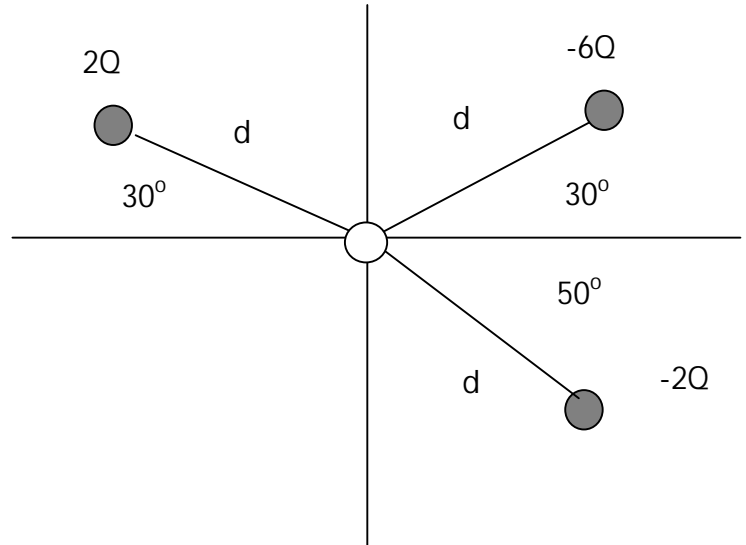
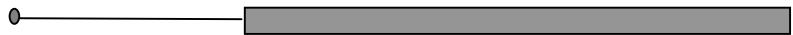


1. Three particles with charges $2Q$, $-2Q$ and $-6Q$, each at a distance of d from the origin are positioned as shown in the figure. In the origin is located a charge of $4Q$. Determine the electric force on the charge at the center.



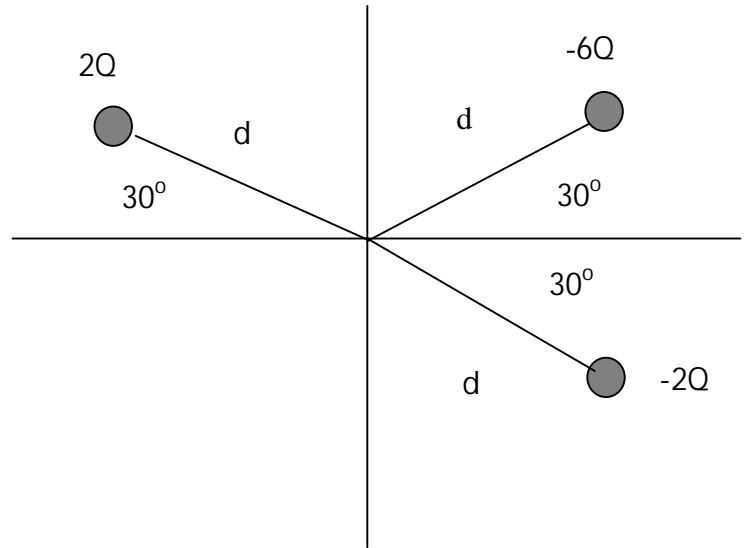
2. A certain charge Q is divided into two parts q and $Q-q$, which is then separated by a certain distance. What must q be in terms of Q to maximize the electrostatic repulsion between the two charges?
3. A thin non-conducting rod of length 10.0 cm has a charge density distribution of 4.00 $\mu\text{C}/\text{m}$. A point charge of 0.2 μC is placed at a distance of 15.0 cm from the near end of the charge distribution and along the same line. Find the force on the charge distribution.

$0.2 \mu\text{C}$



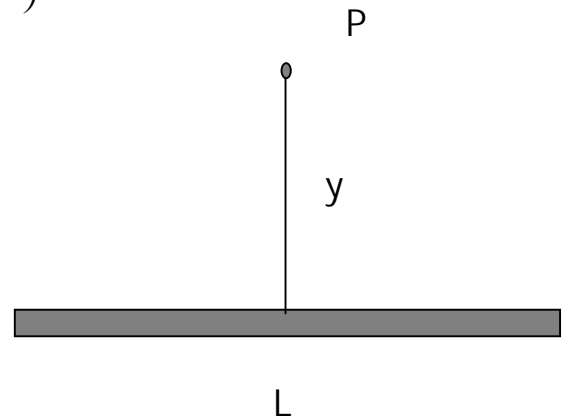
10.0 cm

4. Three particles with charges $2Q$, $-2Q$ and $-6Q$, each at a distance of d from the origin are positioned as shown in the figure. Determine the electric field at the origin.

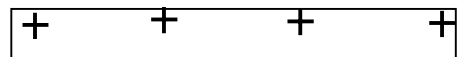


5. A plastic rod having uniformly distributed charge $-Q$ is bent to a 140 degree circular arc of radius r . What is the electric field due to the rod at the center of curvature of the arc?
6. A thin non-conducting rod of finite length L has a charge $+q$ spread uniformly along it. Show that the magnitude of the electric field at a point P along the bisector of the rod is

$$E = \frac{q}{2\pi\epsilon_0 y} \frac{1}{(L^2 + 4y^2)^{1/2}}$$



7. A uniform electric field exists in a region between two oppositely charged plates. An electron is released from rest at the surface of the negatively charged plate and strikes the surface of the opposite plate, 2.0 cm away, in a time 1.5×10^{-8} s. a) What is the speed of the electron as it strikes the second plate? b) What is the magnitude of the electric field?
8. A pair of two charges of equal magnitude (one positive and the other negative) separated by a distance 'd' and is usually called a dipole. Find the electric field at a distance along the perpendicular bisector of the straight line connecting the two charges.
9. An electric dipole consists of charges $+2e$ and $-2e$ separated by 0.78 nm. It is in an electric field of strength 3.4×10^6 N/C. Calculate the magnitude of the torque on the dipole when the dipole moment is a) parallel to, b) perpendicular to, and c) anti parallel to the electric field.
10. The net flux through each face of the die (singular of the dice) has a magnitude in units of 10^3 N.m²/C that is exactly equal to the number of spots N on the face (1 through 6). The flux is inward for N odd and outward for N even. What is the net charge inside the die?
11. The figure shows cross-sections through two large, parallel, non conducting sheets with identical distribution of positive charges with surface charge density σ . What is E at points a) above the sheets, b) between them and c) below the sheets?



12. A thin metallic spherical shell of radius ' a ' has a charge q_a . Concentric with it is another spherical shell of radius ' b ' ($b > a$) and charge q_b . Find the electric field at radial points r where a) $r < a$, b) $a < r < b$, and c) $r > b$. Discuss the criterion one would use to determine how the charges are distributed on the inner and outer surfaces of the shell.
13. A long straight wire has a fixed negative charge with a linear density of magnitude 3.6 nC/m . The wire is to be enclosed by a thin, non-conducting cylinder of outer radius 1.5 cm coaxial with the wire. The cylinder is to have positive charges on its outside surface with a charge density σ such that the net external electric field is zero. Calculate the required σ .
14. Determine the electric field at a distance r due to a long wire with a linear charge density λ . Use Gauss law.
15. A sphere of radius ' a ' has a charge $+q$ uniformly distributed through out the volume and is concentric with a spherical conducting shell of inner radius ' b ' and outer radius ' c '. This shell has a net charge of $-q$. Find expressions for the electric field, as a function of the radius r , a) within the sphere ($r < a$); b) between the sphere and the shell ($a < r < b$); c) inside the shell ($b < a < c$); and d) outside the shell ($r > c$). e) What are the charges on the inner and outer surfaces of the shell?

