Name_____ Date_____ Period_____

Unit 11

Electrostatics Practice Test

Form P

Some useful constants

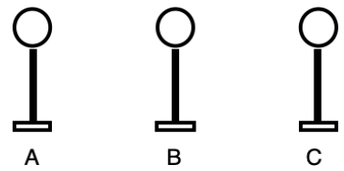
$k = 8.99 \times 10^9\ N \cdot m^2/C^2$ $1\ \text{elementary charge} = 1.69 \times 10^{-19}\ C$

1. Four identical metal spheres, A, B, C, and D, are on insulating wooden stands in a straight line and separated from each other by a distance of 5.00 cm. Sphere A has a charge of +8 μC; sphere B has a charge of –8 μC; sphere C has a charge of +12 μC; and sphere D has a charge of –4μC. What is the charge on each of the four spheres if…
   a. Sphere A is touched to sphere C and then moved back to its original place.

   b. Then Sphere B is touched to sphere D and then moved back to its original place.

   c. Then sphere A is touched to sphere D and then moved back to its original place.

2. Three identical spheres are on insulating wooden stands in a straight line and separated from each other by a distance of 5.00 cm. Sphere A has a charge of +8 μC; sphere B has a charge of –8 μC; sphere C has a charge of +12 μC.



   a. Find the net force on A due to the charges on spheres B and C.

   b. Find the net force on B due to the charges on spheres A and C.

   c. Find the net force on C due to the charges on spheres A and B.

   Suddenly, and for no good reason, the three spheres are placed at three corners of a square, 5.00 cm on each side. Sphere B occupies the vertex of the right angle ABC.

   d. Find the net force, both magnitude and direction, on B due to the charges on spheres A and C. (You did remember to tell the direction for each answer above, right?)

3. Given two identical metal spheres on wooden stands, an ebonite rod, and clean hair, describe, step by step, how you could give each of the two spheres
    a. the same charge as the rod.

    b. the opposite charge as the rod.

    c. equal but opposite charges to each other.

4. Explain how a balloon can be stuck onto a neutral wall after you rub it on your hair.

5. A charge of +Q and -q attract each other with a force of 36 N when separated by 1.00 m. What will the force of attraction become if…
    a. the distance between them is tripled?

    b. the distance between them is cut to 0.200 m?

    c. the distance between them is changed to 2.50 m?

    d. the first charge is changed from +Q to +4Q?

    e. the first charge is changed from +Q to +Q/4?

    f. the first charge is changed from +Q to +2Q and the distance is changed to 2.00 m?

    g. both charges are doubled and the distance is halved?

6. A calcium ion (Ca^{2+}) has a charge of plus two.
    a. Plus two what?

    b. How much is this charge in Coulombs?

7. If you rub an ebonite rod on your clean hair, it becomes negatively charged. What happens to your hair? Explain.