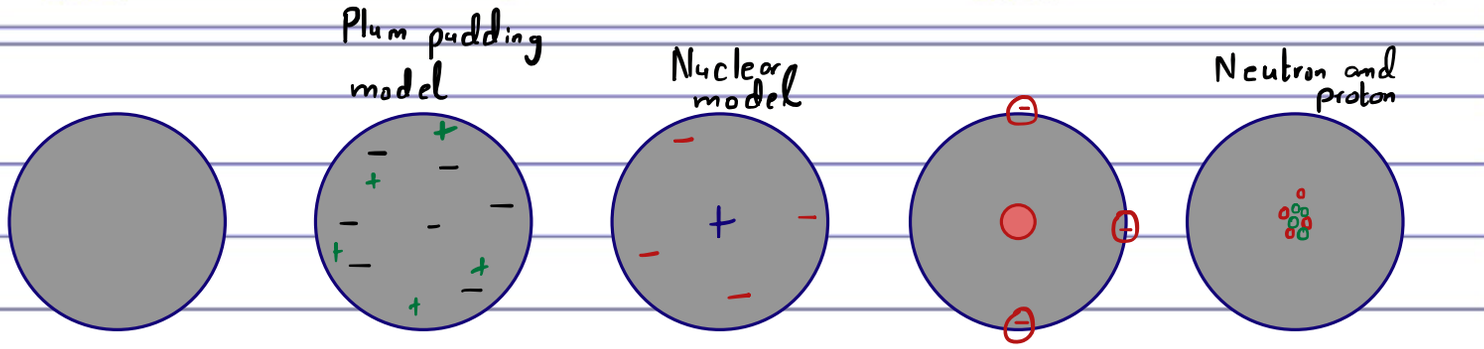
Topic: _____ Date: _____



Dalton's Atomic model | Thomson's Atomic model | Rutherford Atomic Model | Bohr's Atomic model | Chadwic's Atomic model.

Composition and Structure of Atom.

35.5

CL

17

(Neutral Atom)

⇒ Composition

Proton : 17

Neutrons: 18

Electrons: 17

- Proton and neutron Exist inside the nucleus of an atom
- Electrons Exist around nucleus in Shells.

No effect of any external factor

α β γ

Radioactivity : Spontaneous emission of invisible radiations from unstable nuclie.

Nikl ne

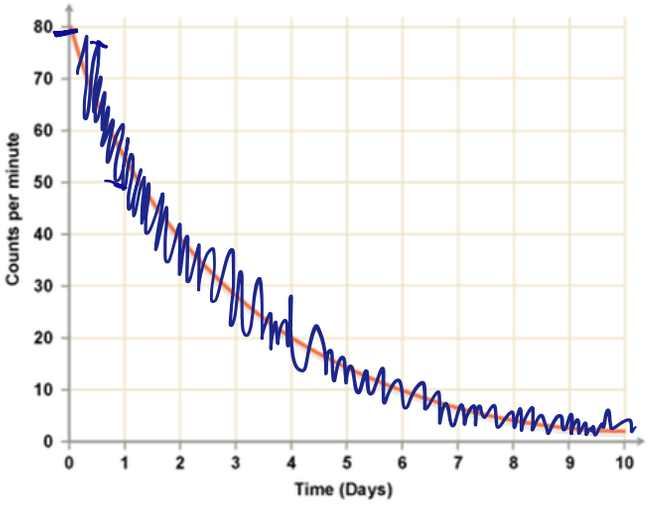
Topic: _____ Date: _____

Radioactivity:

* Phenomenon of the emission of radioactive radiation from the nucleus of an atom (unstable)
* The unstability of the nucleus due to insufficient binding force to keep all the particles intact results in emission of these radiation.

