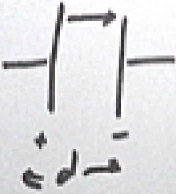
22C

$$U_E = \frac{1}{2} C V^2 \qquad C = \frac{Q}{V}$$

$$= \frac{1}{2} Q V \qquad V = \frac{Q}{C}$$

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

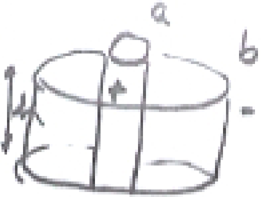


$$Q = \sigma A$$

$$V = \frac{\sigma}{\varepsilon_0} d \qquad C = \frac{\sigma A}{\frac{\sigma}{\varepsilon_0} d}$$

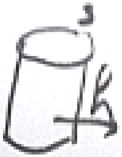
$$E = \frac{\sigma}{\varepsilon_0} \qquad C = \varepsilon_0 \frac{A}{d}$$

$$V = E d$$



$$C = \frac{Q}{V}$$

$$Q = \lambda \cdot h$$



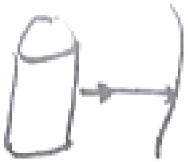
V:

$$\Phi_E = \frac{Q_{enc}}{\varepsilon_0}$$

$$\Phi_E = (2\pi s h) E$$

$$E = \frac{\lambda h}{\varepsilon_0 (2\pi s h)}$$

$$\vec{E} = \frac{\lambda}{\varepsilon_0 (2\pi s)} \hat{s}$$



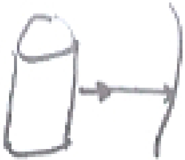
$$V = \sum E \Delta s$$

$$= \sum \frac{\lambda}{2\pi\varepsilon_0} \frac{\Delta s}{s}$$

$$\int = \frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{b}{a}\right)$$

$$C = \frac{\lambda h}{\frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{b}{a}\right)} = \frac{2\pi\varepsilon_0 \boxed{h}}{\ln(b/a)}$$

$$\frac{C}{h} = \frac{2\pi\varepsilon_0}{\ln(b/a)}$$



$$V = \Sigma E \Delta s$$

$$= \Sigma \frac{\lambda}{2\pi\varepsilon_0} \frac{\Delta s}{s}$$

$$\Delta V = \frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{b}{a}\right)$$

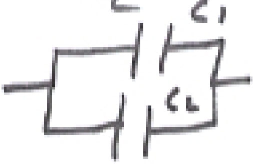
$$C = \frac{\lambda h}{\frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{b}{a}\right)} = \frac{2\pi\varepsilon_0 \boxed{h}}{\ln(b/a)}$$

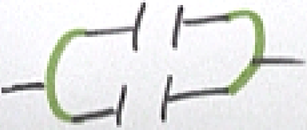
$$\frac{C}{h} = \frac{2\pi\varepsilon_0}{\ln(b/a)} \qquad C = \left|\frac{Q}{V}\right|$$

