Charging by Induction
Lesson Notes

Focus Questions:

- What is charging by induction and how does it occur?
- How can the results of charging by induction be predicted and explained?

What is Charging by Induction?

- A process of charging a neutral object.
- Involves bringing a charged object (**A**) near to a neutral object (**X**).
- While **A** is held near Object **X**, a third object (**G**) is touched to Object **X**.
- Then Object **G** is pulled away and Object **X** is observed to be charged.

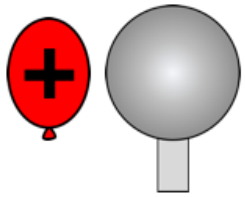
The Result: the charge that Object **X** acquires is the opposite of the charge that Object **A**.

How Does Charging by InductionWork?

The process takes place in two steps.

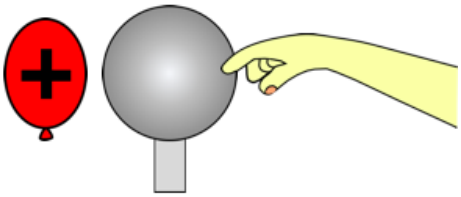
Example 1: Consider using a + balloon to charge a neutral conducting sphere by induction.

Step 1: Polarization



The **+ balloon** forces e^-s in the **sphere** to move from the right side to the left side of the sphere.

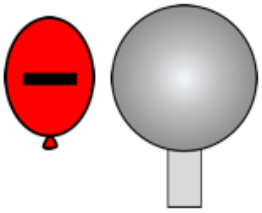
Step 2: Charging



When touched by the **hand** (ground), e^-s move from the hand into the sphere. The sphere acquires a - charge.

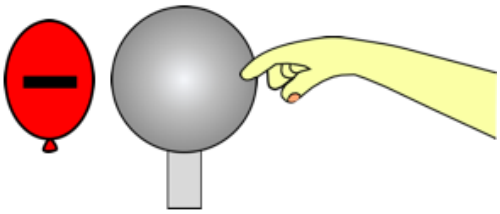
Example 2: Consider using a - balloon to charge a neutral conducting sphere by induction.

Step 1: Polarization



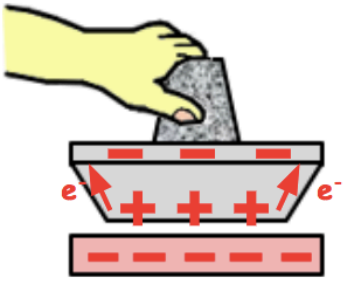
The **+ balloon** forces e^-s in the **sphere** to move from the right side to the left side of the sphere.

Step 2: Charging

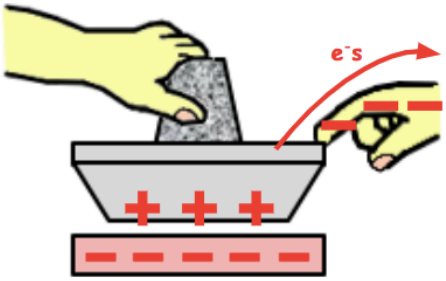


When touched by the **hand** (ground), e^-s in the **sphere** move to the hand. The sphere acquires a + charge.

Example 3: Use a negative foam plate to charge a neutral aluminum plate by induction.

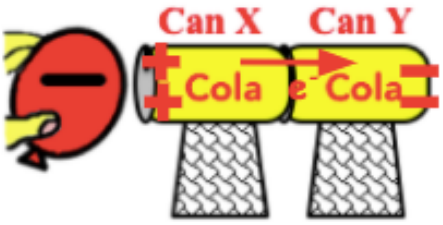


The negative foam plate forces e⁻s to move from the bottom to the top of the pie tin.

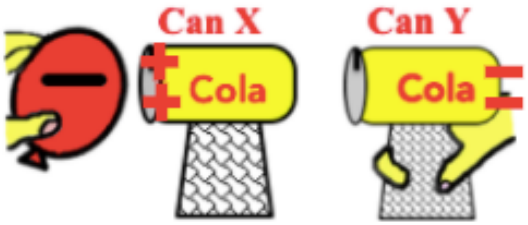


When touched by ground (hand), e⁻s move from the pie tin into the hand. The pie tin is now positively-charged.

Example 4: Use a negative balloon to charge a neutral, two-can system.



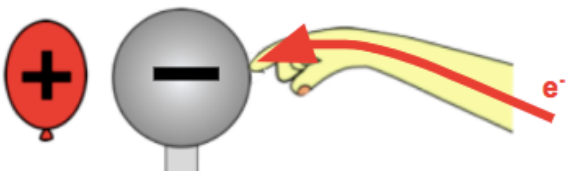
The negative balloon forces e⁻s in Can X to move away from the balloon into Can Y.



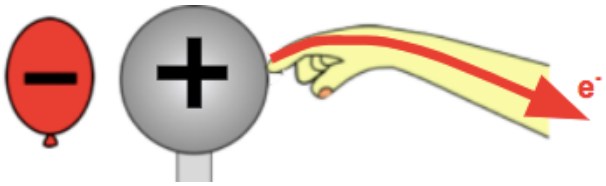
When the cans are separated, the two cans each exhibit a charge. Can Y is acting as the ground in this example.

Role of the Ground

A ground is an object that serves as a source of or a sink for electrons. Think of a ground as being either an *electron faucet* or an *electron drain*.



Ground acts as a source of electrons.



Ground acts as a sink for electrons.