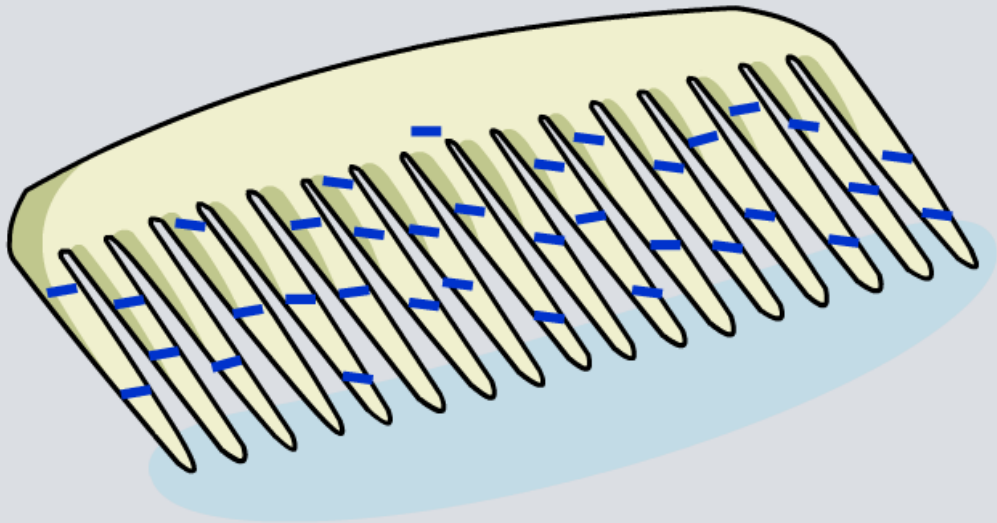
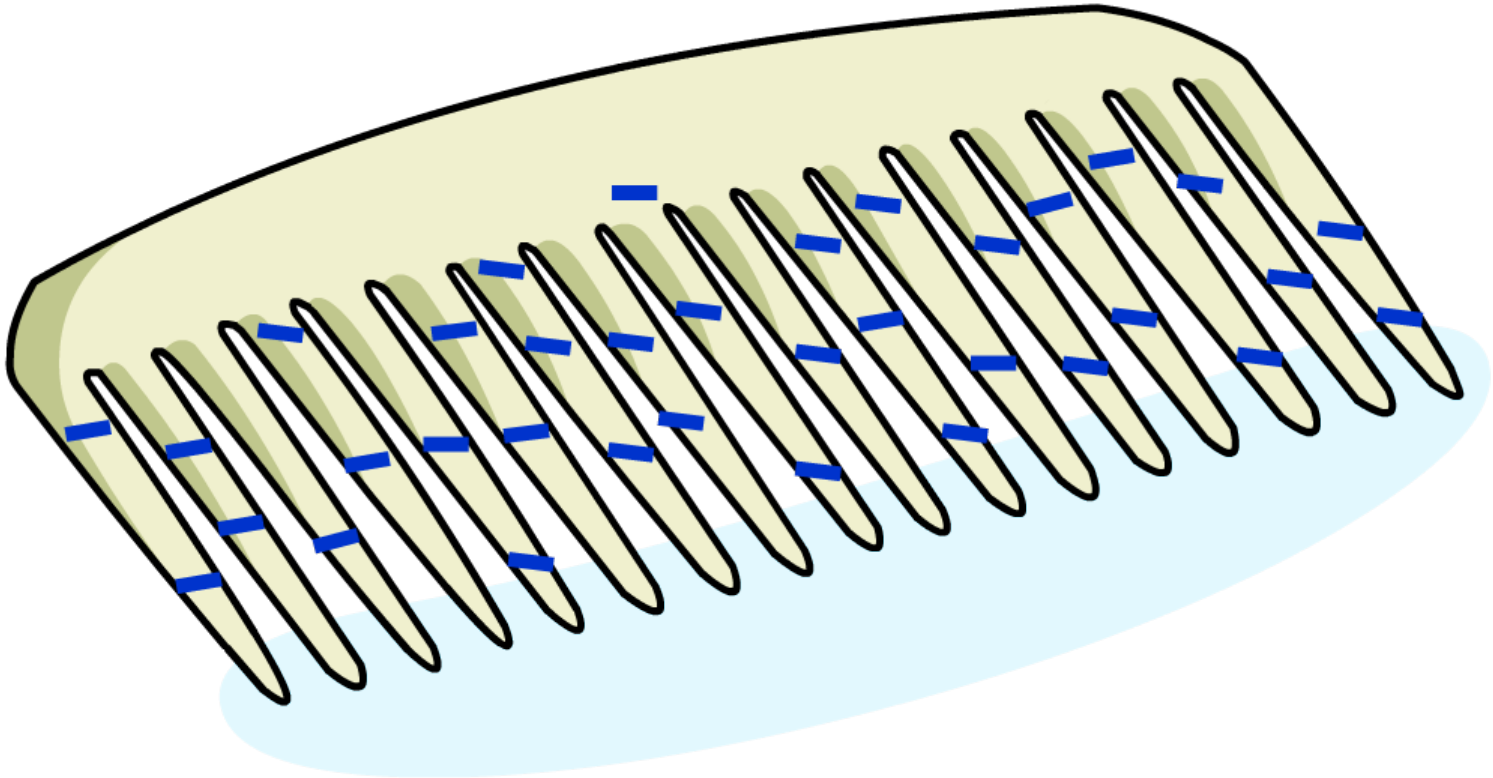
Static Electricity



