Forces on Charged Bodies

Explain the following diagram:

Neutral Objects

Neutral objects have equal numbers of positive and negative charges.

When a neutral object is brought near a negatively charged object, the positive charges of the neutral object is brought near the neutral object and the negatives are repelled.

Conduction

A conductor can be charged by a method called conduction.

In conduction, a negatively charged rod is touched to the conductor. When this happens, the electrons spread over the conductor's surface.

The same can happen with a positively charged rod and neutral conductor.

The charge can be removed from the conductor by touching it (grounding the charge).

Induction

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Induction is another method for charging a conductor. In this method, the conductor is not touched by the charged rod.

A charged rod is brought near one of two conductors that are touching. The opposing charge is attracted to the closer conductor, and the same charge is repelled to the farther conductor.

When the two conductors are separated, they have opposing charges.

Coulomb's Law

It is possible to calculate the force of attraction or repulsion of two charged objects.

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Coulomb was the first to perform a charge repulsion experiment. He determined the constant K to be equal to 9.0×10^9 $N*m^2/C^2$

The Coulomb, C, is the unit for charge (q).

A positive charge (q) and a negative charge (-q) will attract, giving a negative force.

Two like charges will repel, giving a positive force.

Example

Object A has a positive charge of 6.0×10^{-6} C. Object B, carrying a positive charge of 3.0×10^{-6} C is 0.030 m away.

a) Calculate the force on A

b) What would be the force if the charge on B were negative?

c) What distance would the two charges need to be to get a force of 45 N?

Example

Object A, with $+6.0 \times 10^{-6}$ C charge, has two other charges nearby. Object B, -3.0×10^{-6} C, is 0.04 m to the right. Object C, $+1.5 \times 10^{-6}$ C is 0.030 m below.

a) Draw a diagram for the set-up.

b) Determine the magnitude and direction of the two forces on A (while ignoring the other)

c) Determine the net force (magnitude and direction) on A.