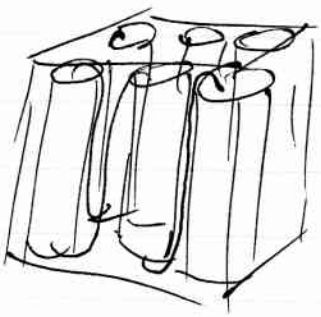
4-20

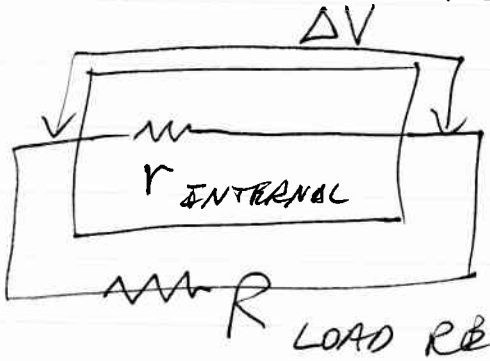


9 V BATTERY

6 1.5 V CORES IN SERIES

$6 \times 1.5 = 9$ V

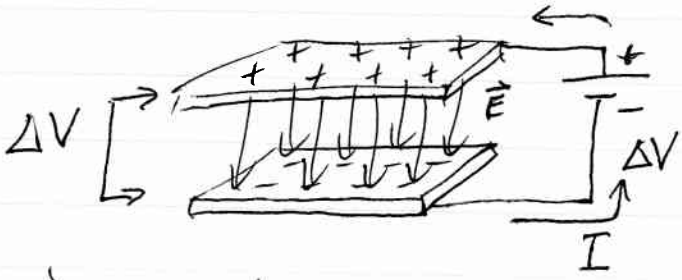
BATTERIES HAVE INTERNAL RESISTANCE



WHEN A BATTERY DIES, $r_{INTERNAL}$ GET HIGHER
CURRENT DROPS

CAPACITORS - STORE ENERGY IN AN ELECTRIC FIELD

DISCHARGES QUICKLY



'CHARGED'

UNITS OF CAPACITANCE:

$$C = \frac{\text{MAX CHARGE (+)}}{\Delta V}$$

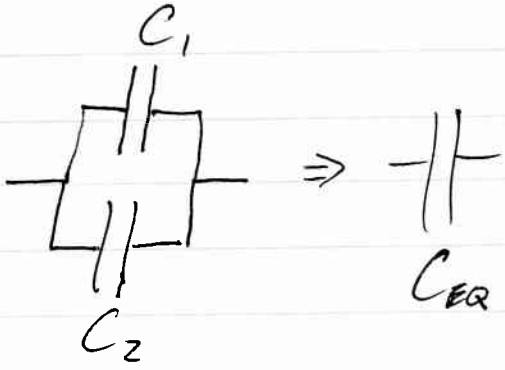
(GEOMETRY DEPENDENT)

UNITS ARE FARADS (F)

USUALLY TINY μF OR nF OR pF

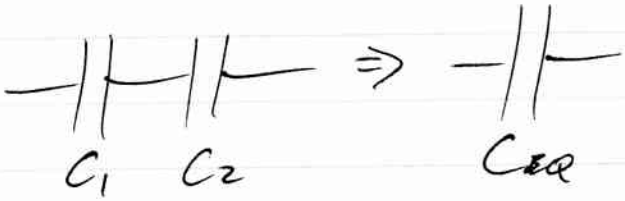
$$1F = \frac{1C}{1V}$$

CAPACITORS IN PARALLEL:

