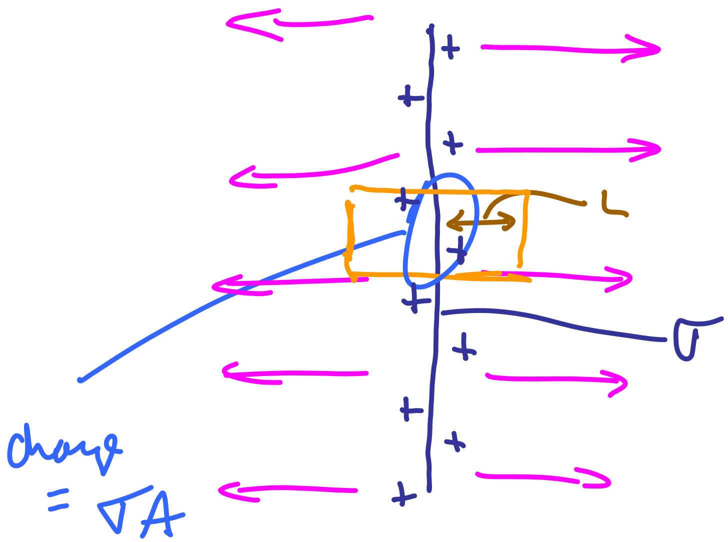
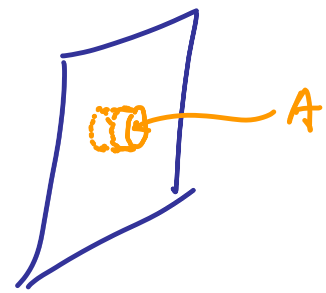
Physics 114 - February 17, 2014

- Exam I grading underway ... Thursday is target date to hand back to you
- BB issue ... working to understand + straighten out



