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Charging an Electroscope Computer Simulation

Student Recording Sheet

1. Type in the following web address:

<http://www.shep.net/resources/curricular/physics/P30/Unit2/electroscope.html>

2. **Do not click on anything yet.** Notice that this picture shows some positive (red +) and negative (black -) charges. Draw a picture of the electroscope before the rod is brought near. Include the charges as shown in the picture on the screen.

3. How many positive charges does this picture show? _____
4. How many negative charges does this picture show? _____
5. Does the electroscope as shown have a total positive charge, a total negative charge, or is it neutral? How do you know? Answer in one or more complete sentence(s).
6. Now click on the **Charge Separation** button and then click on the **Play** button. Watch what happens to the charges and the leaves of the electroscope. You can click on the play button again to see the simulation again.

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7. Draw a sketch of the electroscope after the rod has been brought close (but not touching) to the ball on the electroscope.

8. Which charges in the electroscope moved the negatives or the positives? Answer in a complete sentence.

9. Which way did the charges move; towards the negative rod or away from the negative rod? Answer in one or more complete sentence(s).

10. Why did the charges move in the direction they did? Answer in one or more complete sentence(s).

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14. In the activity done last class did the leaves in your electroscope behave in the same way when you brought the negative rod towards the ball on the electroscope? Go back and look at the pictures you drew when doing the activity. Answer in a complete sentence.

15. Click on the **Menu** button and then click on **Charge by Conduction**. Click **Play** and watch the simulation as the negative rod is brought in close **and touches** the ball on the top of the electroscope. Draw three sketches (include the charges (as shown in the diagram) as described in the table below. You can click on play again and again so that you can have a chance to clearly see what is happening.

Before rod was brought close to the ball	As the rod approaches (but hasn't yet touched) the ball	After the rod has touched and then moved away

16. What happened to some of the negative charges on the rod because it touched the ball on the electroscope? Answer in one or more complete sentence(s)

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17. After the rod has touched the ball and is then moved away how many positive charges are there on the electroscope? _____
18. After the rod has touched the ball and is then moved away how many negative charges are there on the electroscope? _____
19. Is there more of one charge than the other? _____
20. Are there more positive charges than negative charges or are there more negative charges than positive charges on the electroscope after the rod touches it and then moves away. Answer in one or more complete sentence(s).
21. Is the over all charge on the electroscope because of being touched with the rod positive or is it negative? Answer in a complete sentence.
22. Is the overall charge on the electroscope the same type as the charge on the rod that touched it or is the overall charge on the electroscope the opposite charge to the rod that touched it? Answer in one or more complete sentence(s).

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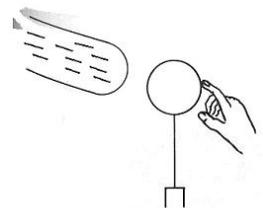
23. Tell me why this is called charging by **conduction**. Answer in one or more complete sentence(s)

24. When you did this same thing with the electroscopes in class last day, did the leaves in your real electroscope move in the way the simulation showed them moving? _____

25. Click on the **Menu** button and then click on **Charge by Induction**. Click **Play** and watch the simulation as the negative rod is brought in close **but does not touch** the ball on the top of the electroscope. Notice that as the rod approaches the ball you see something attach to the ball of the electroscope. The symbol looks like the following:



This means a wire (or other conductor) connected to ground. When something is connected to ground excess negative charge can flow through the conductor and be removed from the object (more on grounding later this week). This grounding in the computer simulation represents the same thing you did when you had a partner hold their finger on the ball of the electroscope in the activity last day (see picture to the right). Draw four sketches (include the



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charges (as shown in the diagram) as described in the table below. You can click on play again and again so that you can have a chance to clearly see what is happening.

Before rod was brought close to the ball	As the rod approaches no grounding yet	As the rod is near and the grounding conductor (finger) is connected to the ball of the electroscope	After the rod and the grounding conductor (finger) have both been moved away.

26. What happened to some of the negative charges on the electroscope because the grounding conductor (finger) was attached while the rod was near the ball on the electroscope? Answer in one or more complete sentence(s).

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27. After both the grounding conductor (finger) and the charged rod have been moved away how many positive charges are on the electroscope? _____
28. After both the grounding conductor (finger) and the charged rod have been moved away how many negative charges are on the electroscope? _____
29. Is there more of one charge than the other? _____
30. Are there more positive charges than negative charges or are there more negative charges than positive charges on the electroscope after the grounding conductor (finger) and the rod have been moved away. Answer in one or more complete sentence(s).
31. Is the overall charge on the electroscope after the grounding conductor (finger) and the rod have been moved away positive or is it negative. Answer in a complete sentence.
32. Is the overall charge on the electroscope the same type as the charge on the rod that touched it or is the overall charge on the electroscope the opposite charge to the rod that touched it? Answer in one or more complete sentence(s).

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33. This charging is called **induction**. The charged rod does not touch the electroscope but causes the charges in the electroscope to separate (induces a charge) and repels some negative charges to ground through the grounding conductor (finger).
34. When you did this same thing with the electroscopes in class last day, did the leaves in your real electroscope move in the way the simulation showed them moving? _____

Please print off and pass this worksheet in at the end of class. Make sure your name is on the sheet.