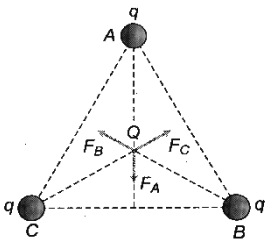
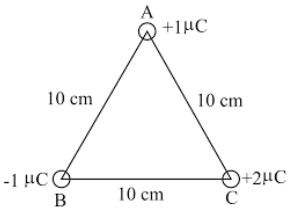
Exercise 01

Consider three charges q_1, q_2, q_3 each equal to q at the vertices of an equilateral triangle of side *l*. What is the force on a charge Q (with the same sign as q) placed at the centroid of the triangle, as shown in the opposite Figure.



Exercise 02

Consider the charges +q, +2q, and –q placed at the vertices of an equilateral triangle, as shown in opposite figure. What is the force on each charge?

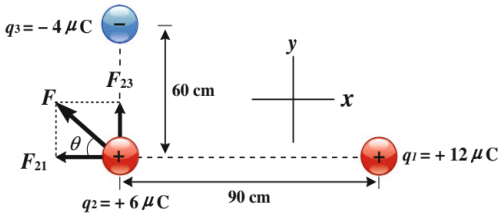


Exercise 03

In the Millikan experiment, two horizontal metal plates are separated by a distance of 1.5 *cm*, with a potential difference of 3 kV. One plate is positively charged, the other negatively charged. Small oil droplets, negatively charged, are present between the plates in equilibrium. Calculate the charge of a spherical oil droplet and compare it to the charge of an electron. Given values: oil density (ρ) = 900 kg/m³, droplet radius (R) = 2.05 μm, gravitational field strength (g) = 9.8 m/s².

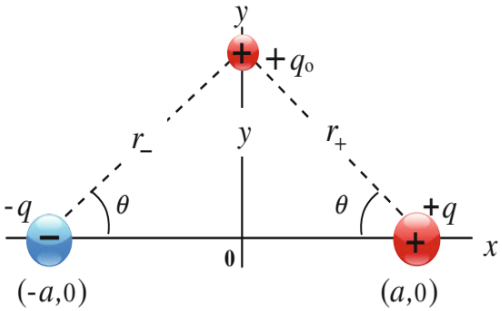
Exercise 04

Consider three charges $q1$ = +12 μC, $q2$ = +6 μC, and $q3$ = -4 μC are setup as shown in opposite figure. Find the resultant force exerted on the charge $q2$ by the two charges $q1$ and $q3$.



Exercise 05

A negative point charge of magnitude q is located on the x-axis at point $x = -a$, and a positive point charge of the same magnitude is located at $x = +a$, see the opposite figure. A third positive point charge q_0 is located on the y-axis with a coordinate $(0, y)$. (a) What is the magnitude and direction of the force exerted on q_0 when it is at the origin (0,0)? (b) What is the force on q_0 when its coordinate is (0, y)? (c) Sketch a graph of the force on q_0 as a function of y, for values of y between -4a and +4a.



Exercise 06

The position vector expression for two charges Q_1 and Q_2 in an orthogonal and homogeneous feature (oxy) is given as follows:

$$\overrightarrow{OQ_1} = 2\,\vec{\imath} + 3\,\vec{\jmath}\ ;\ \overrightarrow{OQ_2} = -2\,\vec{\imath} - 3\,\vec{\jmath}$$

1) Represent Graphically the force exerted by charge Q_1 and Q_2
2) Calculate the electrical force that Q_1 exerts on Q_2
3) Calculate the force that both charges Q_1 and Q_2 exert on a charge Q_3 placed at the origin.