PHY232 General University Physics

About myself:
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Course web page:
http://www.pa.uky.edu/~kwng/summer2016

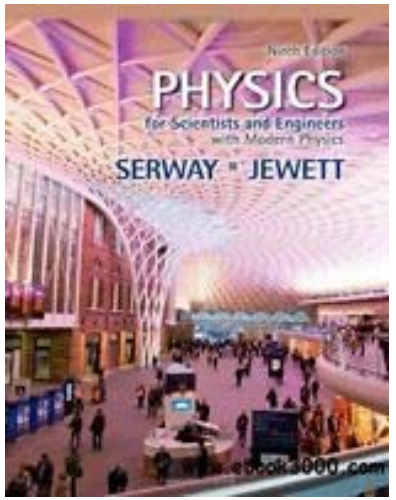
About this course

Time: M, T, W, R, and F 10:20-11:20 a.m.

Place: CP 153

Text book:

Physics for Scientists and Engineers 9th edition, by Serway and Jewett.



Grading policy

Homework	150 pts
Recitation quizzes	60 pts
Class work	40 pts
Test 1	150 pts
Test 2	150 pts
Final Examination	150 pts
Total	700 pts

1. Homework: Expert TA www.theexpertta.com/registration, code: USH19KY-4D67F8-1DK
2. Homework: 10 attempts allowed for each problem. Each homework set carries equal weight.
3. Recitation quizzes: All quizzes carry equal weight. Two lowest scores will be dropped.
4. Course work: Each lecture carries equal weight. Two lowest scores will be dropped.

Final Grades

Grading scale for undergraduates:

92 % or above	A
80% or above	B
60% or above	C
50% or above	D
Below 50 %	E

The actual curve at the end of the semester may be adjusted according to the class performance and it may be slightly easier than the above letter grade assignment.

Class 1: Charges and Coulomb's Law

The four fundamental interactions of nature

(From Wikipedia: Fundamental interaction)

Electric | Magnetic

Property/Interaction	Gravitation	Weak	Electromagnetic	Strong	
		(Electroweak)		Fundamental	Residual
Acts on:	Mass - Energy	Flavor	Electric charge	Color charge	Atomic nuclei
Particles experiencing:	All	Quarks, leptons	Electrically charged	Quarks, Gluons	Hadrons
Particles mediating:	None Graviton hypothesised	W^+ W^- Z^0	γ	Gluons	Mesons
Strength in the scale of quarks:	10^{-41}	10^{-4}	1	60	Not applicable to quarks
Strength in the scale of protons/neutrons:	10^{-36}	10^{-7}	1	Not applicable to hadrons	20

All this course about

Charges

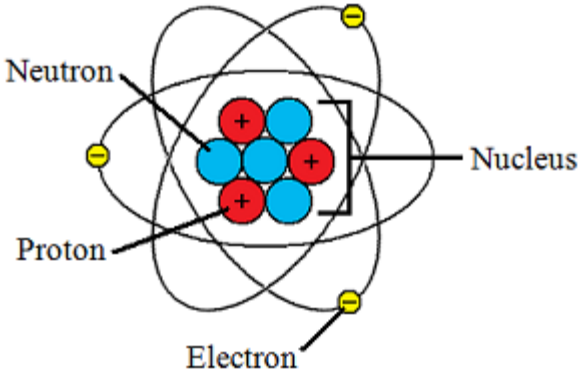
Units for charge: Coulomb (C)

Charge has sign: positive (+) or negative (-)

Basic charge: 1.602×10^{-19} C

Charge of an electron = -1.602×10^{-19} C

Charge of a proton = $+1.602 \times 10^{-19}$ C



A neutral atom/molecule must have equal numbers of proton and electron.

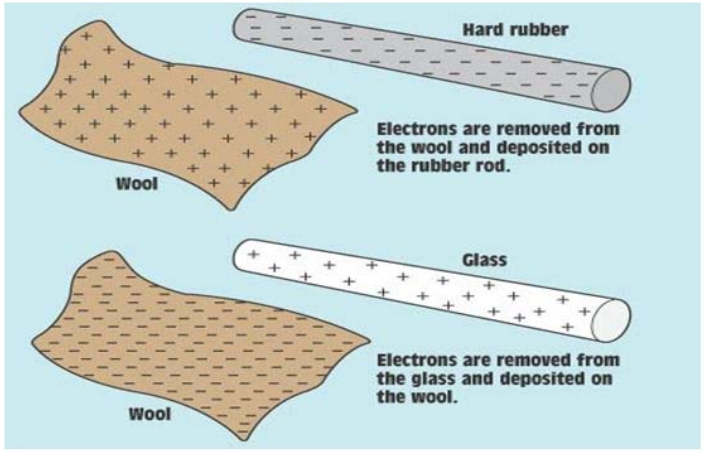
An atom/molecule can be made positive or negative by removing or adding electrons to it.