Types of Radiation

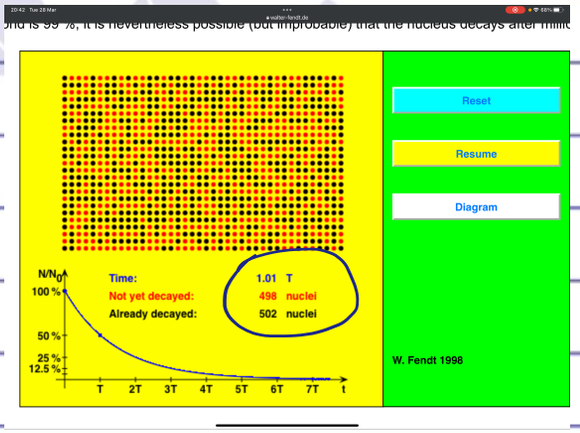
1) Alpha
2) Beta β^+ (+ve electron) β^- (-ve electron)
3) Gamma.
4) Neutron ✗



Properties of Radioactivity.

1) Random process: All nuclie have equal chance to decay. i.e. emit radioactive radiation at any time No prediction which nucleus decay when.

2) Spontaneous Process: There is no effect on the rate of emission of radiation by changes in external conditions e.g temperature, pressure etc



1000 $\xrightarrow{10\,min}$ 500 $\xrightarrow{10\,min}$ 250 $\xrightarrow{10}$ 125

Topic: α $^{4}_{2}$ Date:

electron positron

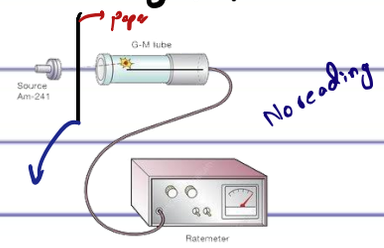
β^{-1} β^{+1}

Alpha: (α)

→ +2 charge

→ High ionisation.

→ Low penetration can be stopped by paper.



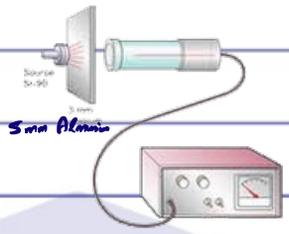
5cm few cms

Beta: (β)

→ −1 charge

→ Medium ionisation

→ Can be stopped by few mm thick Almunium



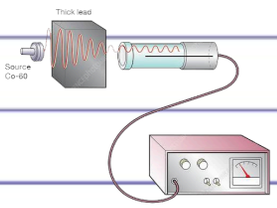
25cm

Gamma: (γ)

→ 0 charge

→ low ionisation

→ Reduced by few cm thick Lead.



infinite.

Inside a nucleus

$\beta^{-1} = e^{-}$ ✓

$\beta^{+} = e^{+}$

$^{1}_{0}n \longrightarrow {}^{1}_{1}p + {}^{0}_{-1}e + \bar{\nu}$ electron anti nutrino.

proton number

When nutron is converted in proton it will emit electron and electron anti nutrino.

${}^{1}_{1}p \longrightarrow {}^{1}_{0}n + {}^{0}_{+1}e + \nu$ electron nutrino.

proton number

When proton is converted to neutron it will emit a positron and electron nutrino.

remains

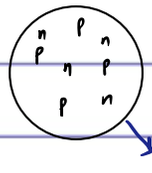
* In a nuclear reaction total momentum, energy and Proton number conserved.

$^{200}_{50}X \longrightarrow {}^{0}_{-1}\beta + {}^{200}_{51}W$ + energy

Topic: _____ Date: _____

$$^{A}_{Z}X \longrightarrow {}^{4}_{2}\alpha^{2+} + {}^{A-4}_{Z-2}W + \text{energy.}$$

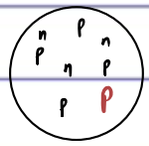
$$^{A}_{Z}X \longrightarrow {}^{0}_{-1}\beta^{-1} + {}^{A}_{Z+1}Z$$



$Z = 4$
$A = 8$

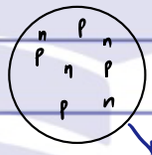
$\beta^{-1} \rightarrow$ electron.

