Name KEY

$$F = \frac{Kq_1q_2}{d^2} \quad K = 9.0 \times 10^9 \frac{Nm^2}{C^2} \qquad 1\ \mu C = 10^{-6}\ C$$

Coulomb's Law Problem Set 2

1. A sphere carrying a charge of + 2.5 μ C is placed 0.25m from a sphere carrying a charge of - 0.50 μC. What is the force between the two spheres? ***(0.18 N)***

$$F = \frac{Kq_1q_2}{d^2} = \frac{(9\times10^9)(2.5\times10^{-6})(0.5\times10^{-6})}{(0.25)^2} = 0.18\ N\ \text{ATTRACTION}$$

2. Two equally charged spheres that exert a force on each other of 0.900 N when separated by a distance of 0.65m. What is the magnitude of the two charges? ***(6.5 μ C)***

$$F = \frac{Kq_1q_2}{d^2} = \frac{Kq^2}{d^2} \qquad 0.9 = \frac{9\times10^9 q^2}{(0.65)^2}$$

$$q_1 = q_2 = q \qquad 0.9 = 2.13\times10^{10} q^2$$

$$q^2 = 0.9/2.13\times10^{10} \qquad q^2 = 4.225\times10^{-11}$$

$$q = \sqrt{4.225\times10^{-11}} \qquad q = 6.5\times10^{-6}\ C$$

3. A charge of 8.0 x 10^{-6} C is attracted by a second charge with a 0.350 N force when the separation between them is 0.15m. Calculate the magnitude of the second charge ***(0.11 μ C)***

$$F = \frac{Kq_1q_2}{d^2}$$

$$0.35 = \frac{9\times10^9 (8\times10^{-6})q}{(.15)^2}$$

$$3{,}200{,}000\ q = 0.35$$

$$q = 0.35/3200000$$

$$q = 1.1\times10^{-7}$$

$$q = 0.11\times10^{-6}$$

MOVE Right Subtract

4. What is the distance between two spheres, one with a charge of 3.5 x 10^{-6} C and the other with a charge of 5.5 x 10^{-6} C, when the force between them is 0.025 N? ***(2.6 m)***

$$F \cdot d^2 = Kq_1q_2$$

$$0.025\, d^2 = 9\times10^9 (5.5\times10^{-6})(3.5\times10^{-6}) = 173.25\times10^{-3}$$

$$d^2 = \frac{173.25\times10^{-3}}{0.025} = 6.93$$

$$d = \sqrt{6.93} = 2.63\ m$$