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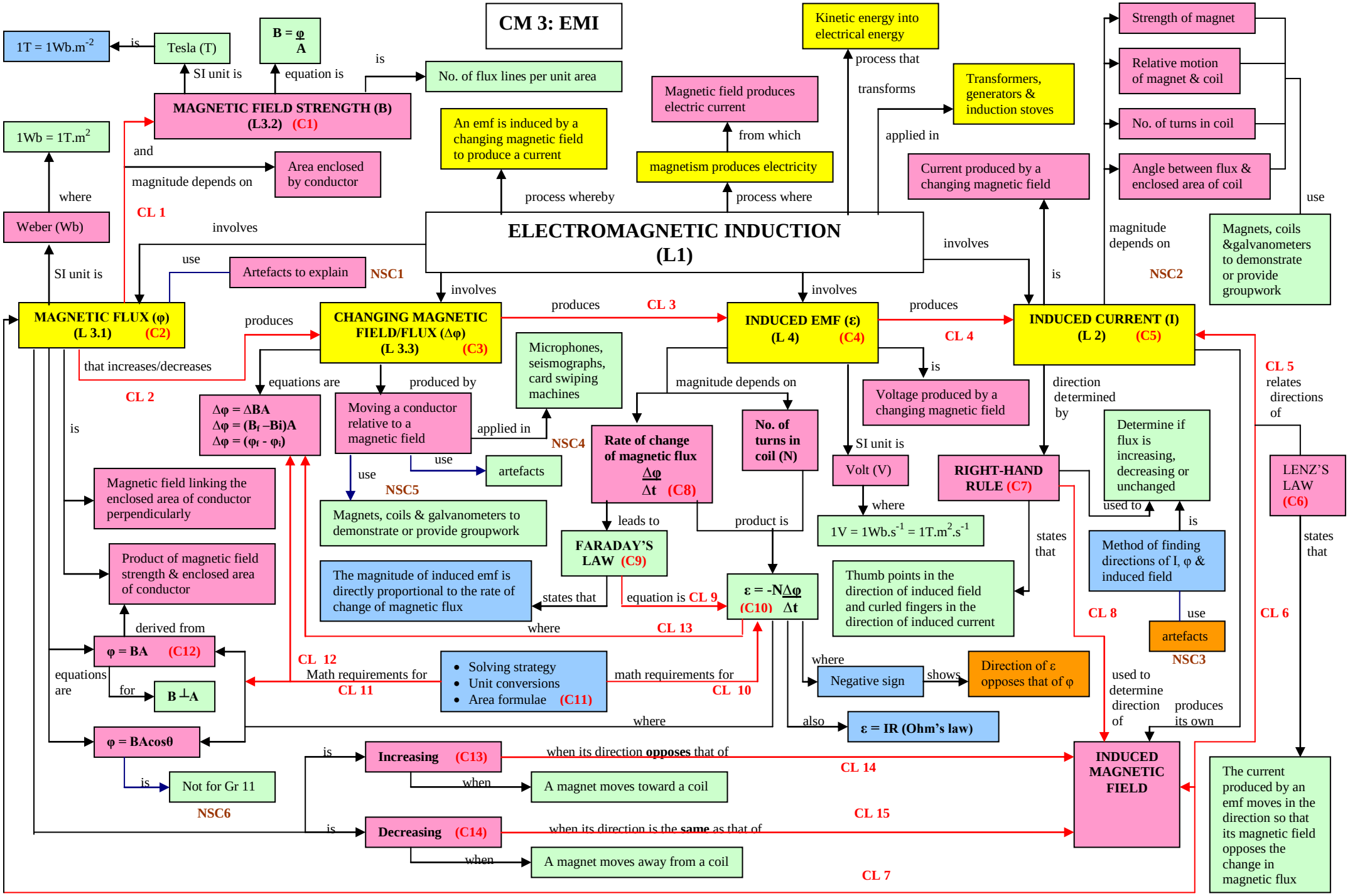
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A self-study on learning and teaching electromagnetism in grade 11.

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CM 3: EMI
ELECTROMAGNETIC INDUCTION (L1)
1T = 1Wb.m-2
is
Tesla (T)
SI unit is
B = φ / A
equation is
is
No. of flux lines per unit area
MAGNETIC FIELD STRENGTH (B) (L3.2) (C1)
1Wb = 1T.m2
where
Weber (Wb)
SI unit is
and
magnitude depends on
Area enclosed by conductor
CL 1
involves
use
Artefacts to explain
NSC1
MAGNETIC FLUX (φ) (L 3.1) (C2)
that increases/decreases
CL 2
produces
CHANGING MAGNETIC FIELD/FLUX (Δφ) (L 3.3) (C3)
produces
CL 3
INDUCED EMF (ε) (L 4) (C4)
produces
CL 4
INDUCED CURRENT (I) (L 2) (C5)
An emf is induced by a changing magnetic field to produce a current
process whereby
Magnetic field produces electric current
from which
magnetism produces electricity
process where
Kinetic energy into electrical energy
process that
transforms
Transformers, generators & induction stoves
applied in
Current produced by a changing magnetic field
involves
is
Strength of magnet
Relative motion of magnet & coil
No. of turns in coil
Angle between flux & enclosed area of coil
magnitude depends on
NSC2
use
Magnets, coils &galvanometers to demonstrate or provide groupwork
equations are
produced by
Δφ = ΔBA
Δφ = (Bf –Bi)A
Δφ = (φf - φi)
Moving a conductor relative to a magnetic field
applied in
NSC4
Microphones, seismographs, card swiping machines
use
artefacts
use
NSC5
Magnets, coils & galvanometers to demonstrate or provide groupwork
is
Magnetic field linking the enclosed area of conductor perpendicularly
Product of magnetic field strength & enclosed area of conductor
derived from
φ = BA (C12)
equations are
for
B ⊥ A
φ = BAcosθ
is
Not for Gr 11
NSC6
magnitude depends on
Rate of change of magnetic flux Δφ / Δt (C8)
No. of turns in coil (N)
leads to
product is
FARADAY'S LAW (C9)
The magnitude of induced emf is directly proportional to the rate of change of magnetic flux
states that
equation is CL 9
ε = -NΔφ / Δt (C10)
where
CL 13
CL 12
Math requirements for CL 11
Solving strategy
Unit conversions
Area formulae (C11)
math requirements for CL 10
where
also
ε = IR (Ohm's law)
is
Voltage produced by a changing magnetic field
SI unit is
Volt (V)
where
1V = 1Wb.s-1 = 1T.m2.s-1
direction determined by
RIGHT-HAND RULE (C7)
states that
Thumb points in the direction of induced field and curled fingers in the direction of induced current
where
Negative sign
shows
Direction of ε opposes that of φ
used to determine direction of
produces its own
Determine if flux is increasing, decreasing or unchanged
used to
is
Method of finding directions of I, φ & induced field
CL 8
use
artefacts
NSC3
CL 5 relates directions of
LENZ'S LAW (C6)
states that
CL 6
is
Increasing (C13)
when
A magnet moves toward a coil
when its direction opposes that of
CL 14
is
Decreasing (C14)
when
A magnet moves away from a coil
when its direction is the same as that of
CL 15
CL 7
INDUCED MAGNETIC FIELD
The current produced by an emf moves in the direction so that its magnetic field opposes the change in magnetic flux