Introduction

In these investigations, you will produce a concentrated charge on objects and observe effects when charged bodies are brought close to one another. In most cases you will produce the charge, predict the outcome, observe the reaction, and suggest why objects behaved as they did.

Equipment required

plastic rods, fur, glass rod, silk cloth, pith balls, insulated (wooden) stand, wire stirrup, van der Graaff generator, aluminium pie dishes, Wimshurst machine and small pieces of paper

Background

Some materials have electrons more securely bound than others. A material that has relatively loosely bound electrons is more likely to give up some of its electrons to a second material if that material has more securely bound electrons. When two objects made of different materials are rubbed together, electrons may be transferred between them.

Task 1

- Vigorously rub a plastic rod with fur, then bring the rod close to some small pieces of paper.

1. What do you observe?

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2. What do you think is happening? Consider how charges might be distributed on the rod, fur and paper, given that fur has more loosely bound electrons than plastic.

Task 2

- Vigorously rub a glass rod with a silk cloth, then bring the rod close to some small pieces of paper.

3. What do you observe?

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4. What do you think is happening? Consider how charges might be distributed on the rod, silk and paper, given that glass has more loosely bound electrons than silk.

Task 3

- Suspend two pith balls by cotton threads from an insulated stand so they are touching. Vigorously rub a plastic rod with fur, then touch a suspended pith ball with one end of the rod.

5. What do you observe?

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6. What do you think is happening?

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7. What charge does a plastic rod carry after being rubbed with fur?

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8. What charge does fur carry?

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9. What charge do pith balls carry after contact with the rod?

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10. Why does the distance between the pith balls change after a short time?

Task 4

- Suspend a wire stirrup from an insulated stand. Vigorously rub a plastic rod with fur and place it in a stirrup, noting which end is charged. Quickly rub a second plastic rod with fur and bring the charged end close to the charged end of the suspended rod, without touching it.

11. What do you observe?

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12. Why does it happen?

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13. If the suspended plastic rod does NOT carry a charge (ie, it is neutral), predict what will happen if a charged plastic rod is brought close to it.

- Test your prediction by placing an uncharged rod in the stirrup and bringing a charged plastic rod close to it.

14. Explain why your prediction was correct or not.

Task 5

- Vigorously rub a plastic rod with fur, then bring the rod close to another student's hair.

15. What do you observe?

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16. Why does is it happen?

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17. Better results can be obtained if the student who is being tested stands on an insulated box. Explain why this is the case.

Task 6

- With the help of your teacher, set up a Wimshurst machine so it produces a charge on the terminals when the handle is turned. Observe what happens when the two terminals are brought relatively close together.

18. Explain how terminals on a Wimshurst machine become charged.

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19. What causes a spark to jump between the two terminals?

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20. If the distance between the two terminals is increased, predict what you will observe.

- Test your prediction by increasing the distance between the two terminals. Explain why your prediction is correct or not.

Task 7

With the help of your teacher, set up a Van de Graaff Generator and place up to 10 aluminium pie dishes on the top of the aluminium dome. Turn on the machine.

21. What do you observe?

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22. Why does it happen?

- Your teacher may be prepared to demonstrate other interesting activities with a Van de Graaff generator.