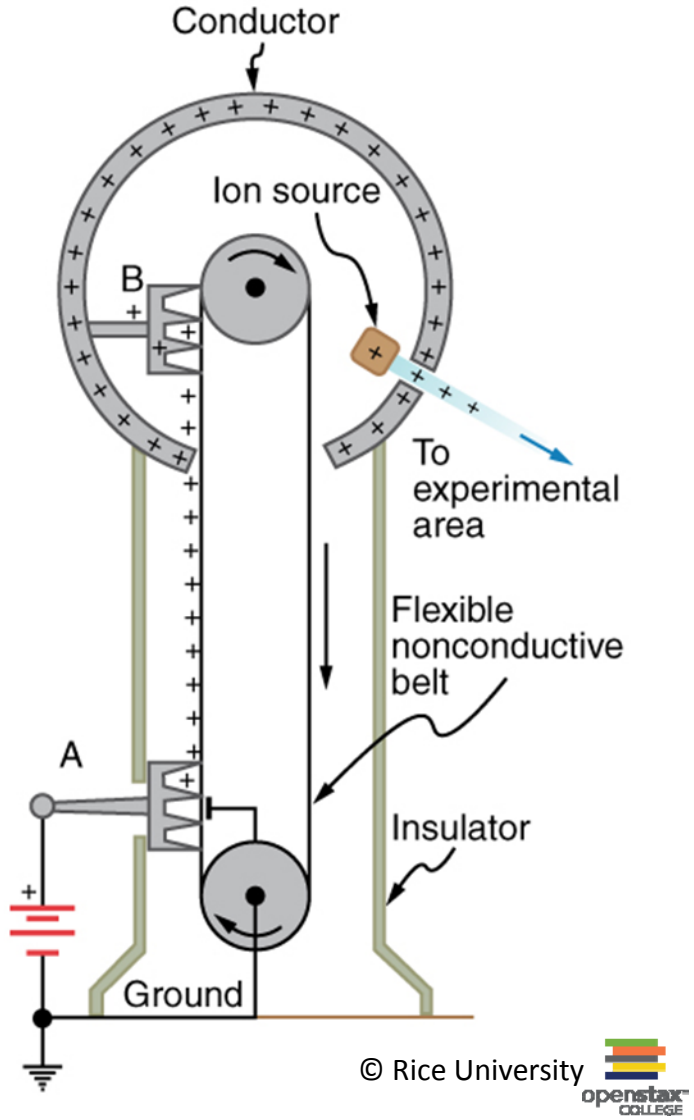
Attraction and repulsion between charges

Two charges repel if they have the same sign.

Two charges attract if they have the opposite sign.

Producing electrostatic charges





Van de Graaff generator

What is inside the tower of this building?

Conservation of charges

Total charge is constant in any process

(p. 698 of textbook)

Conductors, Insulators, and Earth

Charges can move freely in a *conductor*.
An *insulator* does not allow charges to move through them.

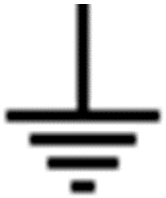
(p. 700 of textbook)

For a net charge in a conductor:

(i) They can only stay on the surface of the conductor.
(ii) They will be more concentrated at sharper areas.

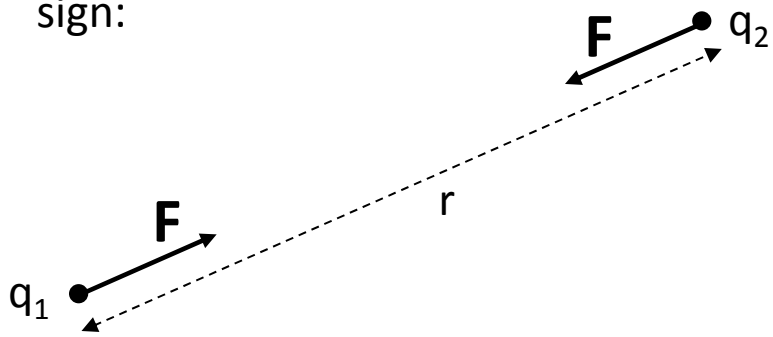
Earth is a gigantic charge reservoir. Receiving or giving a few charges will have no significant effect on it.

Symbol:

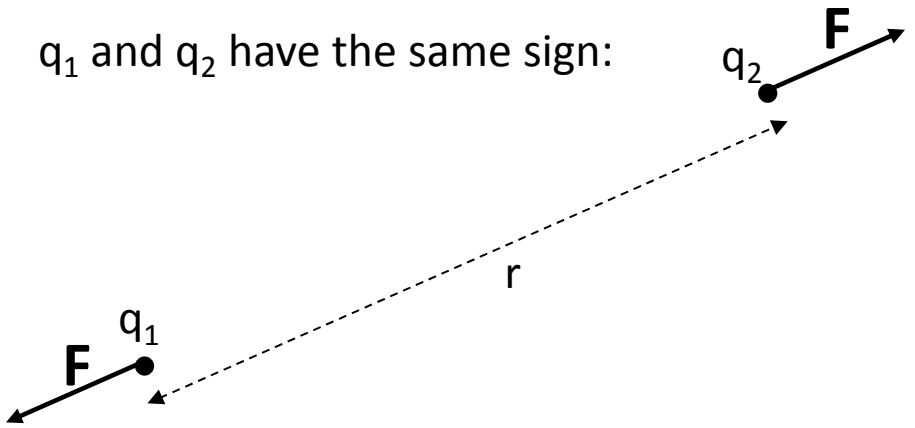


Coulomb's Law

q_1 and q_2 have the opposite sign:



q_1 and q_2 have the same sign:



$$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2}$$ ← Magnitude equation

$\varepsilon_0 = 8.8542 \times 10^{-12}\ C^2/Nm^2$

1. In SI units (aka MKS system), charge q is a new dimension and it has no mechanical equivalence, i.e. you can not express Coulomb in terms of kg, m, and s. So now we have four basic units: C, kg, m, and s.
2. There is a (4π) here so that there is no (4π) in the Maxwell's Equations. For this reason, the SI units is called the "rationalized" units.