Name Period Date

Concept-Development Practice Page 32-2

Electrostatics

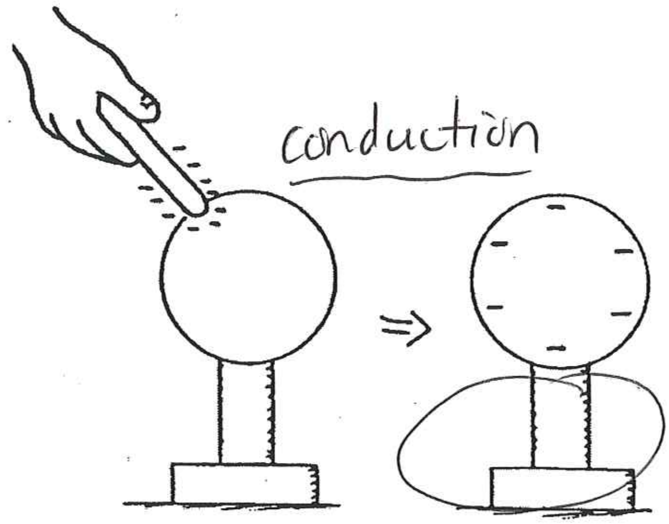
1. The outer electrons in metals are not tightly bound to the atomic nuclei. They are free to roam in the material. Such materials are good

   (conductors) (insulators)

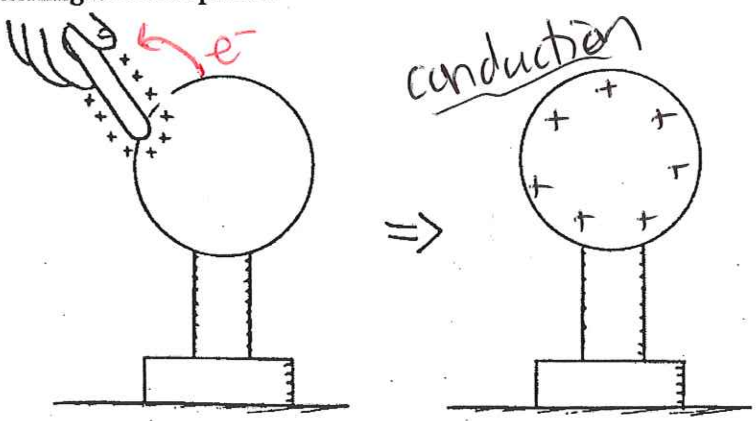
   Electrons in other materials are tightly bound to the atomic nuclei, and are not free to roam in the material. These materials are good

   (conductors) (insulators)

2. A rubber rod that has been rubbed with fur is negatively charged because rubber holds electrons better than fur does. When the rod touches a metal sphere, some of the charge from the rod spreads onto the metal sphere because like charges repel one another. When the rod is removed the charge spreads evenly over the metal sphere and remains there because the insulating stand prevents its flow to the ground. The negatively charged rod has given the sphere a negative charge. This is *charging by contact,* and is shown to the right.



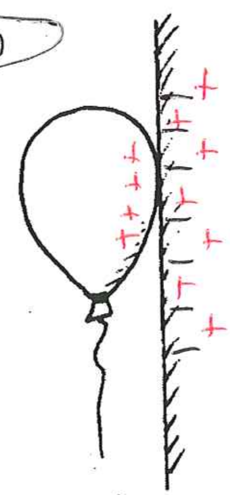
   Label the right-hand sphere below with the appropriate charges below for a positively-charged rod touching a metal sphere.



3. In the examples above, electric charge is

   (created from nothing) (simply transferred from one body to another)

4. A positively-charged balloon will stick to a wooden wall. It does this by polarizing molecules in the wooden wall to create an oppositely-charged surface. Draw the appropriate charges on both the balloon and in the wall. Your completed diagram should be similar to Figure 32.13 in your textbook.



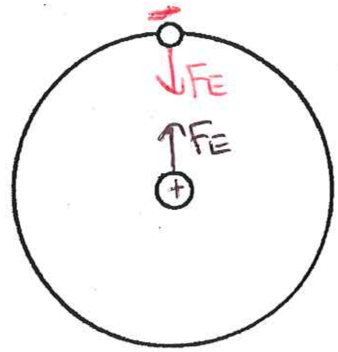
Conceptual PHYSICS

Name Period Date

Concept-Development Practice Page 32-1

Coulomb's Law

1. The diagram is of a hydrogen atom.



   a. Label the proton in the nucleus with a + sign and the orbital electron with a - sign.

   b. The electrical interaction between the nucleus and the orbital electron is a force of

   (attraction) (repulsion)

   c. According to Coulomb's law,

$$F = k\frac{q_1 q_2}{d^2}$$

   if the charge of either the nucleus or the orbital electron were greater, the force between the nucleus and the electron would be

   (greater) (less)

   and if the distance between the nucleus and electron were greater the force would be

   (greater) (less).

   If the distance between the nucleus and electron were doubled, the force would be

   (1/4 as much) (1/2 as much) (two times as much) (4 times as much)

2. Consider the electric force between a pair of charged particles a certain distance apart. By Coulomb's law:

$F_{new} = \frac{kq_1(2q_2)}{d^2} = (2)\frac{kq_1q_2}{d^2} = 2$ Fold

   a. If the charge on one of the particles is doubled, the force is

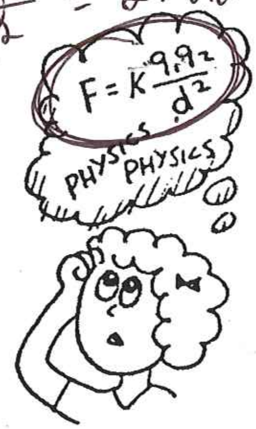
   (unchanged) (halved) (doubled) (quadrupled)

   b. If, instead, the charge on both particles is doubled, the force is

   (unchanged) (halved) (doubled) (quadrupled)

   c. If instead the distance between the particles is halved, the force is

   (unchanged) (halved) (doubled) (quadrupled) $\frac{1}{\frac{1}{4}} = 4$



   d. If the distance is halved, *and* the charge of both particles is doubled,

   the force is 16 times as great.

$F_{new} = \frac{k(2q_1)(2q_2)}{(\frac{1}{2}d)^2} = \frac{4}{\frac{1}{4}}\frac{kq_1q_2}{d^2}$

$F_{new} = 16X$ Fold

Conceptual PHYSICS