In Emission of Bet egative is no change in neucleon number



$Z = 5$
$A = 8$

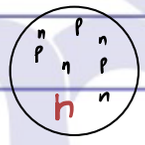
$$^{A}_{Z}X \longrightarrow {}^{+1}_{+1}\beta + {}^{A}_{Z-1}Z$$



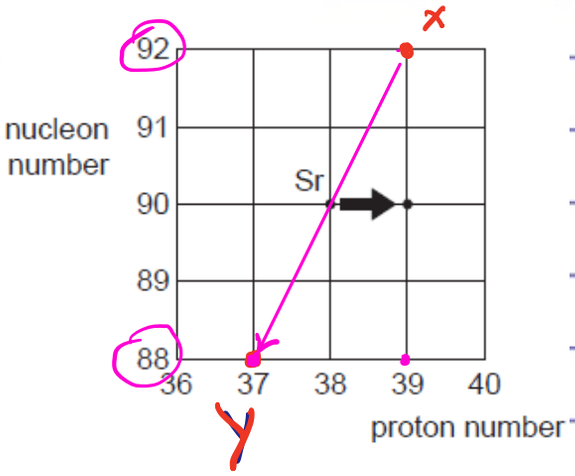
$Z = 4$
$A = 8$

β^{+1}

In Emission of Beta positive there will be no change in nucleon number



$Z = 3$
$A = 8$



Proton number increase.

* This is emission of Beta negative particle.

If Alpha was emitted from X.

$$^{91}_{39}X \longrightarrow {}^{87}_{37}Y + {}^{4}_{2}\alpha$$

$$^{238}_{92}U \longrightarrow {}^{234}_{90}Th + {}^{4}_{2}\alpha$$

602 Sextillion.

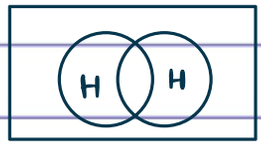
Topic: _____ Date: _____

The size and Structure of atom.

Atom is extremly strong.

2g of Hydrogen : → 6.02×10^{23} molecules.

H_2



Hydrogen is diatomic

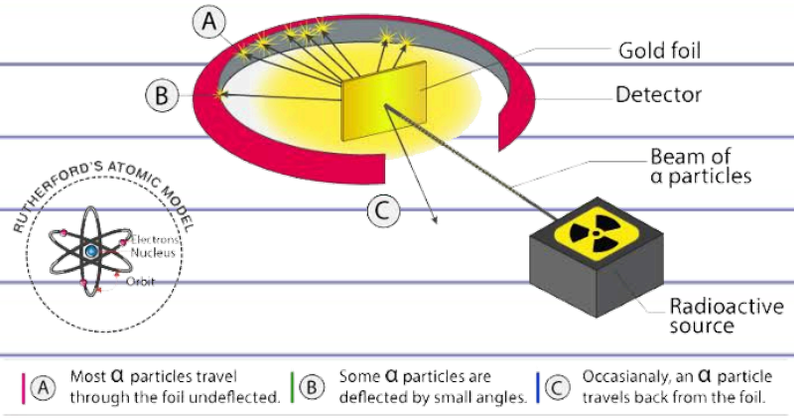
$6.02 \times 10^{23} \times 2 = 12.04 \times 10^{23}$

No microscope has ever seen an atom. }

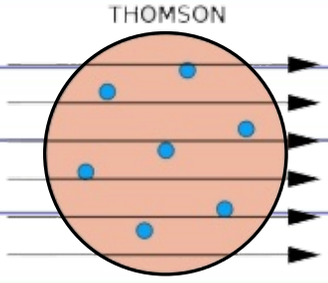
An atom is so so so so so so so small

Topic: _____ Date: _____

⇒ Grieger Morsdon Gold Foil Experiment.

