Conductors and Insulators
Lesson Notes

Focus Questions:

- What are conductors and insulators?
- How does being a conductor or an insulator affect the electrostatic behavior of an object?

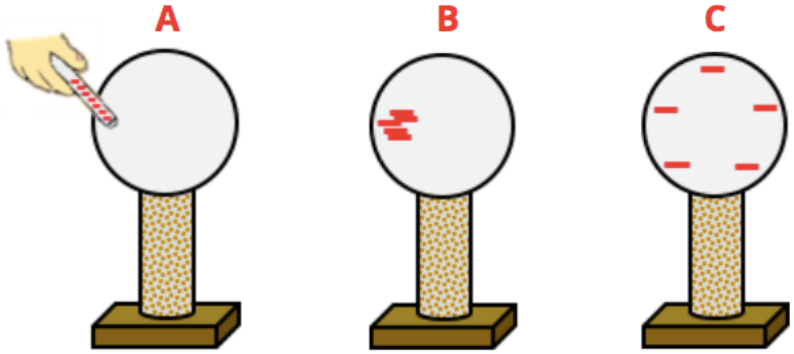
Conductors

Definition: a type of material that allows electrons to flow freely across its surface from atom to atom and particle to particle.

A: Charge a conducting sphere.

B: The conducting sphere acquires an excess of negative charge at the point of contact.

C: The excess negative charge uniformly distributes across the conducting surface because electrons are free to move.



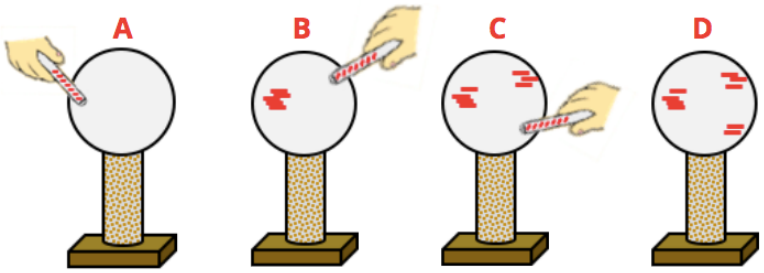
Insulators

Definition: a type of material that impedes the free flow of electrons from atom to atom and particle to particle across an object.

A: Charge an insulating sphere.

B: The excess charge resides at the point of contact and does not distribute. Charge it again at a different location.

C: The charge excess charge once more resides at the contact location and does not distribute about the surface.



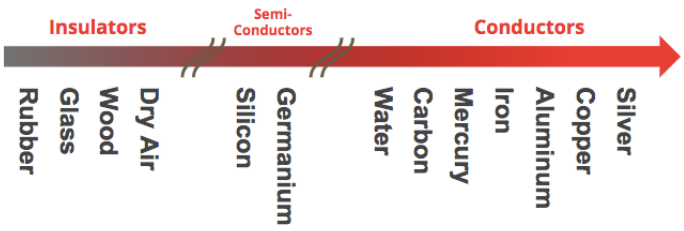
D: In the end, there are as many excess charge *deposits* as there are charging locations. The excess charge does not move to other locations along the insulating surface.

Examples of Conductors and Insulators

Metals are common conductors.

Plastics and synthetics are common insulators.

The human body is on the conductor side of the middle.

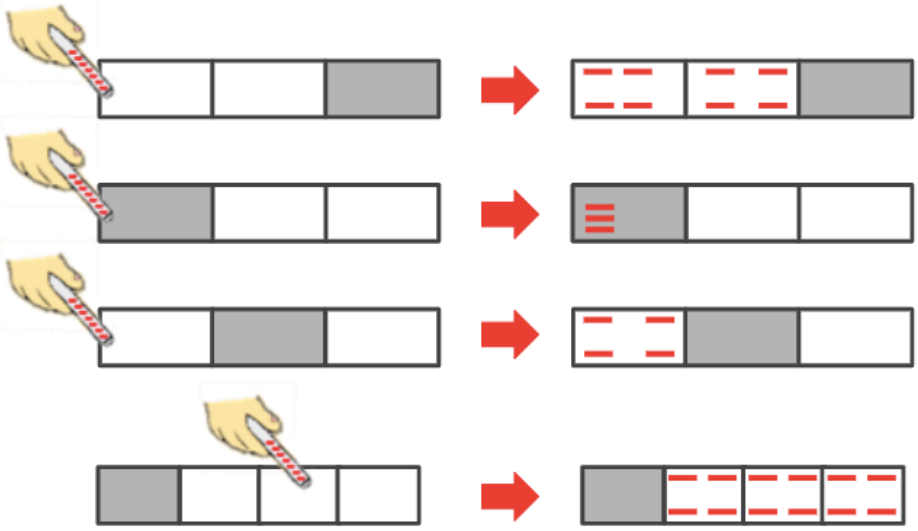


Comparison of Conductors and Insulators

Suppose that you charge an object within a series of connected objects - a mix of conductors and insulators.

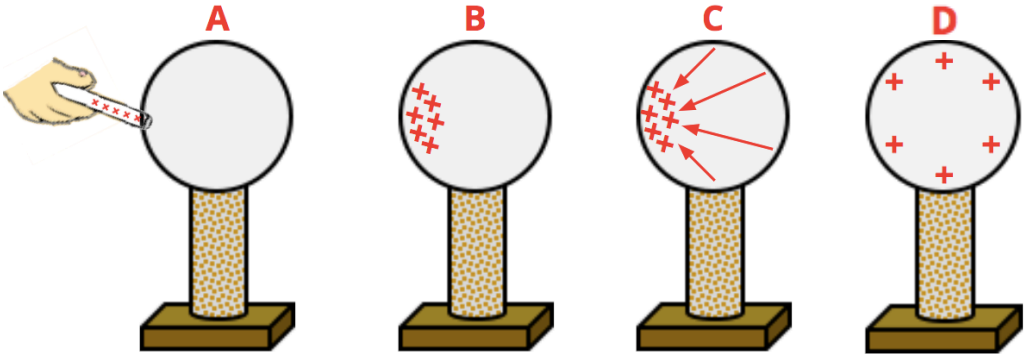
The result is shown.

Conductors allow for the free-flow of excess charge across its surface. Insulators do not.



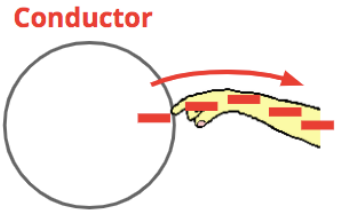
Distribution of Excess Positive Charge on Conductors

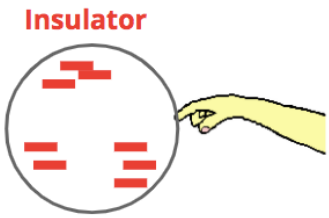
Protons are tightly bound in the nucleus of atoms and cannot move. So how does excess positive charge distribute itself on conductors? The answer: electrons move! Electrons from nearby and distant atoms are drawn towards the location of positive charge. The exiting of electrons from any given location leaves that location positively-charged. Because electrons move from all locations on the surface of the conductor (**C**), the excess positive charge eventually distributes itself evenly across the surface of the conductor (**D**).



Touching a Conductor and an Insulator

When a charged conductor is touched, there is a flow of charge from the conductor to the person. It is often enough flow to discharge the object.





When a charged insulator is touched, the charge remains on the insulator. There is no electron flow between the object and the person.