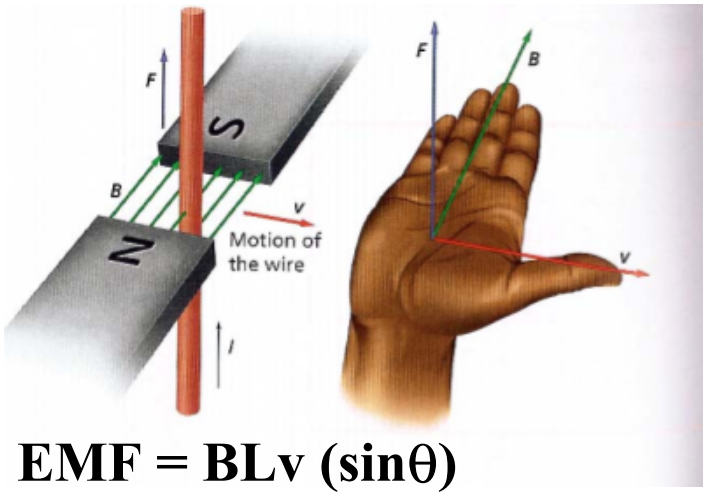
Chapter 23 Electromagnetic Induction

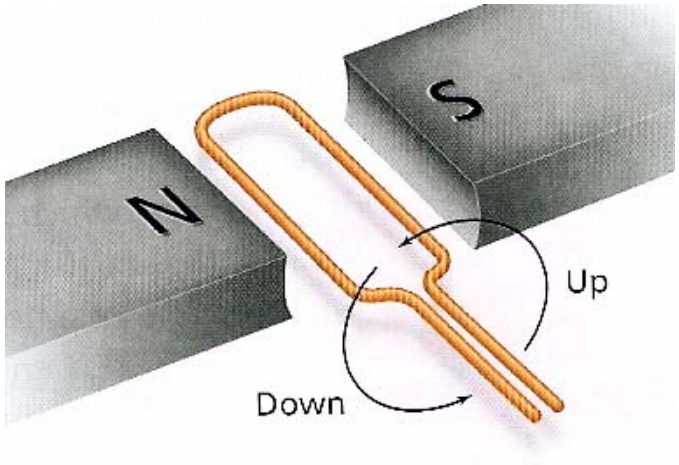
A moving or changing magnetic field causes an electric fiel (which causes a current in a circuit).