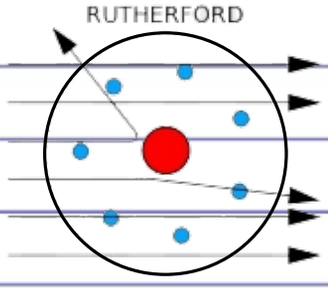


Expectation ⇒



Vs

Reality ⇒



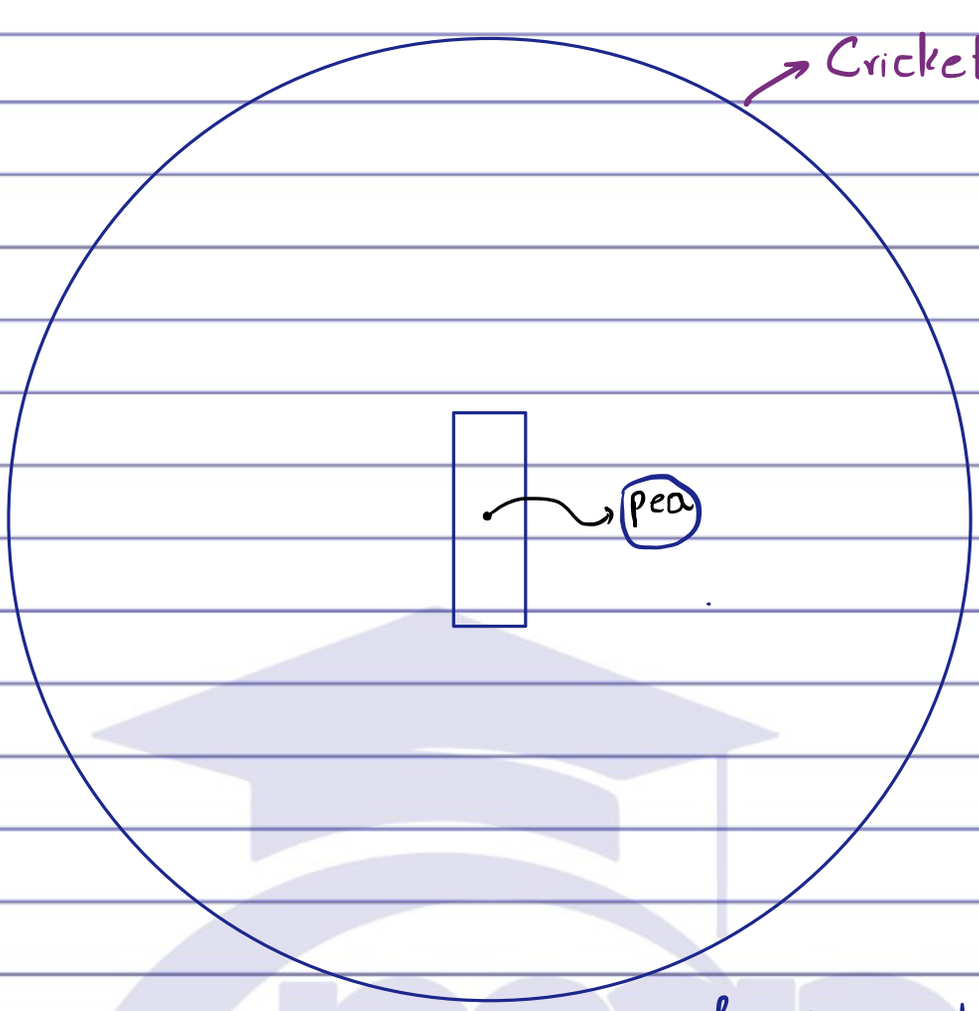
⇒ Observation:

1) Most of Alpha particle were able to pass through.
2) A few deflected at large angles.
3) Very few of them bounced back.

Reasons of Observation.

1) The atom is mostly empty. (99.99.) So Most of Alpha passed undeviated
2) All the charge and mass is concentrated at the centre of atom. i.e. nucleus.
   Alpha particle which approched close, deflected due to repulsion.
3) The nucleus is very small in size, so only few alpha articles approached heads on the nuceus and bounced b

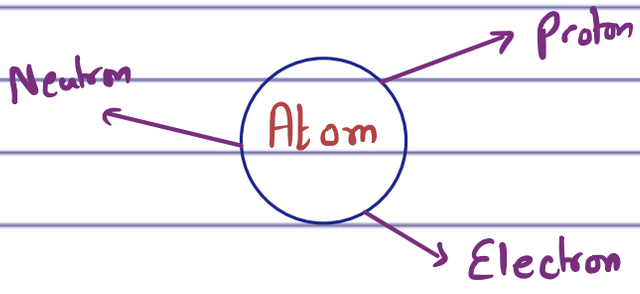
Topic: _____ Date: _____



mass of proton = 1.66×10^{-27}

mass of electron = 9.11×10^{-31}

Quarks:



In an atom there are 30 subatomic particles are proved.

