

Lecture 1

Handouts: * Syllabus

* Intro Survey

* Attendance Sheet.

Introductory questions

* Why don't you, subject to Earth's gravity, fall through your chair?

* How does your cellphone communicate with other devices or phones?

- Introduce yourself to your neighbors

- Discuss question - what is your answer?

- what evidence supports your answer?

- assess your neighbors' answer.

A phone transmits + receives signals using

- electromagnetic waves

- moving electric charges and electric currents.

Electromagnetism is the branch of physics that provides a complete understanding of how electric charges and currents behave.

Course scope

This course will introduce you to electromagnetic theory, which gives a complete framework for describing how charges interact with each other. The theory:

1) is a fundamental branch of physics

2) explains a wide range of phenomena:

* fundamental particles (e.g. electrons, ...)

* atoms/molecules $\rightarrow$ chemistry

* materials $\rightarrow$ solid state physics

* stellar astrophysics

3) is vital for understanding + developing scientific instruments and technology

* electrical devices

↳ solicit list from class

* scientific instruments (e.g. MRI, mass spectrometers, photodetectors,...)

Optics is the study of light and can be derived from electromagnetic theory.

This is important for:

- 1) fundamental understanding of the nature of light
- 2) understanding interactions between light + matter.
- 3) designing + understanding optical instruments (microscopes, telescopes, ..)

Phys 132 is a first course in these subjects.

Course details

- 1) syllabus + contact
- 2) website / course materials page
- 3) D2L site - some material - - can you see text
- 4) Exam dates + notification deadline.

This week

- 1) Tuesday - ~~re~~ typical class, see materials page for coverage.
- 2) Wednesday - Warm Up 1 - reading quiz on D2L

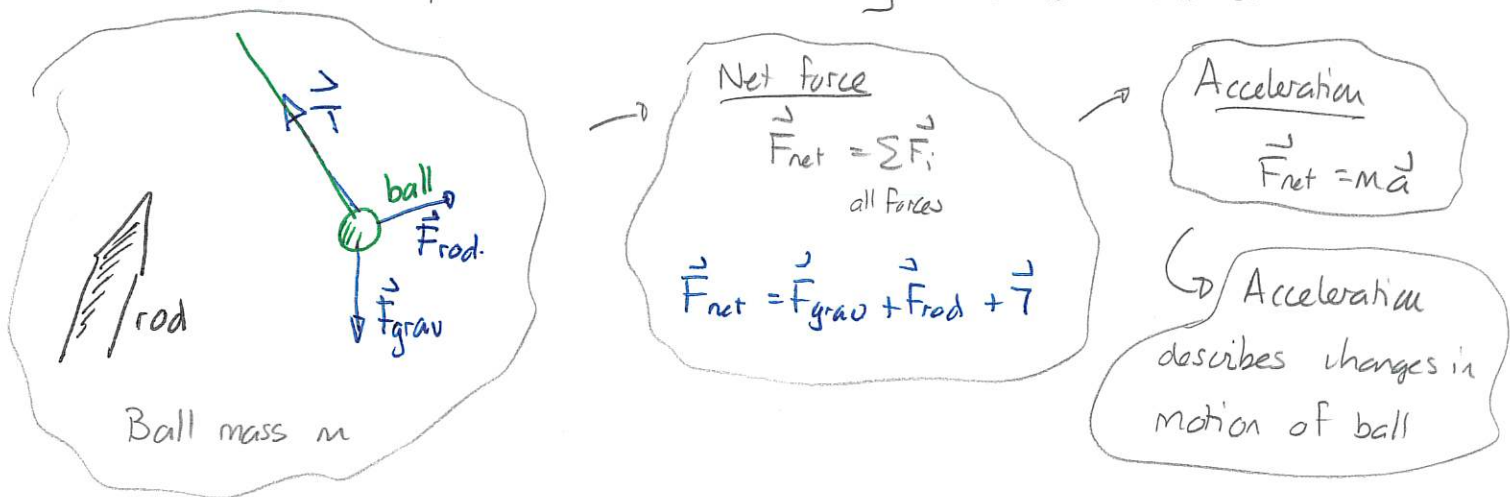
Electric charges + forces

The initial observations of electric phenomena involved rubbed objects.

DEMO: Rubbed rod + suspended ball

- 1) neutral rod + ball $\rightarrow$ observe
- 2) rubbed rod near ball $\rightarrow$ observe
- 3) rubbed rod touches ball $\rightarrow$ observe.

We can begin to explain cases 2 and 3 using Newton's mechanics



We know how to determine $\vec{F}_{grav}$ ($=mg$ pointing down). What about the force exerted by the rod?

Quiz! ~40% -

The force is repulsive and thus cannot be gravitational. Can we find a new force law to describe this?

Not all objects experience such forces but we do find that certain objects both exert and experience these forces. These objects are called electrically charged and are said to possess electric charge. The forces that they exert or feel are called electric forces.

After observing many interactions between charged objects, we find that there are two basic types:

- 1) positively charged $\oplus$
- 2) negatively charged $\ominus$

These interact qualitatively according to:

Particles with like charge repel
Particles with opposite charge attract.

So we can fix the directions of the forces. For example



Quiz 2 20%

We will provide the exact rules from electromagnetic theory to describe such forces.

DEMO: Balloon rubbed + sticks to wall

DEMO: Physics girl - Exploding soda can.