Definition

Atoms. molecules, ions and isotopes

- *Atoms: smallest neutral particles of substance made up of*
- *Molecule: 2 or more atom chemically bond together*
- *Ions: atoms lost (Positive ion) or gained(negative ion) electrons*
- *Isotopes: the **nucleus** of atom that have same number of proton but different number of neutron*

Radioactive Decay

- *Nuclei crack/split emmitting α, β, γ particles, making a more stable element*
- Sub-atomic particles

Properties	α	β	γ
Description	halium nucleus	**fast moving** electron/positron	high energy electromagenetic wave
Penetration (related with energy)	smallest (can be stopped by paper or cm of air)	medium (mm of aluminium)	highest (Can not be stopped but only reduced to accetable level by cm of lead and m of concrete)
Ionization (when atoms lossing/gaining electron)	Strongest	medium	Smallest
Energy Range	0.5c	0.5-0.9c (Conservation of momentum,possibility of more than one electron shoot at the same instance)	c
Interacting with fields	E.f.:Yes(as the direction of field line); M.f.:Yes	E.f.:Yes(reverse the direction of fieldline); M.f.:Yes	E.f.: No,;M.f.:No
Uses	smoke detector	thickness control of sheet	extending shelf life/sterilization
Danger	In: most Out: least	In: medium Out: medium	In: least Out:most

Classifying Particles

- Particles

- Fundamental/Elementary (not made from smaller):
    - Leptons
        - e^-
        - e^+
        - V_e and $\overline{V_e}$
        - V_μ and $\overline{V_\mu}$
    - Quarks
        - u($+\frac{2}{3}e$)
        - d($-\frac{1}{3}e$)
        - s($-\frac{1}{3}e$)
- Non-Fundamental/Hardons (made from quarks):
    - Barons(3 quarks)
        - $p = uud$
        - $n = udd$
    - Mesons(2 quarks)
        - Kaons(one contains s or $\overline{s}$)
            - k_0
            - k_+
            - k_-
        - Pions(do not contain s or $\overline{s}$)
            - π_0
            - π_+
            - π_-

Concept

Rutherford Experiment

- Proof Plam pudding model is wrong(by J.J.Thompson)
    - Atom is made of postively charged with the negative charged stick as pudding plams
- Prapose planetary model
    - Nucleus is highly condensed matter of postive charged and electron ciraling around the nucleus as planet
- Preparation
    - Box of lead specific to one direction
    - a substance of radioactive placed inside
    - 2-3 atom thickness thin gold foil
    - Placed in vacum chamber prevent α particles to collide with air particles
    - Similar reason must keep in darkness
    - G.M. tube connect to the counter around the foil in all direction

- Result
    - 98% are directly pass trhough --> big distance between nucleus and electron
    - Few are bent in small angle --> nucleuas is postivly charged
    - very few bent in large angle --> nucleuas is postivly charged and concentrate the mass

Equation and diagrams of decay

- $\sum atomic\ number$ and $\sum mass\ number$ stays **constnat**

Conservation

- Mass AND energy conserved all together
- Momeuntum conserved
- Nuceloni number conserved(proton number don't conserved)
- Mass number conserved(mass don't conserved)
- charge conserved

Strong force and Weak force

- Strong force control hardron and quarks: hold nuclear together and responsible for α decay
- Weak force control leptons: responsible for β decay