- $_{92}U^{235}$ ← Mass number = Proton + Neutron

  So, Neutron = Mass no. − Proton.

  ↑ Atomic number = no. of proton = no. of electron

  Here no. of neutron = 235 − 92 = 143

  no. of neutron > no. of proton.

- $_1H^1$ → Protium → Neutronless atom
  Mass number = atomic number

  $_1H^2$ → Deuterium → Neutron = Proton = Electron

  Here mass number ≥ atomic number in case of hydrogen atom.

-

	Same	Different
Isotope	Atomic no./Proton/Electron	Neutron/mass no.
Isotone	Neutron	Proton/electron/atomic no./Mass no.
Isobar	Mass no.	Proton/Electron/Neutron/atomic no.
Isodiaphar	(N − P)	Proton/Electron/Neutron/atomic no./mass no.

  ⊛ Iso − same, dia − difference, phar − N & P

- $_6O^{16}$, $_8O^{17}$ − Isotopes

  Isotopes have similar chemical property due to same no. of electron and different physical property.

- $_6C^{13}$, $_7N^{14}$ − Isotones

  (Results of diagonal summation are equal)

  $_6C^{13}$ → $_7N^{14}$ ← $_6C^{13}$; 14 + 6 = 13 + 7

  $_xA^y$ & $_pB^q$ are isotones if $x + y = p + q$

- $_{20}Ca^{40}$, $_{18}Ar^{40}$ − Isobars → Mass no. same.

- $_{92}U^{238}$, $_{90}Th^{234}$ − Isodiaphars

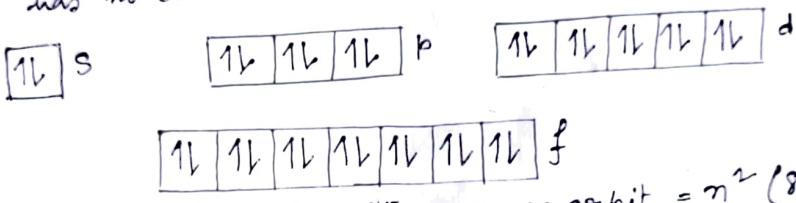
  * difference between atomic numbers = 2 units
  * difference between mass numbers = 4 units.

Chemistry

2 ← 2×1 ← s
6 ← 2×3 ← p
10 ← 2×5 ← d
14 ← 2×7 ← f
+
32 e⁻

Shell (Max^m → 32 e⁻)
↓
Sub shell
↓
Subshell of subshell / Orbital (Max^m → 2 e⁻)

- Max^m no. of electrons present in a shell is → 32 (Capacity of a definite shell)
- Max^m no. of orbital present in a definite shell or orbit → (1+3+5+7) = 16
- s subshell has no orbital.



- No. of orbital present in a definite shell or orbit = n^2 (shell is represented by n)
  example - no. of orbital present in M shell = $(3)^2 = 9$ [n = 1, 2, 3 ...]

- Where electrons are present is - shell - it is a 2-D concept.
- Orbital is a 3D-concept → Electron density.
- No. of shell represents the no. of subshells.
  Example - M-shell (n = 3)
  Subshells present → s, p, d.

- **Electronic configuration and valance shell electron :-**

	K	L	M
Atomic number → 11 →	2	8	1

[M is the outer most orbit or valance shell & Valance shell electron → 1]

	K	L	M
Atomic number → 17 →	2	8	7

→ no. of valance shell electron - 7.

⊛ Max^m electron capacity of valance shell is → 8.

	K	L	M	N
Atomic number → 19 →	2	8	8	1

→ Valance shell N & no. of electron present in Valance shell 1

	K	L	M	N
Atomic number → 20 →	2	8	8	2

→ Valance shell - N & no. of Valance shell electron - 2

	K	L	M	N
" → 35 →	2	8	18	7

→ Valance shell → N & valance shell electron → 7

- In case of Metal, Valance shell electron (V.S.E) → 1/2/3

  V.S.E (1/2/3) $\xrightarrow[e^{\ominus}]{\text{loss of}}$ Cation (+ve ion)

- In case of nonmetal, valance shell electron → 5/6/7.

  V.S.E (5/6/7) $\xrightarrow[e^{\ominus}]{\text{gain of}}$ Anion (-ve ion)

- Number of electron < no. of proton → Cation (+ve)
  no. of electron > no. of proton → Anion (-ve)
  no. of electron = no. of proton → Neutral / Charge = 0.

- Atom X ⇒ P = 13, E = 10, N = 14 } → E < P → Cation → X^{3+}

  Atom Z ⇒ P = 8, E = 10, N = 9 } → E > P → Anion → Z^{-2} / Z^{2-}

  Mass no. = P + N = 8 + 9 = 17

** Atom has no charge until it losses or gains electron (e^-).

- An atom and its ion differ in → electron number.
- When an atom produces cation or anion then it achieves inert gas configuration or fulfill the octet.
- Atomic weight

  H → 1, C → 12, N → 14, O → 16, Na → 23, P → 31, S → 32
  Cl → 35.5, K → 39, Ca → 40, He - 4, Mg - 24, Al → 27

  ⊛ Na (Sodium) has no isotope.

  ⊛ Atomic wt.s are sometime fractional due to the presence of different isotopes in different ratio or proportion in the nature. So atomic wt.s are taken as average.

  Cl → 35, 37
  average of 35 & 37 → 35.5.

$H_2SO_4 = (1\times2) + 32 + (16\times4) = 98$ → Molecular wt.

98 gm H_2SO_4 = 1 mole of H_2SO_4

$HNO_3 = 1 + 14 + (3\times16) = 63$

63 gm HNO_3 = 1 mole of HNO_3

$CO_2 = 12 + (2\times16) = 44$

44 gm CO_2 = 1 mole of CO_2

$O_2 = 2\times16 = 32$

32 gm O_2 = 1 mole of O_2

8 gm O_2 = $\frac{8}{32}$ mole of O_2 = $\frac{1}{4}$ mole of O_2

90 gm H_2O = ? mole

$\frac{90}{18}$ = 5 mole H_2O

- **Volume :-**

22.4 lt. at N.T.P → 1 mole atom / ion / molecule → 6.023×10^{23} (Avogadro's number)

Q. The volume of 4.4 gm of CO_2 at N.T.P = ?

mol. wt of CO_2 = 44 gm. = 1 mole

Volume of 44 gm CO_2 → 22.4 lt.

∴ " 4.4 " " → $\frac{22.4}{44}\times4.4 = 2.24$ lt.

Q2. Which of the following contains highest no. of molecules?

i) a) 16 gm O_2 b) 32 gm O_2 c) 8 gm O_2 d) 64 gm O_2

ii) a) 98 gm H_2SO_4 b) 22 gm CO_2 c) 12.6 gm HNO_3 d) 90 gm H_2O.

- **Isoelectronic :-**

$CO = 6 + 8 = 14\ e^{\ominus}$

$N_2 = 7\times2 = 14\ e^{\ominus}$

$NO^{\oplus} = 7 + 8 - 1 = 14\ e^{\ominus}$

$CN^{\ominus} = 6 + 7 + 1 = 14\ e^{\ominus}$

$Mg^{2+} = 10\ e^{\ominus}$

$Na^{\oplus} = 10\ e^{\ominus}$

$Al^{3+} = 10\ e^{\ominus}$

$O_2^{\ominus} = 10\ e^{\ominus}$

* Energy of n^{th} orbit $E_n = \frac{E_1}{n^2}$