

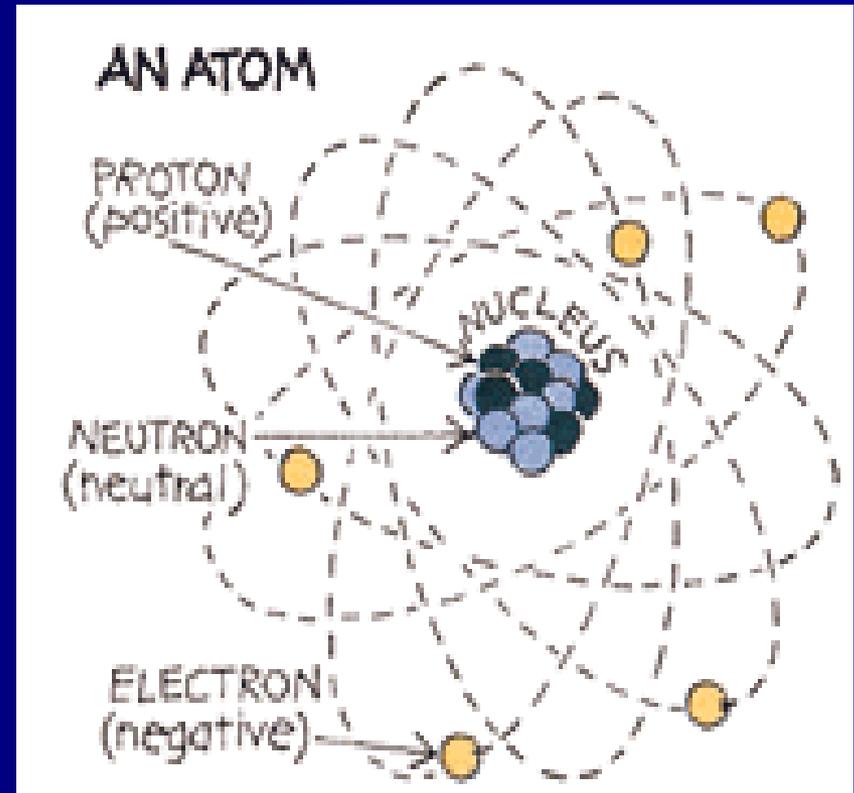
Radiation Interaction with Matter

July, 2009

Interaction with Matter

- "For by convention color exist, by convention bitter, by convention sweet, but in reality only atomos and void."

Democritus of Greece,
circa 500 B.C.



Energy Transfer

- Mass, Charge, and Energy of the radiation
- Density of the matter
- Physical interaction
- Electrostatic interaction (attraction or repulsion)



Energy Transfer Effects

- **Excitation**- increase energy; no change in electrical charge of the atom
 - fluorescence – electron shell
 - fission – nucleus
- **Ionization** - minimal increase energy; change in electrical charge of the atom

Nuclear Radiation Characteristics

Radiation	Mass	Charge	Energy	Speed
Alpha	~ 4	+2	High	Low
Beta	1/1800	-1	Variable	High
Gamma	0	0	Variable	High
Neutron	1	0	High	High

Radiation Interaction Characteristics

Radiation	Energy Transfer	Transfer Mode	Distance Traveled
Alpha	High	Physical and Electrostatic (a)	Very short
Beta	Med to low	Electrostatic (r)	Short
Gamma	Low	Physical	Long
Neutron	Very Low	Physical	Very Long

So What?

**Knowing how radiation
interacts with matter, allows us
to:**

- Detect**
- Protect**