Topic: _____ Date: _____

Electron | Proton Neutrons

Composite particles

Fundamental Particles

$e = 1.6 \times 10^{-19}$

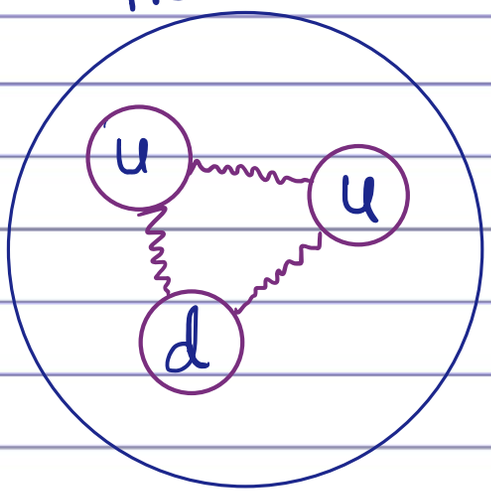
Quark	Symbol	Charge.
Up	u	$+\frac{2}{3}e$
Down	d	$-\frac{1}{3}e$
Strange	s	$-\frac{1}{3}e$

Up, down or strange quarks cannot exist alone they exist together and eventully charge is a multiple of elementary charge.

Quark	Symbol	Charge.
Anti up	$\bar{u}$	$-\frac{2}{3}e$
Anti down	$\bar{d}$	$+\frac{1}{3}e$
Anti strange	$\bar{s}$	$+\frac{1}{3}e$

Topic: _____ Date: _____

Proton

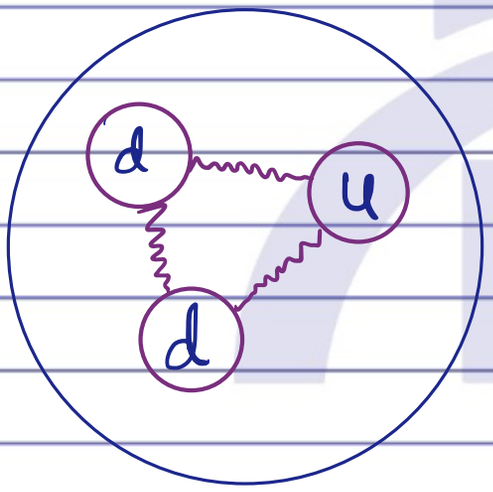


Proton has 2 upquarks and one down quark.

And they are combined by weak nuclear forces.

Weak nuclear forces: Between quarks	Strong nuclear forces: Between electron and proton

neutron



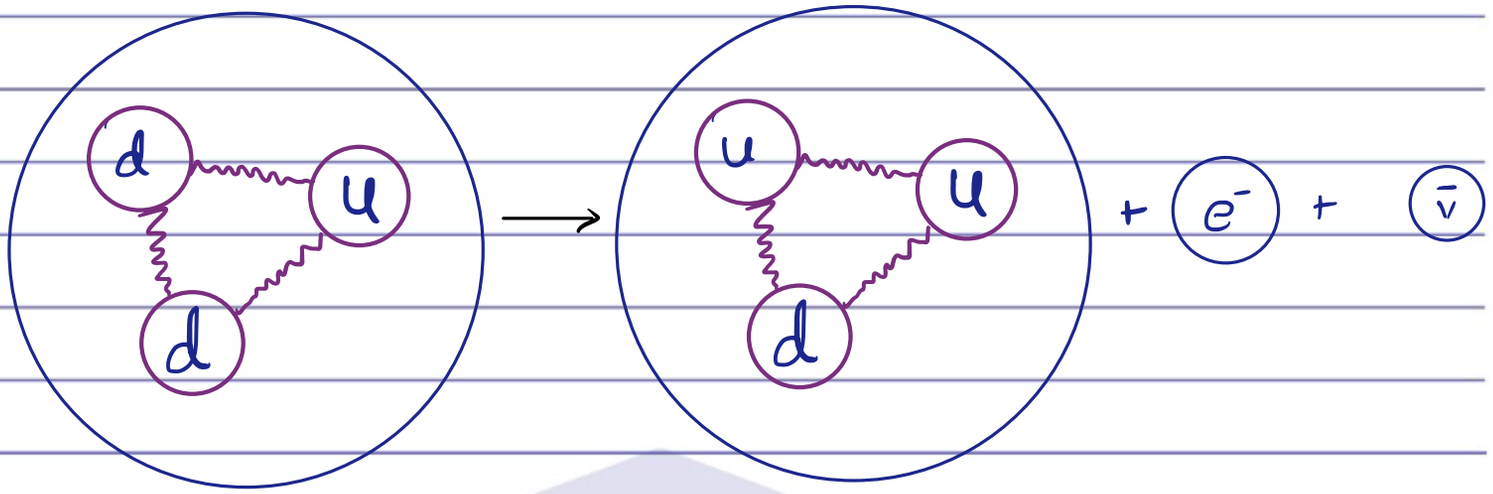
Neutron consist on 2 down quarks and one up quark.

