REVIEW LECTURE

FOLLOWING
EXAM COVERS MATERIALS

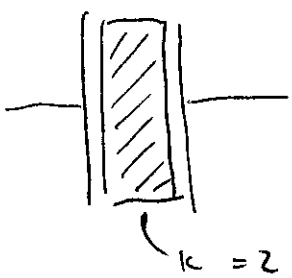
- DIELECTRICS
- ENERGY IN CAPACITOR
- RESISTANCE, CURRENT, CIRCUITS
  - KIRCHHOFF'S LAW
- MAGNETIC FIELD
  FORCE ON MOVING CHARGE, FORCE ON WIRE

DIELECTRICS

DIELECTRIC CONSTANT K

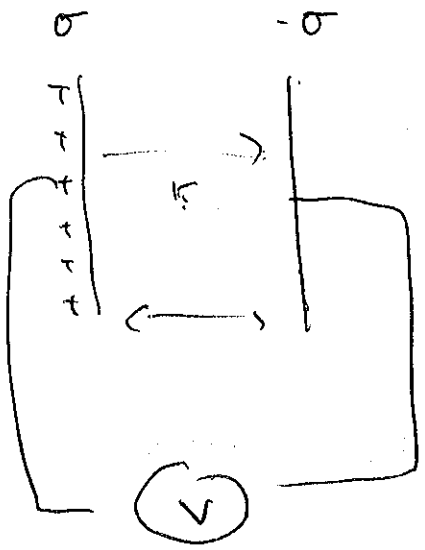
INCREASES CAPACITANCE BY FACTOR OF K

EXAMPLE



$C_{NEW} = C_0 \times 2$

ELECTRIC FIELD INSIDE IS REDUCED BY FACTOR OF 2



$$E_{\text{INSIDE}} = \frac{\sigma}{2\varepsilon_0}$$

$$V = \frac{\sigma d}{2\varepsilon_0}$$

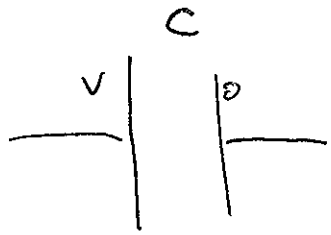
$$Q = CV$$

$$\sigma A = \frac{\sigma d}{2\varepsilon_0} C$$

$$\frac{2\varepsilon_0 A}{d} = C$$

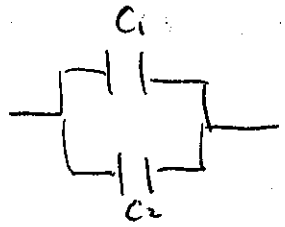
WHICH IS A FACTOR OF 2 LARGER

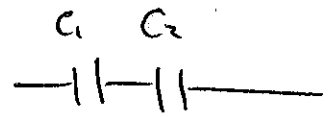
ENERGY STORED IN CAPACITOR



$$\frac{1}{2}CV^2 = \frac{1}{2}\frac{Q^2}{C}$$

CAPACITORS IN PARALLEL OR SERIES



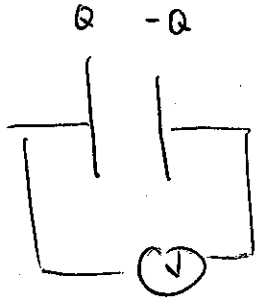


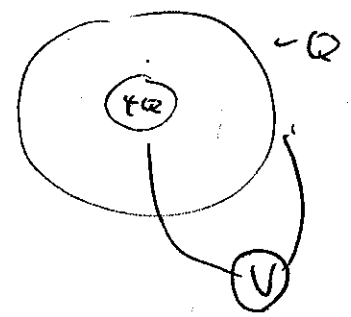
$C_T = C_1 + C_2$

$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2}$

CAPACITANCE CALCULATIONS

CAPACITANCE MEANS IF YOU PUT VOLTAGE V ACROSS IT YOU MOVE EXACTLY Q : TO CREATE IT





$CV = Q$ ALWAYS

CIRCUITS

KIRCHHOFF'S RULES AND RESISTANCE & RESISTIVITY

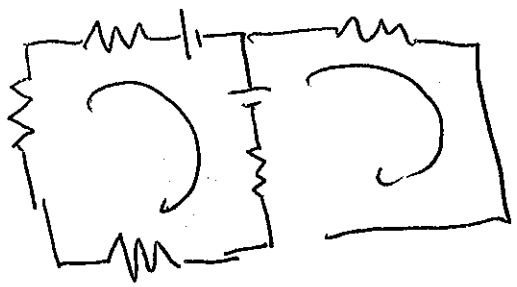
ρ : RESISTIVITY $\Omega \cdot m$

$R = \dfrac{\rho L}{A} : \Omega$

$\sigma = \dfrac{1}{\rho}$

GIVEN A WIRE

RESISTANCE DROPS IF AREA IS INCREASED