What causes static electricity?

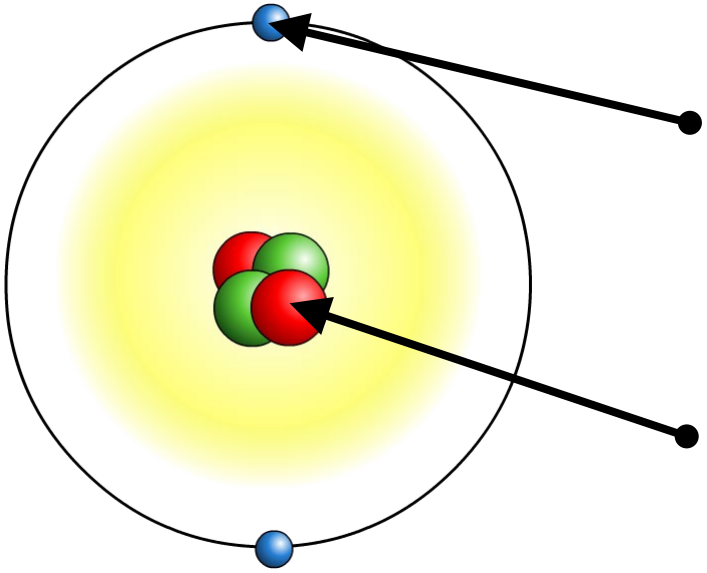
Static electricity is due to electric charge that builds up on the surface of an insulator, such as a plastic comb.



The charge that has built up cannot easily flow away from the insulator, which is why it is called **static** electricity.

Where does static charge come from?

All materials are made of atoms, which contain electric charges.



Around the outside of an atom are **electrons**, which have a **negative charge**.

The nucleus at the center of an atom contains **protons**, which have a **positive charge**.

An atom has equal amounts of negative and positive charges, which balance each other, so the atom has no overall charge.

Electrons do not always stay attached to atoms and can sometimes be removed by rubbing.

How does static charge build up?

Static charge can build up when two insulating materials are rubbed together, such as a plastic comb moving through hair.