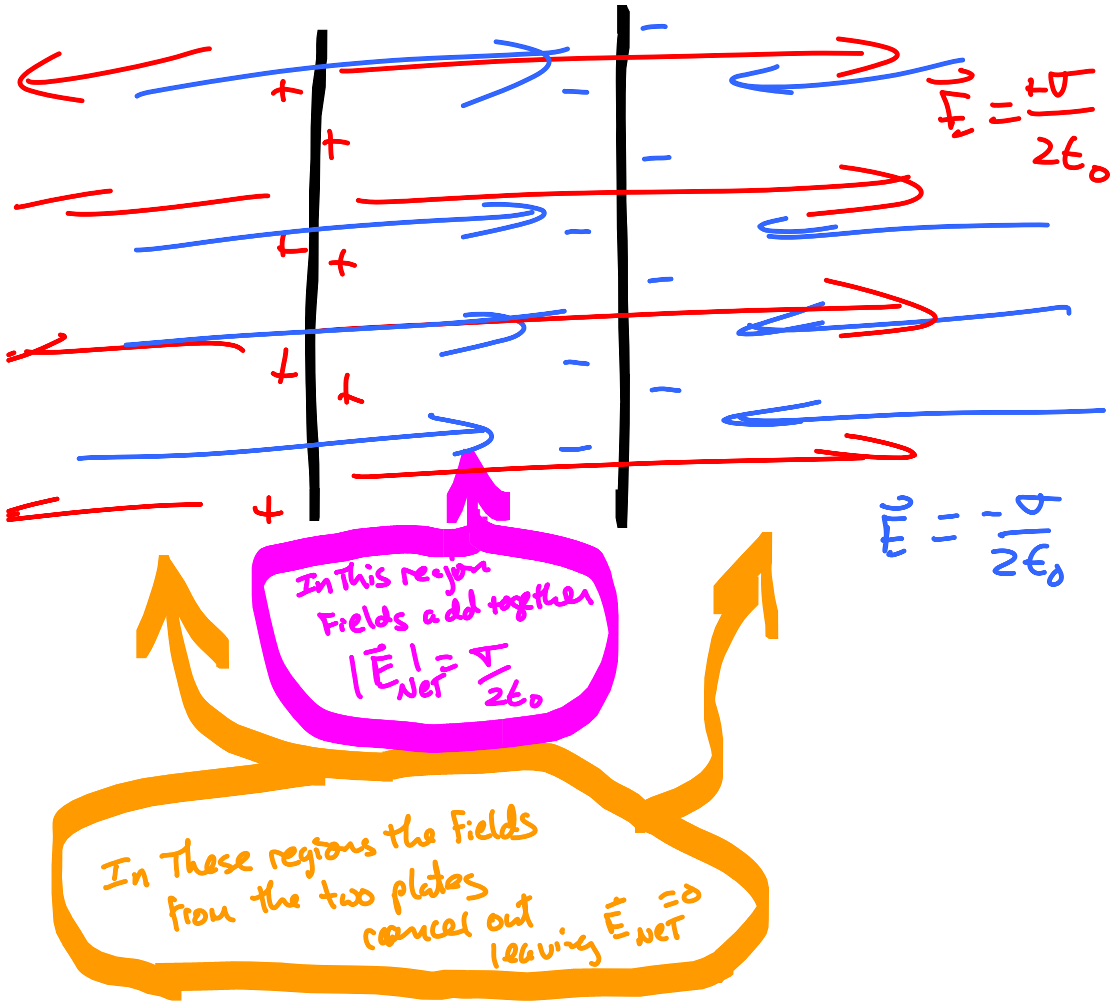


$$\int \vec{E}\cdot d\vec{A} = \frac{Q_{encl}}{\epsilon_0}$$

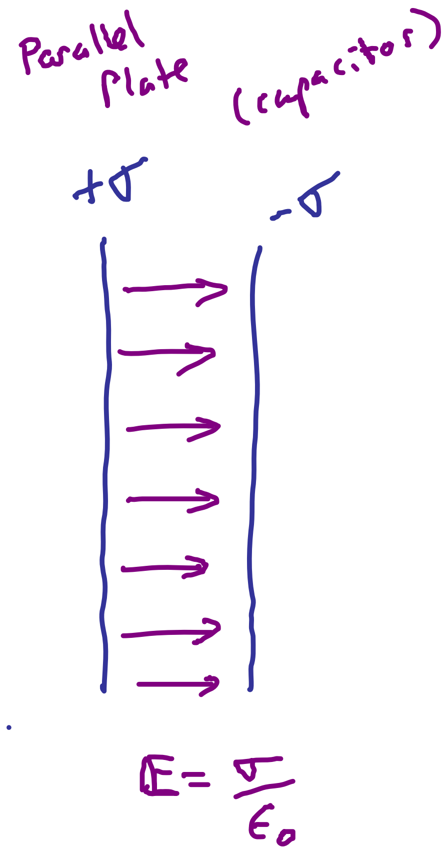
$$2|\vec{E}|A = \frac{Q_{encl}}{\epsilon_0} = \frac{\sigma A}{\epsilon_0}$$

$\sigma =$ area charge Density

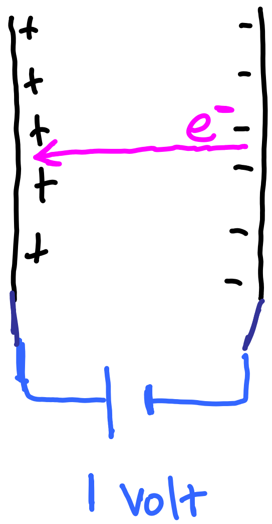
$$|E| = \frac{\sigma}{2\epsilon_0}$$



$\vec{E} = \frac{+\sigma}{2\epsilon_0}$
$\vec{E} = -\frac{\sigma}{2\epsilon_0}$
In This region Fields add together $|\vec{E}_{Net}| = \frac{\sigma}{2\epsilon_0}$
In These regions the Fields from the two plates cancel out leaving $\vec{E}_{Net} = 0$



Parallel plate (capacitor)
$+\sigma$
$-\sigma$
$\vec{E} = \frac{\sigma}{\epsilon_0}$



