Name:_____

Date:_____

ELECTROSTATICS LAB #1

ELECTRIC CHARGE, INSULATORS, CONDUCTORS, INDUCED CHARGE, & ELECTROSCOPES (AKA. "ECICICE")

STATION #1: AMBER ROD AND FUR

(1) RUB the amber rod with the fur.
   a. What is this process called?
   b. Is the amber rod an insulator or a conductor?
   c. What is the charge on the amber rod?
   d. What is the charge on the fur?

(2) Bring it NEAR the electroscope.
   a. What is this process called?
   b. What is happening to the electroscope?

(3) Repeat the parts 1 and 2 but this time TOUCH the amber rod to the electroscope and remove the amber rod away from the electroscope.
   a. What is this process called?
   b. What happened to the electroscope?

(4) CAREFULLY TOUCH the top of the electroscope to a sink faucet in the room.
   a. What is this process called?
   b. What happened to the electroscope? (Hopefully it is still in one piece and dry!!!)

STATION #2: TAPE

1. Tear off TWO 3-inch (~8 cm) piece of tape
2. Tab the end of each piece of the tape.
3. Place one of the piece of tape on a flat surface (i.e. Lab table top) and press it firmly on the surface.
4. Place the other piece of tape on it and press it firmly on the surface.
5. Remove the top piece of tape and attach the very end of the tape to the bottom of hanging cabinet.
6. Remove the bottom piece of tape from the flat surface and bring it close to the hanging tape.
   a. What happens to the pieces of tape?
   b. Does each piece of tape have the same charge or no charge?
   c. If a charge is present, what process did you use to transfer the electrons in steps 3-5?
7. Repeat the above process with 3 pieces of tape.
   a. IMPORTANT NOTE: Hang the top and middle pieces of tape in different locations – NOT on top of each other!)
   b. Use the bottom piece of tape to make your observations
      i. Which piece of tape was attracted to the bottom piece of tape?
      ii. Which piece of tape was repelled by the bottom piece of tape?
8. Repeat the above process with 4 pieces of tape.
   a. IMPORTANT NOTE: Hang the top and two middle pieces of tape in different locations – NOT on top of each other!)
      i. Hypothesize: What do you think will happen when you bring the very bottom piece of towards the other pieces?
         1. The bottom piece of tape will (attract/repel) the top piece of tape.
         2. The bottom piece of tape will (attract/repel) the upper-middle piece of tape.
         3. The bottom piece of tape will (attract/repel) the lower-middle piece of tape.
   b. Use the bottom piece of tape to make your observations
      i. Which piece(s) of tape was attracted to the bottom piece of tape?
         Top Upper-Middle Lower-Middle (Circle all that apply)
      ii. Which piece(s) of tape was repelled by the bottom piece of tape?
         Top Upper-Middle Lower-Middle (Circle all that apply)
      iii. Which of your hypotheses were correct? 1 2 3 (Circle)

STATION #3: GLASS ROD AND SILK

(1) RUB the glass rod with the silk.
    a. What is this process called?
    b. Is the glass rod an insulator or a conductor?
    c. What is the charge on the glass rod?
    d. What is the charge on the silk?
(2) Bring it NEAR the electroscope.
    a. What is this process called?
    b. What is happening to the electroscope?
(3) Repeat the parts 1 and 2 but this time TOUCH the glass rod to the electroscope and remove the glass rod away from the electroscope.
    a. What is this process called?
    b. What happened to the electroscope?
(4) CAREFULLY TOUCH the top of the electroscope to a sink faucet in the room.
    a. What is this process called?
    b. What happened to the electroscope? (Hopefully it is still in one piece and dry!!!)

