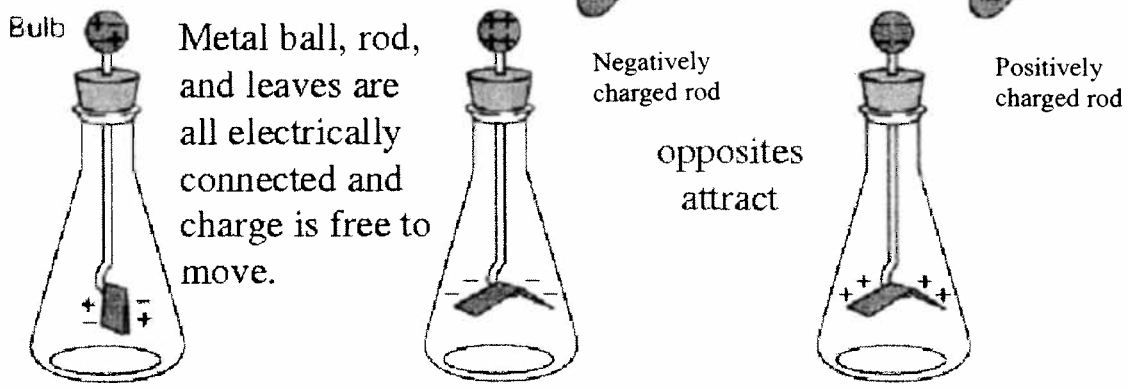
Electroscope – used to study electric charge

- A neutral electroscope can determine if an object is charged
- A charged object *induces* a charge separation – an INDUCED charge separation (zero net charge)



(a) Neutral electroscope is touched with negatively charged rod

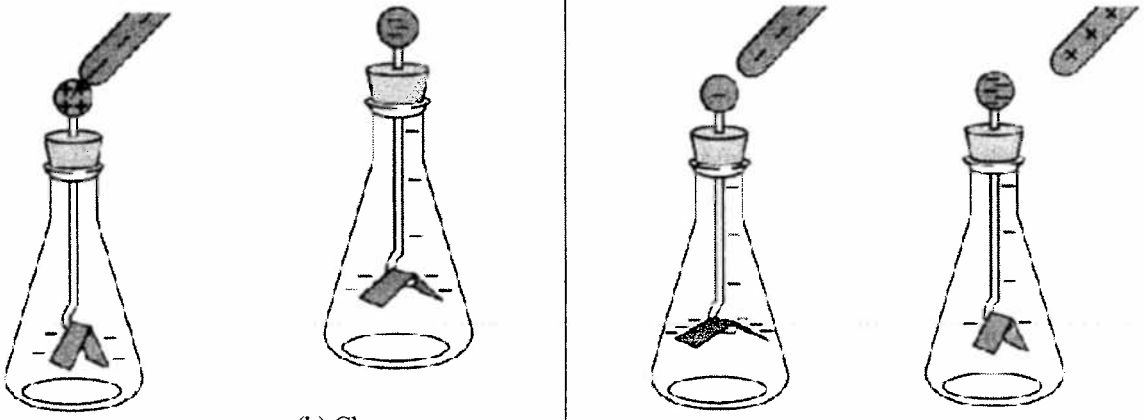
(b) Electrostatic forces cause leaves to separate

Charging ...

- **CONTACT OR CONDUCTION**

  + and – charges cancel, leaving behind a net charge

  – Note that (c) and (d) can distinguish between the two types of charge



(a) Neutral electroscope has charges evenly distributed; Leaves are close together

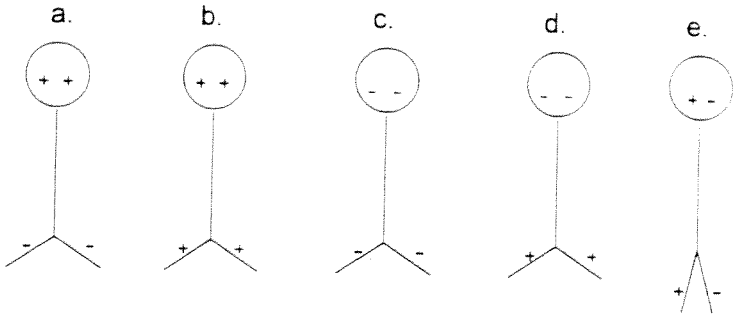
(b) Charges are transferred to bulb; Electroscope has net negative charge

(c) Negatively charged rod repels electrons; leaves separate further

(d) Positively charged rod attracts electrons; leaves collapse

Name _____ Date _____

Commack High School
Regents Physics
Worksheet: CHARGING BY CONDUCTION AND INDUCTION



1. – 7. Place the letter of the diagram that best represents the charge on the electroscope during each of the procedures described.