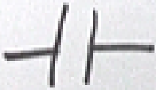
$$C = \frac{Q}{V}$$

$$V = k\frac{Q}{a}$$

$$C = \frac{Q}{k\frac{Q}{a}} = \frac{a}{k}$$



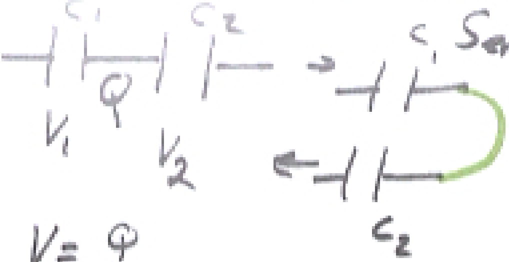




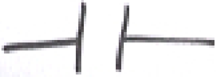
$$C = \varepsilon_0 \frac{A}{d}$$

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

Series



$$V = \frac{Q}{C}$$



C_{eff}

$$V = V_1 + V_2$$

$$\frac{Q}{C_{eff}} = \frac{Q}{C_1} + \frac{Q}{C_2}$$

$$\Rightarrow \frac{1}{C_{eff}} = \frac{1}{C_1} + \frac{1}{C_2}$$

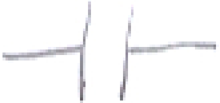
$C_1 = 5\mu f$ $\quad 2\mu f$

$$\frac{1}{C_{eff}} = \frac{1}{5} + \frac{1}{2}$$

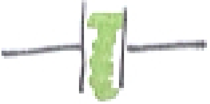
$$= .2 + .5 = .7$$

$$\cancel{C_{eff} = .7\mu f}$$

$$C_{eff} = \frac{1}{.7} \sim 1.4\mu f$$

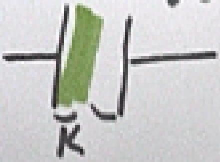


$$C_{geo} = \varepsilon_0 \frac{A}{d}$$



$C_{\text{with material}}$

$$K = \frac{C}{C_{geo}}$$



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

$$\frac{1}{C_{eff}} = \frac{1}{K C_{geo}} + \frac{1}{C_{geo}}$$

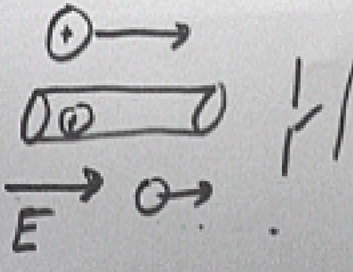
$\frac{1}{K} + 1)$

$$\frac{1}{C_{eff}} = \frac{1}{C_{geo}}\left(\frac{1}{K}+1\right)$$

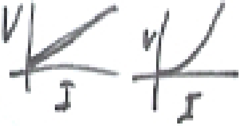
$$I = \frac{\Delta Q}{\Delta t} \qquad 1\frac{C}{s} = 1A$$

$\boxed{\oplus \longrightarrow \text{Conventional}}$

$\longleftarrow \ominus$ Physical



$\boxed{V = IR}$ $\boxed{R = \frac{V}{I}}$



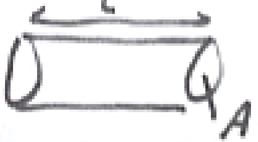
$$R = \frac{\text{Volts}}{\text{Amp}} = \frac{J/C}{C/s}$$

$$1\Omega = \frac{1V}{1A} = \frac{Js}{C^2}$$

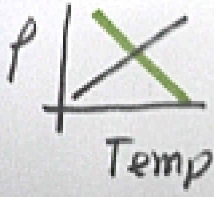
$$= \frac{\frac{N}{C} \cdot m}{\frac{C}{s}} = \frac{Nms}{C^2}$$

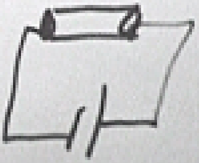
$V, I \Rightarrow R$

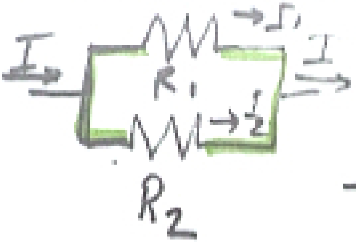
$\rho \; [\Omega m]$

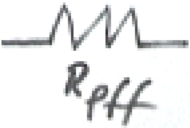


$R = \rho \frac{L}{A}$





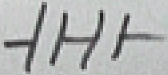




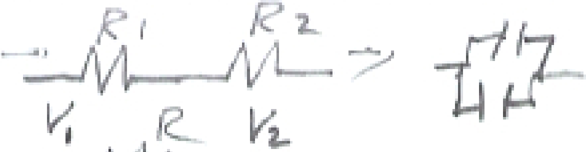
$$I = I_1 + I_2 \qquad V = IR$$

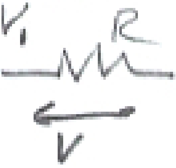
$$I = \frac{V}{R}$$

$$\frac{V}{R_{eff}} = \frac{V}{R_1} + \frac{V}{R_2}$$



$$\Rightarrow \frac{1}{R_{eff}} = \frac{1}{R_1} + \frac{1}{R_2}$$





$$V = IR$$

$$V = V_1 + V_2$$

$$IR_{eff} = IR_1 + IR_2$$

$$\Rightarrow R_{eff} = R_1 + R_2$$