And they are combined by weak nuclear forces.

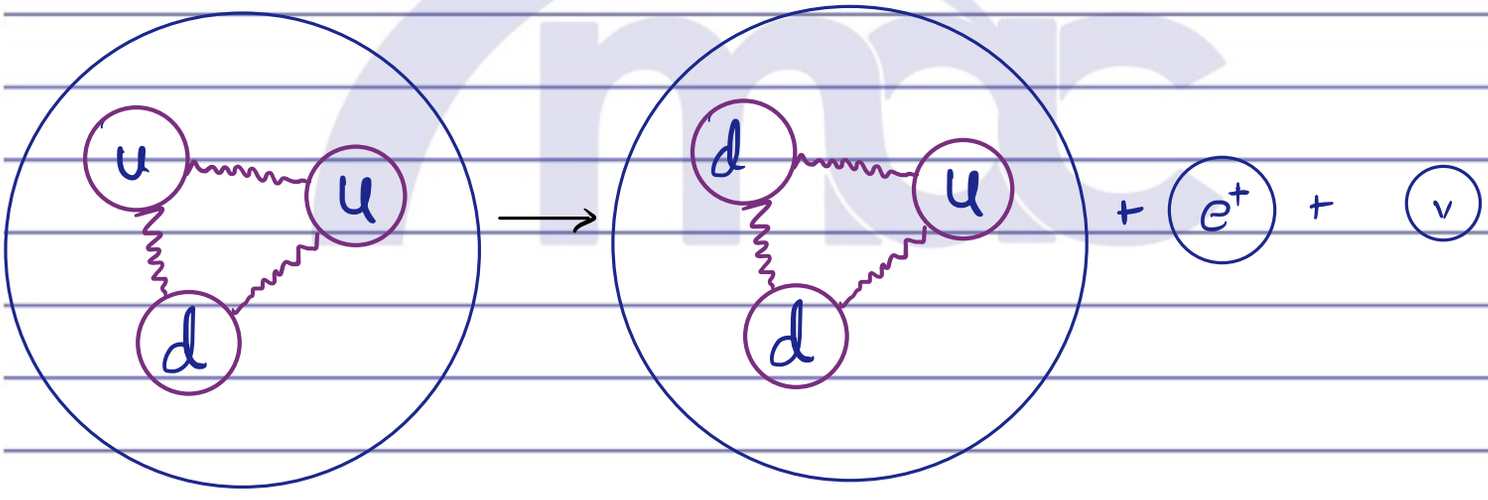
Charge on proton	Charge on neutron
$u + u + d = +\frac{2}{3}e + \frac{2}{3}e - \frac{1}{3}e$	$u + d + d = +\frac{2}{3}e - \frac{1}{3}e - \frac{1}{3}e$
$= +e$	$\Rightarrow 0e$

Topic: _____ Date: _____

Quark model of Beta decay.



n ⟶ p + β^+ + electron anti neutrino



p ⟶ n + β^+ + electron neutrino

Topic: _____ Date: _____

Particle Family.

