Chapters 21-22 (Coulomb's Law and Electric Fields)

1- A charge of $+3.2\times10^{-6}$ C is placed at the origin. A second charge (q_2) is placed at x = 3.0 m. If a charge of 1.0×10^{-6} C experiences no force if placed at x = 4.0 m, then q_2 is: (A: -0.2×10^{-6} C)

2- A proton is shot out along the +x-axis from the origin with a speed of 1.0×10^{6} m/s. In this region a uniform electric field of 2500 N/C exits in the negative x-direction. Find the distance traveled by the proton before it momentarily comes to rest. (A: 2.1 m)

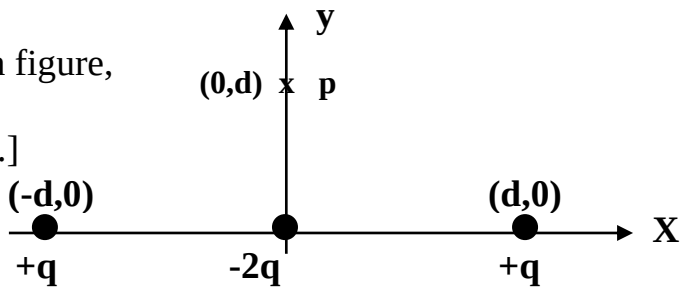
3- An electric dipole consists of charges +2e and -2e separated by 0.78×10^{-9} m. It is in an electric field of strength 3.0×10^{6} N/C. Calculate the magnitude of the torque on the dipole when the dipole is perpendicular to the field. [e is the magnitude of the charge on the electron.]. (A: 7.5×10^{-22} N m)

4- Two fixed particles, of charges q1 = + 1.0×10^{-6} C and q2 = - 9.0×10^{-6} C, are 10 cm apart. How far from each should a third charge be located so that no net electrostatic force acts on it? (A: 5 cm from q_1 and 15 cm from q_2)

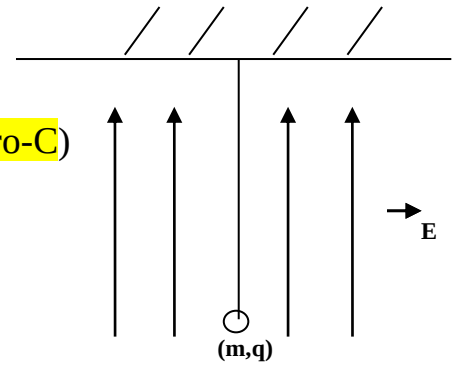
5- An electric dipole consists of two opposite charges, each of magnitude 5.0×10^{-19} C, separated by a distance of 1.00×10^{-9} m. The dipole is placed in an electric field of strength 2.45×10^{5} N/C. Calculate the magnitude of the torque exerted on the dipole when the dipole moment is perpendicular to the electric field. (A: 1.2×10^{-22} N m)

6- Consider two identical conductor spheres, A and B. Initially, sphere A has a charge of -80 Q and Sphere B has a charge of +20 Q. If the spheres touched and then are separated by a distance of 0.3 m, what is the resultant force between them? [Take Q = 5.7×10^{-8} C]. (A: 0.3 N)

7- For the arrangement of charges shown in figure, the electric field at the point P is:
(A: $1.3\times k\times q/d^2$) in the negative y-direction.]



8- In figure, a 0.3 g metallic ball hangs from an insulating string in a vertical electric field of 4000 N/C directed upward as shown. If the tension in the string is 0.005 N, then the charge on the ball is: (A: -0.52 micro-C)



9- A particle of mass 5.0 g and charge 40 mC moves in a region of space where the electric field is uniform and given by $\boldsymbol{E}$ = -5.5 i (N/C). If the velocity of the particle at t = 0 is given by $\boldsymbol{v}$ = 50 j (m/s), find the speed of the particle at t = 2 s. [i, and j are the unit vectors in the directions of x, and y respectively]. (A: 101 m/s)