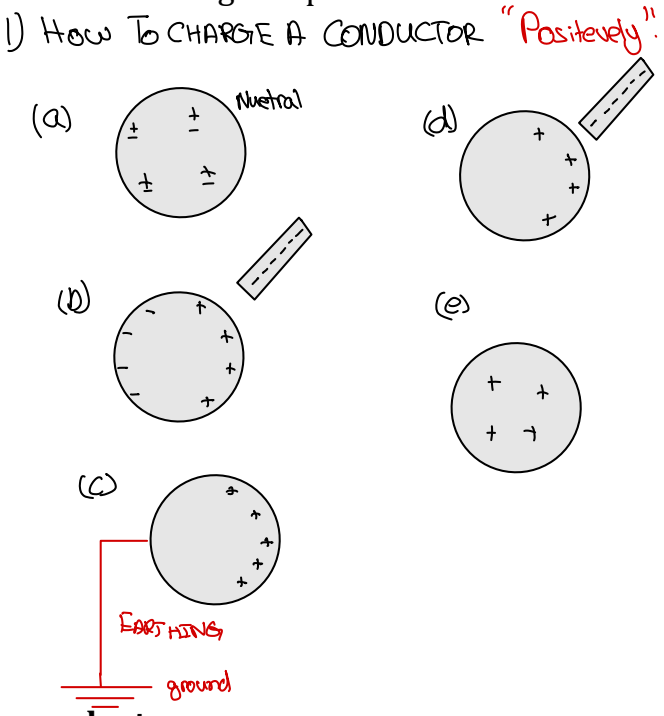
Static electricity

In terms of electricity, materials can be classified as conductors or insulators.

Insulators have electrons which are not free to move, hence insulators cannot conduct electricity, examples include, plastic, nylon, wood, etc.
Conductors have electrons that are free to move hence they can modify electricity examples include metals.

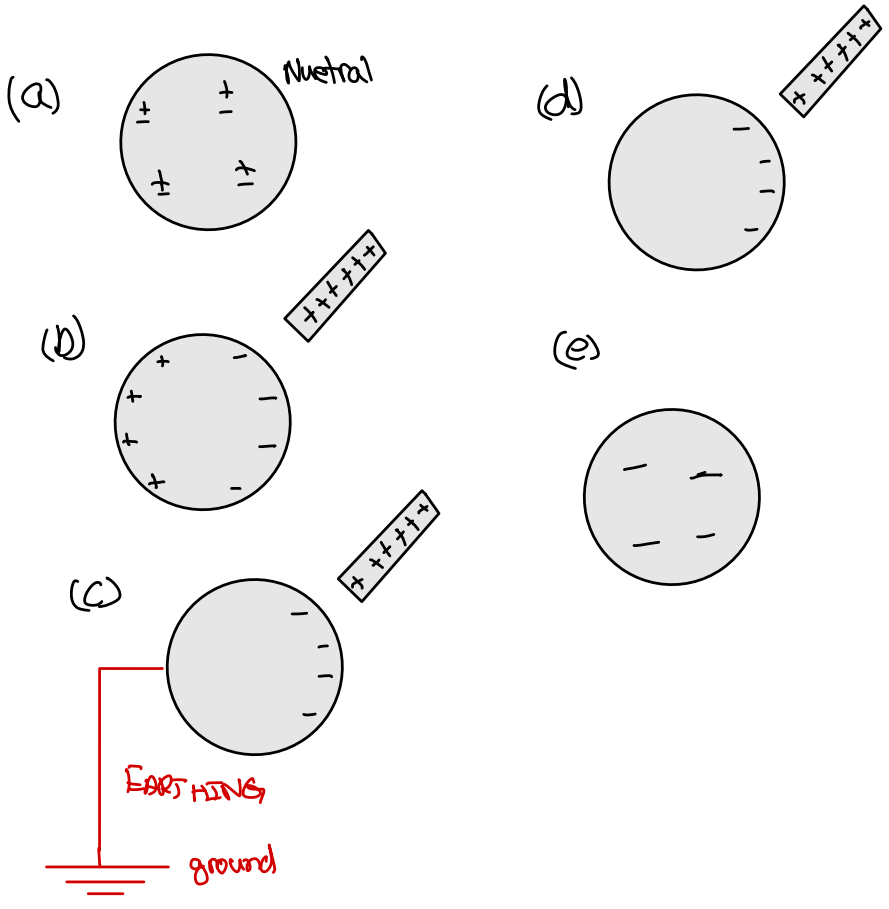
How to charge insulation:
We use a technique called charging by friction. In this method the two insulators are rubbed against each other. This generates heat which causes electrons to be transferred from one material to another. The material which looses electrons acquires a positive charge and the one which gains electrons acquires an equal number of negative charge.

