

Coulomb's Law Problems 1

1. When sugar is poured into the sugar bowl, the rubbing of sugar grains creates a static electric charge that repels the grains and causes the sugar to go flying out in all directions. If 2 sugar grains each acquire a charge of $3.0 \times 10^{-11} \text{ C}$ at a separation of 0.00008 m , what force is causing them to repel away from each other?
2. Boppo the clown carries two balloons that rub against a circus elephant causing the balloons to separate. Each balloon acquires a charge of $2.0 \times 10^{-7} \text{ C}$. How large is the electric force between them when they are separated by a distance of 0.50m ?
3. Inez uses hairspray on her hair each morning before school. The spray spreads out before reaching her hair partly because of the electrostatic charge on the hairspray droplets. 2 drops of hairspray repel each other with a force of $9.0 \times 10^{-9} \text{ N}$ at a distance of 0.070cm , what is the charge on each of the equally charged drops of hairspray?
4. Bonnie is dusting the house and raises a cloud of dust particles as she wipes across the table. If two $4.0 \times 10^{-14} \text{ C}$ pieces of dust exert an electrostatic force of $2.0 \times 10^{-12} \text{ N}$ on each other, how far apart are the dust particles at that time?
5. Two hot air balloons each acquire a charge of $3.0 \times 10^{-5} \text{ C}$ on their surfaces as they travel through the air. How far apart are the balloons if the electrostatic force between them is $8.1 \times 10^{-2} \text{ N}$?

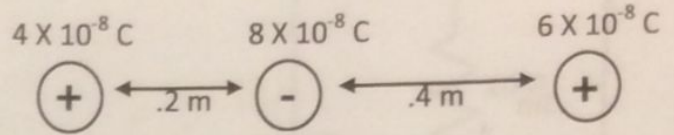
Coulomb's Law Problems 2



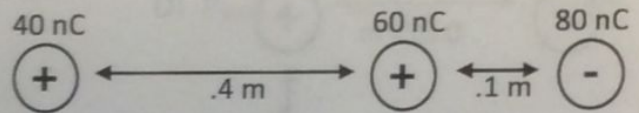
1. An object with a positive charge of $6.0 \mu\text{C}$ is 30 mm from a second object with a positive charge of $3.0 \mu\text{C}$. A) Calculate the force between the charges. B) How would your answer change if the second object had a negative charge? C) What is the force between the charges if the distance is changed to 90 mm?
2. Two positively charged objects are next to each other. One object has a charge of 590 nC and the other has a charge of 480 nC. How far apart are the objects if the force between them is 0.0058 N?
3. How far apart are two protons if they exert a force of repulsion of 1 N?
4. A positively charged object of $6.0 \times 10^{-10} \text{ C}$ has two other charged objects nearby. One negatively charged object is 0.040 m to the left of the other and has a charge of $3.0 \times 10^{-10} \text{ C}$. The third object has a positive charge of $1.5 \times 10^{-10} \text{ C}$ and is 0.030 m to the right of the first object. A) What is the net force of the $6.0 \times 10^{-10} \text{ C}$ object? B) What is the net force of the object on the right?
5. A negatively charged object of $3.5 \mu\text{C}$ has another negatively charged object of $4.8 \mu\text{C}$ that is .56 m to its right. There is also a positively charged object another 0.35 m further to the right. That object has a charge of $2.3 \mu\text{C}$. What is the net force on the left object?
6. An object with a negative charge of $6.0 \mu\text{C}$ exerts an attractive force of 65 N on a second charged object. What is the charge on this second object if they are 5 cm away from each other?
7. 3 protons grouped together have a group of 2 electrons that are 3 mm to the right and a group of 10 protons that are 5 mm to the left. What is the net force on the group of 3 protons?
8. Two charges, q_1 and q_2 , are at rest near a positively charged object of $7.2 \times 10^{-6} \text{ C}$. q_1 is 0.025 m north of the object and has a positive charge of $3.6 \times 10^{-6} \text{ C}$. q_2 is 0.068 m to the right of the object and has a negative charge of $6.6 \times 10^{-6} \text{ C}$. What is the net force acting on the object (remember forces have both magnitude and direction)?
9. The combined charge of all electrons in a nickel coin is hundreds of thousands of coulombs. Does that imply anything about the net charge on the coin? Explain.
10. A charged rod is brought near a pile of tiny plastic spheres. Some of the spheres are attracted to the rod, but as soon as they touch the rod they fly away in different directions. Explain how this could happen using you notes on the 4 ways objects can get a charge.
11. A strong lightning bolt transfers about 25 C of charge to Earth. How many electrons are transferred?

Coulomb's Law Problems 3

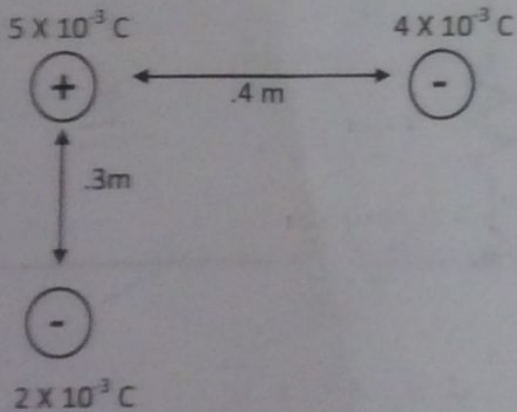
1. What is the force on the negative charge?



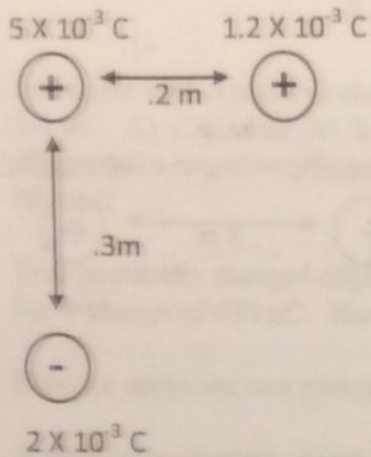
2. What is the force on the positive charge on the left??



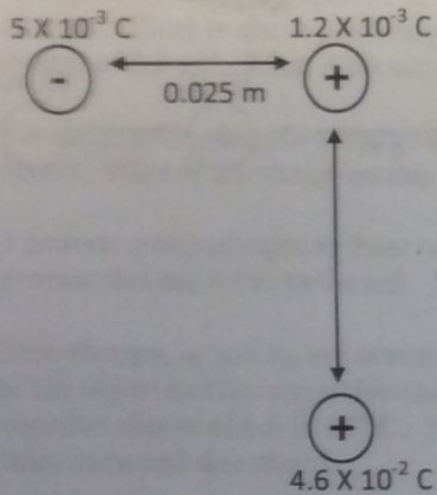
3. What is the force on the positive charge?



4. What is the force on the positive charge in the middle?



5. What is the distance between the top and bottom objects if the net force on the $1.2 \times 10^{-3} \text{ C}$ object of 203029230.5 N at 64.8142° North of West?



6. What is the net force on the $32 \times 10^{-6} \text{ C}$

