ARJUNA NEET BATCH

Some Basic concept of chemistry

Lecture - 4

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Objective of today's class

Laws of Chemical Combination

① Law of Conservation of mass

② Law of Constant & Definite

③ Law of Multiple Propo

→ two Elements → many Compounds

⇒ KOH, CsOH → K, O, H, Cs

H_2O, H_2O_2

⇒ H, O

Eg → C_2H_6, C_6H_6

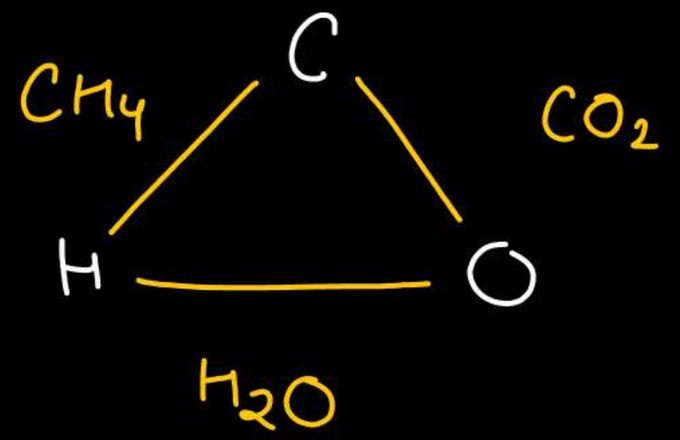
⇒ =

Eg CO, CO_2, C_3O_2

⇒ C, O

		% M	% O
I	M_3O_4	72.4%	27.6%
II	?	70%	30%

IV Law of Reciprocal Proportion



CH_4	CO_2	H_2O
12:4	12:32	2:16
	4:32	1:8
	1:8	H:O
	H:O	

Law of Reciprocal proportion

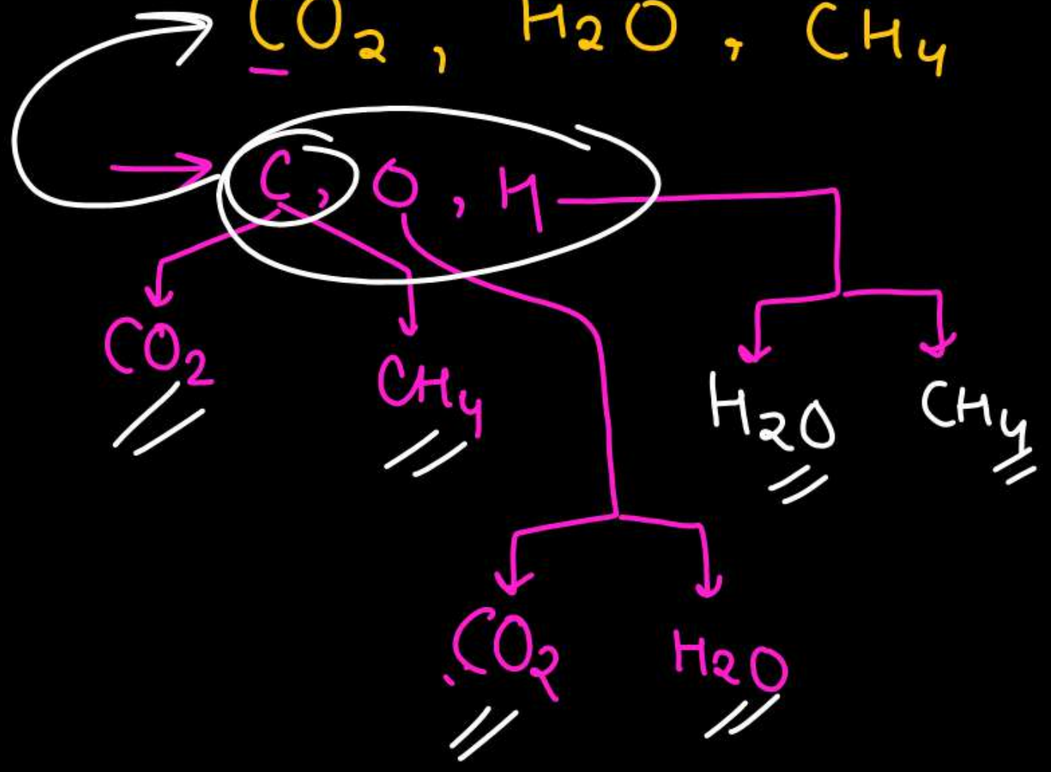
Proposed by Ritcher.

