# General Physics 2

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CAS PY 212

# Contents



Tue 03 Sep 2024 17:01

James Miller has no idea how to operate technology.
email: miller@bu.edu

Experiments this mf is doing/did:
Muon 2-g
Me2e

# Chapter 1

# Introduction to Electricity and Magnetism

**As Previously Seen**

Let $\mathbf{a}, \mathbf{b} \in \mathbb{R}^2$ be vectors with

$$\mathbf{a} = \langle a_x, a_y \rangle, \quad \mathbf{b} = \langle b_x, b_y \rangle.$$

Then

$$\mathbf{a} + \mathbf{b} = \langle a_x + b_x, a_y + b_y \rangle.$$

For some vector $\mathbf{R}$ which forms angle $\phi$ with the horizobntal,

$$\tan \phi = \frac{R_y}{R_x}.$$

Also, $F_g = -G\frac{m_1 m_2}{r^2}$.

Electric charge is a concerved quantity, and there are two types: "+" and "-". There are also conductors, which are materials that allow for free flow of electric charge, adn insulators which do not allow free movement of charges.

Conduction - charging method via touching

Induction - charges by:

1. Bring a charged object close to a neutral object, positive and negative charges rearrange within neutral object
2. Neutral object gruounnded, excess charges flow
3. Remove the ground, sphere is charged

**Theorem 1.1 (Coulomb's Law)**

The magnitude of the electric force between two point charges at $\mathbf{q}_1, \mathbf{q}_2$ with magnitudes $q_1, q_2$ is given as

$$\mathbf{F}_{12} = k\frac{q_1 q_2}{r_{12}^2}\hat{\mathbf{r}}_{12},$$

where

$$k = \frac{1}{4\pi\epsilon_0} \approx 9 \times 10^9 \frac{Nm^2}{C^2},$$

$$r_{12} = \|\mathbf{q}_2 - \mathbf{q}_2\|,$$

and $\hat{\mathbf{r}}$ is a unit vector specifying the direction of the force.

To find $\hat{\mathbf{r}}$, we have

$$\hat{\mathbf{r}} = \cos\theta\hat{\mathbf{i}} + \sin\theta\hat{\mathbf{j}}.$$

Unit vectors:

$$\hat{\mathbf{x}} \equiv \frac{\mathbf{x}}{\|\mathbf{x}\|}.$$

Electron charge is not continuous, it's quantized. Every electron has the charge

$$e = 1.6 \times 10^{-19} C.$$

This is the lowest charge seen on a *free* particle (quarks only exist within hadrons). So the charge of an object with $n$ electrons is $q = ne$.

## Lecture 2: Electric Forces and Fields

Thu 05 Sep 2024 17:00

ill do ths myself