

## Magnetism

Joanna Radov

### **Vocab:**

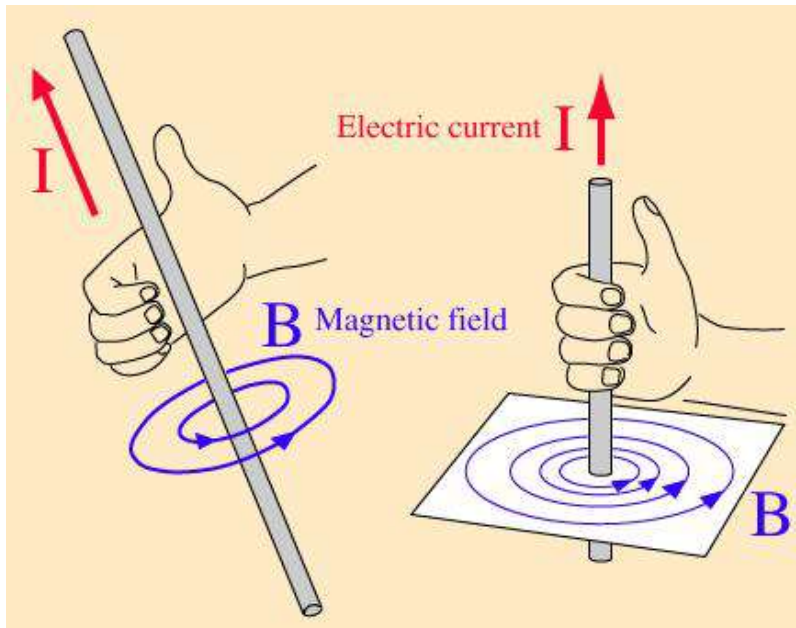
- Armature- is the power producing part of a motor
- Domain- is a region in which the magnetic field of atoms are grouped together and aligned
- Electric Motor- converts electrical energy into mechanical energy
- Electromagnet- is a type of magnet whose magnetic field is produced by an electric current
- First Right-Hand Rule (delete)
- Fixed Magnet- is an object made from a magnetic material and creates a persistent magnetic field
- Galvanometer- type of ammeter- detects and measures electric current
- Magnetic Field- is a field of force produced by moving electric charges, by electric fields that vary in time, and by the 'intrinsic' magnetic field of elementary particles associated with the spin of the particle.
- Magnetic Flux- is a measure of the amount of magnetic B field passing through a given surface
- Polarized- when a magnet is permanently charged
- Second Hand-Right Rule- (delete)
- Solenoid- is a coil wound into a tightly packed helix
- Third Right-Hand Rule- (delete)

### **Major Points:**

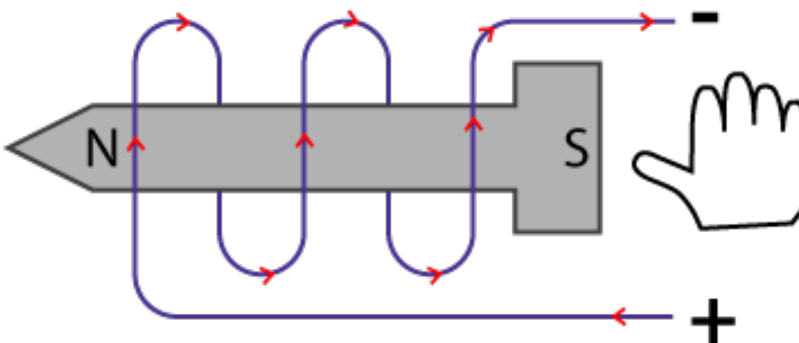
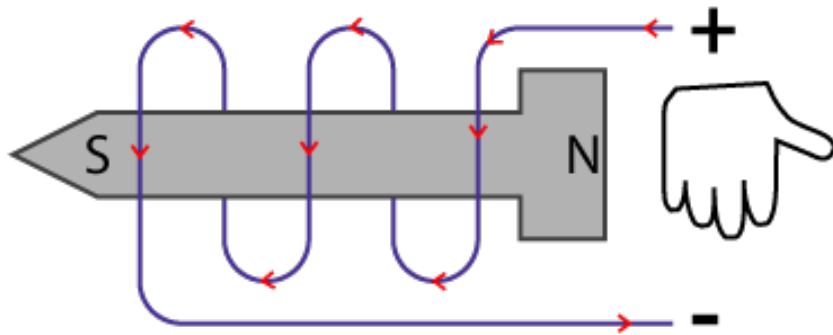
- Similar magnetic poles repel each other, whereas opposite poles attract each other
- Magnets exert a force on current-carrying wires
- An electric charge produces an electric field in the region of space around the charge and that this field exerts a force on other electric charges placed in the field
- The source of a magnetic field is moving charge, and the effect of a magnetic field is to exert a force on other moving charge placed in the field
- The magnetic field is a vector quantity
- We denote the magnetic field by the symbol B and represent it graphically by field lines
  - These lines are drawn  $\perp$  to their entry and exit points
  - They travel from N to S
- If a stationary test charge is placed in a magnetic field, then the charge experiences no force.
- If the test charge has a velocity, the force is perpendicular to the plane formed by vectors  $v$  and  $B$  in a direction given by the right-hand rule

