$q_{electron} = 1.6 \cdot 10^{-19}\ C$ $F_e = \frac{k\ q_1 q_2}{d^2}$ $k = 8.988 \cdot 10^9\ \frac{N \cdot m^2}{C^2}$ 4/28/15

Coulomb's Law Worksheet → Key

1. Two charged spheres 10 cm apart attract each other with a force of 3.0×10^{-6} N. What force results from each of the following changes, considered separately?

   $F_c = 3 \cdot 10^{-6} N$

   a) Both charges are doubled and the distance remains the same. $\times 4 = 1.2 \cdot 10^{-5} N$
   b) An uncharged, identical sphere is touched to one of the spheres, and then taken far away. No force!
   c) The separation is increased to 30 cm. $\frac{3 \cdot 10^{-6}}{3^2} = 3.3 \cdot 10^{-7} N$

2. The force of electrostatic repulsion between two small positively charged objects, A and B, is 3.6×10^{-5} N when AB = 0.12m. What is the force of repulsion if AB is increased to

   a) 0.24 m $3.6 \cdot 10^{-5} N$ $9 \cdot 10^{-6} N$ b) 0.36 m $4 \cdot 10^{-6} N$

3. Calculate the force between charges of 5.0×10^{-8} C and 1.0×10^{-7} C if they are 5.0 cm apart. $= 0.05m$ $F = 0.018 N$

4. What is the magnitude of the force a 1.5×10^{-6} C charge exerts on a 3.2×10^{-4} C charge located 1.5 m away? $F = 1.92 N$

5. Two spheres; 4.0 cm apart, attract each other with a force of 1.2×10^{-9} N. Determine the magnitude of the charge on each, if one has twice the charge (of the opposite sign) as the other. $1.2 \cdot 10^{-9} N = k \frac{2c \cdot c}{(0.04)^2}$ $c = 1.0 \cdot 10^{-11} C$

6. Two equal charges of magnitude 1.1×10^{-7} C experience an electrostatic force of 4.2×10^{-4} N. How far apart are the centers of the two charges? $4.2 \cdot 10^{-4} N = 8.98 \cdot 10^9 \cdot \frac{(1.1 \cdot 10^{-7})^2}{d^2}$ $d = 1.92 m$

7. How many electrons must be removed from a neutral, isolated conducting sphere to give it a positive charge of 8.0×10^{-8} C? $\frac{8.0 \cdot 10^{-8} C}{1.6 \cdot 10^{-19} C/electron} = 5 \cdot 10^{11}$ electrons

8. What will be the force of electric repulsion between two small spheres placed 1.0 m apart, if each has a deficit of 10^8 electrons? $10^8 \cdot 1.6 \cdot 10^{-19} = 1.6 \cdot 10^{-11} C$ each $F = 2.3 \cdot 10^{-12} N$

9. Two balloons are charged with an identical quantity and type of charge: -6.25×10^{-9} C. They are held apart at a separation distance of 61.7 cm. Determine the magnitude of the electrical force of repulsion between them. $F = 9.21 \cdot 10^{-11}$

10. Two balloons with charges of $+3.37 \times 10^{-6}$ C and -8.21×10^{-6} C attract each other with a force of 0.0626 N. Determine the separation distance between the two balloons.

$$\frac{0.0626\ N}{8.98E9 \cdot 3.37 \cdot 10^{-6} \cdot -8.21 \cdot 10^{-6}} = d^2$$

$d = 0.50 m$