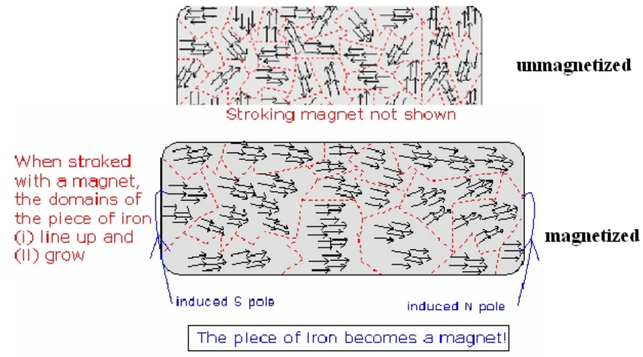
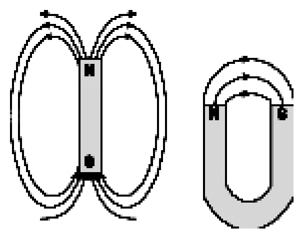
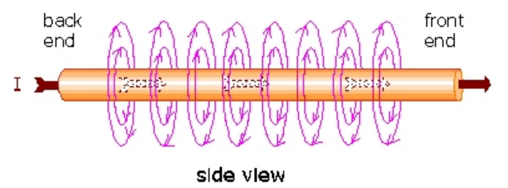
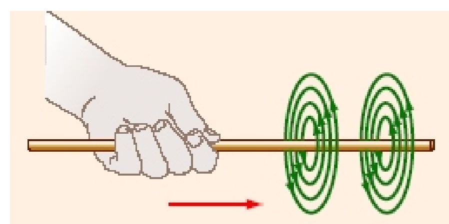
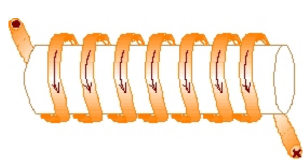
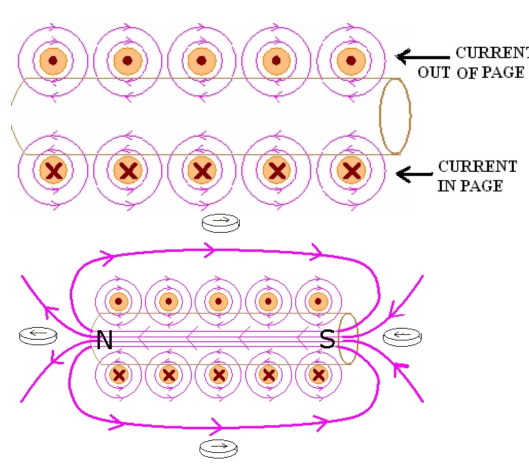
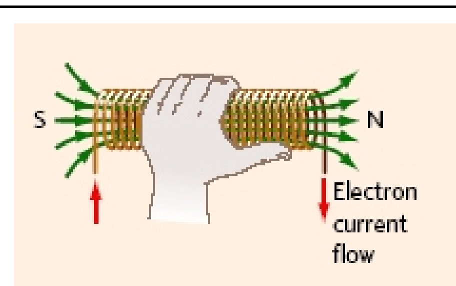
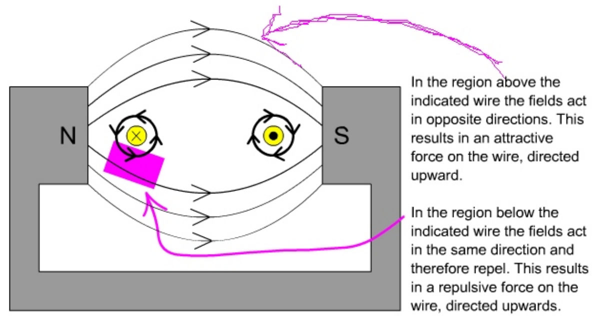
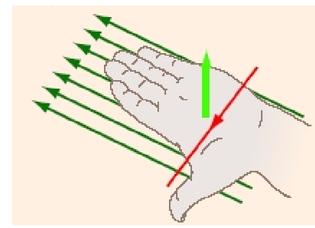
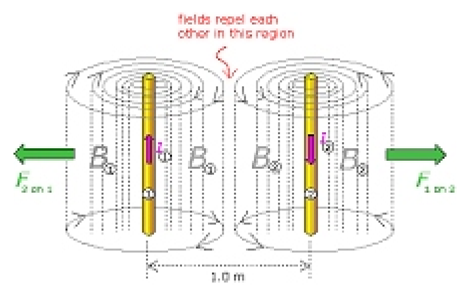
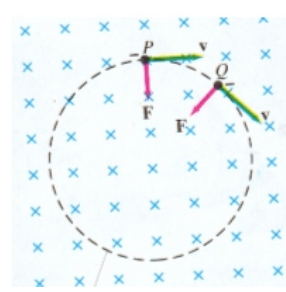
Physics 3204 Electromagnetism