- **When 2 elements combine with fixed mass of 3rd element than the ration of mass in which they of combine with each other are same or simple whole no. multiple.**

Trick.

(1) Only three elements forms three compounds.

(2) One elements is common in two compounds only.

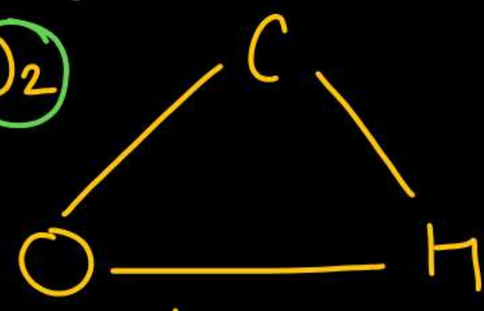


⇒ CO_2 , CH_4 , H_2O_2

⇒ C, H, O

12 : 32

CO_2



CH_4

12 : 4

H_2O_2

2 : 32

1 : 16

H : O

4 : 32

1 : 8

(A) H_2O , H_2S , SO_2

(B) PCl_3 , PH_3 , HCl

(C) PCl_3 , PH_3 , PCl_5.

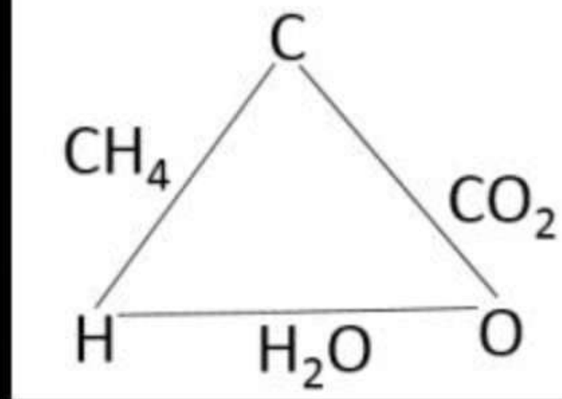
(D) PCl_5, HCl , PH_3

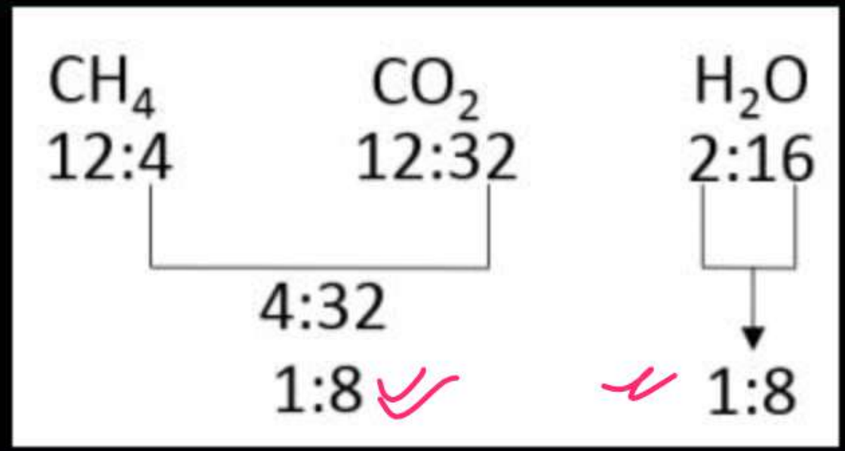
(A) H, O, S

(B) P, H, Cl

(C) P, H, Cl

(D) P, Cl, H





⑤ Gayhussac's Law

⇒ Only applicable for gaseous R & P

$V \propto n$

⑥ Avogadro Law

→ Modified Berzilius Synthesis

At same condition

$V \propto$ No. of molecule (n)

$V \propto$ no. of atomp

Gay Lusac's law of gaseous volumes

According to this law, volume of gaseous reactant & gaseous products are in simple whole number ratio.

