ECE 30
Day 7 Notes

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Agenda

- Review Quiz 1
- Electric Charge
- Coulomb's Law
- Superposition

Quiz 1 Review

Lost points on a silly pedantic thing. When asking if velocity is equal don't assume there is a conversion to magnitude.

Everything else was fine, just expect the pedantic next time.

Electric Charge

Amber and Cat fur can be used to make amber repel. Glass and silk also work.

If you touch them together they repel and remain??

When brought near after rubbing amber and cat fur. It collapses and repels.

Conclusions:

1. Amber and Cat fur generated a negative charge
2. Glass and silk generate a positive charge
3. Like charges Repel
4. Opposite Charges Attract
5. Charges flow through conductive materials
6. Charges cannot flow through insulators

The positive and negative assignment was arbitrary.

Set up an experiment called Coulomb Experiment to test his hypotheses.

Set up two hanging masses, with opposite charges. To measure the strength of the force he tied both masses to pulleys attached to masses. By measuring the mass required for the masses to hang without touching in equilibrium you can measure the force exerted by the charge.

He came to some conclusions.

1. $F_e \propto \frac{1}{d^2}$
2. $F_e \propto \frac{q_1 q_2}{d}$

Introduced a constant of proportionality.

$$F_e = k_e \frac{q_1 q_2}{d^2}$$

Which became known as Coulomb's Law.

The Units for K_e must be $d^3 m/q^2$. The world eventually decided on Coulomb for measuring charge. So K_e has units of $\mathrm{Nm}^2/\mathrm{C}^2$

An alternative formulation is known.

$$k_e = \frac{1}{4\pi e_0}$$

Where e_0 is the permitivity of free space.

Superposition

Net force is still the sum of all forces acting on a body. This applies to Coulomb as well as Newton.

$$q_1, q_2, q_3, q_4$$

$$\vec{F} = \vec{F_{21}} + \vec{F_{31}} + \vec{F_{41}}$$