



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

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

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

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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 $5.3 \times 10^{-11} \text{ m}$. 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:

$$d = 5.3 \times 10^{-11} \text{ m}$$

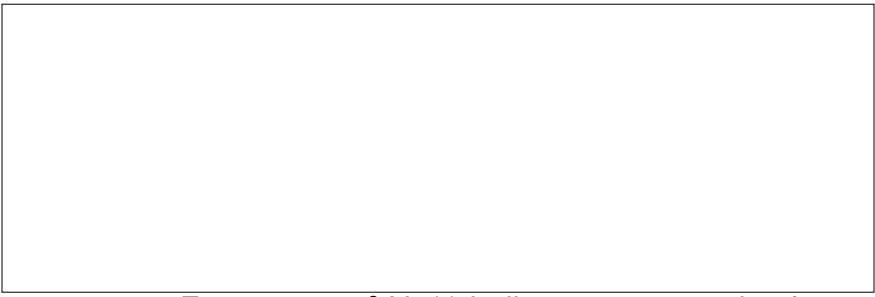
$$F = K \frac{q_A q_B}{d^2}$$

From the Book:

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

$$q_A = -1.60 \times 10^{-19} \text{ C}$$

$$q_B = +1.60 \times 10^{-19} \text{ C}$$


$$F = -8.2 \times 10^{-8} \text{ N}, (-) \text{ indicates an attractive force}$$

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Sample Problem #2

- A $3.4\ \mu\text{C}$ charge and a $-5.2\ \mu\text{C}$ charge experience a $0.23\ \text{N}$ 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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