BoxSand Electric Fields Quantitative Problems

1. At a distance r_1 from a point charge, the magnitude of the electric field created by the charge is 359 N/C. At a distance r_2 from the charge, the field has a magnitude of 243 N/C. Find the ratio r_2/r_1.

2. Four point charges have the same magnitude of 3.6 X 10^{12} C and are fixed to the corners of a square that is 3.50 cm on a side. Three of the charges are positive and one is negative. Determine the magnitude of the net electric field that exists at the center of the square.

3. A proton and an electron are moving due west in a constant electric field that also points due west. The electric field has a magnitude of 6.5 10^4 N/C. Determine the magnitude of the acceleration of the proton and the electron.

4. Two point charges are located along the *x* axis: q_1 = +5.0 μC at x_1 = +3.0 cm, and q_2 = +7.0 μC at x_2 = -5.0 cm. Two other charges are located on the *y* axis: q_3 = +4.0 μC at y_3 = +6.0 cm, and q_4 = -7.0 μC at y_4 = +9.0 cm. Find the net electric field (magnitude and direction) at the origin.

5. The total electric field **E** consists of the vector sum of two parts. One part has a magnitude of E_1 = 1300 N/C and points at an angle of θ_1 = 45 degrees above the +*x* axis. The other part has a magnitude of E_2 = 1600 N/C and points at an angle of θ_2 = 65 degrees above the +*x* axis. Find the magnitude and direction of the total field. Specify the directional angle relative to the +*x* axis.

6. Two particles are in a uniform electric field that points in the +*x* direction and has a magnitude of 3500 N/C. The mass and charge of particle 1 are m_1 = 2.4 10^{-5} kg and q_1 = -9.0 μC, while the corresponding values for particle 2 are m_2 = 1.6 10^{-5} kg and q_2 = +22 μC. Initially the particles are at rest. The particles are both located on the same electric field line but are separated from each other by a distance *d*. Particle 1 is located to the left of particle 2. When released, they accelerate but always remain at this same distance from each other. Find *d*.