Friction between the materials causes electrons to be **transferred** from one material to the other:

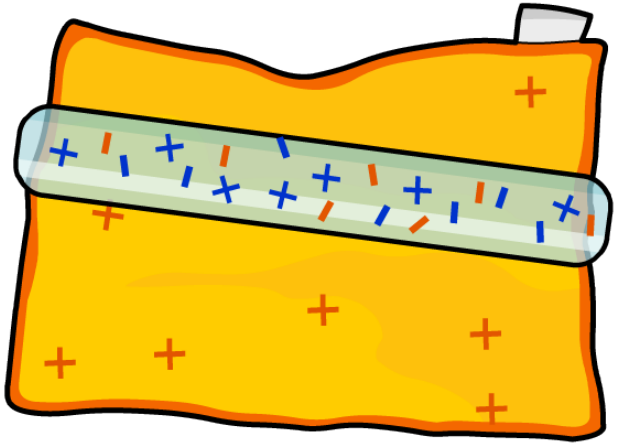
- One material ends up with more electrons, so it now has an overall **negative charge**.
- One material ends up with fewer electrons, so it now has an overall **positive charge**.

How can static charge be created?

Friction can be used to create a static charge.

If an insulator is rubbed with a cloth, it can become charged in one of two ways:

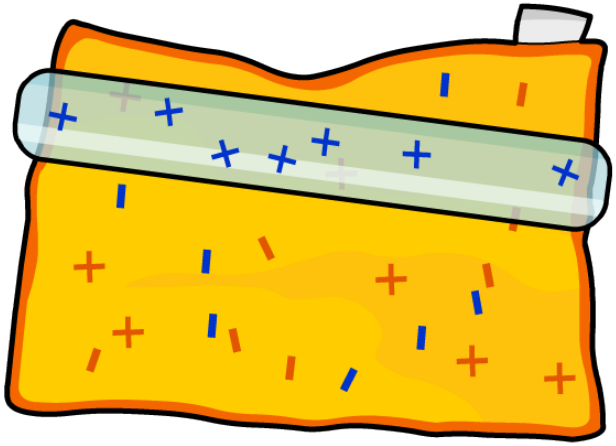
Electrons move from the cloth to the insulator.



The insulator ends up with an overall negative charge.

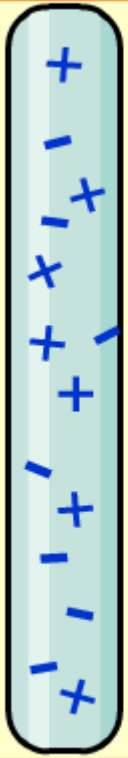
OR

Electrons move from the insulator to the cloth.



The insulator ends up with an overall positive charge.

How can different materials be charged?

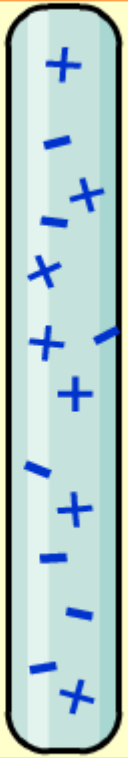


When a rod is rubbed with a cloth it can either become positively or negatively charged, depending on the material used to make the rod.

Choose a material to see if it becomes negatively-charged or positively-charged.

acetate

polythene



Static charge – true or false?