Leptons ⟶ Electrons ⟶ e^-, e^+, ν, $\bar{\nu}$

Hadrons ⟶ Baryons ⟶ Protons (P), neutrons (n)

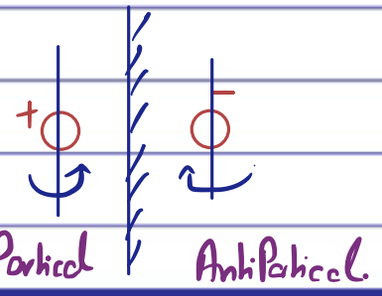
The electron e^- ⟷ The anti electron e^+

The up quark u ⟷ The anti up quark. $\bar{u}$

The down quark d ⟷ Anti down quark $\bar{d}$

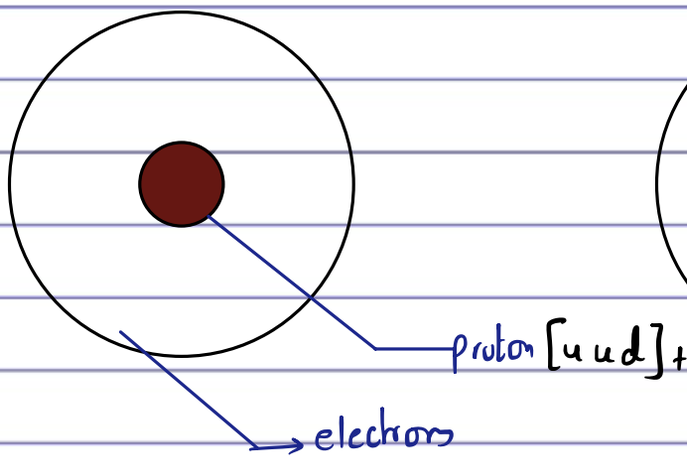
Every particle has an equivalent antipartical. An Antipartical is like the mirror image of the respective particle. So an antipartical has.