Drawback:-

→ Only valid for gaseous reaction contain 2 gas at least.

$2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

2 Volume 1 volume 2 volume

2 : 1 : 2

2L H_2 1L O_2 2L $H_2O(g)$

Avogadro's law

- According to him at condition of same temperature and pressure equal volume of all the gases contain equal number of molecules(moles)

$V \propto n$

BERZELIUS HYPOTHESIS :-

At condition of same temperature and pressure equal volume of all the gases contain equal number of atoms.

$V \propto n$

$$\underset{1}{CH_4} + \underset{2}{2O_2} \longrightarrow \underset{1}{CO_2} + \underset{2}{2H_2O}$$

⇒ **Significance of Avogadro law:-**

Equal value of all the gases at same condition of temp. & pressure may or may not have equal number of atoms but number of molecules are always equal.

- Atom is smallest part of element ,which take part in chemical reaction & may or may not have independent Existence.
- Molecule is smallest part of element or compound which have independent existence.
- Noble gases are gases not made up of molecule.

Practices Time

Q. What volume of O_2 gas measured at 0°C and 1 atm is needed to burn completely 1L of propane gas measured under the same condition?

Sol.

$T = 0^\circ C$

$P = 1$ atm

$1C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$

1L ? 5L O_2

100

DALTON'S ATOMIC THEORY

Atom is indivisible particle and called as-tomio (meaning-individual) at the time of Democritus. The main pints of Dalton's atomic theory are as follows:

- Matter is made up of extremely small, indivisible particles called atoms.
- Atoms of a given elements are identical in all respect, i.e., they possess same size, shape, mass, chemical properties etc.
- Atoms of a different elements are different in all respect, i.e., they possess different sizes, shapes, masses, chemical properties etc.

- Atoms of different elements may combine with each other in a fixed, simple, whole number ratio to form compounds.
- Atoms can neither be created nor be destroyed in a chemical reaction.

Dalton's theory could explain the laws of chemical combination.

$$H_2 + Cl_2 \longrightarrow HCl$$

ATOMIC AND MOLECULAR MASSES

ATOMIC MASS:- Relative mass of an atom as compared to 1 amu (or 1 u)

$1\ amu = \frac{1}{12} \times {}^{12}C\ atom \Rightarrow \frac{1}{N_A} \Rightarrow \frac{1}{6.022 \times 10^{23}} \Rightarrow 1.66 \times 10^{-24}\ g$

(Atomic mass Unit)

$N_A \rightarrow$ Avogadro no. $\Rightarrow 6.022 \times 10^{23}$

$\Rightarrow 1\ u$ (Unified mass)

