

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

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

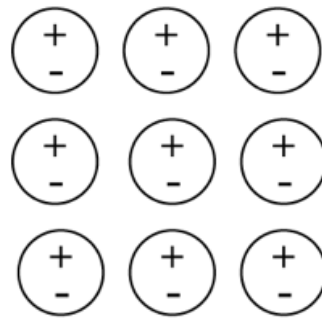
Determine the total dipole moment of this cylinder:

- 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. $\frac{1}{2} P_0 \pi a b^2 \hat{z}$
- E. Something else

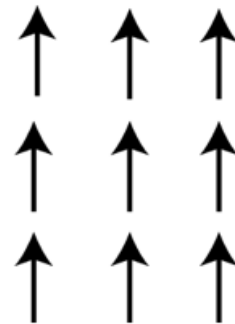
EXAM 2 INFORMATION

- 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?



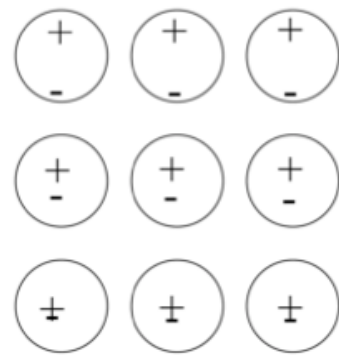
Physical dipoles



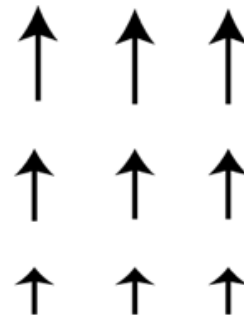
idealized dipoles

- 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. $\sigma_b \neq 0, \rho_b = 0$

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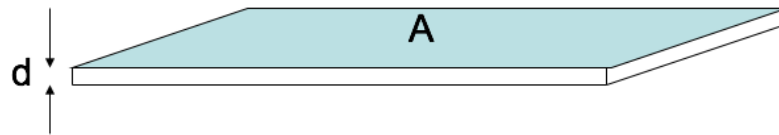
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A VERY thin slab of thickness d and area A has volume charge density $\rho = Q/V$. Because it's so thin, we may think of it as a surface charge density $\sigma = Q/A$.

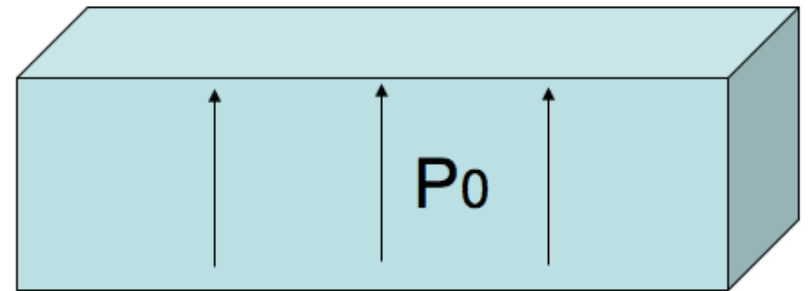


The relation between ρ and σ is:

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

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_0Ah
- E. P_0A

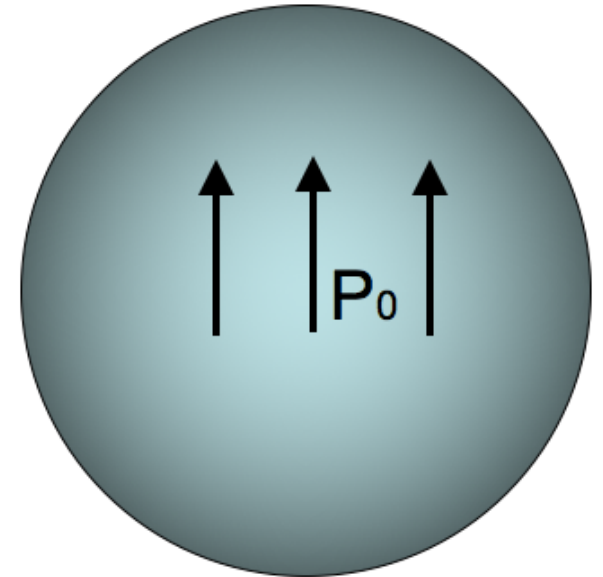


A dielectric sphere is uniformly polarized,

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

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. ?

