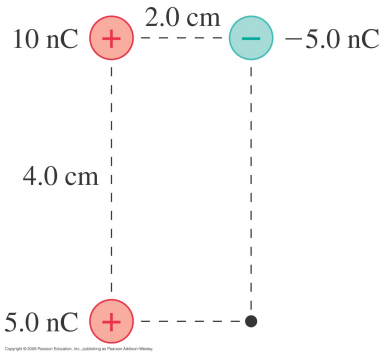
PHYS 212 Homework Assignment

Chapter 5.2

Problem 1 For a birthday present you were given a hollow sphere that is evenly charged across its surface. What is the electric field at the center of this sphere? Explain.

Problem 2 What is the net electric field at the lower right point in the figure below?

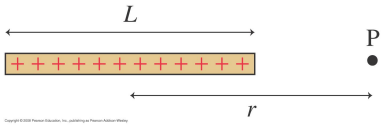


Problem 3 Below is a thin rod of total charge Q and length L.

(a) Draw the electric field lines due to the charged rod.

(b) Find an expression for the electric field on the axis of the rod at a distance r from its center.

(c) What would you expect the electric field would look like if you were very far away from the rod along its axis? Verify that your expression has the correct behavior as $r >> L$.



Problem 4 An electron enters the gap between two oppositely charged plates (we call this a capacitor). The electron is initially centered in the gap, traveling at 2.0×10^6 m/s, parallel to the plates. The gap has a width of 1.0 cm and the electric field between the plates is a constant 1000 N/C, perpendicular to the plates (pointing from one plate to the other).

How far will the electron travel before hitting a plate?

Problem 5 An electric dipole consisting of charges of magnitude 1.5 nC separated by 6.20 μm is in an electric field of strength 1100 N/C. What are

(a) the magnitude of the electric dipole moment;

(b) the difference between the potential energies for dipole orientations parallel and antiparallel to $\vec{E}$?

Problem 6 Charge is uniformly distributed around a ring of radius $R = 2.4$ cm and the resulting electric field magnitude E is measured along the ring's central axis, perpendicular to the plane of the ring. At what distance from the ring's center is E maximum?