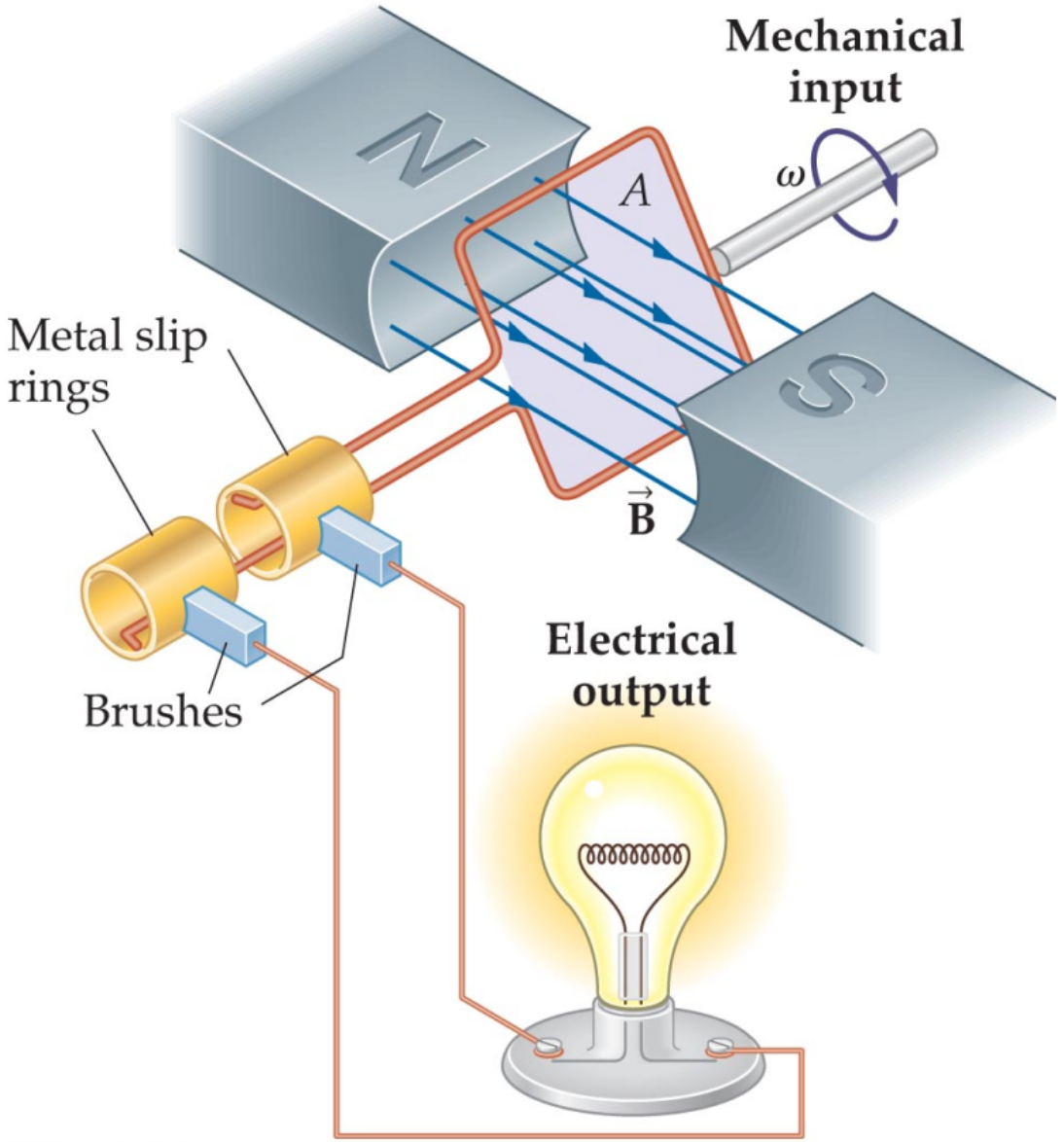


EMF = BLv (sinθ)

http://www.walter-fendt.de/ph11e/lorentzforce.htm

How a generator works:




Mechanical input
ω
A
N
S
B
Metal slip rings
Brushes
Electrical output
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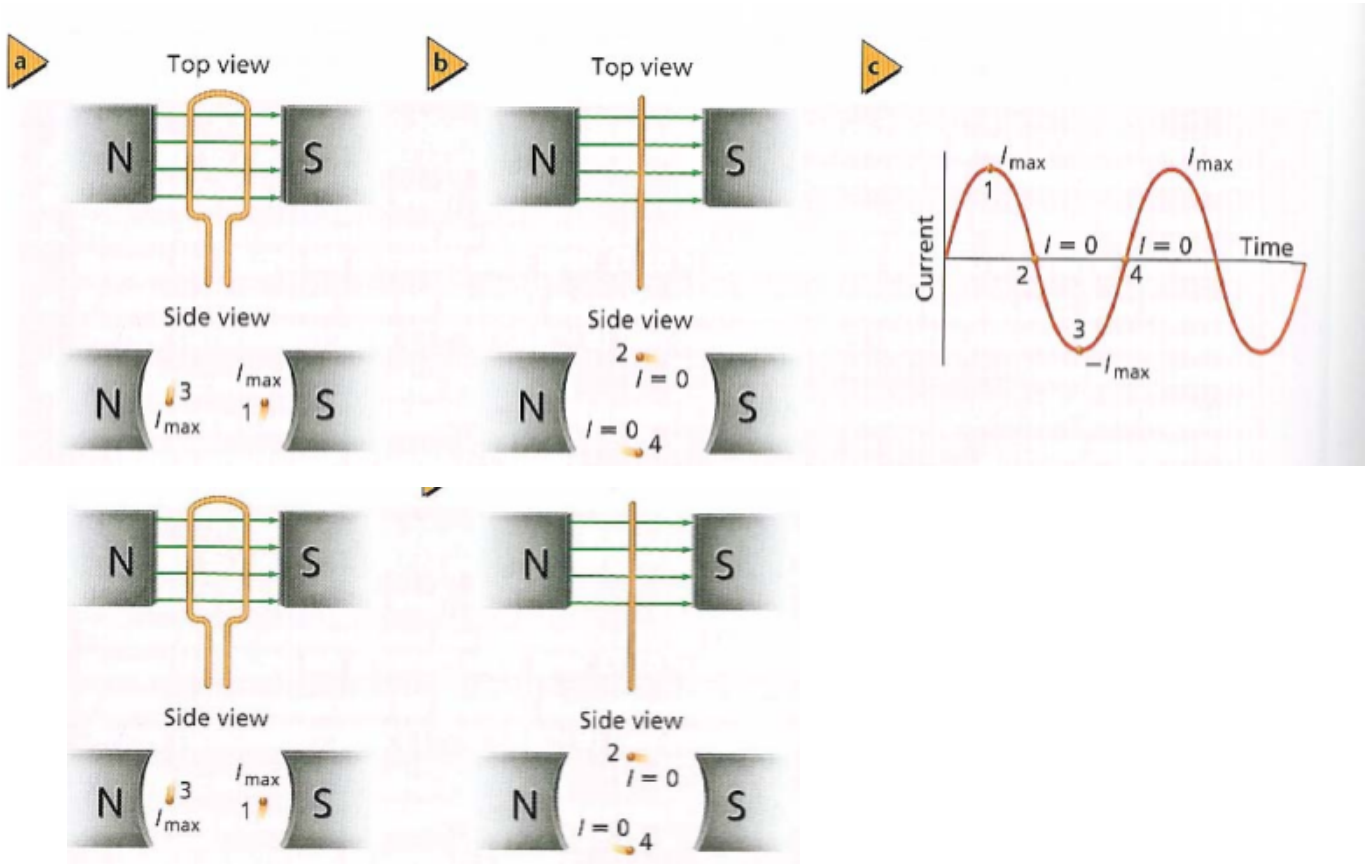
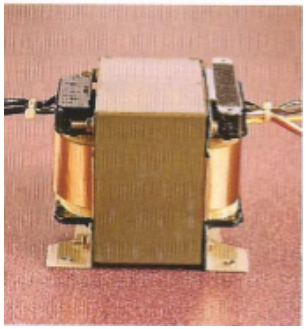

a
Top view
N
S
Side view
N
S
3
I_{max}
I_{max}
1
b
Top view
N
S
Side view
2
$I = 0$
N
S
$I = 0$
4
c
Current
I_{max}
1
I_{max}
$I = 0$
$I = 0$
Time
2
4
3
$-I_{max}$
N
S
Side view
N
S
3
I_{max}
I_{max}
1
Side view
2
$I = 0$
N
S
$I = 0$
4

