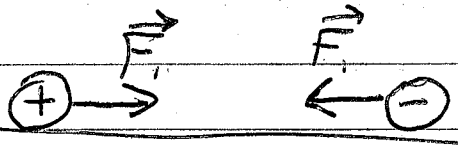
① Phys 1402 General Physics II

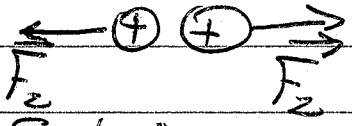
Why study E & M?
- Our society is electronic.
  - communication / information
  - energy
- Part of Light & Optics
- E & M holds matter together & apart.

Chap 15 - Electrostatics

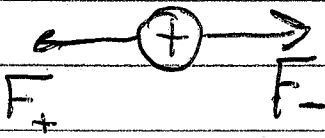
Matter is made of atoms.
Atoms have protons (+) and electrons (−).
(+) and (−) are the charge of the particles.
Charges exert forces on each other.
Opposites Attract.



Like Charges Repel:



What happens to a ⊕ if it "sees" both ⊕ and ⊖?



Our Charge.
Net Force is
$\vec{F}_- + \vec{F}_+ = 0$

Equal & Opposite,
@ same place.

Neutral: • Net zero charge
• Causes no force

(2)

Most regular matter is neutral.

How small are the particles?

	Mass	Charge
Proton	1.67×10^{-27} kg	$+e = +1.6 \times 10^{-19}$ C
Neutron	1.67×10^{-27} kg	0
Electron	9.11×10^{-31} kg	$-e = -1.6 \times 10^{-19}$ C

Neutral means $\#_p = \#_e$

Typically: $\#_p = \#_n$

Ex: 1 kg object

	Mass	Count
Mass of protons:	0.5 kg	3×10^{26}
neutrons:	0.5 kg	3×10^{26}
electrons:	~ 0	3×10^{26}

$M = N m$

- m — individual
- N — count
- M — Total

How wrong was that ☹? ←

Charge: $N_e q_e = (3 \times 10^{26})(-1.6 \times 10^{-19}\ C) = 48 \times 10^{6}$ C

Mass: $N_e m_e = (3 \times 10^{26})(9.11 \times 10^{-31}) = 0.0003$ kg