# Electrostatics

1. What force does a positive point charge of 2×10^{-6} C exert on a negative point charge of -5×10^{-6} C when they are separated by a distance of 0.10 m?   (9 N)

2. What force does a charge of $+10 \ \mu C$ exert on a charge of $+40 \mu C$ at a distance of

   (a) 1.0 cm?   (3.6×10^4 N)

   (b) 2.0 cm?   (9.0×10^3 N)

   (c) 0.10 cm?   (3.6×10^6 N)

3. How far must a charge of 10 μC be from a charge of 5.0 μC in order that they exert a force of 0.50 N on each other?

                                                                                        (0.95 m)

4. A pithball "A" carrying a charge of $-20 \ \mu C$ is suspended 6.0 cm above another charged ball, "B" by the electrical force of repulsion exerted on it by B. Ball A weighs 0.50 N. What is the charge on ball B?   (-1×10^{-8} C)

5. Three point charges are placed along a metrestick. Each bears a charge of 2.00 μC. "A" is located at the zero mark, "B" at the 10 cm mark and "C" at the 20 cm mark.

   (a) What is the force exerted by A and B on C?

   (b) What is the force exerted by A and C on B?

   (c) What is the force exerted by B and C on A?

6. A pithball, "A", of mass 0.10 g and a positive charge of $+0.10 \ \mu C$ is placed on a frictionless insulating table 50 cm from a second pithball bearing a charge of $-0.20 \ \mu C$. What will be A's acceleration?

7. An electron of charge -1.6×10^{-19} C revolves around a proton of equal but positive charge. The mass of an electron is 9.1×10^{-31} kg and the distance between the electron and the proton is 5.0×10^{-11} m. Find

   (a) the electrical force acting on the electron assuming a circular orbit.

   (b) the speed of the electron in m/s.

   (c) the time it takes to go around once.

   (d) the gravitational force between the electron and the proton. (The mass of a proton is 1.7×10^{-27} kg).

8. Equal charges of $+3.0 \times 10^{-6}$ C are placed at the corners of a rectangle which is 6.0 cm by 4.0 cm. What is the resultant force exerted on a charge of $+1.0 \times 10^{-6}$ C placed in the middle of the rectangle?

9. Equal charges of $+10 \ \mu C$ charges are placed at the corners of a square with sides of size 10 cm. What is the net force on each of the four charges from the other three?

10. Three point charges are placed in a vacuum at the corners of a right angled triangle as shown below, $q_1 = +2.0 \times 10^{-6}$ C, $q_2 = +5.0 \times 10^{-6}$ C and $q_3 = -6.0 \times 10^{-6}$ C. Find the net force on q_1.
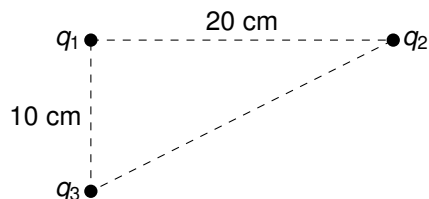
Electric Fields

1. What is the strength of an electric field caused by a 10 μC point charge at a distance of

   (a) 10 cm from the charge? $\hspace{8cm}$ (9.0$\times$10^6 N/C)

   (b) 1.0 m? (9.0$\times$10^4 N/C)

   (c) 5 mm? (3.6$\times$10^9 N/C)

2. Draw the electric field lines around

   (a) a positive point charge.

   (b) negative point charge.

   (c) two positive point charges a distance d apart.

   (d) two negative point charges a distance d apart.

   (e) a positive and negative point charge a distance d apart.

3. A charge of 4.0 μC placed in an electric field experiences a force of 0.08 N. What is the magnitude of the electric field intensity? $\hspace{5cm}$ (2$\times$10^4 N/C)

4. Find the electric field at a point 20 cm north of a small sphere bearing a charge of

   (a) -2.0 μC $\hspace{8cm}$ (4.5$\times$10^5 N/C South)

   (b) $+0.4$ μC $\hspace{8.5cm}$ (9.0$\times$10^4 N/C North)

5. Charges of +20 μC and -30 μC are placed on identical spheres 40 cm apart.

   (a) Find the force between the spheres. $\hspace{7cm}$ (-34 N)

   (b) Find the electric field strength at a point 80 cm from the +20 μC charge, if the other sphere has been removed. $\hspace{8cm}$ (2.8 $\times$ 10^5 N/C)

   (c) Find the **total** electric field 50 cm from the positive charge and 10 cm from the negative charge.