Domain Theory	
Magnetic Properties	Paramagnetic substances are attracted by a magnet. Paramagnetic substances that are strongly attracted, are called ferromagnetic. Diamagnetic are weakly repelled by a magnet
Magnetic Fields	Field lines leave North and come into the South 
The Law of Magnetic Forces	Like magnetic poles (north and north or south and south) repel. Unlike poles (north and south or south and north) attract one another.
Mapping Magnetic Field lines	Use a compass or Iron Filings
Oersted, Hans	**Oersted's Principle:** conductor produces a circular magnetic field around the conductor. The field is represented by concentric rings around the conductor. 
LEFT HAND RULE #1	Left-hand rule #1: Grasp the conductor with the thumb of the left hand pointing in the direction of electron, or negative (–) current flow. The curved fingers point in the direction of the magnetic field around the conductor. 

A Magnetic Field around a Coiled Conductor (Solenoid) If the coil is long and has many turns it is called a solenoid	 =  The result magnetic Field is
LEFT HAND RULE #2	Left-hand rule #2: for electron current flow: Grasp the coiled conductor with the left hand such that the curved fingers point in the direction of electron, or negative (–), current flow. The thumb points in the direction of the magnetic field within the coil. Outside the coil, the thumb represents the north (N) end of the electromagnet produced by the coil. 
Factors that affect the strength of electromagnet	1. the size of the current 2. the number of turns in the coil 3. the size of the coil 4. the type of core inside the coil-

The Motor Principle	Electric motors may look complicated when you look at them, but the underlying principle is as simple as this: if two magnetic fields are in the same vicinity, they will act on each other. 
LEFT HAND RULE #3 (Motor Principle)	Left-hand rule #3 for electron current flow (The motor principle): Open the left hand so that the fingers point in the direction of the magnetic field, from north to south. Rotate the hand so that the thumb points in the direction of electron, or negative (–), current flow. The orientation of the palm indicates the direction of the force produced. 
MAGNETIC FORCE	**$F = BIL \sin\theta$** F is the magnetic force in newtons (N), B is the magnetic field strength in tesla (T), I is the current in the conductor in amperes (A), L is the length of the conductor in the magnetic field in metres (m), a θ is the angle between the conductor and the magnetic field, in degree
BIOT'S LAW.	$B = \frac{\mu I}{2\pi r}$ B is the field strength in tesla (T), μ is the magnetic permeability. If the field is in free space, the μ is written as μ_o where $\mu_o = 4\pi \times 10^{-7}$ T·m/A. I is the current in amperes (A) r is the perpendicular distance away from the conductor in metres (m).
Force between two Parallel Conductors (combine Mag. Force and Biots law)	$F = B_1 I_2 L_2$ $F = \left[\frac{\mu_0}{2\pi r} I_1\right] I_2 L_2$ $F = \frac{\mu_0 I_1 I_2 L_2}{2\pi r}$ 
AMPERE'S LAW	One ampere (1 A) is the current flowing through two parallel wires placed one meter apart in air when the wires exert a force of 2×10^{-7} N/m on each other for each metre of their length.
THE MAGNETIC FORCE ON A SINGLE MOVING CHARGE	**$F = Bnqv \sin\theta$** F is the magnetic force in newtons (N) B is the field strength in tesla (T), n = number of charge q=charge on particle Coulumbs(C) . Usually electron 1.60×10^{-19} C v = velocity of particle (m/s) θ =is the angle between the conductor and the magnetic field, in degree
MOVING CHARGES CIRCULAR MOTION	$r = \frac{mv}{Bq}$ m is mass of charge (kg) B= is the field strength in tesla (T), v = velocity of particle (m/s) q=charge on particle Coulumbs(C) . Usually electron 1.60×10^{-19} C r= radius of circular path with which the particle is deflected (m) 
FARADAY'S LAW	when a magnetic field moves near a conductor it makes any free charge in the conductor move. --that is, a changing magnetic field creates a current.
LENZ'S LAW	The direction of the induced current creates an induced magnetic field that opposes the motion of the inducing magnetic field.