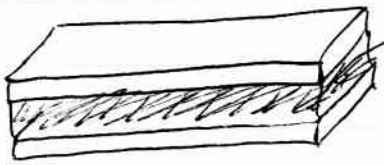


$$C_{EQ} = C_1 + C_2$$

CAPACITORS IN SERIES

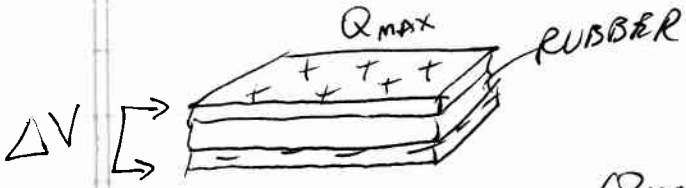


$$\frac{1}{C_{EQ}} = \frac{1}{C_1} + \frac{1}{C_2}$$

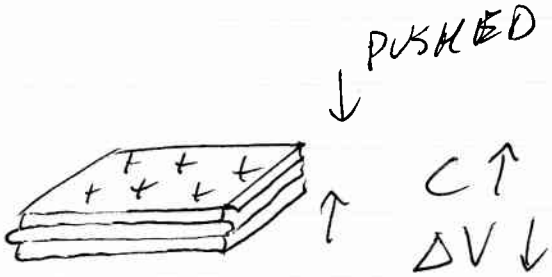


DIELECTRIC (INSULATOR)
INCREASE CAPACITANCE

CAPACITIVE SENSOR



$$\Delta V = \frac{Q_{MAX}}{C}$$



MONITOR VOLTAGE DROPS

POWER DISTRIBUTION

$P = \frac{\text{ENERGY}}{\text{TIME}}$ WATTS $1(W) = \frac{1(J)}{1(S)}$

$\mathcal{E} = V = \frac{\text{ENERGY}}{\text{CHARGE}} \longrightarrow \text{ENERGY} = \mathcal{E} \cdot \text{CHARGE}$

VOLTAGE VOLTAGE

OR

ELECTRO-MOTIVE 'FORCE'

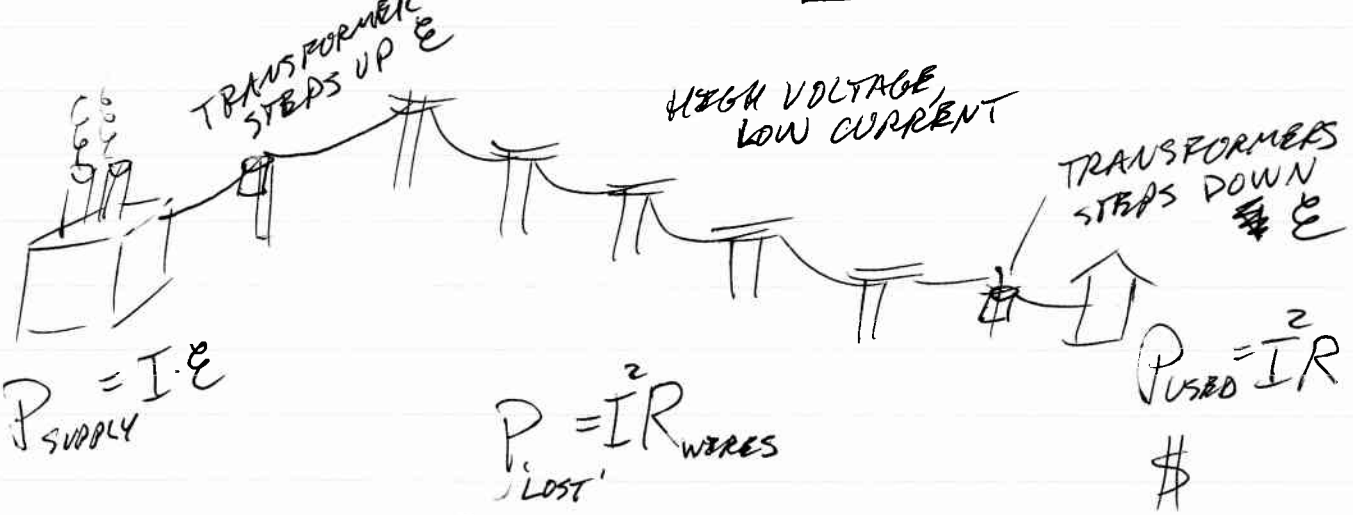
emf

$P = \frac{\mathcal{E} \cdot \text{CHARGE}}{\text{TIME}} = \mathcal{E} I$ OR

$\boxed{P = I\mathcal{E}}$ (POWER SUPPLIED)

