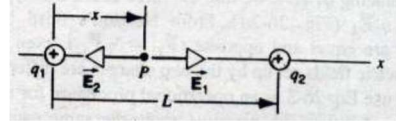


## Numerical Problems

### Topic Covered: Electric Field and Electric Dipole

1. Following figure shows a charge  $q_1$  of  $+1.5 \mu C$  and a charge  $q_2$  of  $+2.3 \mu C$ . The first charge is at the origin of an x-axis, and the second is at a position  $x = L$ , where  $L = 13 \text{ cm}$ . At what point  $P$  along the x-axis is the electric field zero?



2. An alpha particle, the nucleus of a helium atom, has a mass of  $6.64 \times 10^{-27} \text{ kg}$  and a charge of  $+2e$ . What is the magnitude and direction of the electric field that will balance its weight?
3. What is the magnitude of a point charge chosen so that the electric field  $75.0 \text{ cm}$  away has the magnitude  $2.30 \text{ N/C}$ ?
4. Calculate the dipole moment of an electron and a proton that are  $4.30 \text{ nm}$  apart.
5. Calculate the magnitude of the electric field, due to an electric dipole of dipole moment  $3.56 \times 10^{-29} \text{ Cm}$ , at a point  $25.4 \text{ nm}$  away along the bisector axis.
6. Two equal and opposite charges of magnitude  $1.88 \times 10^{-7} \text{ C}$  are held  $15.2 \text{ cm}$  apart. What are the magnitude and direction of  $\vec{E}$  at a point midway between the charges?
7. An electric dipole consists of charges  $+2e$  and  $-2e$  separated by  $0.78 \text{ nm}$ . It is in an electric field of strength  $3.4 \times 10^6 \text{ N/C}$ . Calculate the magnitude of the torque on the dipole when the dipole moment is (a) parallel, (b) at a right angle, and (c) opposite to the electric field.
8. Two point-charges of magnitudes  $q_1 = 2.16 \mu C$  and  $q_2 = 85.3 \text{ nC}$  are  $11.7 \text{ cm}$  apart. (a) Find the magnitude of the electric field that each produces at the site of the other. (b) Find the magnitude of the force on each charge.