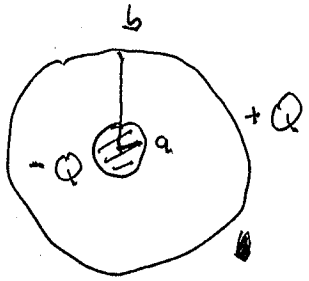
Lecture # 9

Electric Fields in Symmetric shapes

Electric Field

Sphere



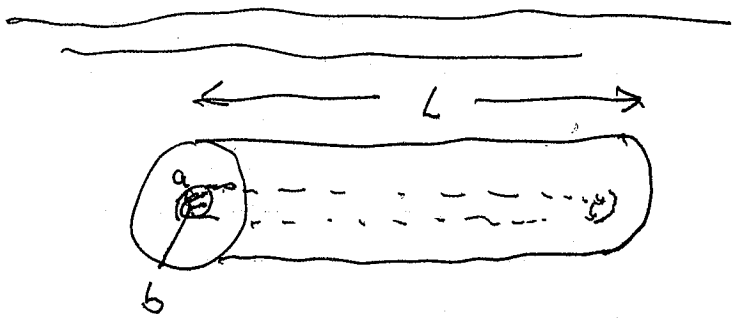
Electric Fields

(1) $r > b$

(2) $a < r < b$

(3) $r < a$

What would be different if if $r<a$ is a conductor?



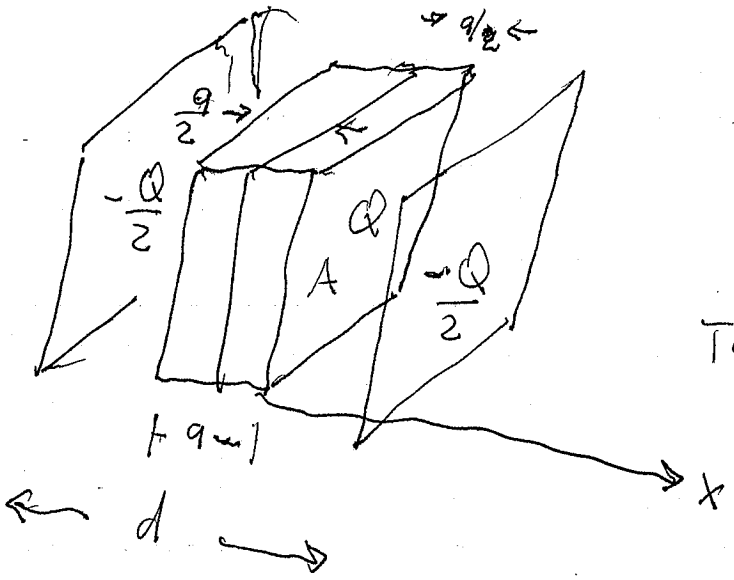
coax cable

(1) $r > b$

(2) $a < r < b$

(3) $r < a$

What would be different if $r<a$ were a conductor?



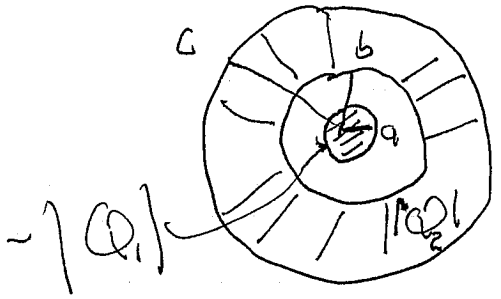
Take $d << A^{1/2}$

What is $\vec{E}$, $x > d/2$?

for $\frac{a}{2} < x < \frac{d}{2}$?

for $|x| < \frac{a}{2}$?

What would be different if material for $|x| < \frac{a}{2}$ were a conductor?



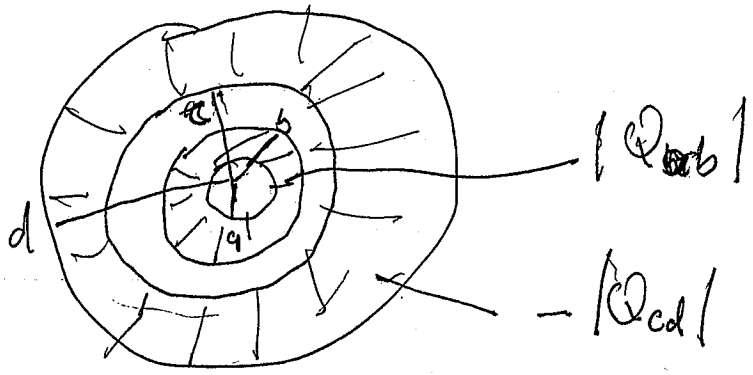
Find electric fields if field in regions we conductors

