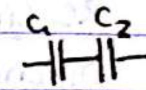
Review Sessions - 2-4pm on Sat & Sun @ 1 Pimentel 10/29/15

Quick Summary

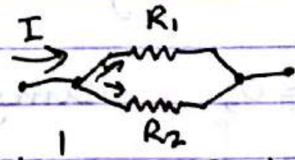
Rseries 

$R_{eq} = R_1 + R_2$; $R_{eq} = \sum_i R_i$

- ΔV is shared
- I is same →

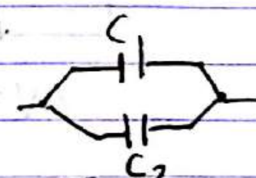
Cseries 

$\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2}$, $= \sum_i \frac{1}{C_i}$

Rparallel 

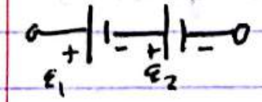
$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} = \sum_i \frac{1}{R_i}$

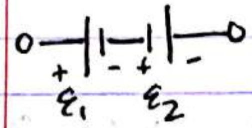
- I shared
- ΔV is same

Cparallel 

$C_{eq} = C_1 + C_2 = \sum_i C_i$

EMF series

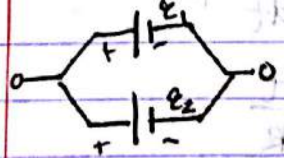
 $\Rightarrow \mathcal{E}_{eq} = \mathcal{E}_1 + \mathcal{E}_2 = \sum_i \mathcal{E}_i$

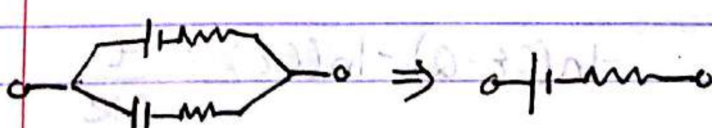
 $\mathcal{E}_1 > \mathcal{E}_2 \Rightarrow \mathcal{E}_{eq} = \mathcal{E}_1 - \mathcal{E}_2$

$\mathcal{E}_2 > \mathcal{E}_1 \quad \mathcal{E}_{eq} = \mathcal{E}_2 - \mathcal{E}_1$

smallest EMF acts like a resistor.

EMF parallel

 $\Rightarrow \mathcal{E}_{eq} = \mathcal{E}_1 = \mathcal{E}_2$ (if $\mathcal{E}_1 = \mathcal{E}_2$)

 $\mathcal{E}_{eq} = \mathcal{E}_1 = \mathcal{E}_2$

$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$

If $\mathcal{E}_1 \neq \mathcal{E}_2$, apply Kirchoff's Law
$R_1 \neq R_2$

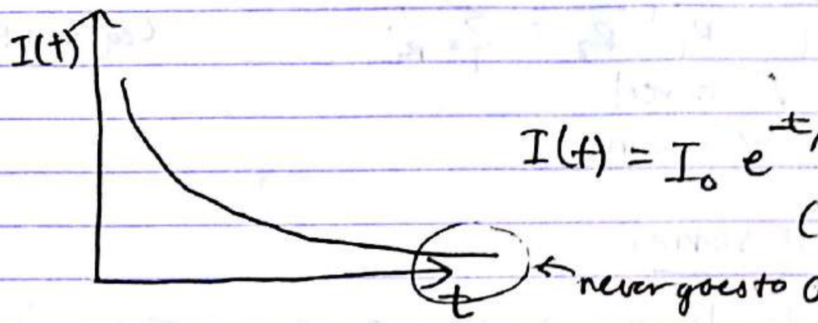
RC Circuit

Discharging C

$t=0$, capacitor fully charged, $Q = C\Delta V$

t $I = -\frac{dQ}{dt}$ (decreasing)

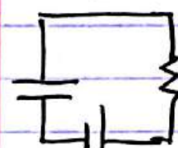
$\Delta V = \frac{Q}{C}$, $\frac{Q}{C} - IR = 0$, solving this diffeq,



