Static Electricity Lesson 3, March 23, 2020

Your Tasks

Task 1: Complete the Static Electricity – Assessment 1: Strictly 35 – 40 minutes

Questions are on Slide 1- Download the PPT, type your answers and send me by email after saving it in your name. Please note that you should not share your PPT with anyone else other than me.

Also,

(i) you need to make your own drawing of the triboelectric series.

(ii) your answers for any question should be in your own words and not copy-pasted from any website including the lesson PPTS

Task 2: Read the content on Gold Leaf Electroscope on Slide 3 and Take Quiz at:

https://sciencesource2.pearsoncanada.ca/resources/hotpotato_quiz_09_10_2.htm

Task 3: Read the content on van de Graff Generator on Slide 4 and Take Quiz at: SOCRATIVE: RENURAJAS

Test 1 on Static Electricity

(1) Which of the subatomic particles are dislocated in static electricity?

(2) What are the three methods of generating static electricity?

(3) Explain with examples how rubbing can create static electric charges.

(4) What is a Triboelectric Series? Draw Triboelectric series of various materials for their capacity to generate static electric charges.

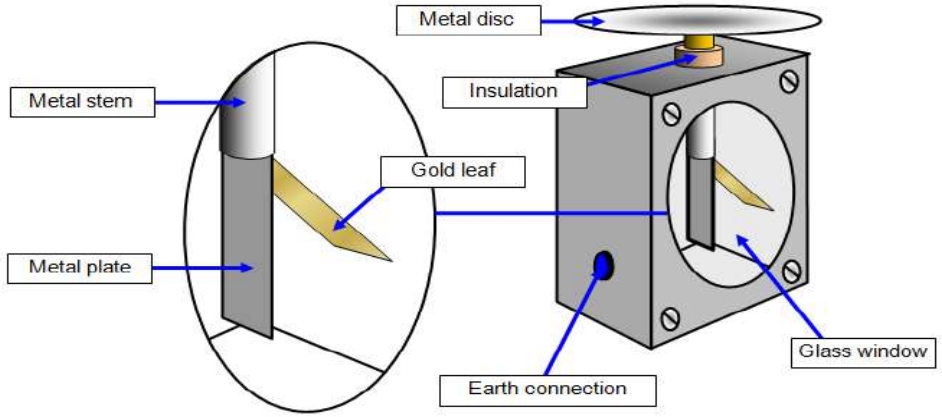
(5) A charged body of charge 50mC (milli coulombs) comes into contact with another charged body of 120 cC (centicoulombs); what would be the final steady static charge on these bodies in coulombs?

Show Detailed work with units.

(6) A negatively charged body of mass 1.5 kg and charge of 1.325 x 10^-23 C approaches another body of mass 3.3 kg and a charge of 8.4 78 x 10^-19 C. What will be the electrical and magnetic forces of attraction between these two bodies. Given: The relative magnitudes of the **Coulomb constant**, k = 9 x 10^9 $Nm^2C^{-2}$and the **gravitational constant**, G = 6.67 x 10^{-11} $Nm^{-2}kg^{-2}$ (Remember Inverse Square Law of Lesson 1)

Show Detailed work with units.

The Gold Leaf Electroscope: This is an instrument for detecting and measuring static electricity or voltage. A metal disc is connected to a narrow metal plate and a thin piece of gold leaf is fixed to the plate. The whole of this part of the electroscope is insulated from the body of the instrument. A glass front prevents air draughts but allows you to watch the behavior of the leaf.



In addition to reading the content, watch the video at the following link https://www.youtube.com/watch?v=CUXnL-kMZeM

When a charge is put on the disc at the top it spreads down to the plate and leaf. This means that both the leaf and plate will have the same charge. Similar charges repel each other and so the lea rises away from the plate - the bigger the charge the more the leaf rises.

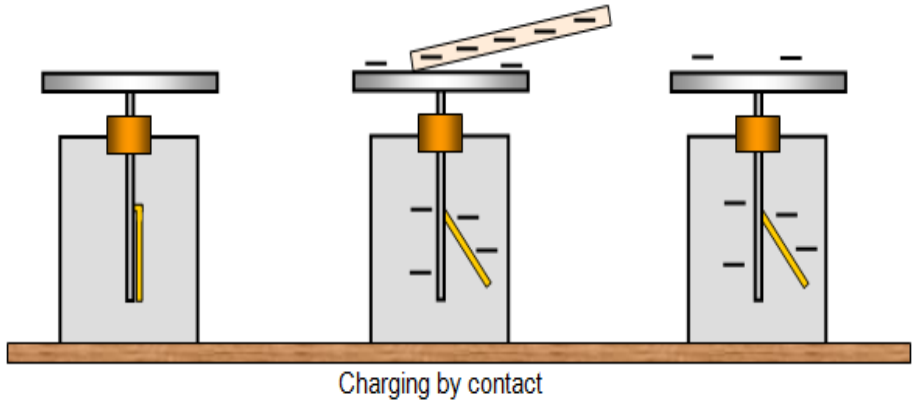
The leaf can be made to fall again by touching the disc - you have earthed the electroscope. An earth terminal prevents the case from becoming live. The electroscope can be charged in two way

