

Electric Force Problems

1. In Figure-1, the particles have charges $q_1 = q_2 = 100 \text{ nC}$ and $q_3 = q_4 = 200 \text{ nC}$, and distance $a = 5.0 \text{ cm}$. What are the (a) x and (b) y components of the net electrostatic force on particle 3? (Ans : (a) 0.17 N (b) -0.046 N)

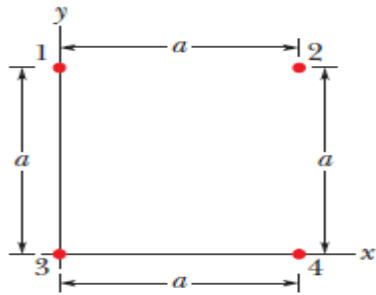


Fig-1

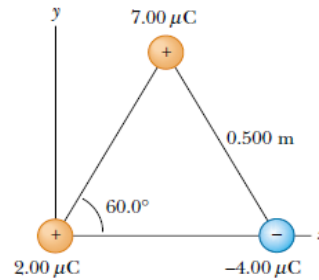


Fig-2

2. Three point charges are located at the corners of an equilateral triangle, as shown in Figure -2 . Calculate the net electric force on the $7 \mu \text{ C}$ charge.
3. A point charge $q_1 = -9 \mu \text{ C}$ is at $x=0$, while $q_2 = 4 \mu \text{ C}$ is at $x=1 \text{ m}$. At what point, besides infinity, would the net force on a positive charge q_3 be zero ? ($d=2\text{m}$)
4. At what separation would the force between a proton and an electron be 1 N ? (Ans: $1.52 \times 10^{-14} \text{ m}$)
5. In Fig. 3a, particles 1 and 2 have charge 20.0 mC each and are held at separation distance $d = 1.50 \text{ m}$. (a) What is the magnitude of the electrostatic force on particle 1 due to particle 2? In Fig3b Particle 3 of charge 20.0 mC is positioned so as to complete an equilateral triangle. (b) What is the magnitude of the net electrostatic force on particle 1 due to particles 2 and 3? (Ans: (a) 1.6 N, (b) 2.77N)

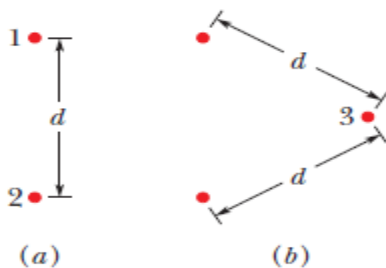


Fig-3

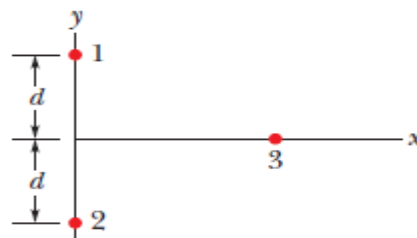


Fig-4

6. In figure-4 , particles 1 and 2 of charge $q_1 = q_2 = +3.2 \times 10^{-19} \text{ C}$ are on a y axis at distance $d = 17 \text{ cm}$ from the origin. Particle 3 of charge $q_3 = +6.4 \times 10^{-19} \text{ C}$ is moved gradually along the x axis from $x=0$ to $x=+5 \text{ m}$. At what values of x will the magnitude of the electrostatic force on the third particle from the other two particles be (a) minimum and (b) maximum? (Ans: (a) 0 (b) 12cm)