Consider a cylinder of radius a and height b that has it base at the origin and is aligned along the z-axis. The polarization of this cylinder is "baked in" and can be modeled using

$$\mathbf{P} = P_0 \left(\frac{z}{b} \right) \hat{z}.$$

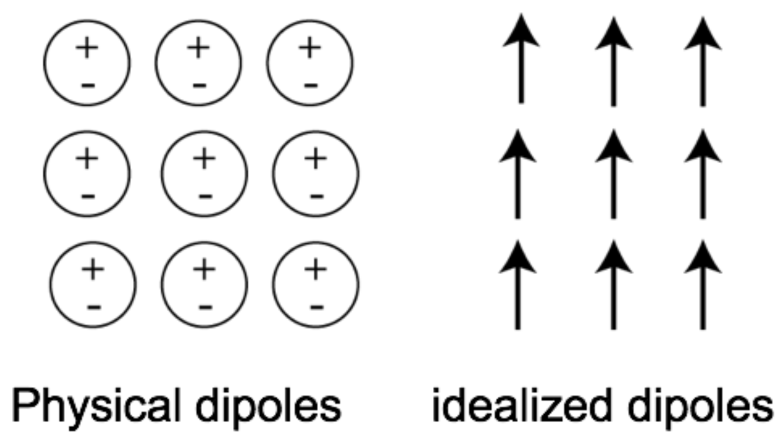
Determine the total dipole moment of this cylinder:

A. $P_0 \pi a^2 b \hat{z}$
B. $\frac{1}{2} P_0 \pi a^2 b \hat{z}$
C. $P_0 2 \pi a b^2 \hat{z}$
D. $\frac{1}{2} P_0 \pi a^2 b \hat{z}$
E. Something else

EXAM 1 INFORMATION

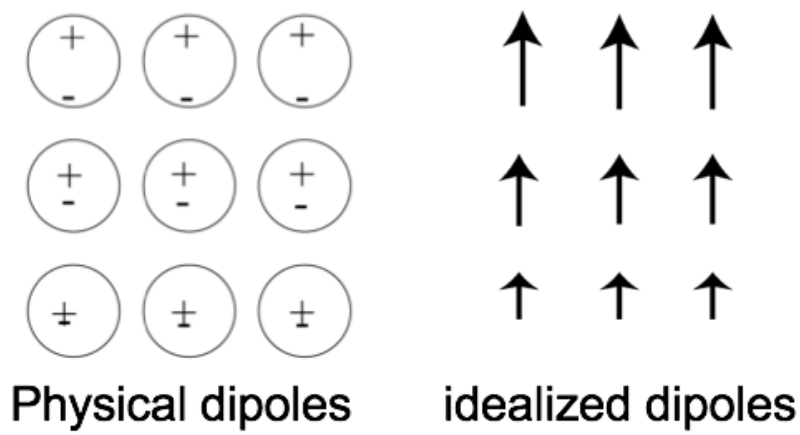
- Covers through polarization (up to Ch 4.2.3)
- Emphasizes material since Exam 1
  - But don't forget Exam 1 material!
- Specifics on Wednesday

In the following case, is the bound surface and volume charge zero or nonzero?



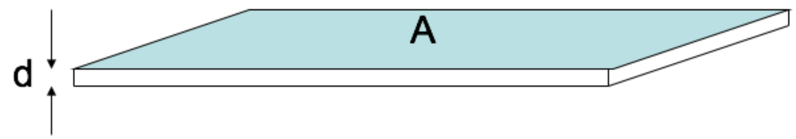
A. $\sigma_b = 0, \rho_b \neq 0$
B. $\sigma_b \neq 0, \rho_b \neq 0$
C. $\sigma_b = 0, \rho_b = 0$
D. $\sigma_b \neq 0, \rho_b = 0$

In the following case, is the bound surface and volume charge zero or nonzero?



A. $\sigma_b = 0, \rho_b \neq 0$
B. $\sigma_b \neq 0, \rho_b \neq 0$
C. $\sigma_b = 0, \rho_b = 0$
D. $\sigma_b \neq 0, \rho_b = 0$

A VERY thin slab of thickness d and area A has volume charge density $\rho = Q/V$. Because it's so thin, we may think of it as a surface charge density $\sigma = Q/A$.



The relation between ρ and σ is:

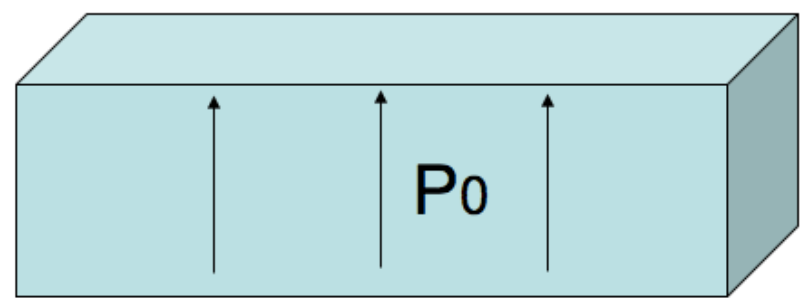
A. $\sigma = \rho$
B. $\sigma = \rho d$
C. $\sigma = \rho / d$
D. $\sigma = V\rho$
E. $\sigma = \rho / V$

Are ρ_b and σ_b due to real charges?

A. Of course not! They are as fictitious as it gets!
B. Of course they are! They are as real as it gets!
C. I have no idea

A dielectric slab (top area A, height h) has been polarized, with $\mathbf{P} = P_0$ in the $+z$ direction. What is the surface charge density, σ_b, on the bottom surface?

A. 0
B. $-P_0$
C. P_0
D. $P_0 A h$
E. $P_0 A$



A dielectric sphere is uniformly polarized,

$$\mathbf{P} = +P_0\hat{z}$$

What is the surface charge density?

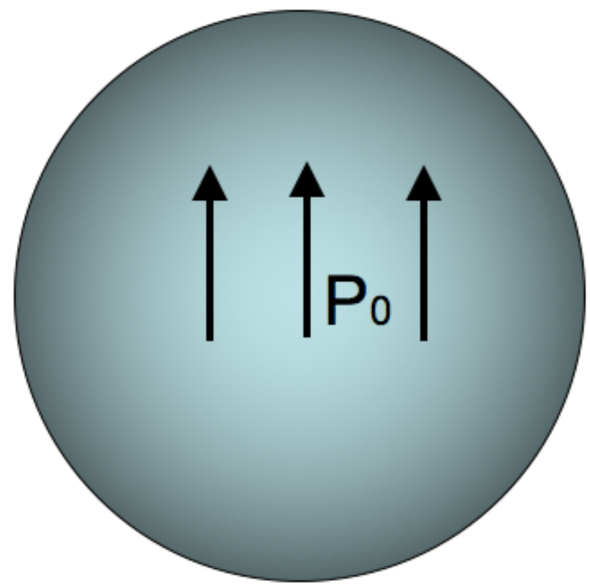
A. 0

B. Non-zero Constant

C. constant*$\sin\theta$

D. constant*$\cos\theta$

E. ??



A dielectric sphere is uniformly polarized,

$$\mathbf{P} = +P_0\hat{z}$$

What is the volume charge density?

A. 0
B. Non-zero Constant
C. Depends on r, but not θ
D. Depends on θ, but not r
E. ?