Electrostatics Test Review

Name _____
Pre AP Physics **Period** _____

Basic Information:

- The charged particles that move in a *solid conductor* are _____.
- Negative charges _____ (attract/repel) positive charges, and positive charges _____ (attract/repel) negative charges.
- Positive charges _____ (attract/repel) positive charges, and negative charges _____ (attract/repel) negative charges.
- Charged objects _____ (attract/repel) electrically neutral objects.
- Coulomb's Law allows us to calculate the _____.
- The value of k, the coulomb constant is _____.
- When drawing electric field lines, the electric field lines point _____ (toward/away from) positive charges and _____ (toward/away from) negative charges.
- The spacing between adjacent lines is tighter when the field strength is _____ (strongest/weakest).
- One microcoulomb (μC) is equal to _____ coulombs.
- One nanocoulomb (nC) is equal to _____ coulombs.

Equations:

Identify each of the variables in the following equations:

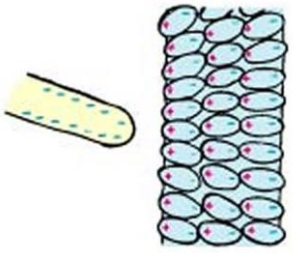
$$F_e = k\frac{Q_1 Q_2}{r^2} \qquad E_A = \frac{F_{onq\ 0}}{q_0} = k\frac{Q}{r^2}$$

Show, using dimensional analysis and Coulomb's Law, that the units for electrostatic force are Newtons:

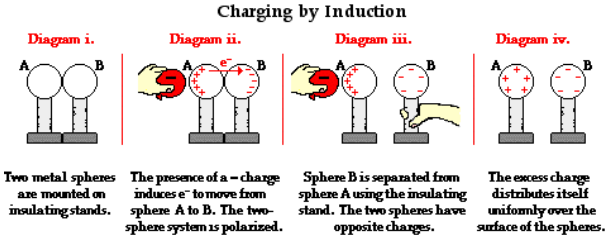
Show, using dimensional analysis and the equation for electric field, that the units for electric field are N/C:

Concepts:

- If the distance between Q_1 and Q_2 is doubled, the force Q_1 exerts on Q_2 _____.
- If the distance between Q_1 and Q_2 is halved, the force Q_1 exerts on Q_2 _____.
- The electric field strength a distance r from Q_1 is 100 N/C. The electric field strength a distance 2r from Q_1 has a value of _____.
- The picture shown shows a negatively charged object approaching an electrically neutral insulator. Charge polarization occurs on a molecular level in the insulator. Explain what charge polarization is, and why the insulator (though electrically neutral) is attracted to the negatively charged rod:



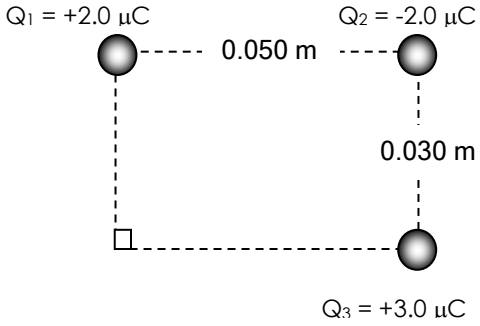
- The figure shows charging by induction. Describe EACH step in the process of charging by induction illustrated in this figure. In particular, discuss (a) the forces that charges exert on each other, and (b) the charges that actually *move* in a circuit.



Put Into Practice

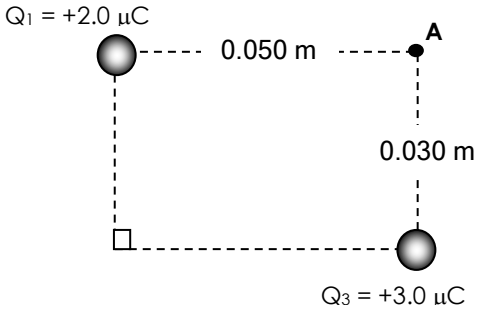
1. Given the charges shown:

(a) What is the magnitude and direction of the force that charge Q_1 exerts on Q_2?
(b) What is the magnitude and direction of the force that charge Q_3 exerts on Q_2?
(c) What is the magnitude of the net electrostatic force exerted on Q_2 by the other charges?
(d) What is the direction of the net electrostatic force exerted on Q_2 by the other charges?
(e) What is the electric field strength at the location of Q_2 due to the other two charges?



2. Given the charges shown:

(a) What is the magnitude of the electric field at point A due to Q_1?
(b) What is the magnitude of the electric field at point A due to Q_3?
(c) What is the magnitude of the net electric field at point A due to both charges?
(d) What is direction of the net electric field at point A due to both charges?
(e) If a -2.0 μC charge is placed at point A, what force does it experience?



3. Given the charges shown:

(a) What is the magnitude of the electric field at point P due to Q_1?
(b) What is the magnitude of the electric field at point P due to Q_2?
(c) What is the magnitude of the net electric field at point P due to both charges?
(d) What is direction of the net electric field at point P due to both charges?
(e) If a -1.0 μC charge is placed at point P, what force does it experience?