ELECTROMAGNETISM I

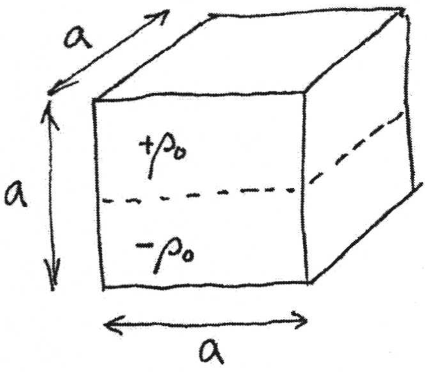
POP QUIZ

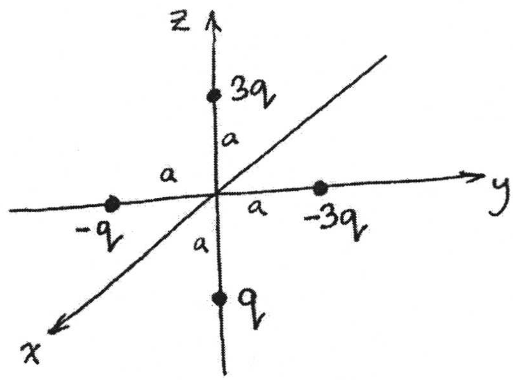
Collection from weeks 7-10

PH 631 Fall 2015

Instructor Ethan Minot

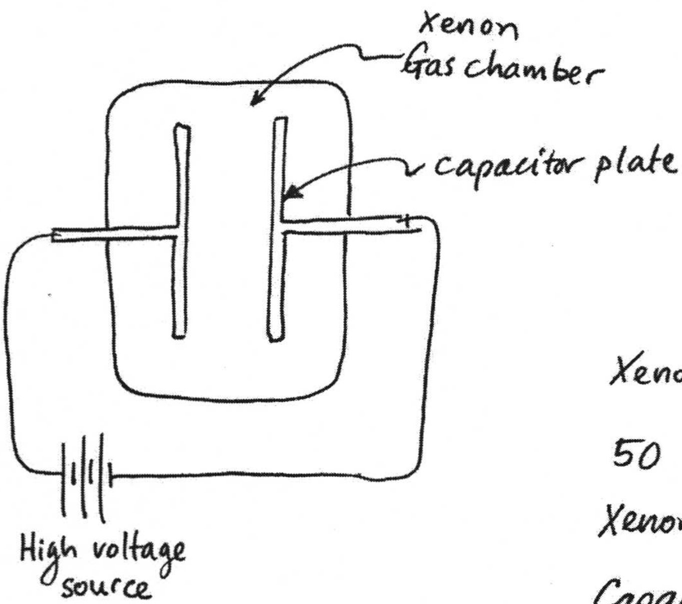
DAY 19 POP QUIZ PH631





Find the dipole moment, $\vec{p}$, for these two charge distributions.

PH 631 (4) POP QUIZ Day 20

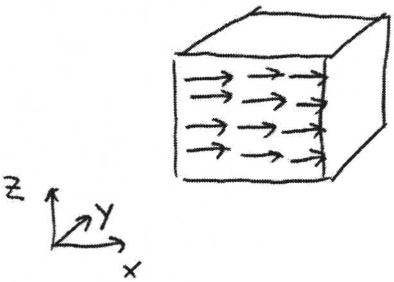


Xenon has an atomic radius ~0.2 nm. 50 mol (300×10^{23} atoms) of Xenon are placed in a $1 m^3$ chamber. Capacitor plates inside the chamber are charged up so that the spatially averged $\vec{E}$-field near the center of the chamber reaches 10^6 V/m.

Estimate the polarization of the gas, $\vec{P}$ near the center of the chamber. Note, $\vec{P}$ has units of $\frac{C \cdot m}{m^3}$.

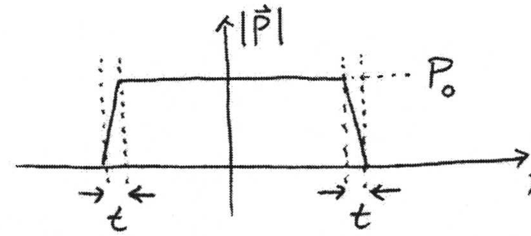
DAY 21

POP QUIZ



Inside the cube, $\vec{P} = P_0 \hat{x}$

Cross section along x-axis



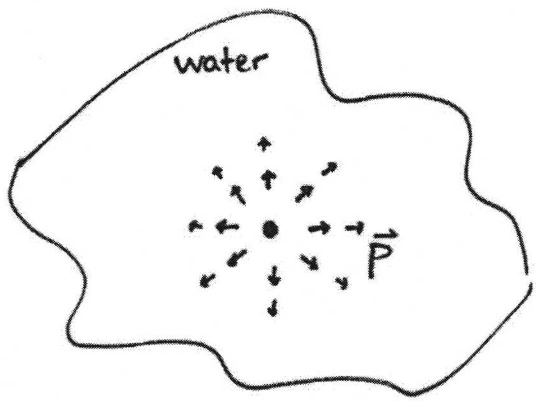
The thickness t represents the surface of the material.

a) Calculate the bound charge density, $-\vec{\nabla}\cdot\vec{P}$, along the x-axis. Make a plot.

b) Make a 3d sketch of the surfaces where $-\vec{\nabla}\cdot\vec{P}$ is non-zero. What is the bound charge per unit area on these surfaces?

PH631 Pop Quiz, Day 22

Name:



A positive point charge Q is placed at the origin and surrounded by water (a polarizable medium). The water dipoles point away from Q. The polarization of the water is described by $\mathbf{P}(\mathbf{r})$.

Find the combined quantity $\varepsilon_0\mathbf{E}(\mathbf{r}) + \mathbf{P}(\mathbf{r})$ in the water.