Atoms and Molecules

500 BC   maharishi kanad → (matter)
                          ↓ padrath
                          ↓ parmanu → (Atom)

P.C.400 BC → 0.00001

Democritus and Leucippus → Matter & Atoms

Ravisha Katyayan

He states that atoms may not exist in to be free state but may exist in the combined state in the form of molecules.

Oxygen $O_2 \rightarrow O = O$ ⎯ 2 oxygen atoms
         molecule   ↑ bond

→ CO_2 → 1 Carbon atom & 2 oxygen atom

→ H_2O → 2 hydrogen atom & 1 oxygen atom

Atom combine to form molecule ⎯ Element (same atom)
                               ⎯ Compound (diff atom)

O_2 is an element while CO_2 & H_2O are compounds.

they combine ....
Antoine L. Lavoisier laid the foundation
of chemical sciences by establishing two
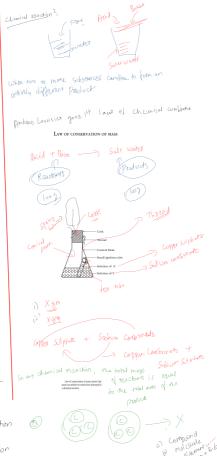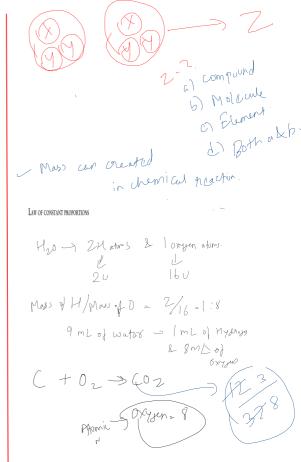important laws of chemical combination.

Law of chemical Combination

Elements :— Substances those molecules are made up of only one type of atoms.

Compounds :— Substances whose molecules are made up of more than one type of atoms are called compounds.

— Properties of compound are different from the properties of elements they are made up of.

— The combination takes place via chemical reaction following certain laws called laws of chemical combination

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Chemical reaction :

sugar + water
Acid + Base
salt water

When two or more substances combine to form an entirely different Product

Antoine Lavoisier gave 1st law of chemical combination

LAW OF CONSERVATION OF MASS

Acid + Base → Salt water
(Reactants)   (Products)
100 g   100 g

Cork
Thread
Conical Flask
Small ignition tube
Solution of X
Solution of Y

String (cotton) — Cork
Conical flask
Thread
Copper Sulphate
Sodium carbonate
test tube

(i) X gm
(ii) X gm

Copper Sulphate + Sodium Carbonate
→ Copper Carbonate + Sodium Sulphate

In any chemical reaction, the total mass of reactants is equal to the total mass of the Products

Law of conservation of mass states that
mass can neither be created nor destroyed in
a chemical reaction.

a) Compound
b) molecule
c) Element
d) Both a & b

X Y Y → Z
X Y Y Y

2-2.
a) compound
b) Molecule
c) Element
d) Both a & b.

— Mass can created in chemical reaction.

LAW OF CONSTANT PROPORTIONS

$H_2O \rightarrow$ 2H atoms & 1 oxygen atoms.
                    ↓   ↓
                    2 u   16 u

Mass of H/Mass of O = $\frac{2}{16} = 1:8$

9 mL of water → 1 mL of Hydrogen & 8 mL of oxygen

$C + O_2 \rightarrow CO_2$

Atomic { Oxygen = 8

$\frac{12}{3}$
$\frac{32}{8}$

"In a chemical substance the elements are
always present in definite proportions by
mass".

① When 4.2g of $NaHCO_3$ is added to a solution of HCl weighing 10g, it is observed that 2.2g of CO_2 is released into atmosphere, The residue left behind is found to weigh 12g.

is in agreement of
which law,
show me

$$NaHCO_3 + HCl \longrightarrow CO_2 + NaCl + H_2O$$

$$4.2 + 10g = 14.2g$$

mass of reactant = mass of products.

mass of products = 2.2g + 12g = 14.2g

✓ There is no loss or gain of mass during the reaction.

✓ Hence, the given observations prove the law of conservation of mass.

a) Calculate the mass of carbon present in 4g of CO_2

2) What mass of $AgNO_3$ will react with 5.85g of NaCl to produce 14.35g of AgCl & 8.5g of $NaNO_3$, if the law of conservation of mass holds true.

Mass of reactant = Mass of products

$$x + 5.85 = 8.5 + 14.35$$

3) CuO was prepared by 2 diff methods, In one case, 1.75g of the metal gave 2.19g of oxide, In the 2nd case, 1.14g of the metal gave 1.43g of oxide. Show that given data illustrates law of constant proportions.