$\Rightarrow 1$ Dalton

$\Rightarrow 1$ Aston

$\Rightarrow 1$ Avogram

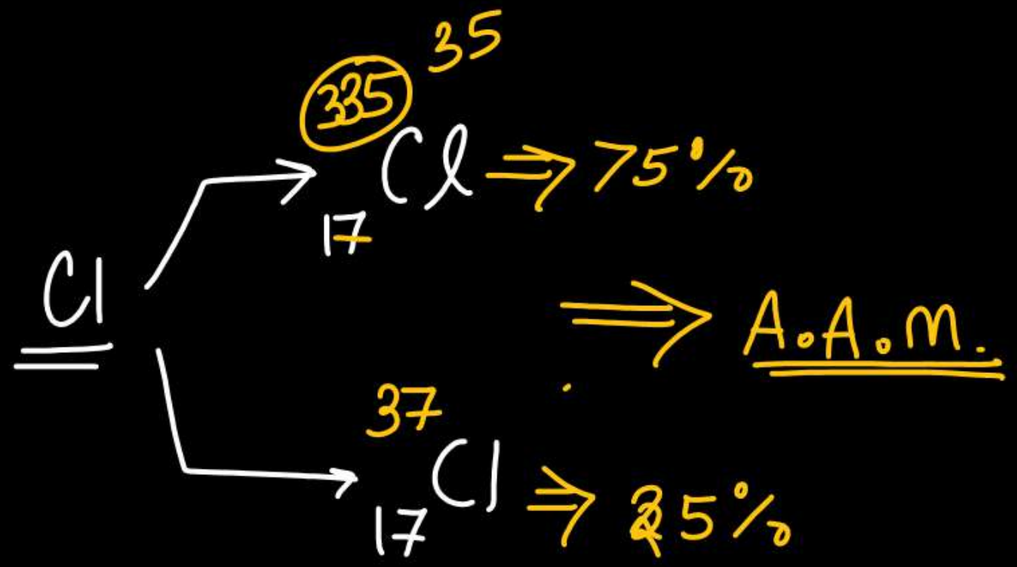
AVERAGE ATOMIC MASS:-

$O = ?$

$$\Rightarrow \frac{\%\text{ abundance of } 1^{st} \text{ isotope} \times \text{At. mass of } 1^{st} + \%\text{ of } 2^{nd} \text{ isotope} \times \text{At. mass of } 2^{nd} + \dots}{100}$$

$$\Rightarrow \frac{90 \times 16 + 8 \times 17 + 2 \times 18}{100} \Rightarrow 16.12$$

- ${}_8O^{16} \longrightarrow 90\%$
- ${}_8O^{17} \longrightarrow 8\%$
- ${}_8O^{18} \longrightarrow 2\%$



A.A.M. $= \frac{75 \times 35 + 25 \times 37}{100}$

$= 35.5$

MOLECULAR MASS:- Relative mass of a molecule as compared to 1 amu.

(u)

⇒ Eg H_2O ⇒ 1×2+16 ⇒ 18 u

FORMULA MASS:- For Ionic Compound

Elements

At. no → 1 → 30

At mass → on the tips

NaCl → 23 + 35.5

⇒ 58.5

Q. Calculate molecular mass of following

(i) $CaCO_3 \rightarrow 40 + 12 + 16 \times 3 \rightarrow 40 + 12 + 48 \Rightarrow 100\ u$

(ii) $NaNO_3 \rightarrow 23 + 14 + 16 \times 3 \Rightarrow 23 + 14 + 48 \Rightarrow 85\ u$

(iii) $CO_2 \Rightarrow 12 + 16 \times 2 \Rightarrow 12 + 32 \Rightarrow 44\ u$

(iv) $NaCl \Rightarrow 23 + 35.5 \Rightarrow 58.5$

(v) $H_2SO_4 \Rightarrow 1 \times 2 + 32 + 16 \times 4 \Rightarrow 2 + 32 + 64 \Rightarrow 98\ u$

(vi) $MgSO_4$ → 24 + 32 + 16 × 4 → 24 → 120 u

32

64

120

(Vii) $Mg(OH)_2$ → 24 + 17 × 2

→ 24

34

58

(viii) H_2O_2 → 1 × 2 + 32

→ 34

(ix) $C_6H_{12}O_6$

(glucose) → 12 × 6 + 1 × 12 + 16 × 6 → 180 u

(x) $C_{12}H_{22}O_{11}$ → 12 × 12 + 1 × 22 + 16 × 11 → 342 u

(Sucrose)

(xi) NaOH → 23 + 16 + 1 → 40 u

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