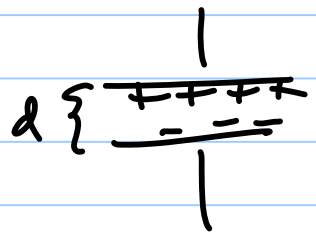
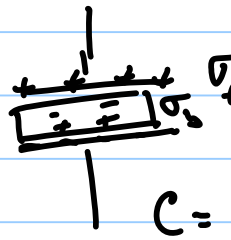
Note Title 3/5/2008

Energy in cap $C = \frac{Q_f}{V}$



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

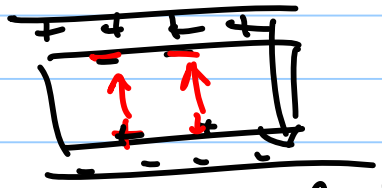


$C = K C_0$

" ↑

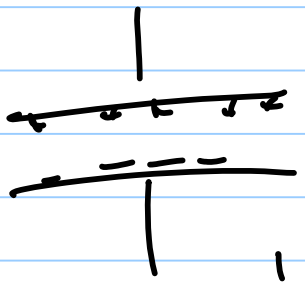
$\frac{\epsilon}{\epsilon_0}$ dec

$Ed = V$ fixed then you need more σ_f to compensate the reduction of E due to σ_b

