

Magnetic Fields

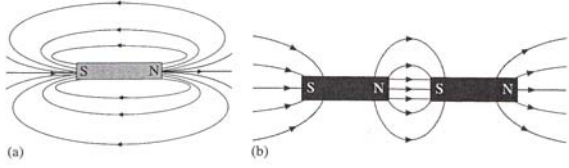
Magnetic Field

- Magnet and electric currents create magnetic fields around themselves
- When another magnet or moving charge enters this magnetic field it will experience a magnetic force
- The magnetic field is a vector quantity

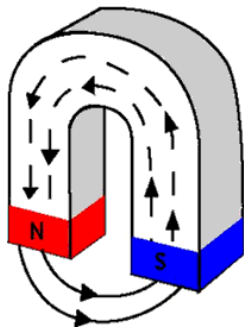
Magnetic Field Lines

- Imaginary lines around magnets and currents
- Tangents to the field lines give the direction
- Field lines go from "North" to "South"

Bar Magnet



Horseshoe Magnet

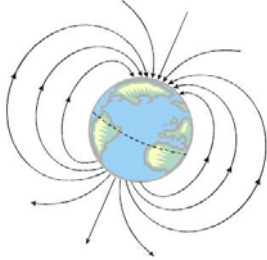


Units

- The unit of the magnetic field is the tesla (T)
- The magnetic field of the earth is about 10^{-4} T

Earth

- The magnetic field of the earth resembles that of a bar magnet



- The magnetic poles are not in the same location as the geographic poles
- The angle of declination is the angle between true north and magnetic north
- The angle depends on where you are:
 - Victoria, BC (20°)
 - St. John's, NF (23°)

Inclination

- At each location on the Earth, the magnetic field lines intersect the Earth's surface at a specific angle of inclination
 - At the equator, 0°
 - At the poles, 90°

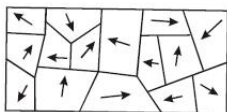


Monopoles

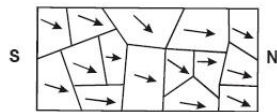
- A monopole is an isolated north or south pole
 - Predicted by modern theories of particle physics but have never been found

Domain Theory

- All materials are made up of tiny regions called domains
- The domains behave like magnets
- When the domains are distributed randomly their magnetic effects cancel
- When the domains line up, the material is magnetized



Domains aligned randomly
(no magnetic effects)



Domains aligned

Auroras

- Northern and Southern lights
- Caused by high-energy particles from the solar wind trapped in the Earth's magnetic field
