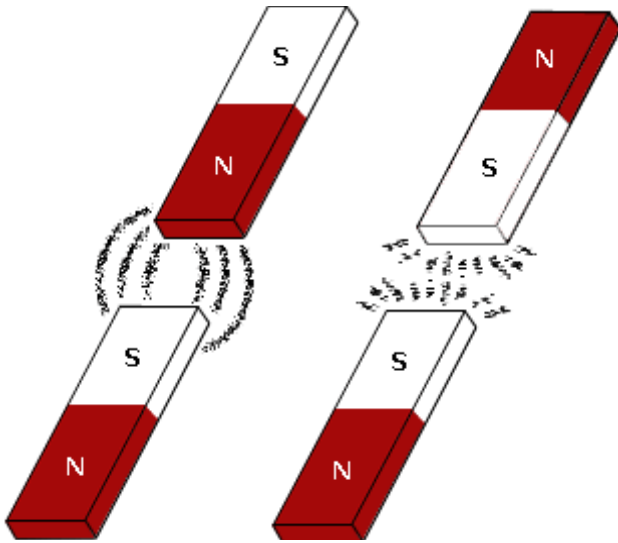


Magnetism and Electromagnetism

SPH4C



A permanent magnet has two poles:

_____ and _____.

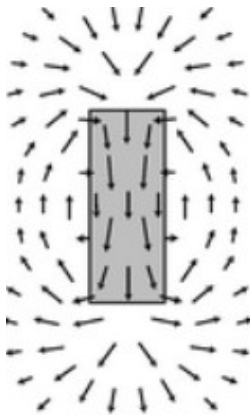
Like poles _____.

Unlike poles _____.

These repulsive or attractive forces can act at a distance (_____).

The region in space over which these forces can act is called a _____.

The iron filings in the picture above show the _____.



Magnetic field lines are drawn _____

and _____ but they don't stop and start

there: the magnetic field lines are drawn _____ the poles.

Every magnet is a _____: it must have two poles.

If a dipole magnet is broken in two, _____.

Why does this happen?

A bar magnet is made up of _____

_____, each with North and South poles,

all aligned. The dipoles may be knocked out of alignment by _____

_____.

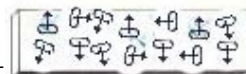
A bar magnet may be re-magnetized by placing it in a _____

magnetic field. This is _____.

_____.

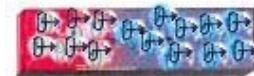
Not all materials may be easily magnetized. Those that can are called _____.

They include iron ore (lodestone), cobalt, zinc, and nickel.



Unmagnetized iron

Dipoles randomly oriented
Arrows show direction of B



Strongly magnetized



Two magnets from one

The strongest permanent magnets are made from _____ (lanthanoid) elements, the strongest of these being _____-iron-born (NIB) magnets.

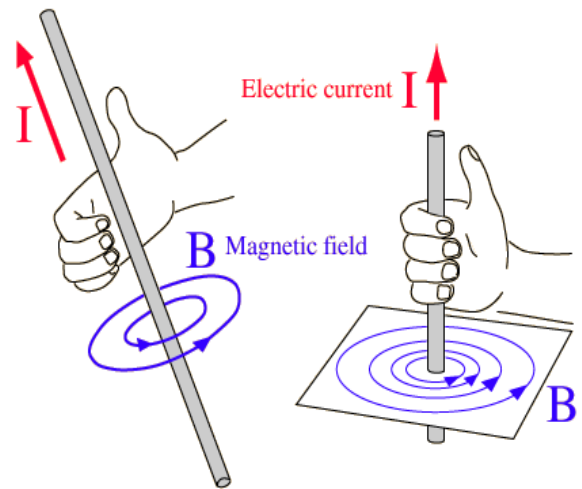
Current (moving charge) will also produce a magnetic field. This is called _____.

To show that a current, field line, or force is directed out of the page (towards us), we draw:

To show that a current or field line is directed into the page, we draw:

Right-Hand Rule #1:

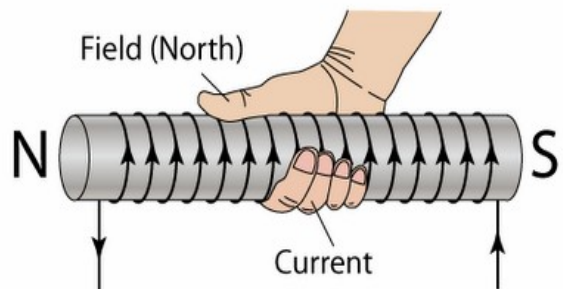
When the thumb is pointed in the direction of _____,
the fingers _____ in the direction of _____.



