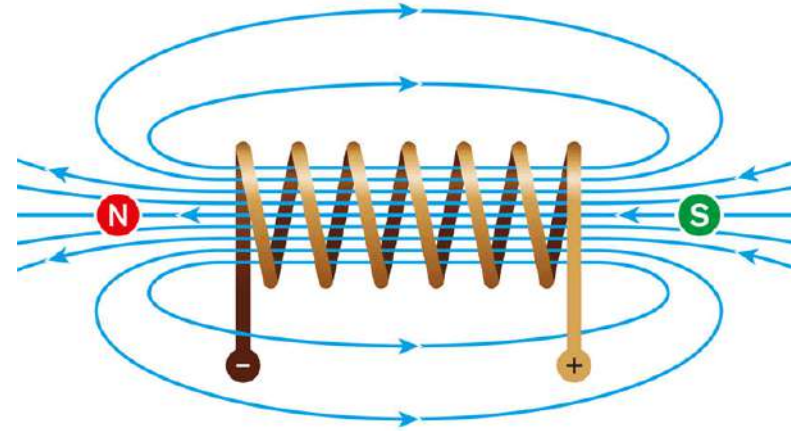
Electricity and magnetism affect each other. For this reason, the force that governs them is often called the electromagnetic force.

If you put a compass near a wire with electricity in it, you will be able to see the electric field.



Solenoid

- A wire with many loops that is connected to a circuit is called a solenoid
- When a solenoid is turned on, each loop produces its own magnetic field. All of the magnetic fields are in the same direction, so the fields add together and make it bigger.



Electromagnets

When the electric current in a solenoid, it has a magnetic field similar to a permanent magnet. However, when the current is off, it does not have a magnetic field.

We call a magnet whose magnetic field is produced by an electric current an Electromagnet. A huge benefit to electromagnets is that they can be turned on and off

