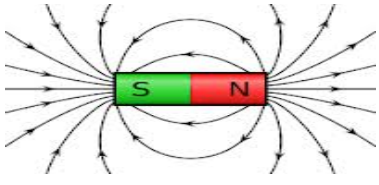
Review Notes Ch 21/22

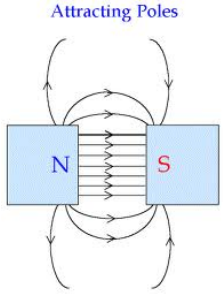
Magnetism:

1) B-field

2) Caused by magnetic domains so never have monopole

3) arrows point from N to S





Magnetism causes forces on MOVING charge particles (only at RIGHT angles)

1) Can do NO work, can NOT increase v

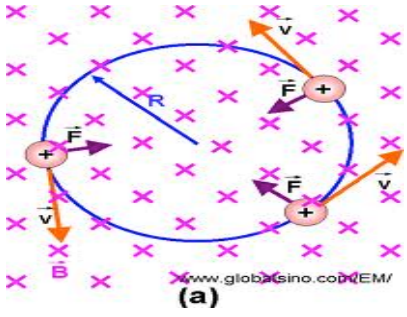
2) $F_B = qvB\sin\theta$ (single charged particle)

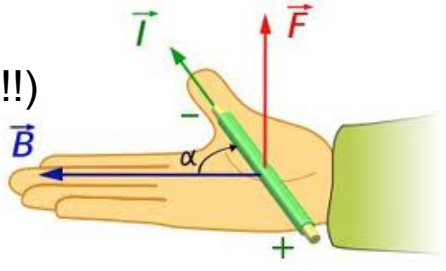
3) $F_B = BIL\sin\theta$ (wire in field)

4) ***RHR #1 FLAT!!!***

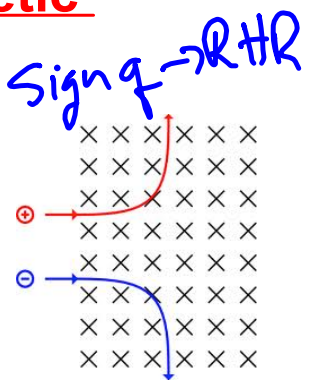
fingers = B, thumb = I, palm = force

(left hand for NEGATIVE charges only!!!!)





Moving charged particles in magnetic fields:



1) Follow circular or spiral pattern

(if already heading up or down)

2) $F_c = F_b$ so **$mv^2/r = qvB$**

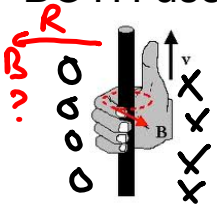
3) Use equation to determine ~~sign on~~ value q, m, or v for a given particle based on radius of circle

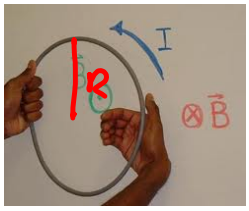
B-fields around wires, loops, and solenoids

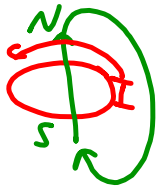
1) Wire = circular, $B = \mu_o I/2\pi r$ (r = ~~radius~~ distance)

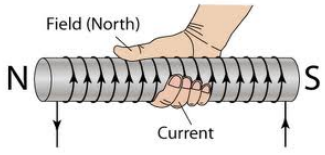
2) Loop = one side N, one side S, $B = N\mu_o I/2r$ (r=~~distance~~ radius, N = # of loops)

BOTH use RHR# 2, thumb = I, fingers = B, fingers CURVE!!









3) Solenoid = bar magnet, $B = n\mu_o I$ (n = turns/length)

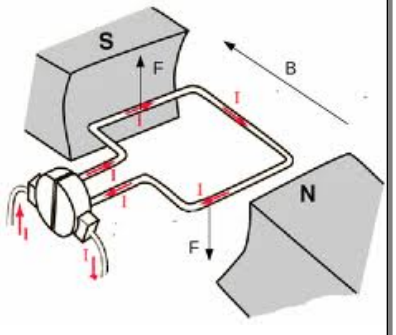
Modified RHR #2, fingers = I, thumb points to N pole

Motor Effect

1) Due to moving current in wire experience force/torque in magnetic field

2) Changes electrical energy in to mechanical energy

2) **NIA = magnetic moment**



Basic EM induction concepts:

1) Moving B or E fields induce each other

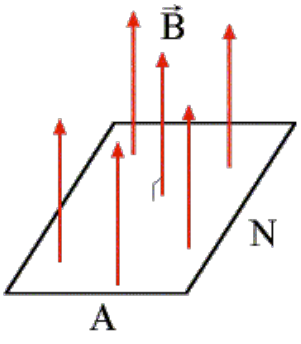
2) B, E, and v are always 90 deg to each other

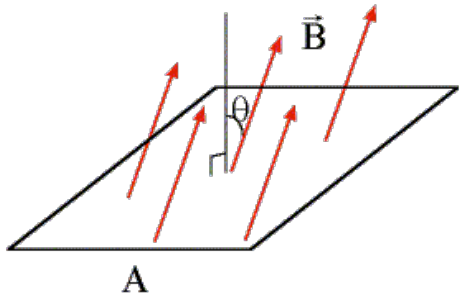
3) Magnetic flux MUST change to induce emf (emf does not mean current, just emf = the push)

Magetic Flux

1) $\Phi = BA\cos\phi$

2) ϕ = angle between NORMAL of plane of loop and B -field (90^o = no flux, 0^o = max flux)





Faraday - rate of change of flux = emf

$\varepsilon = -N\Delta\Phi/\Delta t$ $\varepsilon = IR$

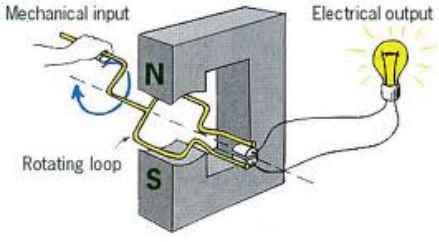
Lenz = induced current FROM emf always OPPOSES motion

Generator

1) Due to moving loop in magnetic field

2) Changes mechanical energy in to electrical energy

3) $\varepsilon = NBA\omega$



Transformers

1) Step up or down voltage and current

2) Energy (power) stays the same (VI)

3) Must use AC

4) Turn ratio = voltage ratio

$N_s/N_p = V_s/V_p = I_p/I_s$