'USED' POWER BY RESISTORS

$P = I \cdot V = I \cdot (I \cdot R) = I^2 R$ $\boxed{P_{USED} = I^2 R}$



TRANSFORMERS ONLY WORK FOR AC CURRENT

WANT TO MINIMIZE $P_{'LOST'}$

SO, WANT I AS LOW AS POSSIBLE

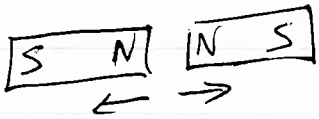
SO, WANT $\mathcal{E}$ TO BE HIGH

MAGNETISM

ORIGINALLY THOUGHT TO BE A SEPERATE PHENOMENON FROM ELECTRICITY
(NOW, IT IS COMBINED EFFECT ELECTRO-MAGNETISM)

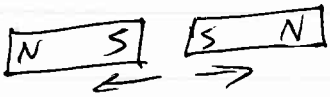
LODE STONES - NATURAL MAGNETS

(COMPASSES) 

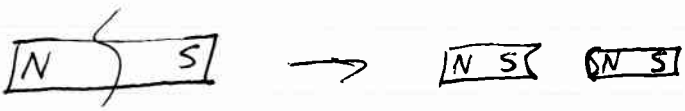


LIKE POLES REPEL

UN LIKE POLES ATTRACT



TRY TO ~~SEPER~~ BREAK POLES APART



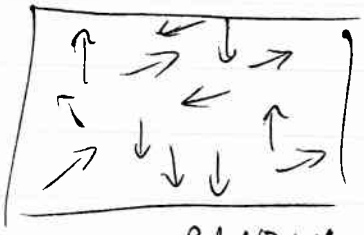
N-S POLES REMAIN PAIRED

ALL THE WAY DOWN TO THE ATOMS

NO MONOPOLES HAVE BEEN OBSERVED

ATOMIC MAGNETISM

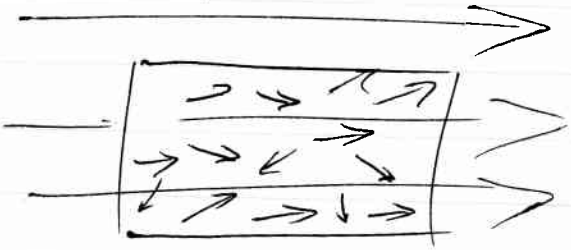
QUICK-COOLED IRON



RANDOM ORIENTATION

NO NET MAGNETIC FIELD

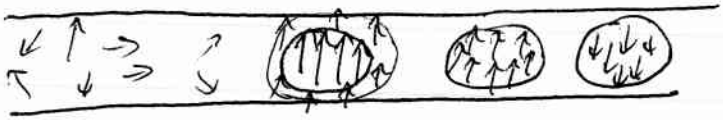
SLOW-COOLED IN PRESENCE OF EXTERNAL MAGNETIC FIELD



NET INTERNAL FIELD REMAINS

MAGNETIC TAPE

WRITE HEAD



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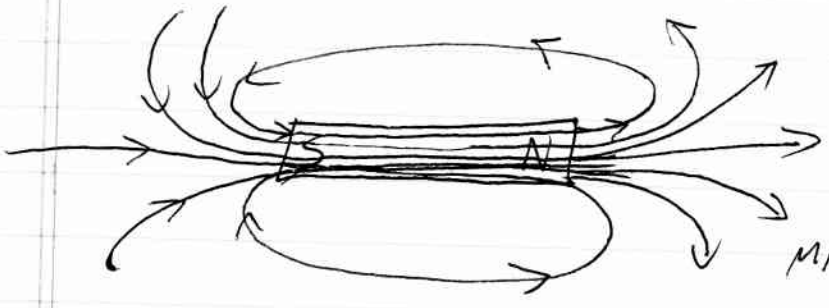
CURRENT ~~ALSO~~ ALSO GENERATES A MAGNETIC FIELD

MAGNETIC FIELD INTENSITY: $\vec{B}$



MAGNETIC DIPOLE

N = SOUTH-SEEKING POLE

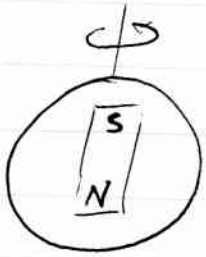
S = NORTH-SEEKING POLE

MAGNETIC FIELD LINES ALWAYS FORM LOOPS

DENSITY OF LINES ⇒ STRENGTH

NEVER CROSS

~~GEOGRAPHIC~~ GEOGRAPHIC NORTH IS A SOUTH MAGNETIC POLES



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