D 1. A positive-charged rod is brought near, but not touching an uncharged electroscope.

C 2. A glass rod is charged positively by rubbing it with silk. The silk is touched to a neutral electroscope.

C 3. A positive rod is brought near a neutral electroscope, and the electroscope is charged by induction.

B 4. An electroscope is charged by conduction by a positive rod.

A 5. A negatively-charged rod is brought near a neutral electroscope.

B 6. A positively-charged rod is brought near a positively-charged electroscope.

B 7. A metal rod is brought near a positively-charged electroscope.

8. A charged rod is placed in a pile of paper confetti. First, the confetti is attracted to the rod, then it starts jumping off the rod. Explain what is happening in terms of electron flow.

9. Two identical insulated metal spheres have charges of +8 mC and –4 mC. Describe in terms of electron flow what happens when they are brought into contact.

2mC

10. A charge of $5.0X10^{-5}C$ is attracted by another charge with a force of $3.0X10^{2}$ N when they are separated by 15 cm. Find the magnitude of the other charge.

$449,500 = 6.75$ $1.5X10^{-5}$ C

$\frac{300}{(} = \frac{8.99\times10^{9}(5\times10^{-5})q_2}{(.15m)^2}$

11. – 21. Completion: Write in the word that best completes each statement.

11. Each electron bears a net _____ charge equal in magnitude but opposite in sign to a proton.

12. The _____ unit of charge is the quantity of charge on an electron or proton.

13. Under ordinary circumstances, an atom is electrically _____

14. All electric phenomena are due to the movement of electrons

15. A neutral object becomes positively charged if electrons are removed.

16. Unlike charges attract one another.

17. A(n) electroscope is a device used to detect the presence of a static charge.

18. Because they are poor conductors, rubber and class rods are used for electrostatic experiments.

19. Semi-Conductors are materials with a conductive capacity between conductors and insulators.

20. The process of charging a neutral body by touching it with a charged body is called charging by Conduction

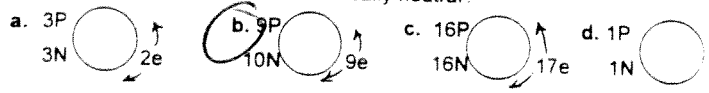
21. Charges added to a(n) conductor will immediately spread throughout the body.

22. Charges added to one part of a(n) insulator will remain in that part.

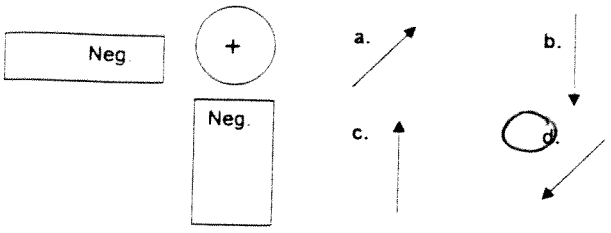
23.– 30. Multiple Choice

23. Which atom pictured below is electrically neutral?

a. 3P, 3N, 2e b. 9P, 10N, 9e c. 16P, 16N, 17e d. 1P, 1N



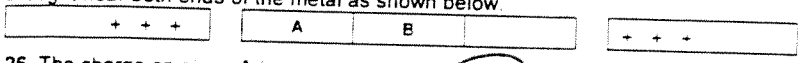
24. In which direction will the positively charged ball shown below move? The rods are equally charged.



25. A negatively charged rod is brought near the left hand side of two insulated, neutral metal spheres that are touching one another. The spheres are then separated with charges as shown below. Which pair of spheres shows the correct charges?

a. - - b. + + c. - + d. + -

26.- 30. Three insulated pieces of metal are touching. Positively charged rods are brought near both ends of the metal as shown below.



26. The charge on piece A is a) pos. b) neg. c) neutral

27. The charge on piece B is a) pos. b) neg. c) neutral

28. The coulomb is the charge on $6.25X10^{18}$ electrons or protons. Therefore the charge on a single electron or proton is _____ coulombs.
a) $1.6X10^{-19}$ b) $6.25X10^{18}$ c) $1.6X10^{-18}$ d) $6.25X10^{-19}$

29. If the charge on each of two objects is doubled and the objects are moved three times closer than they were, the electric force increases by a factor of
a) ¾. b) 12. c) 18. d) 36.

30. Two objects 1.0 cm apart each have four elementary charges on them. If two of the charges are removed from one object and placed on the other object, the electric force changes by a factor of a) ½. b) ¾. c) 2. d) 4.