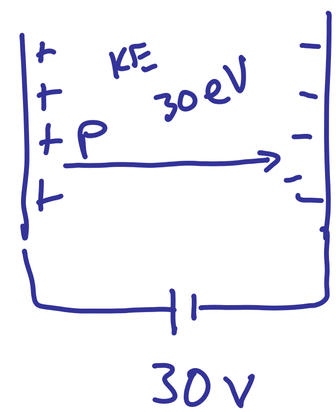
what is energy of e^-?

$$V = \frac{W}{q}$$

$$W = |q|\,V = KE \text{ gain by } e^-$$

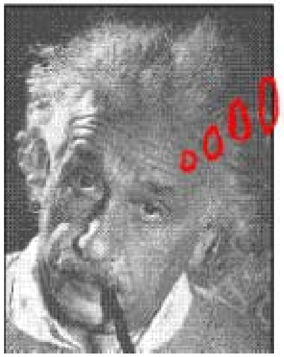
$$KE = \left(1.6\times10^{-19}\,C\right)\,1\,\frac{J}{C}$$

$$= 1.6\times10^{-19}\,J$$



Unit of energy ≡ electron-Volt = eV

$$1\,eV = 1.6\times10^{-19}\,J$$



$E = mc^2$

← Speed of light

$$m = E/c^2$$

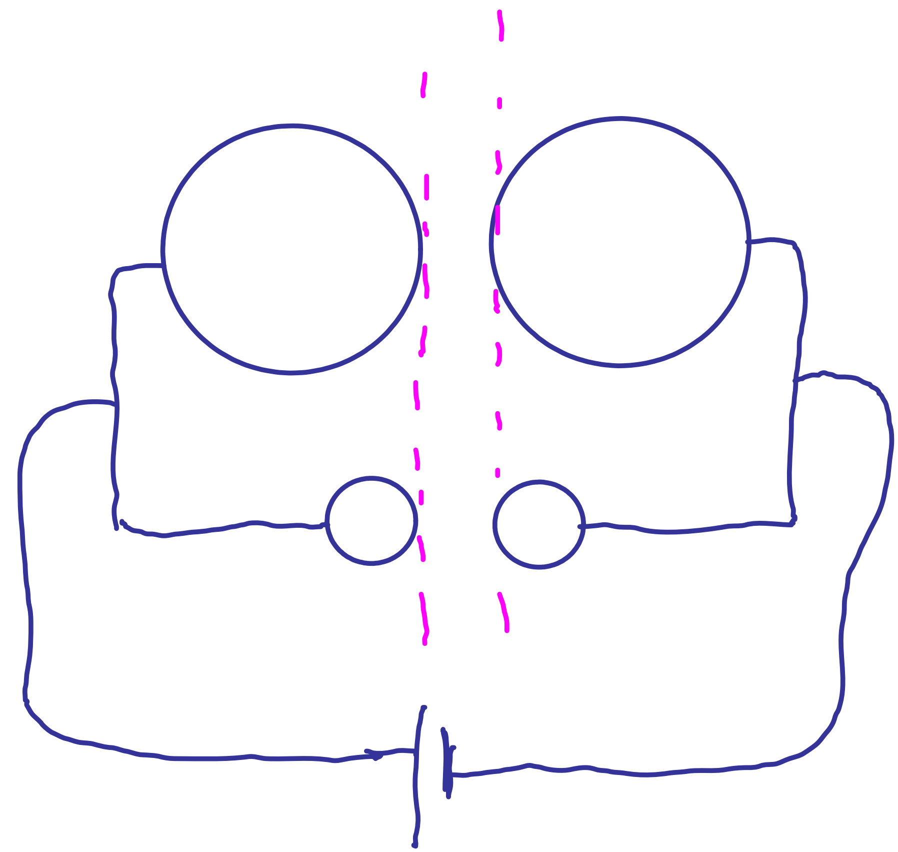
$$m_{election} = 0.511 \text{ MeV}/c^2$$