$$F = BIL \quad (f=\text{force, } b=\text{magnetic field, } i=\text{current, } l=\text{length of conductor})$$

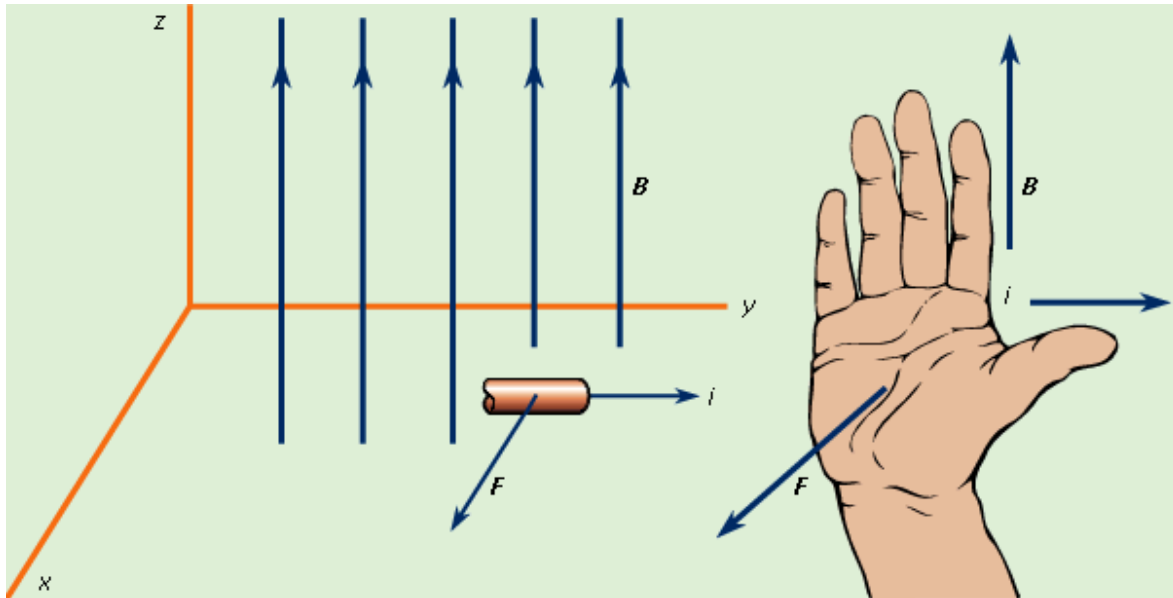
-1st Right-Hand Rule: Thumb= direction of the current. Fingers= wrap around into the direction of the magnetic field



-2nd Right-Hand Rule: Thumb= direction of the current



-3rd Right-Hand Rule: Thumb= direction of the current. Palm= in direction of force. Fingers= direction of magnetic field



-When there is a moving charged particle through an electric field,  
 $\mathbf{F} = \mathbf{B}q\mathbf{v}$  (f= force, b= magnetic field, q= charge of particle, v= velocity)

### Uniform Magnetic Field:

-When projected into a magnetic field, a point charge will follow a trajectory. Since the magnetic force is always perpendicular to the charge's velocity, there can be no component of this force along the trajectory, **therefore**, the magnetic force does no work on the charge. If the magnetic force is the only force acting on the charge then the charge's speed is constant; the magnetic field can affect only the direction of motion.

-A solenoid is a coil of wire wound around a cylindrical form, in the shape of a helix. The purpose of the solenoid shape is to produce a strong magnetic field in a limited region of space. Solenoids are frequently used in electrical circuits. For example, a solenoid is used as part of an automobile's electrical starter system.