LAWS OF CHEMICAL COMBINATION

law of conservation of mass: mass can neither be created nor be destroyed in a chemical reaction. [Antoine Lavoisier]; *atoms are indivisible particles, which can neither be created nor destroyed in a chemical reaction.*

law of constant proportion: in a chemical substance the elements are always present in definite proportions by mass. [Joseph Proust]; *the relative number and kinds of atoms are constant in a given compound.*

ATOMS

atoms are smaller than anything we can imagine. atomic radius is measured in *nm*. $1/10^9$m = 1nm; 1m = 10^9nm

IUPAC: International Union of Pure and Applied Chemistry

TERMS: atoms

atomic mass unit is a mass unit equal to exactly $1/12^{th}$ the mass of one carbon-12 atom.

atomic mass of an element is the relative mass of its atom as compared with the mass of a carbon-12 atom.

relative atomic mass is the ratio of the average mass of atoms of an element to $1/12^{th}$ the mass of a carbon-12 atom.

ATOMIC MASSES OF ELEMENTS

H	1
C	12
N	14
O	16
Na	23
Mg	24
S	32
Cl	35.5
Ca	40

TERMS: molecules

molecules are the smallest particle of an element/compound which can exist independently and show all the properties of that substance. molecules constitute same type of atoms. it may be monoatomic, diatomic, polyatomic. they join together in definite proportions.

number of atoms constituting a molecule is known as its **atomicity**. ex. Ar: monoatomic

ATOMICITY OF ELEMENTS [non-metals]

Ar	monoatomic
He	monoatomic
O	diatomic
H	diatomic
N	diatomic
Cl	diatomic
PO_4	tetra-atomic
S	poly-atomic

MOLECULES OF COMPOUNDS

COMPOUND	COMBINING ELEMENTS	RATIO BY MASS
water	H, O	1:8
ammonia	N, H	14:3
carbon dioxide	C, O	3:8

quick lime - calcium oxide - Ca, O
baking powder - sodium hydrogen carbonate - Na, H, C, O
potassium sulphate - K, S, O

IONS

compounds composed of metals and non-metals contain charged species. the charged species are called ions. anion: -vely charged; cation: +vely charged. ex. Na^+ Cl^-.

a group of atoms carrying a charge is known as a **polyatomic ion**. ex. Ammonium ion - NH_4; Carbonate ion: CO_3^{2}.

IONIC COMPOUNDS

IONIC COMPOUND	CONSTI-TUTING ELEMENTS	RATIO BY MASS
calcium oxide	Ca, O	5:2
magnesium sulphide	Mg, S	3:4
sodium chloride	Na, Cl	23:35.5

VALENCY

combining capacity of an element. can be used to find out how the atoms of an element will combine with the atom[s] of a compound.

MOLECULAR MASS

sum of atomic masses of all the atoms in a molecule of the substance. expressed in [u].

FORMULA UNIT MASS

sum of atomic masses of all atoms in a formula unit of a compound. expressed in [u].

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