Coulombs Law

Forces on Charges

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Forces Caused By Charges

- Two types of charges: positive and negative
- Charges exert _____ on other charges over a distance
- Like charges _____
- Opposite charges _____
- Charged objects are always _____ neutral objects

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Coulomb's Law

- Magnitude of the force that a tiny sphere with charge q_A exerts on a second sphere with a charge of q_B, separated by a distance, d, is

$$F = K\frac{q_A q_B}{d^2}$$

$K = 9.0 \times 10^9\ N \cdot m^2/C^2$

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Coulomb's Law

- Direction of Forces
  - Positive force symbolizes a _____ force
  - Negative force symbolizes an _____ force
- Charged objects are always attracted to neutral objects
- Charge and force have a direct relationship.
- Distance and force have an inverse square relationship

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Coulomb's Law Example

- The electron and proton of a hydrogen atom are separated by an average distance of 5.3 x 10^{-11}m. Find the magnitude and direction of the electric force they exert on each other.

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Coulomb's Law Example

From the Problem:

d = 5.3 x 10^{-11} m

$$F = K\frac{q_A q_B}{d^2}$$

From the Book:

K= 9.0 x 10^{9} N·m^2/C^2

q_A= -1.60 x 10^{-19} C

q_B= +1.60 x 10^{-19} C

F = -8.2 x 10^{-8} N, (-) indicates an attractive force

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Sample Problem #2

- A 3.4 μC charge and a -5.2 μC charge experience a 0.23 N attractive force between each other. How far are the two charges apart from one another?

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Sample Problem #2

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What happens when….

- Double the one of the charges?
- Double one charge and triple the other?
- Double the distance between them?
- Double one charge, quadruple the other and double the distance?

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What if..

- Two charges have a force of 13 N between them and you double the amount of one of the charges. What is the new force?
- Two charges are 20 cm apart and they have a force of 24 N between them. Spreading them to 40 cm, what is the new force?

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