Coulomb's Law II

1. How many electrons make up a charge of –30 μC?

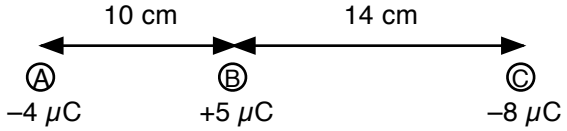
2. What is the magnitude of the electric force between two protons if the distance between them is 1.5×10^{-15} m?

3. Two identically charged objects experience a force of 2.3 N when placed 40 cm apart. What is the charge on each of these objects?

4. Two charged particles exert a force of 4.2×10^{-2} N on each other.
   a. What will be the force if the charges are moved so that they are eight times as far apart?

   b. What if they were 1/2 as far apart?

5. Three charges are arranged as shown in the diagram:



   a. Find the force between charge A and charge B.

   b. Find the force between charge A and charge C.

   c. Draw a free body diagram for the forces acting on charge A.

   d. What is the net force on charge A?

   e. What is the net force on charge C? (Note: this is a few steps, but remember Newton's Third Law to cut down on your calculations.)

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6. Two charges are located as shown in the picture.

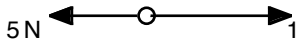
   a. Where should a small positive charge be placed so that the net force on it is zero?

   b. Where should a small negative charge be placed so that the net force on it is zero?

7. Two identical spherical shells on insulating stands are 2 meters apart. The charge on one of the spheres is 25 μC. The two charges are attracted to each other with a force of 4.22 N.
   a. What is the second charge?

   b. If you then pick up one of the spheres by the insulating stand, then let the two spheres touch each other, and then put the sphere back where is was originally, what will be the new electric force between the charges? (Hint: what will happen to the charges of the two spheres after they come in contact?)

Answers
1) 1.88 x 10^{14} electrons 2) 102 N 3) 6.39 x 10^{-6} C, both positive or both negative (6.39 μC)
4. a) 6.56 x 10^{-4} N b) 0.168 N 5. a) (-)18 N (attract) b) 5 N (repel)



c) d) 13 N to the right e) 13.4 N to the left
6. a) to the right (somewhere) of the –3 μC charge b) same spot
7. a) -7.5 x 10^{-5} C b) 1.41 N (repel) (hint: new charges on both spheres –2.5 x 10^{-5} C)