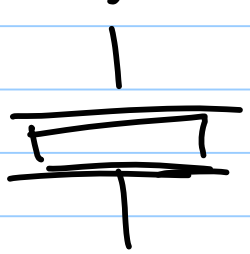


Energy $= \frac{1}{2} CV^2 = \frac{1}{2} \frac{Q^2}{C}$

↑ increases by K

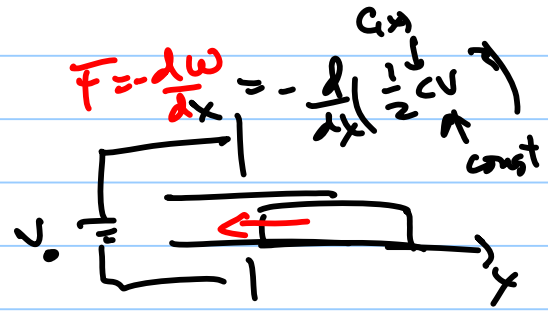


$\frac{1}{2} \frac{Q^2}{C} = \frac{1}{2} CV^2$



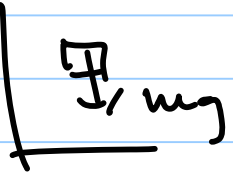
$\frac{1}{2} K C_0 V^2$

$F = -\frac{dW}{dx} = -\frac{d}{dx}\left(\frac{1}{2} CV\right)$ ↑ const



$W_m = \int \vec{F}_m \cdot d\vec{x}$

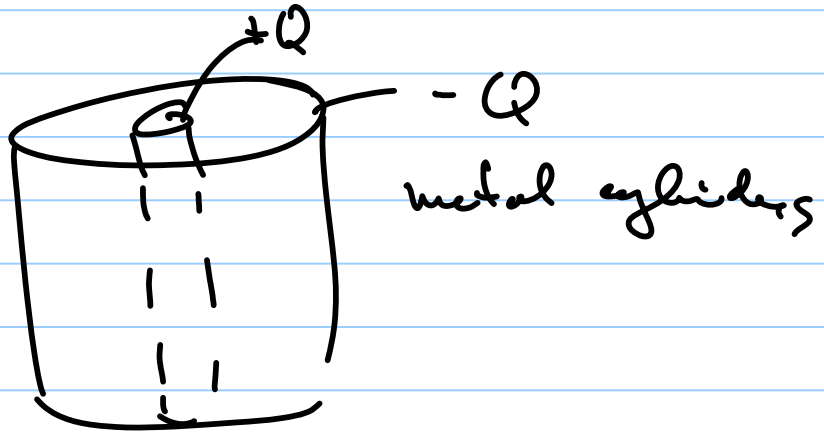
$-\frac{dW}{dy} = F_y$ $\quad -mgy$

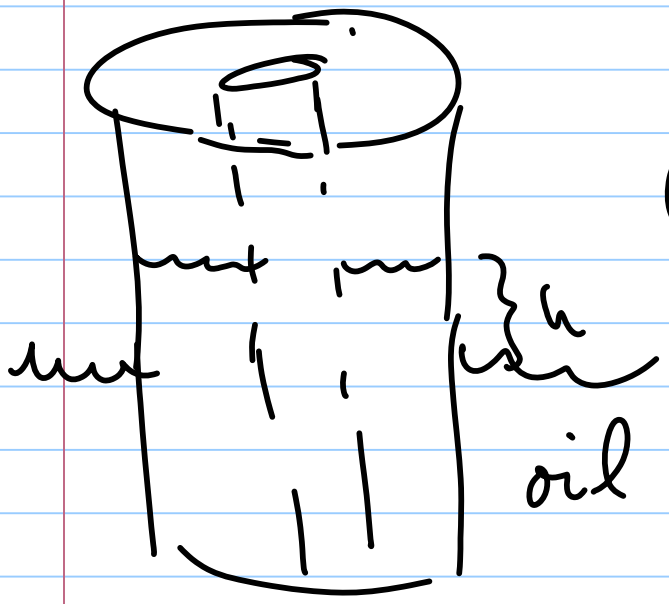


Problem Solving Strategies

- identify fundamental principles
- outline soln
- check answer

Example





(1) Energy stored in cap

$$\sum \vec{F} = m\vec{a} = 0$$

$$F_{gravity} = mg$$

$$F_{dielectric} = -\frac{dW_{energy\ cap}}{dh}$$

2.) calculate energy stored as a function of h

$$\frac{1}{2}CV^2 \text{ or } \frac{1}{2}\frac{Q^2}{C}$$

$PV = nRT$

vary

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

Calculate $C(h)$

$$mg = -\frac{dW}{dh} = -\frac{d}{dh}\left(\frac{1}{2}\frac{Q^2}{C}\right) = \frac{1}{2}Q^2\frac{d}{dh}\frac{1}{\varepsilon_0 A}$$

3.) Check if $Q \to 0$ then $h \to 0$

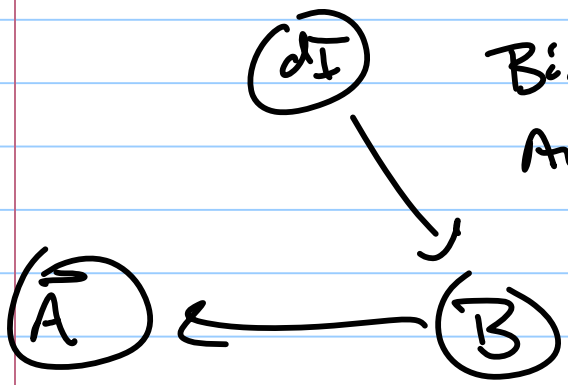
Ch 5 Magnetostatics

$$\vec{F} = q\vec{v}\times\vec{B} \qquad \text{line of charge}$$

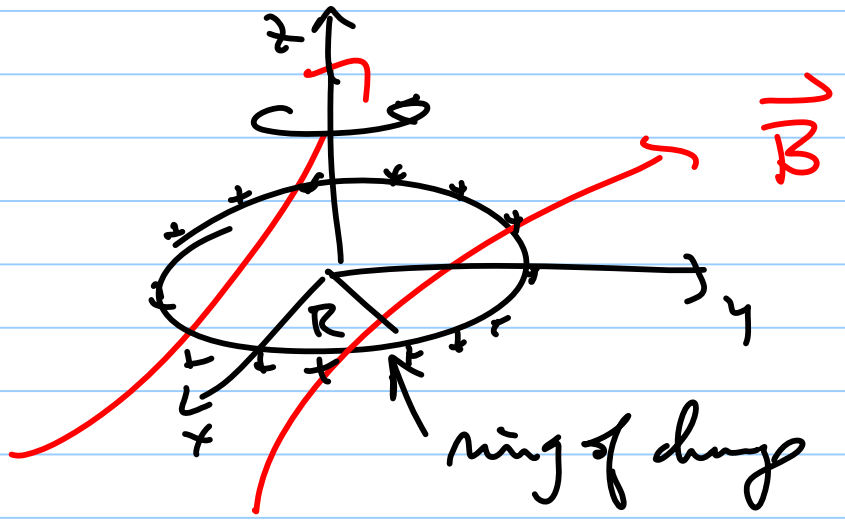
$$= \int I d\vec{l}\times\vec{B} \qquad \text{sheet of charge}$$

$$\text{vol of charge}$$

cal $\vec{B}$ Biot & Savart $\vec{B} = \frac{\mu_0}{4\pi}\int \frac{I d\vec{l}\times\hat{r}}{r^2}$



Ex:



Find Force on loop