Physics 30 – Lesson 13
Electric Charge & The Transfer of Electric Charge Activity
Part A – Pre-Investigation

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1. Opposite charges attract each other
   Similar charges repel each other
/2 Charged objects attract some neutral objects

2. In a closed system, the net charge is conserved (i.e. Fur loses as many electrons as
/2 a rod gains.)

3. If an object is charged, it is a result of excess or missing electrons. Electrons are
/2 free to move, but protons and neutrons (in the nucleus) are not.

4. A conductor is a solid in which electrons are able to move easily from one atom to
/2 another. An insulator does not allow electrons to flow freely.

5.
/6

Brass	-	Paraffin wax	+
Wool	-	Glass	+
Wool	+	Lead	-
Paraffin wax	+	Ebonite	-
Ebonite	-	Fur	+
Glass	+	Silk	-

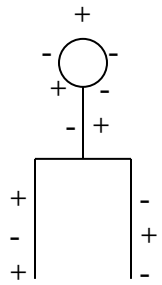
6. If Electrons are removes from an object it will have a net **positive** charge. If
/2 electrons are added to an object it will have a net **negative** charge.

7. An induced charge separation is only temporary
/1 An induced charge is permanent

8. How does an <u>electroscope</u> appear when it is:

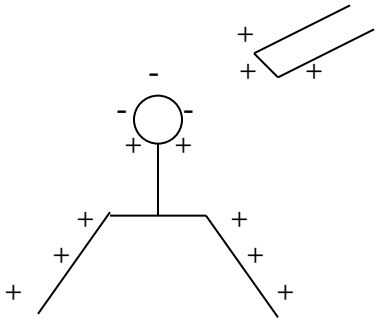
/6

A. Neutral



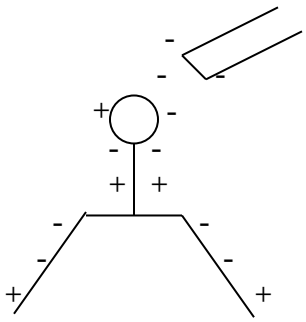
- charge evenly distributed
- leaves hang limp

B. Positively Charged



- electrons collect at knob
- ∴ leaves have +'ve charge
- positive repels positive
- ∴ separation

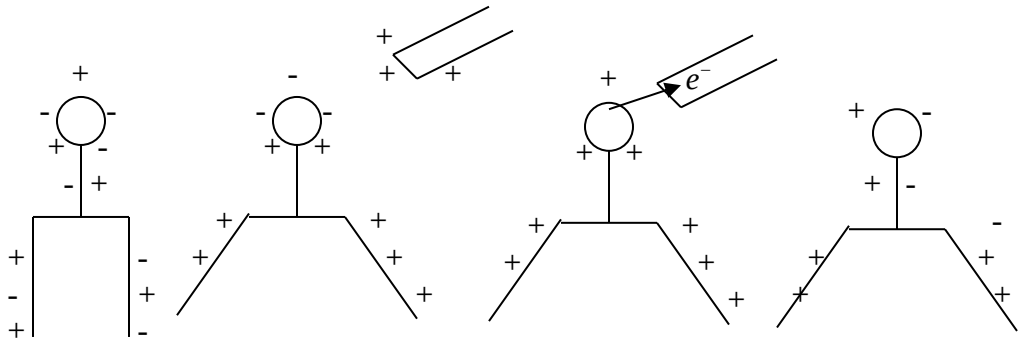
C. Negatively Charged



- electrons are repelled from rod into leaves
- negative repels negative
- ∴ separation

9. Giving an electroscope a positive charge by conduction

/2

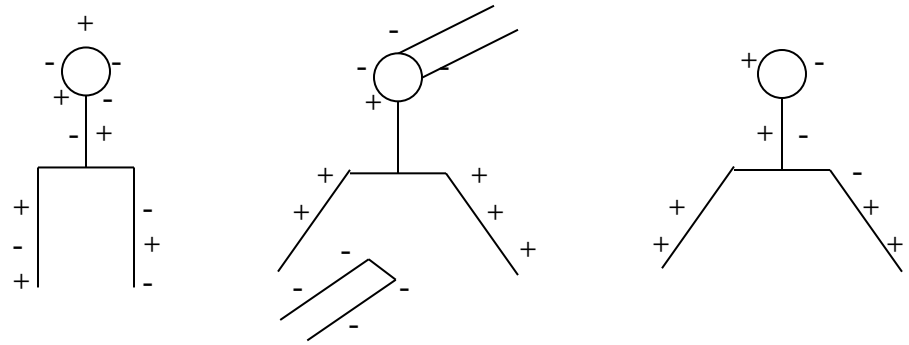


- neutral
- bring +ve rod close
- knob –ve charge
- electrons flow to rod

Leaves have a positive charge

10. Giving an electroscope a positive charge by induction.
/2

e^- flow through ground



- neutral

- bring negative rod to leaves

- net positive charge

11. What is the rule for an object charged by conduction? (ie. If a negative rod is used
/1 to charge the object by conduction, the object will have a **negative** charge.)

12. What is the rule for an object charged induction? (ie. If a negative rod is used to
/1 charge the object by induction, the object will have a **positive** charge.)

13. Initial

+10 C -20 C

/2

when the spheres are brought together the charges combine or neutralize each other. The remaining charges distribute themselves evenly around both spheres.

-10 C

when the spheres are separated ½ the charge stays on each sphere.

-5 C -5 C

14)

When the spheres are touched together, 5.0 mC of charge will distribute itself evenly over both spheres. The amount of charge that each sphere has will depend on the surface area.

The area of sphere A is $4\pi(1.0\text{cm})^2 = 4\pi\ \text{cm}^2$ and the area of sphere B is $4\pi(3.0\text{cm})^2 = 36\pi\ \text{cm}^2$.

Sphere B has 9 times the area of sphere A and will therefore hold 9 times the charge since the charge will be distributed evenly over the area of both spheres.

/5

The total area for both spheres is $4\pi\ \text{cm}^2 + 36\pi\ \text{cm}^2 = 40\pi\ \text{cm}^2$. Both spheres will have a proportionate amount of charge.

For sphere A $q_A = \frac{4\pi}{40\pi} \times -5.0mC$

$$\boxed{q_A = -0.50mC}$$

For sphere B $q_B = \frac{36\pi}{40\pi} \times -5.0mC$

$$\boxed{q_B = -4.50mC}$$