Physicists often Drop the c being a bit lose

$$M_e = .511 \text{ MeV}$$

can lead to confusion

Million election-Volts



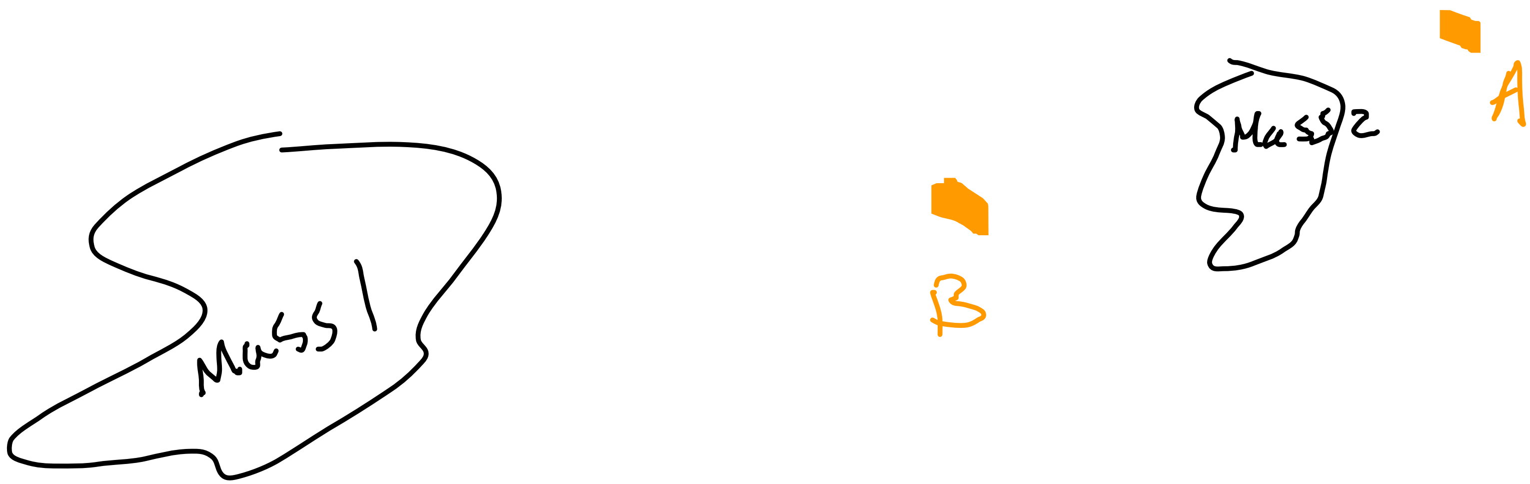
$$Q = Q_1 + Q_2$$

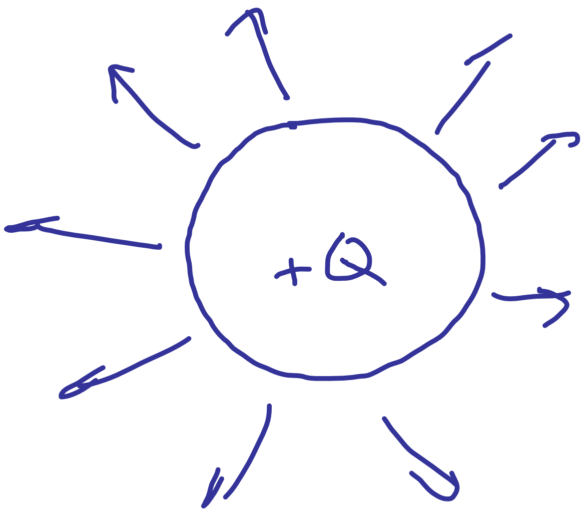
$$\frac{kQ_1}{R_1} = \frac{kQ_2}{R_2}$$

$$E_1 = \frac{kQ_1}{R_1^2} = \frac{kQ_1}{R_1}\,\frac{1}{R_1}$$

$$E_2 = \frac{kQ_2}{R_2^2} = \frac{kQ_2}{R_2}\,\frac{1}{R_2}$$

$$\frac{E_1}{E_2} = \frac{1/R_1}{1/R_2} = \frac{R_2}{R_1}$$

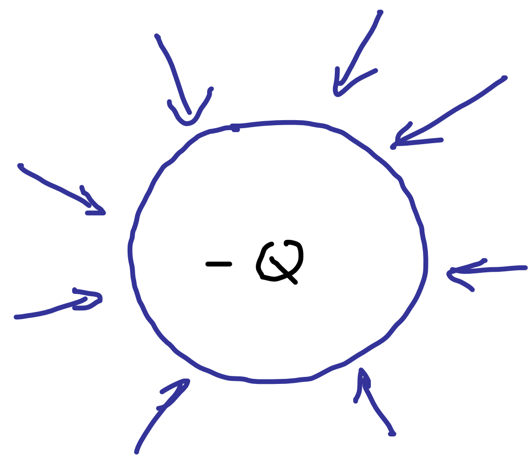

Mass 1
Mass 2
A
B



$V_+ \propto Q$

$$V_+ = \frac{kQ}{R}$$

$V_- \propto Q$



$$\Delta V = V_+ - V_- = \frac{2kQ}{R} \propto Q$$

$$V_- = -\frac{kQ}{R}$$

