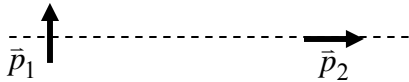


Study section 4.1-4.2 and answer the following questions (be sure to show / explain your work).

1. Work out the units for (a) dipole moment and (b) polarization.
2. Consider the two dipoles shown below. What is the direction of the torque exerted on \vec{p}_1 by \vec{p}_2 ? What is the direction of the torque exerted on \vec{p}_2 by \vec{p}_1 ? In each case, explain how you know.



3. Which configuration minimizes the potential energy of a pair of electric dipoles: (a) parallel ($\uparrow\uparrow$) or (b) anti-parallel ($\uparrow\downarrow$)? Explain how you know.

4. Explain how bound surface charge arises in a dielectric material in an external electric field. Do the same for bound volume charge. (I am looking for the physical mechanism here, not a mathematical explanation.)

5. In (a) a dielectric material is inserted between the plates of a capacitor, and in (b) a dielectric has a point charge located at its center. For each of these, indicate whether the dielectric has bound surface charge, bound volume charge, both, or neither.

