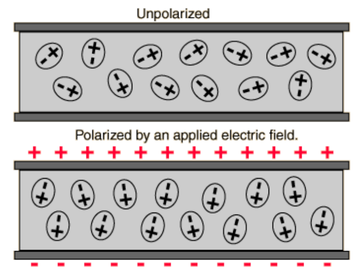
Consider a single point charge at the origin. It will have ONLY a monopole contribution to the potential at a location $\mathbf{r} = \langle x, y, z \rangle$.

As we have seen, if we move the charge to another location (e.g., $\mathbf{r}' = \langle 0, 0, d \rangle$), the distribution now has a dipole contribution to the potential at $\mathbf{r}$!

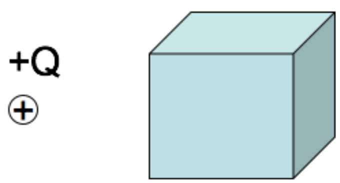
What the hell is going on here?

A. It's just how the math works out. Nothing has changed physically at $\mathbf{r}$.
B. There is something different about the field at $\mathbf{r}$ and the potential is showing us that.
C. I'm not sure how to resolve this problem.

POLARIZATION

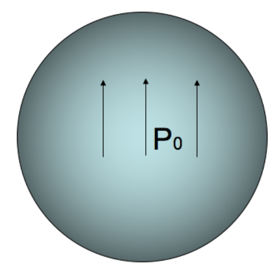


A stationary point charge $+Q$ is near a block of polarization material (a linear dielectric). The net electrostatic force on the block due to the point charge is:



A. attractive (to the left)
B. repulsive (to the right)
C. zero

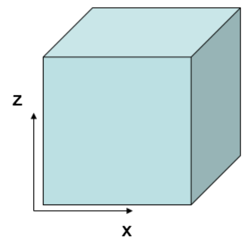
The sphere below (radius a) has uniform polarization $\mathbf{P}_0$, which points in the $+z$ direction. What is the total dipole moment of this sphere?



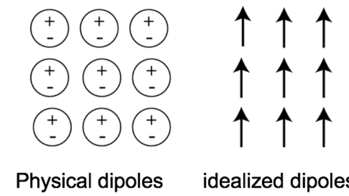
A. zero
B. $\mathbf{P}_0 a^3$
C. $4\pi a^3 \mathbf{P}_0/3$
D. $\mathbf{P}_0$
E. None of these/must be more complicated

The cube below (side a) has uniform polarization $\mathbf{P}_0$, which points in the $+z$ direction. What is the total dipole moment of this cube?

A. zero
B. $a^3\mathbf{P}_0$
C. $\mathbf{P}_0$
D. $\mathbf{P}_0/a^3$
E. $2\mathbf{P}_0 a^2$

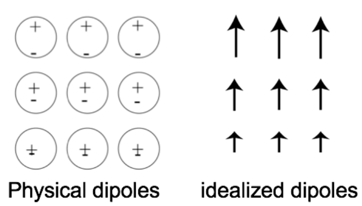


In the following case, is the bound surface and volume charge zero or nonzero?



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