PHet Electricity Simulations Analysis Worksheet

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Balloons and Static Electricity

to the website: <https://phet.colorado.edu/en/simulation/balloons-and-static-electricity> and click on the “Play” symbol to open the simulation.

1. Count the number of positive and negative charges on each object in the simulation and determine the overall charge of each object.

|  |  |  |  |
| --- | --- | --- | --- |
|  | + Charges | * Charges
 | Overall Charge |
| Sweater |  |  |  |
| Balloon |  |  |  |
| Wall |  |  |  |

1. Click on the balloon and drag it over and rub the balloon against the wall. Describe what, if anything, happens to the balloon/wall. Pull the balloon slightly away from the wall and release it, does anything happen?
2. Now drag the balloon over the sweater and rub it against the sweater. Describe what, if anything, happens to the balloon/sweater.
3. Count the number of positive and negative charges on each object in the simulation and determine the overall charge. (It might be easier to select “show charge differences” and count how the charges have changed and use your numbers above to answer.)

|  |  |  |  |
| --- | --- | --- | --- |
|  | + Charges | * Charges
 | Overall Charge |
| Sweater |  |  |  |
| Balloon |  |  |  |
| Wall |  |  |  |

1. Pull the balloon back toward the middle of the simulation and let it go, describe what happens? How can you explain this occurrence?
2. Drag the balloon over to the wall. As you bring the balloon near the wall, what happens within the wall? Why do you think this happens?
3. Hold the balloon just away from the wall and release it. What happens? Why do you think this happens?
4. Hold the balloon a little further from the wall and release it, keep repeating this moving the balloon a little bit further from the wall each time until the balloon stops being attracted to the wall. What eventually happened? Is the balloon more attracted to the sweater or the wall? Why?

Click “Reset Balloon” then click on the picture with two balloons. Lastly click on “remove wall” to remove the wall.

1. Determine the number of positive charges, negative charges and the overall charge of each object. (Sweater number should not have changed.)

|  |  |  |  |
| --- | --- | --- | --- |
|  | + Charges | * Charges
 | Overall Charge |
| Sweater |  |  |  |
| Green Balloon |  |  |  |
| Yellow Balloon |  |  |  |

1. Take the green balloon and rub it gently against the sweater. Then determine the new charges.

|  |  |  |  |
| --- | --- | --- | --- |
|  | + Charges | * Charges
 | Overall Charge |
| Sweater |  |  |  |
| Green Balloon |  |  |  |
| Yellow Balloon |  |  |  |

1. Drag the green balloon over to the yellow balloon, does it have any effect on the yellow balloon? Why or why not?
2. Release the green balloon, what happens? Why?
3. Now drag the yellow balloon and rub it against the sweater. Determine the new charges.

|  |  |  |  |
| --- | --- | --- | --- |
|  | + Charges | * Charges
 | Overall Charge |
| Sweater |  |  |  |
| Green Balloon |  |  |  |
| Yellow Balloon |  |  |  |

1. Pull the green balloon off the sweater and put it all the way across the room. Quickly grab the yellow balloon and bring it near the green balloon? What happens when the balloons are brought together? Why does this happen?
2. Try to find a way to get the 2 balloons to stick to each other.
3. What would you need to do in order to get the balloons to stick together? After completing this activity is it possible to do that? Why or why not?

Analysis

1. When an object becomes charged which charge is transferred between the objects?
2. How does an object become positively charged?
3. How does an object become negatively charged?
4. In order to repel each other two objects must have \_\_\_\_\_\_\_\_\_\_\_\_\_ charge(s).
5. In order to attract each other two objects must have \_\_\_\_\_\_\_\_\_\_\_\_\_\_ charge(s).
6. When the balloon was brought near the wall, the wall technically stayed neutral, but the balloon was still attracted to the wall. How can this be explained?

**Part B: John Travoltage!**

Go to the following: <http://phet.colorado.edu/en/simulation/john-travoltage> and click **Play**! (sound on makes it more fun!)

1. Click on John Travoltage’s arm and move his finger by the doorknob. What happens?
2. Move his finger away from the doorknob and rub John Travoltage’s FOOT across the carpet. Describe what happens!
3. Move his finger toward the doorknob again. Describe what happens this time. Why does that happen?
4. Move his finger away again and drag his foot across the carpet multiple times. Then bring his hand toward the doorknob again. What do you notice about the distance between his finger and the doorknob this time compared to the first time? Why do you think its changed.
5. Before John Travoltage approaches the doorknob is the doorknob charged or neutral? What evidence do you have to support your claim?
6. a) Why does **carpet** tend to produce differences in static electricity more than hardwood or tile floors (think!)?

b) Why do you sometimes feel a shock when you touch **metallic** objects (like the doorknob)?

1. Why doesn’t John Travoltage get a shock if he touches the doorknob ***without*** rubbing his foot on the carpet?
2. Charge John Travoltage up a lot and observe which **direction** the spark travels when John Travoltage’s finger comes close to the metal doorknob.
3. Draw a diagram of his finger and the doorknob below.
4. Label the **CHARGES** (positive, negative, neutral) of both objects and show the direction the spark is traveling!

 (optional) If you have time go to Electric Field Hockey: <https://phet.colorado.edu/en/simulation/legacy/electric-hockey>. This won’t work on your chrome book, you will need to use a desktop computer.

On the bottom change the difficulty to 1. The goal is to score a “goal” by using the charges to direct the positively charged puck into the net. Try to score the goal, if you get it up the difficulty!. Draw the arrangement of your particles in the space below which allowed you to score the goal.