University Physics 2

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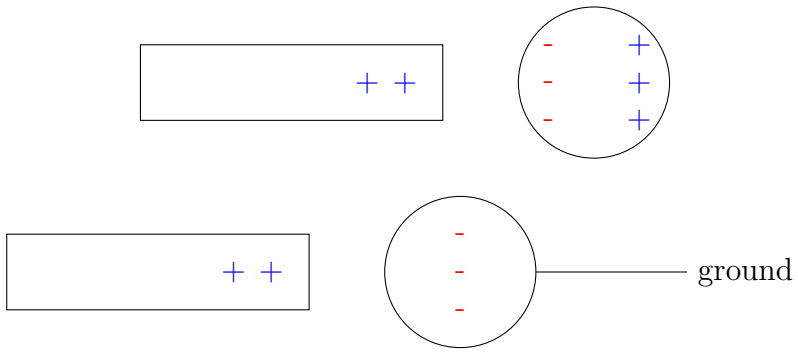
Introduction to Electric Charge

Initial Ideas:

- Charges are positive, negative, or neutral, and measured in units of Coulombs. Charge is quantized in units of electrons, which has a charge of $e = -1.6 \times 10^{-19}$ coulombs.
- They are related and analogous to electrons, protons, and neutrons in atoms.
- The movement of charges is the driving forces behind electricity and magnetism.
- Like charges repel and dislike charges attract.
- The strength of the charge is distance dependent.
- Conductors allows for the movement of charge through it, while insulators do not.
- Ground is the term for a large neutral conductor which excess charge can go into.

Induced Charge

Induced charging creates unbalanced charges using only interactions, not physical touching.



Coulomb's Law

$$\vec{F_e} = \frac{Kq_1q_2}{r^2}\hat{r}$$

where q_1 and q_2 are the charges (measured in Coulombs), r is the distance between q_1 and q_2, $\hat{r}$ is the direction of force, and K is the electric constant (equal to $8.98 \times 10^9 \frac{Nm^2}{C^2}$). The electric constant is derived from:

$$K = \frac{1}{4\pi\epsilon_\circ}$$

where $\epsilon_\circ$ is the permitivity of free space, equal to $8.85 \times 10^{-12} \frac{C^2}{Nm^2}$. Thus, Coulomb's law can be written also as:

$$\vec{F_e} = \frac{1}{4\pi\epsilon_\circ}\frac{q_1q_2}{r^2}\hat{r}$$

Note how this formula is nearly analogous to the formula for gravitational attraction.

You can find all my notes at `http://omgimanerd.tech/notes`. If you have any questions, comments, or concerns, please contact me at alvin@omgimanerd.tech