

Doc - I (H/S) :- Chapter - At. Structure.Topic - Isotopes, Isobars & BoloneIsotopes :-(Greek, α iso = same, topos = place)Definition :- Atoms of same element having same at. no but differ in their mass. no. and thus occupy same position in P.T. are called isotopes.

(OR)

Atoms of same element having same no of protons but differ in their no of Neutrons.

(OR)

Atoms which differ in at. mass (roughly mass. no) or radioactive properties but have identical chemical properties.

Example :- Hydrogen.

	No of p.	No of n
H^1/H^1 — Hydrogen — 1	1	0
H^2/D^2 — Deuterium — 1	1	1
H^3/T^3 — Tritium — 1	1	2

Types of isotopes :-

Two types of isotopes —

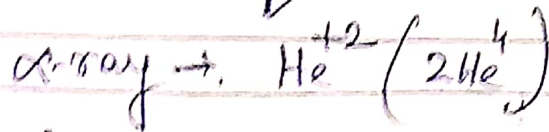
① Stable and Non-Radioactive — which do not takes part in Radioactivity.

Example - (a) C^{13} , C^{12} (b) Cu^{63} , Cu^{65}

② Unstable & Radioactive — which takes part in Radioactive disintegration process —

Example $\rightarrow U^{234}$, U^{235} , U^{238}

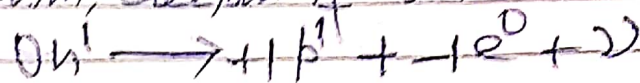
Generation of isotopes —
by the radioactive emission of α -ray & two consecutive β -rays.



β -ray — electron emission ($-1e^0$)

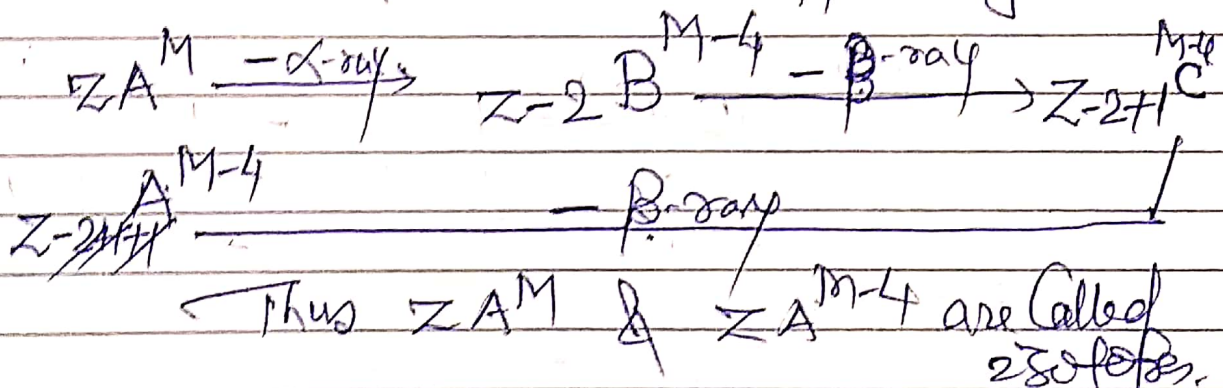
Mechanism of β -ray emission.

Neutron from nucleus change into proton, electron & neutrino.



Remember — (i) By the emission of one α -ray the atomic no decrease by two-unit & mass no by four-units.

(ii) By the emission of one β -ray atomic no increase by one unit but mass no have no change.



Relation b/w Types of Nuclei & Number of Protons
Constitution of Nucleus | No of stable isotopes

Proton	Neutron	
Even	Even	162
Odd	Even	52
Even	Odd	56
Odd	Odd	4

Uses of Isotopes:-

- There are various uses of Radioactive isotopes
- (1) I^{131} are used to locate brain tumors monitor cardiac & especially in thyroid gland.
 - (2) Na^{24} are used for study blood-circulation.
 - (3) C^{14} are used in the Carbon-dating process. Used to estimate the age of object containing it.
 - (4) Co^{60} are used in Radiation therapy to prevent cancer.

Isobars:-

Def:- Atomic species having the same at. mass (mass no) but different at. no are called Isobars.

(OR)
Isotopic forms of different elements which have same mass no but different at. no.

(OR)
Nuclei of two isobars contain the total no of nucleons ($p+n$) but unequal no of protons.

example —

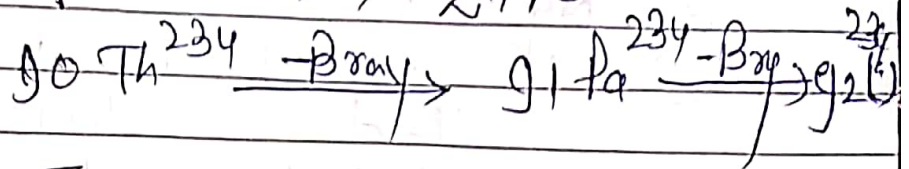
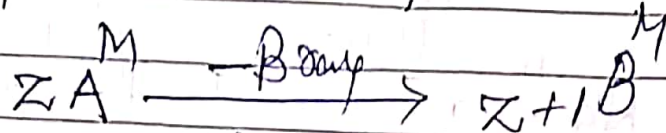
(a)	Ar^{40}, K^{40}, Ca^{40}
(b)	C^{14}, N^{14}
(c)	Th^{234}, U^{234}
(d)	$Pb^{210}, Bi^{210}, Po^{210}$

Features of Isobars:-

They are different elements —
have different chemical & physical properties.
In a pair of isobars one is generally stable where as other is unstable.

Generation of Bobars:

Bobars are generated by the emission of only one β -rays.



Isotones:

Two or more species of atoms or nuclei which have same number of neutrons but differ in at.no as well as mass no.

Example:

Isotopes	at.no	Mass No	neutrons
${}^{30}_{14}\text{Si}$	14	30	16
${}^{31}_{15}\text{P}$	15	31	16
${}^{32}_{16}\text{S}$	16	32	16

Question — why tin have highest number of stable isotopes (Ten).

Ans — There are two reasons.

firstly it posses magic number of protons and secondly there are no strong shell effects to spoil the nucleus.