To strengthen and straighten the magnetic field, we coil the current-carrying wire into a _____.

Right-Hand Rule #2

When the fingers are curled in the direction of _____,
the thumb indicates the direction of _____.



Since current will produce a magnetic field, the interaction of this field with an *external* magnetic field will result in a _____ acting on the moving charge. This is the _____.

The magnitude of the magnetic force F_M on a current-carrying wire is directly proportional to the _____ and _____ of the wire and to the _____:

Note that B , the magnetic field, is measured in _____.

The magnitude also depends on the _____ between the magnetic field vector and the current vector.

When $\theta = 90^\circ$, (the current is moving _____ to the field), the force is _____.

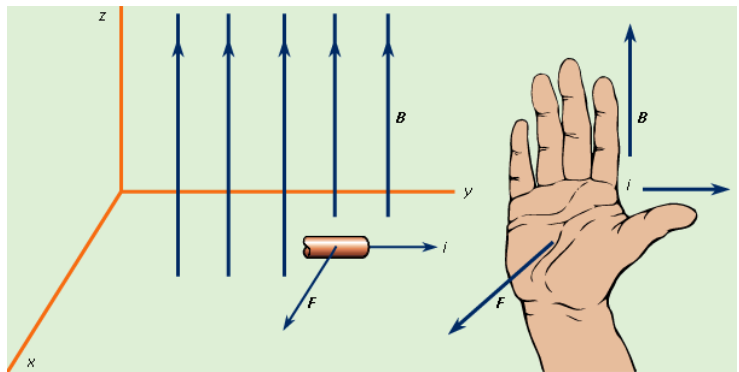
When $\theta = 0^\circ$ or 180° (the current is moving _____ to the field), the force is _____.

Right-Hand Rule #3

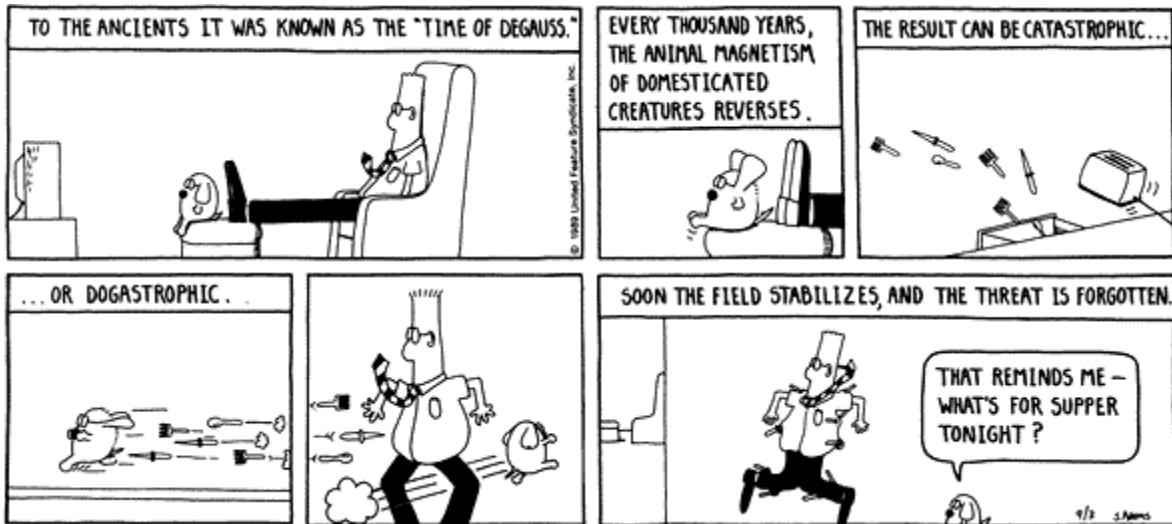
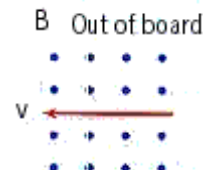
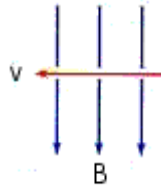
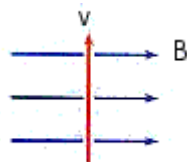
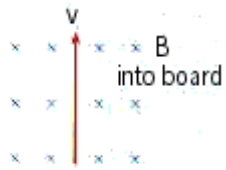
If the right thumb follows the direction of _____

and the extended fingers point in the direction of _____,

the force is in the direction _____.



What is the direction of the force (if any) in each of the following cases?



More Practice

The diagram at right shows two current-carrying wires between the poles of a permanent magnet. The force on each wire is directed:

- A. up on the left wire, down on the right wire
- B. down on the left wire, up on the right wire
- C. up on the left wire, up on the right wire
- D. down on the left wire, down on the right wire