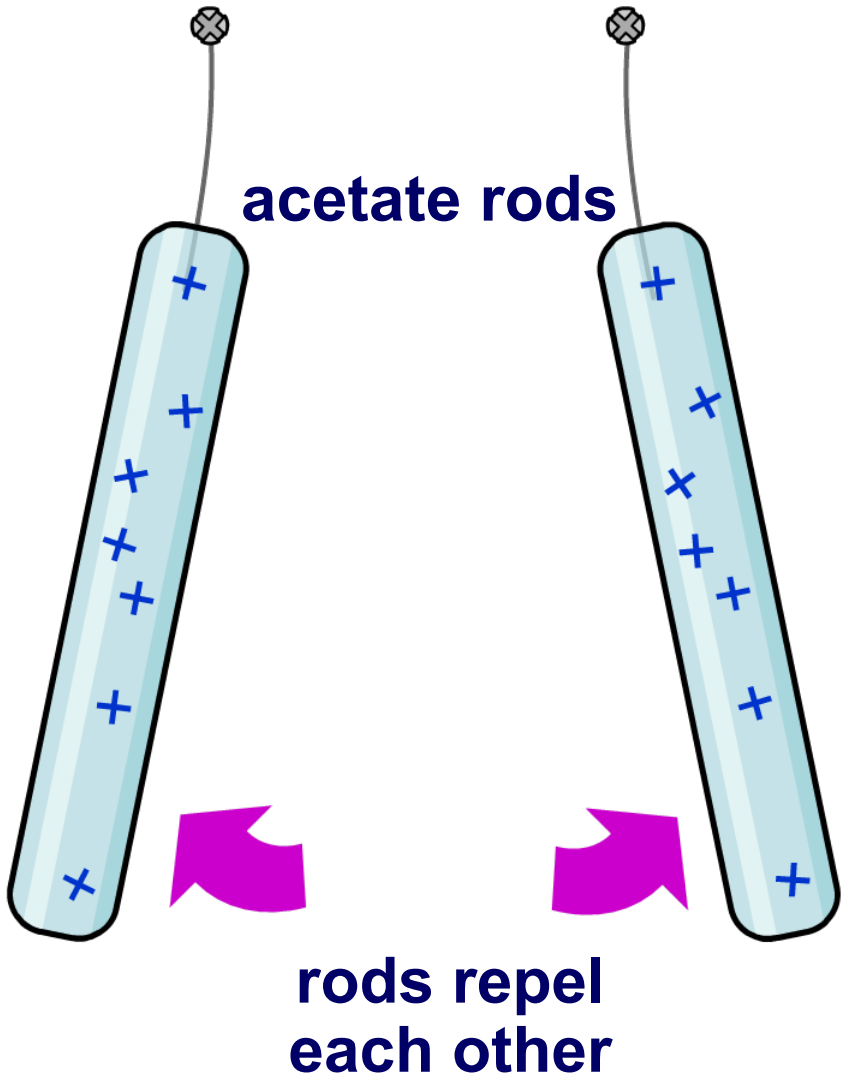
What are the forces between charges?

The forces between charges can be investigated using rods made of insulating materials.

What happens when two **positively-charged acetate rods** are placed near each other?

The rods **repel** each other because they have the same overall charge.

What will happen if one rod is replaced with a charged **polyethylene rod**?