If field in regions were equally ~~spread~~ distributed charge distributions in which regions would the electric fields be the sam

(a) $r > c$ (b) $b < r < c$ (c) $a < r < b$ (d) $r < a$

1. (a) and (b)
2. (a) and (c)
3. (b) and (c)
4. (b) and (d)

What is the value of E : field when there is distributed charge



Concentric conductors in region $a < r < b$ and $c < r < d$

In $a < r < b$ charge is $|Q_{ab}|$

In $c < r < d$ charge is $-|Q_{cd}|$

What is asked for $r > d$?

$c < r < d$

$b < r < c$

$a < r < b$

$r < a$

What is surface charge on spheres?

at $r = a$, $E = \frac{|Q_{ab}|}{4\pi a^2 \epsilon_0}$, True False

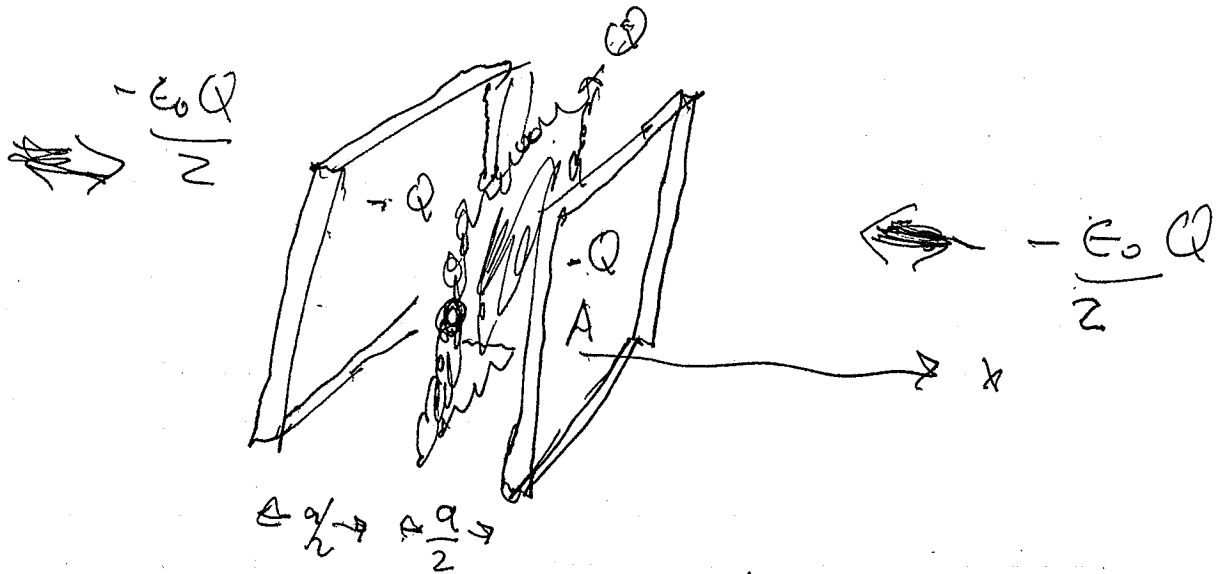
at $r = b$ $E = \frac{|Q_{ab}|}{4\pi a^2 \epsilon_0}$ True False

at $r = c$ $E =$

What is electric charge at each of the surfaces

$r \approx a$	$Q = 0$	T, F	
$r \approx b$	$Q = \lvert Q_{ab} \rvert$	T, F	
$r = c$	$Q = 0$	T, F ✓	$Q = \lvert Q_{ab} \rvert$
$r = d$	$Q = -\lvert Q_{cd} \rvert$	T, F	

$$Q = \lvert Q_{ab} \rvert - \lvert Q_{cd} \rvert$$



what field vs. x

and what is charge distribution on conductors

$|x| > \frac{a}{2} \quad \vec{E} = (\text{sign}(x)) = \frac{-Q}{2\epsilon_0}$

$|x| < \frac{a}{2} \quad \vec{E} = (\text{sign}(x)) = \frac{Q}{2\epsilon_0}$

Charge on plate

$Q_{po} + Q_{pi} = -Q$

$Q_{pi} = Q$

$\therefore Q_{po} = 0$

no charge on outer sheet.