Announcements

- Happy Chaper Day!!
- Still working on the tests, sorry
- Homework 7 is due on Monday!
- Physics Club on Thursday at 4:30pm
    - Nobody showed last week, so there goes my faith in you being able to solve the world's problems. . .
    - This week it gets easier. Solving mazes using a computer. Brought to you by me.
    - `http://jrembold.github.io/code_challenge`
- No class on Friday!

Happy Chaper Day!

WILLAMETTE UNIVERSITY
ELECTROMAGNETICS

Q1

On Monday we saw that, for the case of the electret, despite there being no free charges present, $\vec{\mathbf{E}} \neq 0$ and thus $\vec{\mathbf{D}} \neq 0$. Since $\boldsymbol{\nabla} \cdot \vec{\mathbf{D}} = \rho_{free}$, this implies that $\boldsymbol{\nabla} \times \vec{\mathbf{D}} \neq 0$. Where is there a non-zero value of the curl of $\vec{\mathbf{D}}$ in this problem?

A. In the center of the cylinder

B. At the top surface

C. At the bottom surface

D. Just outside the cylinder

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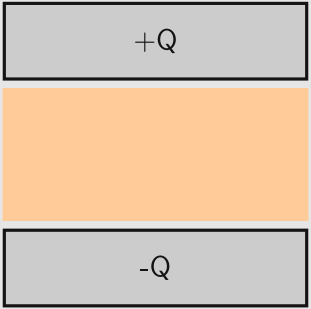
Q2

A very large (basically infinite) capacitor has charge Q. A neutral dielectric is inserted into the gap (and it will of course then polarize). We want to find $\vec{\mathbf{D}}$ everywhere.



Which equation would you head to first?

A. $\vec{\mathbf{D}} = \epsilon_0 \vec{\mathbf{E}} + \vec{\mathbf{P}}$

B. $\oint \vec{\mathbf{D}} \cdot d\vec{\mathbf{A}} = Q_{free}$

C. $\oint \vec{\mathbf{E}} \cdot d\vec{\mathbf{A}} = \frac{Q}{\epsilon_0}$

D. More than one of these would work

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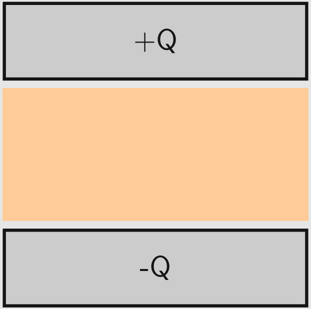
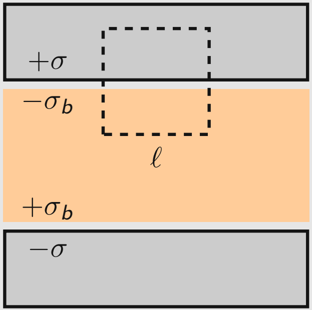


Q3

A large capacitor has charge Q. A neutral linear dielectric is inserted into the gap. We want to find $\vec{\mathbf{D}}$ in the dielectric. For the Gaussian cube shown, what is $Q_{free,enclosed}$?

A. $\sigma \ell^2$
B. $-\sigma_b \ell^2$
C. $(\sigma - \sigma_b)\ell^2$
D. $(\sigma + \sigma_b)\ell^2$



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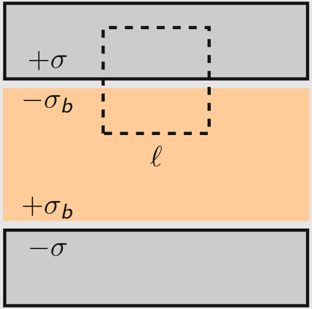


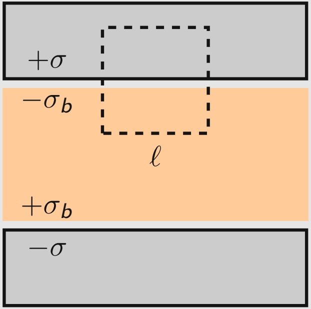
Q4

A large capacitor has charge Q. A neutral linear dielectric is inserted into the gap. We want to find $\vec{\mathbf{D}}$ in the dielectric. Is $\vec{\mathbf{D}}$ zero inside the metal?

A. It must be zero in there.

B. It depends.

C. It is definitely *not* zero in there.



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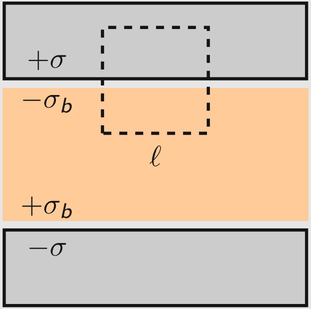

Q5

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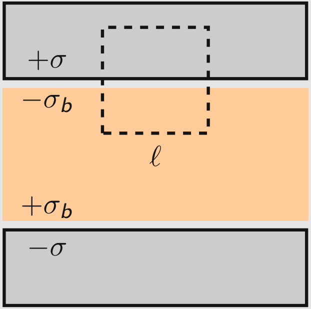
What is the electric field inside the dielectric?

A. $E = \dfrac{\sigma}{\epsilon_0 \epsilon_r}$

B. $E = \dfrac{\sigma}{2\epsilon_0 \epsilon_r}$

C. $E = \dfrac{\sigma \epsilon_r}{2\epsilon_0}$

D. $E = \dfrac{2\sigma \epsilon_r}{\epsilon_0}$



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