Experiment to show like charges repel



How to charge conductors
The technique used to charge conductors is called charging by induction. This technique can either make a conductor positively charged or negatively charged

2) How To CHARGE A CONDUCTOR "NEGATIVELY"



Definitions of:

Induction: the separation of charges within the sphere due to the presence of a charged rod is called induction. Hence this process is known as charging by induction

Earthing: the term earthing refers to connecting the sphere with the ground by means of a copper wire.

Note: Once the sphere is charged, insulating handles are provided so that the sphere can be moved from one position to another.

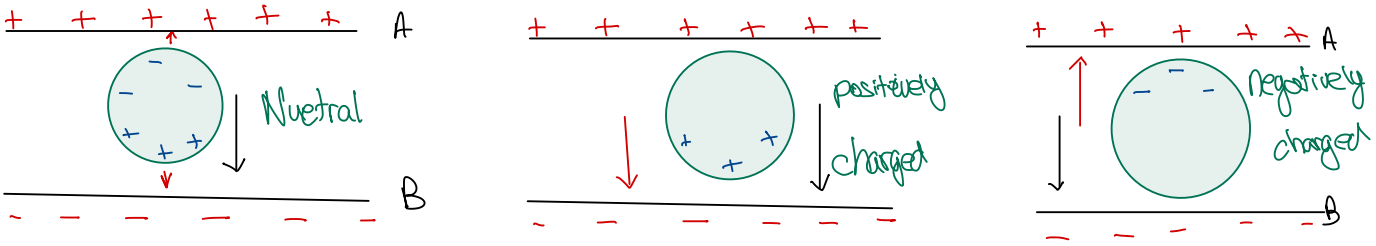
Concept of electrical field

Electric field is defined as a region in which a charged particle experiences a force. Electric field is represented by constructing electric field lines. These electric field lines are shown to be coming out of a positive charge and going into a negative charge. Hence electric field lines indicate the direction in which a positive charge will move

Between two like charges there is a point or a region where a charged particle does not experience any force. This region is called null point or neutral region. If two charges are identically sized, the null point is located at the midpoint whereas for non identically sized charges the null point is towards the weaker charge. This is shown in the diagram below

Two metal plates A and B are connected to a battery. When the switch is closed the metal plate A gets positively charged whereas the metal plate B gets equal number of negative charges. Since the electric field lines indicate the direction in which a positive charge will move therefore these field lines will go from left to right or from positive to negative

Conditions for a charged conductor to remain stationary in a region of electric field.



In the first diagram the electrical forces will balance out each other and the effect of the weight will pull the sphere downward, hence not stationary.

In the second diagram both electrical forces and the weight are acting downwards therefore the sphere can not remain stationary.
In the third diagram the upward electrical force balances out with the downward gravitational force, hence if these forces are equal we can expect the negatively charged sphere to remain stationary between the plates

Hazards of static electricity:

When a person wearing rubber shoes walks about in a carpeted room, friction between the soles of his shoes and the fabric of the carpet causes charges to build up on his body. If he then goes and touches a metallic object, he feels a slight electric shock. This occurs due to the movement of the charges between his body and the metallic object

Application of static electricity

In case of electrostatic spray painting, the section of the car body which is to be painted is connected to the positive terminal of a high voltage battery whereas the spray gun is connected to the negative terminal of the same battery. This allows the car body to acquire positive charges and the spray gun gets negatively charged. When droplets of paint emerge out from the nozzle since they are all negatively charged therefore they will spread out as they travel through the air. As they approach the car body they will get attracted towards the positive charges on the car body. This technique allows a uniform coating of paint with a minimum loss of paint.