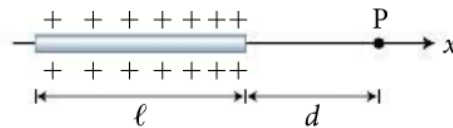


PHY152H1S – Practice Problem Set 3

23.57

The thin glass rod of length ℓ in [Figure P23.57](#) has a linear charge density that starts out as zero at the left end of the rod and increases linearly from left to right. The positive charge on the rod is q_{rod} . (a) What is the electric field along the rod's axis at position P, which lies a distance d from the right end of the rod? (b) What is the approximate expression for the magnitude of the electric field at distances $d \gg \ell$ —that is, far enough away to make the rod look small? ●●

Figure P23.57



2.

A dipole lies on the y -axis and consists of an electron at $y = 0.60$ nm and a proton at $y = -0.60$ nm. Find the electric field (a) midway between the two charges; (b) at the point $x = 2.0$ nm, $y = 0$ nm; and (c) at the point $x = -20$ nm, $y = 0$ nm.

(d) What is the dipole moment (magnitude and direction)?

3. The figure shows a thin rod of length L carrying charge Q distributed uniformly over its length. (a) What's the line charge density, λ , on the rod? (b) Find an expression for the electric field at a point P a distance y along the perpendicular bisector. (c) Show that your result reduces to the field of a point charge when $y \gg L$.