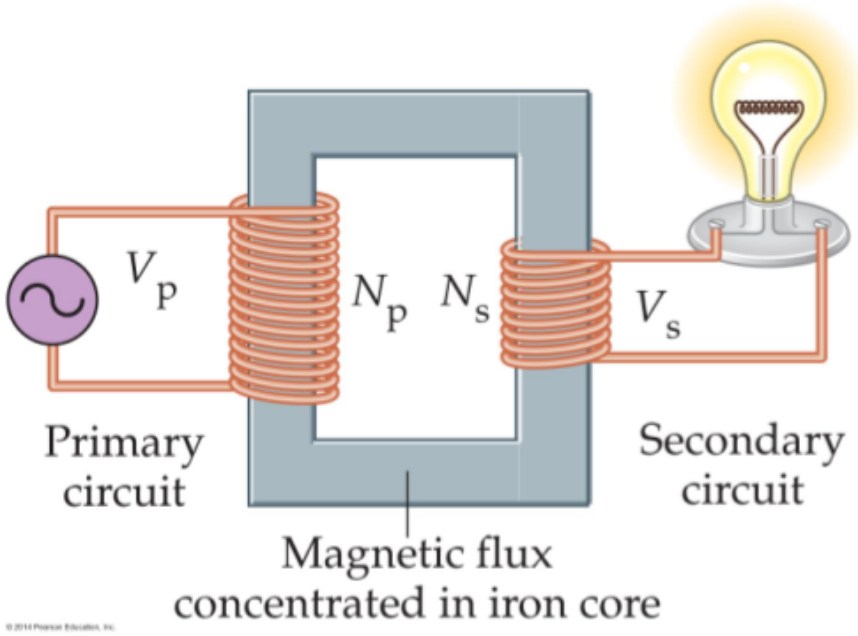
Lenz's Law

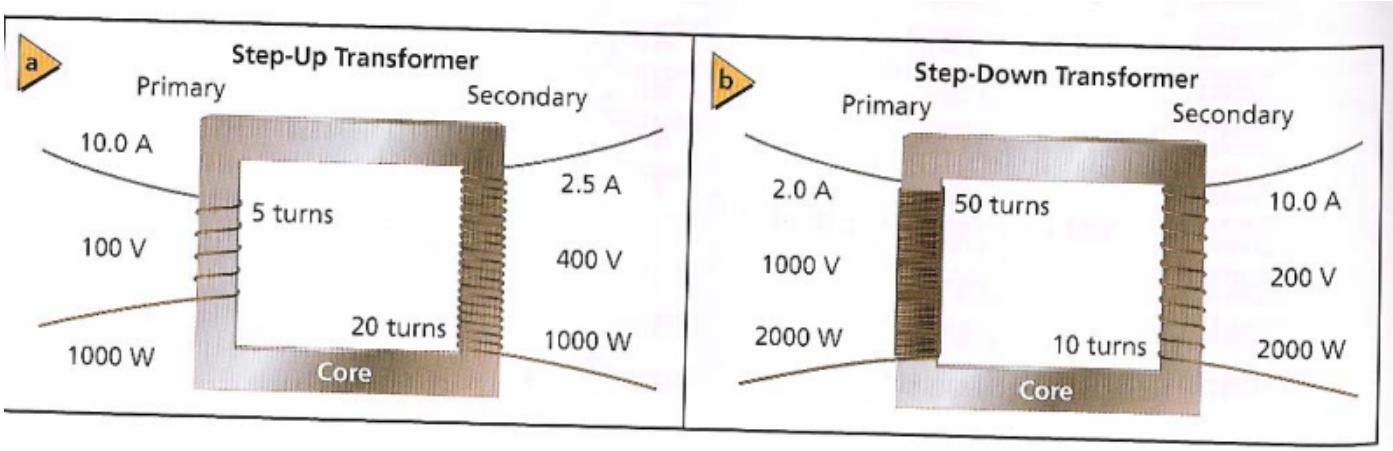
An induced current will flow in such a direction as to oppose by its magnetic field the change which produced it.

Transformers

Used to change alternating current of one voltage to alternating current of a different voltage.




V_p
N_p
N_s
V_s
Primary circuit
Secondary circuit
Magnetic flux concentrated in iron core



Equations for Transformers:

$$Vp/Vs = Np/Ns$$
$$VpIp = VsIs$$

Np = number of turns in primary
Ns = number of turns in secondary
Vp = primary voltage
Vs = secondary voltage
Ip = primary current
Is = secondary current

Important to note:
A STATIC magnetic field does not cause current. Only a moving/changing magnetic field will cause a current.

http://micro.magnet.fsu.edu/electromag/java/compass/index.html