$V \propto Q$

$Q = CV$

↑ capacitance

$C = \frac{Q}{V} = \frac{\text{Coul}}{\text{Volt}} \equiv \text{Farad}$

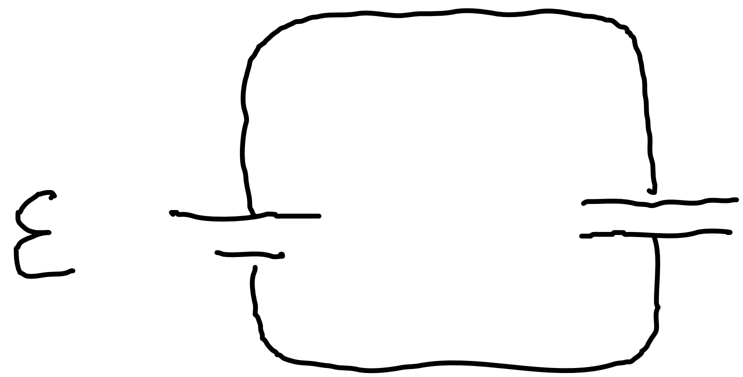
C = capacitance

c = calorie

C = heat capacitance

c = speed of light

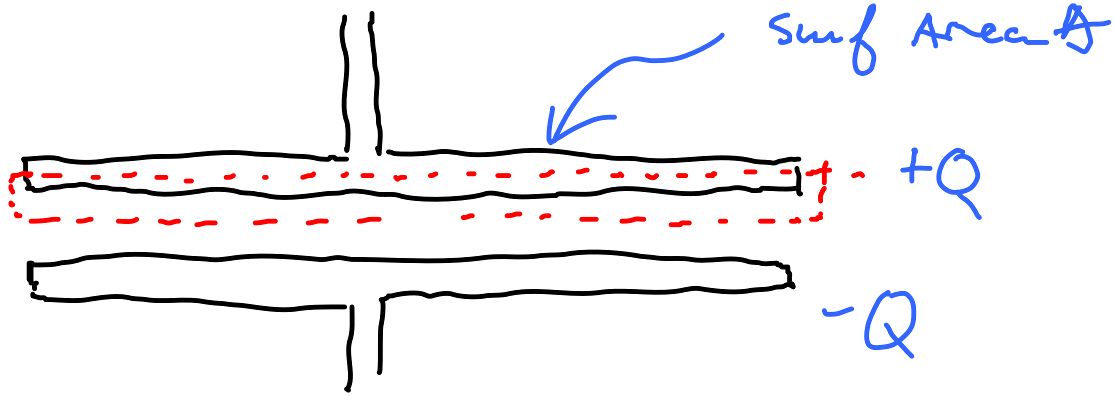
c = charge



EMF ≡ Electromotive force

Think of a battery

maintains a pot. diff between two point



$$\oint \vec{E}\cdot d\vec{A} = \frac{Q_{encl}}{\epsilon_0}$$

$$|E|A = \frac{Q_{encl}}{\epsilon_0} = +Q$$

$$+Q = |E|A\epsilon_0$$

$$\Delta V = \frac{W}{q}$$

$$Q = CV$$

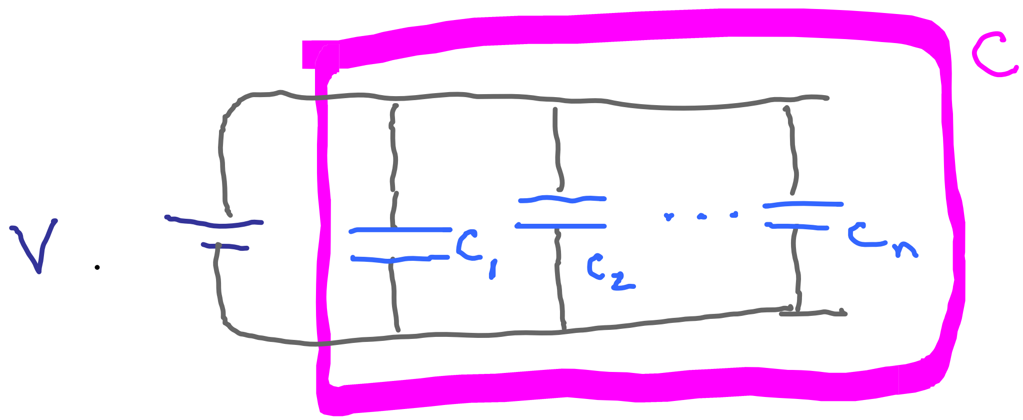
$$C = Q/V$$

$$\frac{F\cdot d}{q} \quad qE \quad E\cdot d$$