$I(t) = I_0 e^{-t/RC}$

$(\tau = RC)$

Charging C



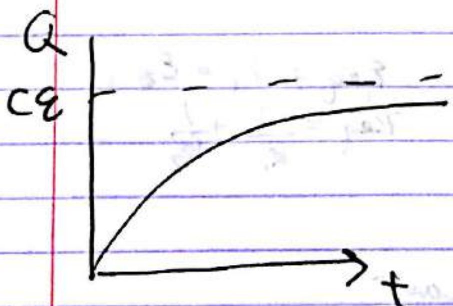
$t=0$, C discharged

$I(t) = \frac{dQ}{dt}$ (increasing), $\Delta V = \frac{Q}{C}$

fully chgd C $\rightarrow$ $Q = C\Delta V = C\mathcal{E}$

$\mathcal{E} - \Delta V_C - IR = 0 \rightarrow \frac{\mathcal{E} - Q}{C} - \frac{dQ}{dt} R = 0$

$\Rightarrow \int_0^Q \frac{dQ}{C\mathcal{E}-Q} = \int_0^t \frac{dt}{CR}$



$-\ln(C\mathcal{E}-Q) - \ln(C\mathcal{E}) = \frac{t}{CR}$

$\ln\left(\frac{C\mathcal{E}-Q}{C\mathcal{E}}\right) = \frac{-t}{CR}$

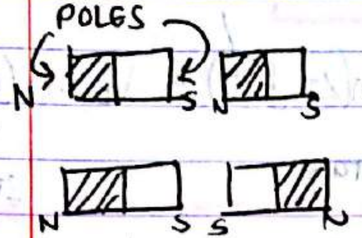
$C\mathcal{E} - Q = C\mathcal{E} e^{-t/\tau}$

$Q = C\mathcal{E}(1 - e^{-t/\tau})$

Magnetism

=New= Force → Attractive / → repulsive "similar" to Coulomb force

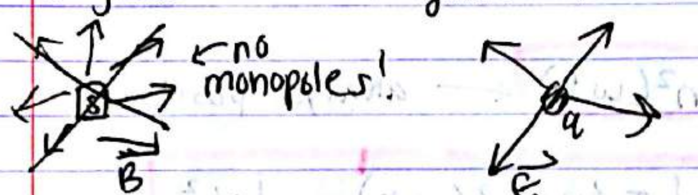
POLES



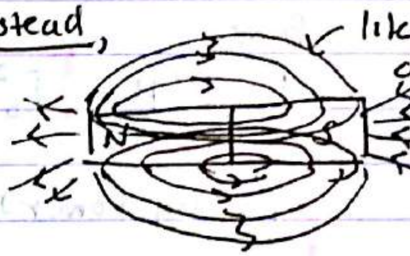
→ MONOPOLE? [N] [S] } Does not exist in nature?

$q_1 q_2 \rightarrow \vec{F}_c \rightarrow \vec{E}$ q (single chg)

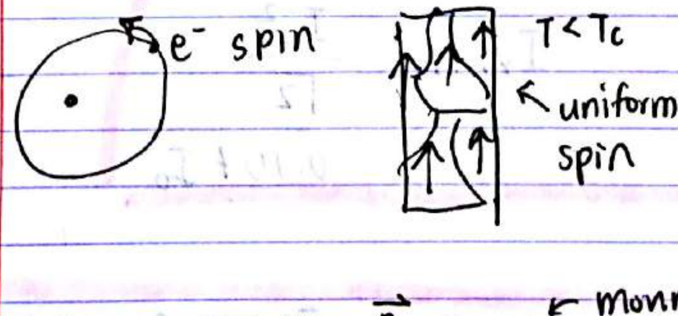
magnets → $\vec{F}$ → magnetic field. $\vec{B}$



instead, like a dipole.



1) Magnet can gen. Force → F_{Magn}
2) Current can gen. F_{magn}
3) Magnet → exerts force on moving charge



Convention
1) field lines go out from N, into S.
2) # field lines ∝ to strength of field
3) There are field lines inside the magnet - the lines do not stop.

FORCE presence $\vec{B}, q, v$ ← moving chg $\vec{F} \perp \vec{v}$

$F \propto qvB$ → $\boxed{\vec{F} = q\vec{v} \times \vec{B}}$

1) $F_?$ does NO WORK. (not conservative F)
2) CANNOT DEFINE U
3) $\Delta K = 0$

$\vec{E}$, Lorentz Force $\boxed{\vec{F}_L = q\vec{E} + q\vec{v} \times \vec{B}}$