1) Same mass as orignal
2) Opposite charge
3) It spins in opposite direction

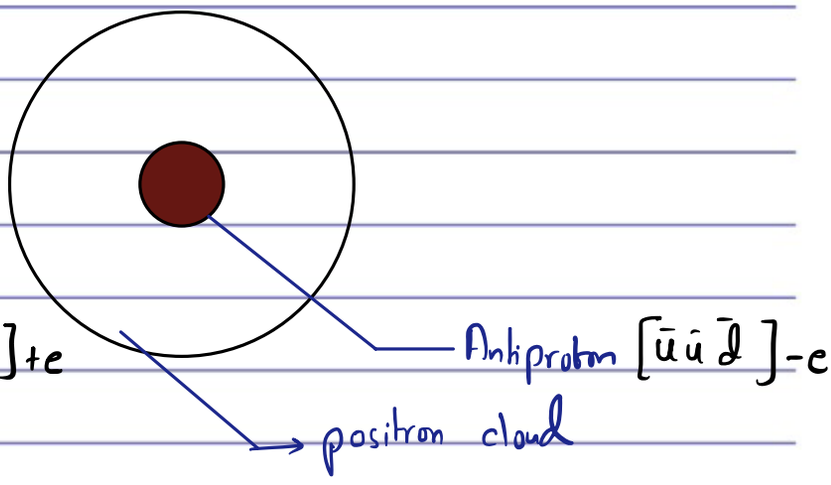


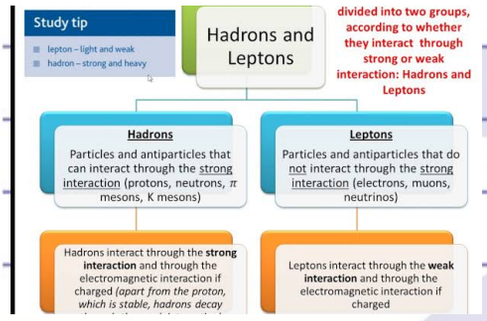
Topic: _____ Date: _____

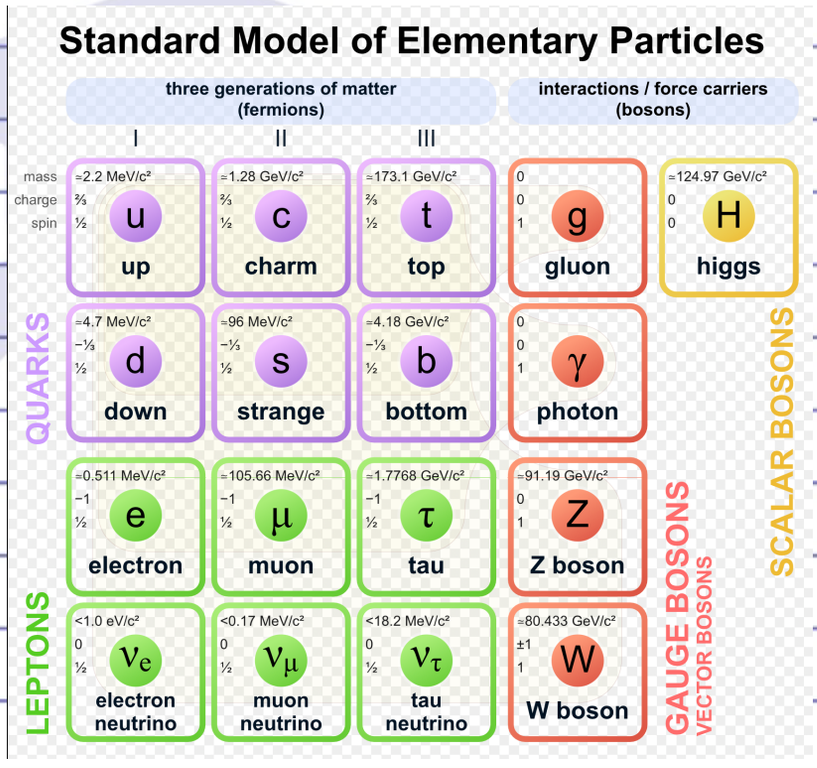
The hydrogen atom.



The anti Hydrogen atom.







0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

12amu

$n = 1.66 \times 10^{-27}$

$\rho = \frac{m}{V}$

Topic: _____ Date: _____

$\frac{4}{3}$

1.66×10^{-27}

How dense is a nucleus.

$\rho = \frac{m}{V}$

Carbon atom : 6p and 6n

mass = 12u & 1n: 1.66×10^{-27}

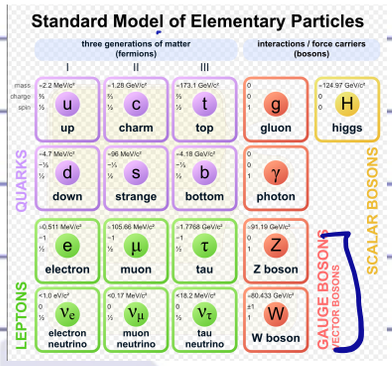
diameter of nucleus: 10^{-14} m

(Assuming nucleus is sphere)

$\rho = \frac{12 \times 1.66 \times 10^{-27}}{\frac{4}{3}\pi\left(\frac{10^{-14}}{2}\right)^3}$

(extremely dense)

The standard model



Fermions

Hadrons
(made up of quarks)

- Mesons
  - 2 quarks
    - π^+
    - ϕ
- 3 quarks
  - Proton ✓
  - neutron ✓
  - Antiproton ✓
  - Anti neutron ✓

leptons
(fundamental)

- electron ✓
- Muon
- Tau
- Neutrino ✓

Bosons
(Force Carriers)

- Gluon (SNF)
- W-boson (WNF)
- Z boson (WNF)
- Photon (EMF)
- Graviton
- Higgs Bos

Topic: _____ Date: _____

Fundemental Forces of Universe

1) Strong Nuclear force
2) Electro magnetic force
3) Weak nuclear force
4) Gravitational force.

Decreasing Strength of force. ↓

⇒ **Anti Matter.**

- Particles having same mass but opposite charge.

- When particles collide with there Corresponding Antimatter. the Annhialate one another Energy is released as Electromagnetic Radiation.

+ proton (uud) — antiproton ($\bar{u}\bar{u}\bar{d}$)

0 neutron (udd) 0 antineutron ($\bar{u}\bar{d}\bar{d}$)

− electron (e) + positron ($\bar{e}$)

0 neutrino (ν) 0 antineutrino ($\bar{\nu}$)

Neutrino :

- Produced during beta decay
- No charge.
- Negligible mass.

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com

Topic: _____ Date: _____

0309 2656780 mahad__amer mahadamerchaudhry@gmail.com