AND INCREASES IF LENGTH IS INCREASED

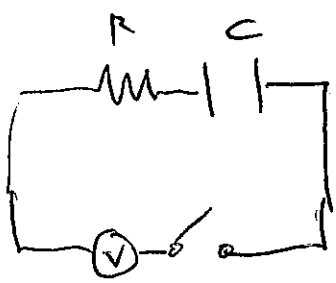


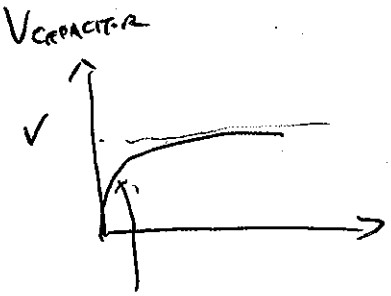
KIRCHHOFF'S RULE

1) VOLTAGE DROP ACROSS THE ENTIRE LOOP MUST EQUAL TO ZERO

2) CURRENT MUST BE CONSERVED

TIME DEPENDENT VOLTAGE IN CIRCUITS





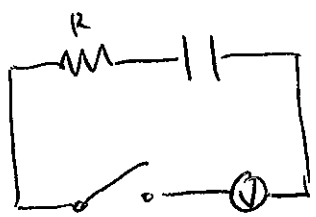
$$V(t) \sim V e^{-\frac{t}{RC}}$$

$$V_0 - V_0 e^{-t/RC}$$

TIME CONSTANT IS $\tau = RC$.

$e = 2.73$

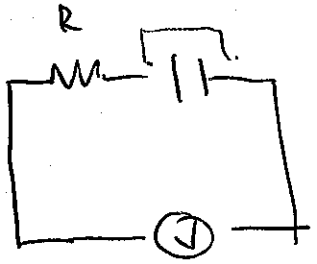
THINK ABOUT THIS



CAPACITOR LOOKS LIKE A SHORT-CIRCUIT

AT $t = 0$

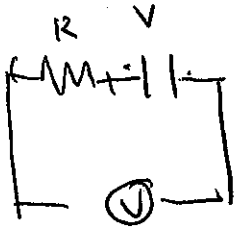
$V_{CAPACITOR} = 0$



$V_{RESISTOR} = V$

$I = V/R$

AT $\tau = \infty$



$V_{RESISTOR} = 0$

$I = 0$

CAPACITOR LOOK LIKE OPEN CIRCUIT.

MAGNETIC FIELD

1 TESLA = 10000 GAUSS

EARTH ~ 0.5 GAUSS

$$\vec{F}_B = q\vec{v} \times \vec{B}$$

WE ALSO SAY

$$I = q v_d n = n q \vec{v_d}$$

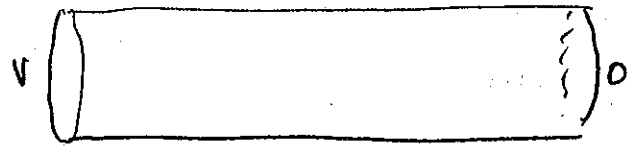
$$\vec{F}_B = I \vec{L} \times \vec{B}$$

OR

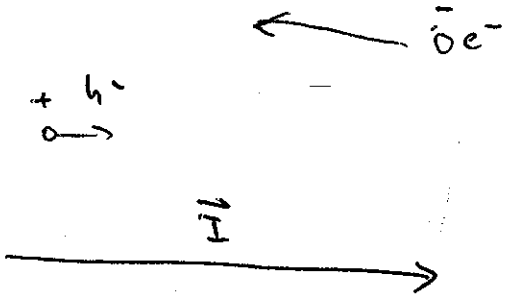
$$= \vec{I} \times \vec{B}$$

RIGHT HAND RULE IS REQUIRED HERE

DIRECTION OF CURRENT:

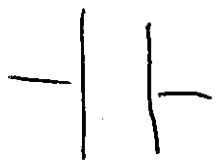


WHICH WAY?



NOTE ON DEPENDENCE.

EXAMPLE HOW DOES CAPACITANCE DEPENDENT ON AREA IN A PARALLEL PLATE CAPACITOR



EXACT: $C = \frac{\varepsilon_0 A}{d}$

$\boxed{C \sim A}$

DEPENDENCE OF RES IS THINCE ON LENGTH OF THE WIRE

$\boxed{R \sim l}$

EXTRA

HOW TO MEASURE RESISTANCE

VOLT METER, AMMETER

HOW TO MEASURE VOLTAGE?