

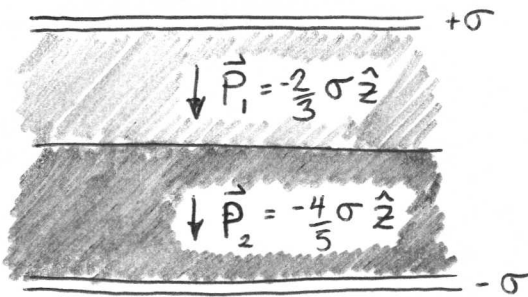
DAY 24

PH631
2015

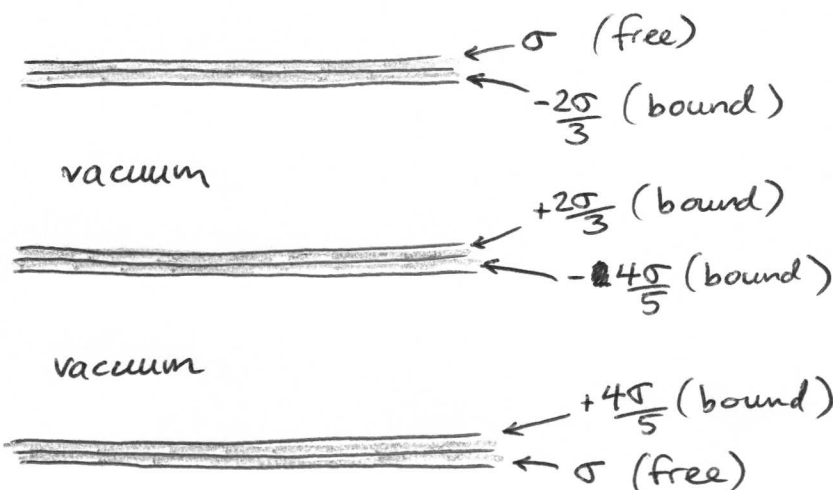
Instructor:
Ethan Minot

Last time: A new version of Gauss's Law
that works with or without
polarized materials present

$$\int_{\text{Gaussian surface}} \vec{D} \cdot d\vec{a} = Q_{\text{free, enc}} \quad \text{where } \vec{D} = \epsilon_0 \vec{E} + \vec{P}$$



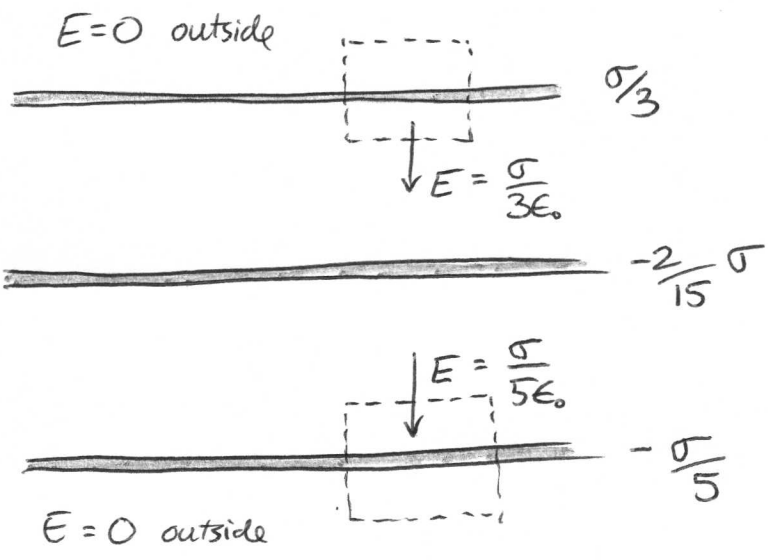
using $\sigma_b = \vec{P} \cdot \hat{n}$ we can map this system onto
an equivalent system with only charge density
(replace \vec{P} with bound charge)



(2)

Using this equivalent charge distribution I can calculate \vec{E} in the different regions of space.

First, superimpose the charge densities that lie on top of each other, then use "standard Gauss's law".

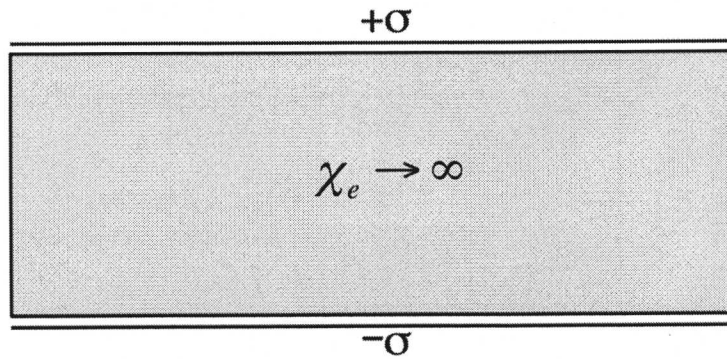


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Pop Quiz, Day ~~23~~ 24

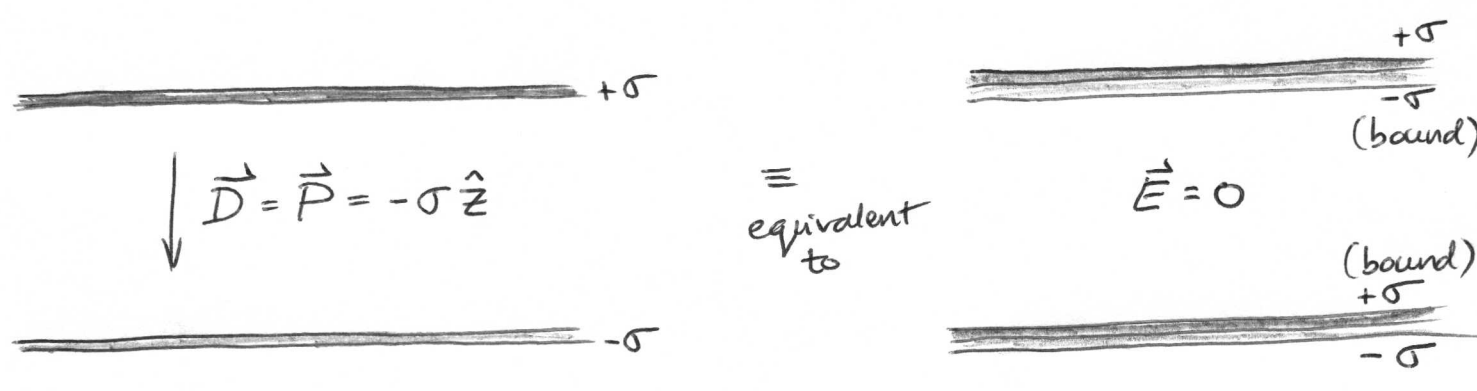
Name:



A slab of polarizable material is placed between two sheets of charge, as shown above. The electric susceptibility of the slab is infinite.

- b) Find the electric field \mathbf{E} and polarization \mathbf{P} inside the slab
- d) Find the location and amount of all bound charge.

Discussion of pop quiz.



when $\chi_e \rightarrow \infty$, polarization can be maintained in material even as $\vec{E} \rightarrow 0$.

Metals are an example of a material with $\chi_e \rightarrow \infty$.

Note: \vec{P} does not become infinite. This would violate physics (infinite energy density and ~~the~~ related issues!)