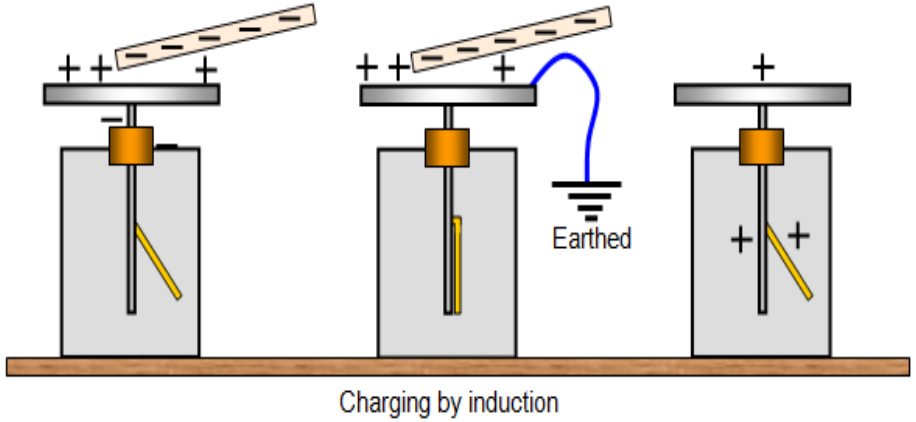
(a) by contact - a charged rod is touched on the surface of the disc and some of the charge is transferred to the electroscope. This is not a very effective method of charging the electroscope.

(b) by induction - a charged rod is brought up to the disc and then the electroscope is earthed, the rod is then removed.

The two methods give the gold leaf opposite charges.

The following diagrams show you how the charges spread over the plate and gold leaf in different conditions.

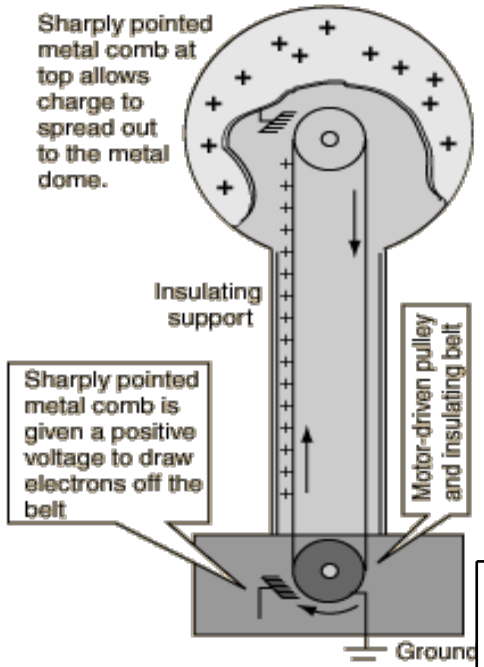




Source http://www.schoolphysics.co.uk/age11-14/Electricity%20and%20magnetism/Electrostatics/text/Gold_leaf_electroscope/index.html

Van de Graaff Generator

Voltages of hundreds of thousands of volts can be generated with a demonstration model Van de Graaff generator. Though startling, discharges from the Van de Graaff do not represent a serious shock hazard since the currents attainable are so small.
A pulley drives an insulating belt by a sharply pointed metal comb which has been given a positive charge by a power supply. Electrons are removed from the belt, leaving it positively charged. A similar comb at the top allows the net positive charge* to spread to the dome.



Voltages in excess of 100,000 volts can be generated with a demonstration model Van de Graaff generator. Though startling, discharges from the Van de Graaff do not represent a serious shock hazard since the currents attainable are so small.
Such voltages are enough to make your hair stand on end! Like charges on individual hairs makes them repel each other and stand away from Jennifer's head. She is standing on a wooden chair to isolate her from ground so that the charge will build up on her.

In addition to reading the content, watch the video on this page

http://hyperphysics.phy-astr.gsu.edu/hbase/electric/vandeg.html#c3

voltages in excess of 100,000 volts can be generated with a demonstration model Van de Graaff generator. Though startling, discharges from the Van de Graaff do not represent a serious shock hazard since the currents attainable are so small. The voltages produced are high enough to ionize the air and produce spark discharges several centimeters long.

A favorite demonstration with the Van de Graaf is to make someone's hair stand on end.

OTHER DEMONSTRATIONS

Puffed wheat

Fluorescent Bulb

Repelling Balloons

Repelling Bubbles