STATION #4: BALLOONS

(1) RUB the two latex balloons together.
    a. What happens to the two latex balloons?
    b. Are latex balloons conductors or insulators? Why or why not?
    c. Does each latex balloon have the same charge or no charge?
    d. If a charge is present, what process did you use to transfer the electrons?
(2) Remove the two latex balloons from the ceiling and rub them on a sink faucet.
(3) Re-attach the two latex balloons to the ceiling in their original location.
    a. What happens to the two latex balloons?
    b. Does each latex balloon have the same charge or no charge?
(4) Now blow up two NEW latex balloons and hang them from the ceiling with string and tape.
(5) RUB the two latex balloons on both sides of your head (unless you don't have hair). DO NOT remove them from your head.
    a. What is happening to the two latex balloons?
(6) Now walk away until the latex balloons are no longer attached to your head
    a. What happens to the two latex balloons?
    b. Does each latex balloon have the same charge or no charge?
    c. If a charge is present, what process did you use to transfer the electrons?
(7) Walk towards the latex balloons.
    a. What happens to the latex balloons?
    b. How many of the NEW latex balloons have the same charge as your hair?
    c. How many of the NEW latex balloons have the opposite charge of your hair?
(8) Remove the two NEW latex balloons from the ceiling and rub them on a sink faucet.
(9) Re-attach the two NEW latex balloons to the ceiling in their original location.
    a. What happens to the two NEW latex balloons?
    b. Does each NEW latex balloon have the same charge or no charge?
(10) RUB the two Mylar® balloons with a piece cloth and attach them to the floor with string and tape.
    a. What happens to the two Mylar® balloons?
    b. Are Mylar® balloons conductors or insulators? Why or why not?
    c. Does each Mylar® balloon have the same charge or no charge?
    d. If a charge is present, what process did you use to transfer the electrons?
(11) Remove the two Mylar® balloons from the ceiling and rub them on a sink faucet.
(12) Re-attach the two Mylar® balloons to the floor in their original location.
    a. What happens to the two Mylar® balloons?
    b. Does each Mylar® balloon have the same charge or no charge?
    c. Why does a Mylar® balloon float?
    d. In terms of conductors and insulators, what is significant about the element that is trapped inside the Mylar® balloon?

Station #5: Bending Water

1. Turn on the water from a faucet. Set the speed to a GENTLE continuous flow.
2. RUB the amber rod with the fur.
    a. What is this process called?
    b. Is the amber rod an insulator or a conductor?
    c. What is the charge on the amber rod?
    d. What is the charge on the fur?
3. Bring it NEAR the stream of water.
    a. What is happening to the stream of water and identify the direction of motion?
4. ***Hypothesize: Will the water be repelled by the charged glass rod? Why or why not?***

5. RUB the glass rod with the silk.
    a. What is this process called?
    b. Is the glass rod an insulator or a conductor?
    c. What is the charge on the glass rod?
    d. What is the charge on the silk?
6. Bring it NEAR the stream of water from the same side as in Step 3.
    a. What is happening to the stream of water and identify the direction of motion?
    b. Did you expect this to happen?
    c. Why does the water move in this direction?
    d. Did both charged rods induce a charge in the water? Why or why not?

CONCLUSION QUESTIONS

1. What are the characteristics of a negative electric charge and how does it interact with other charged and uncharged objects? Provide examples.
2. What are the characteristics of a positive electric charge and how does it interact with other charged and uncharged objects? Provide examples.
3. How is the law of conservation of electric charge applied in this lab?
4. How does grounding each object affect its electric charge? Provide 3 different examples
5. What is electric charge distribution in water and how does it affect its properties? Provide examples from the lab.
6. How can we use the charge on the amber rod to determine the charge on the balloons?
7. Why is the water attracted to the charged rods regardless of their charge?
8. What are the similarities between the basic properties of an insulator and a conductor?
9. What is grounding and how does grounding affect the charge on (1) a conductor and (2) an insulator? Provide diagrams.
10. How do we qualitatively explain the process of charging by (1) friction, (2) conduction, and (3) induction?
11. How does an electroscope detect charge?
12. Does an electroscope have an inherent ability to determine the charge of an object? Provide 2 different examples of charge to justify your answer.
13. Develop a process to determine whether an object has a positive or negative charge using an electroscope?