

Magnetism Review Sheet

- Basic principles:
 - All magnetism involves electrical charges that are moving
 - All magnetic interactions involve all three spatial dimensions
- Magnetic materials are iron-like
 - “Soft” materials do not retain their magnetism
 - “Hard” materials retain their magnetism
 - All have magnetic “grains” or domains that line up in the presence of another magnet
- To demagnetize a magnet
 - Hit it—knock grains out of alignment
 - Heat it—vibrate grains out of alignment
 - Hysteresis—vary the field rapidly and diminish the strength—confuse grains
- If you cut a magnet in half you get two new magnets—you can’t “cut off” a north or south seeking pole and isolate it
- Magnetic field lines come out of the north end of a magnet and go into the south—field lines show the direction a compass would point
- The magnetic force on a moving charged particle depends on q , v , and B . $F = qvB$
- The four “motions” a charged particle can undergo in a magnetic field are
 1. No motion (force requires movement of the charge)
 2. Linear motion (either parallel or anti-parallel to the field lines)
 3. Circular arc (perpendicular to the field lines)
 4. Helical arc (at an angle to the field lines)
- Force on a wire depends on I , L , and B . $F = ILB$ Parallel currents attract.
- Motors use magnetism to change electrical energy into mechanical energy
- Generators use magnetism to change mechanical energy into electrical energy
- DC motors and generators have:
 - Armature (or stator) (AC and DC)
 - Commutator (or rotor) (AC and DC)
 - Split rings (to reverse the direction of the current)—DC only
 - Brushes (DC and most AC)
- Electromagnets have loops of wire surrounding soft iron cores, and produce magnetic fields strong enough to lift cars and trucks. Wires alone can shift the orientation of a compass when current is on.