$$C = \frac{|E|A\epsilon_0}{|E|d} = \frac{\epsilon_0 A}{d}$$

depends on geometry Alone

Capacitors in Parallel



$Q = CV$

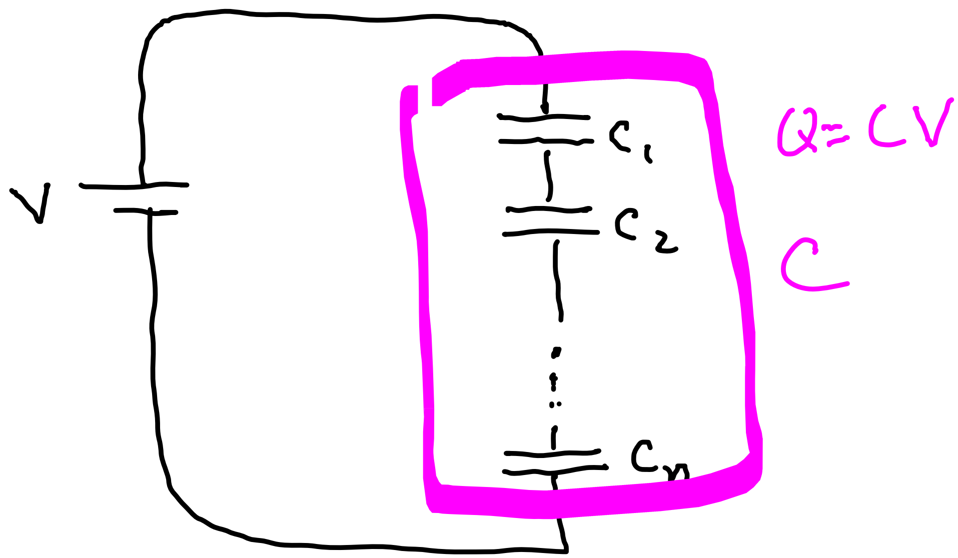
What is C in terms of $C_1, C_2 \cdots C_n$

$$Q_1 = C_1 V$$
$$Q_2 = C_2 V$$
$$\vdots$$
$$Q_n = C_n V$$

$$Q = Q_1 + Q_2 + \cdots + Q_n$$

$$CV = C_1 V + C_2 V + \cdots + C_n V$$

$$C = C_1 + C_2 + \cdots + C_n = \sum_{i=1}^{n} C_i$$



Q = CV

Capacitors in Series

$$V = V_1 + V_2 + \cdots + V_n$$

$$\frac{Q}{C} = \frac{Q}{C_1} + \frac{Q}{C_2} + \cdots + \frac{Q}{C_n}$$

$$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2} + \cdots + \frac{1}{C_n}$$

$$\frac{1}{C} = \sum_{i=1}^{n} \frac{1}{C_i}$$