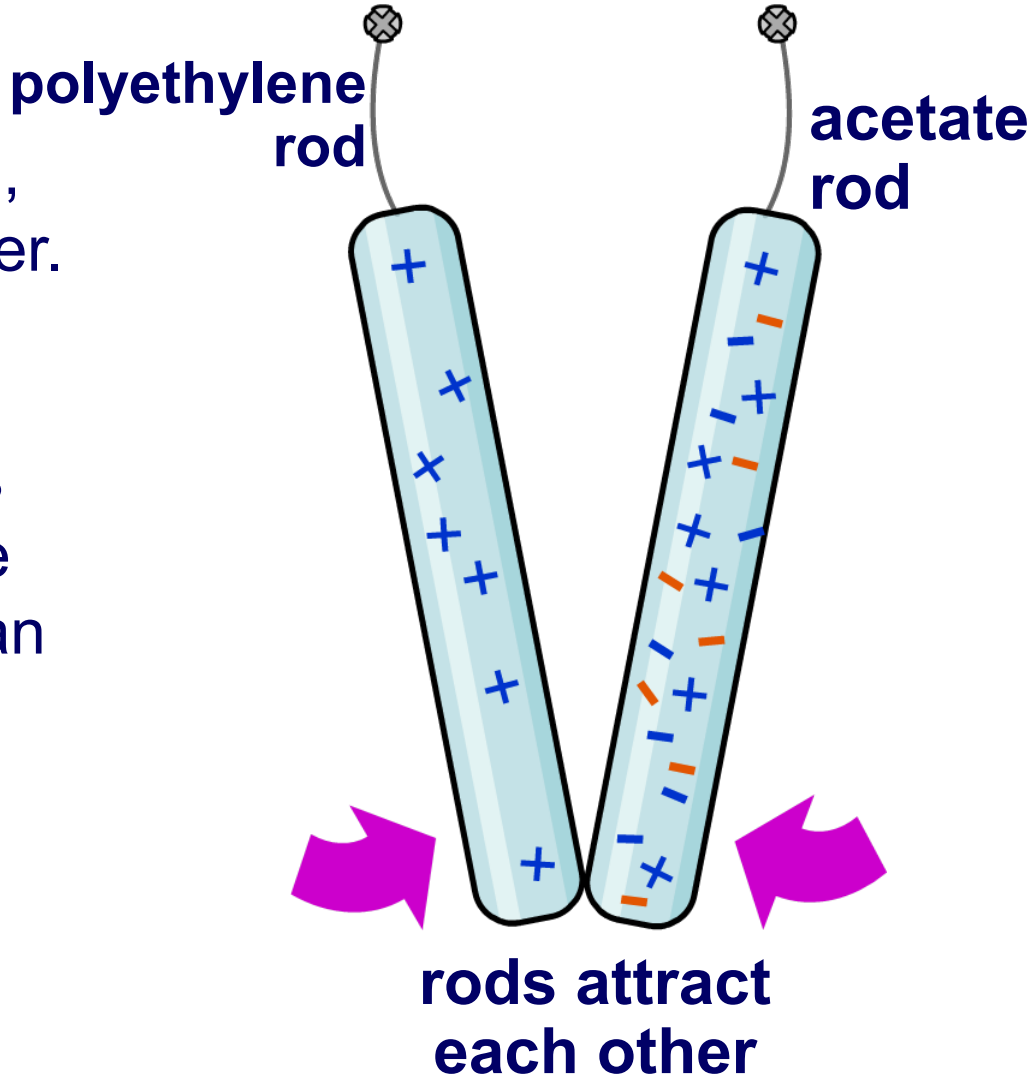
How do opposite charges behave?

When a charged acetate rod is placed near a charged polyethylene rod, the rods **attract** each other.

Why does this happen?

The polyethylene rod has an overall positive charge and the acetate rod has an overall negative charge.

The overall charges of these rods are opposite and so they **attract** each other.

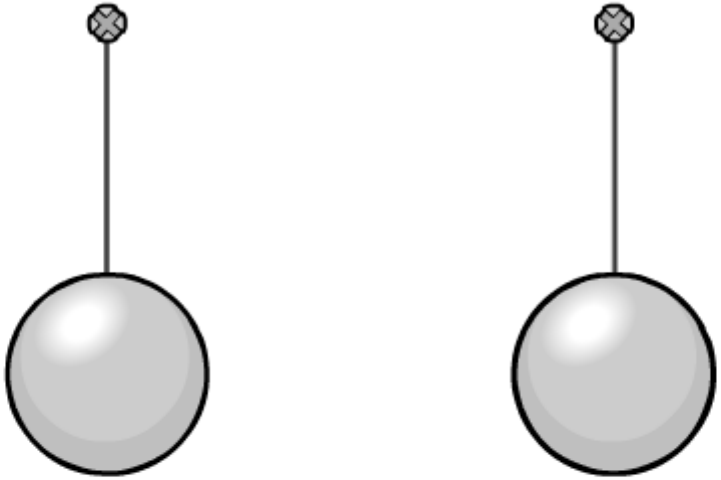


Investigating pairs of charges

How do pairs of charged particles behave?

sphere 1

charge



sphere 2

charge

sphere 1	sphere 2	repel	attract
+	+		
+	-		
-	+		
-	-		

?

C

solve

Experimenting with static charge

How can a balloon demonstrate static charge?

A charged balloon can be used to demonstrate the effects of static charge.

Click the buttons below to experiment with a wall, a cat, paper and water.