

CHAPTER-03(17.09.20)

Classification of elements and periodicity in properties

CLASS-XI

SUBJECT-CHEMISTRY

Classification of Elements

With the discovery of a large number of elements, it became difficult to study the elements individually, so classification of elements was done to make the study easier.

Earlier Attempts to Classify Elements

Many attempts were made to classify the known elements from time to time. The earlier attempts are as follows:

Dobereiner's Triads (1829)

Dobereiner classified the elements into groups of three elements with similar properties in such a manner so that the atomic weight of the middle

element was the arithmetic mean of the other two, e.g.,

Element	Li	NA	K
Atomic weight	7	23	39

Mean of atomic masses = $(7 + 39) / 2 = 23$

Similarly Cl, Br, I; Ca, Sr, Ba are two more examples of such triads.

Limitations Dobereiner could not arrange all the elements known at that time into triads. He could

identify only three such triads that have been mentioned.

Newland's Octaves (1864) (Law of Octaves)

Newland states that when elements are arranged in order of increasing atomic masses, every eighth element has properties similar to the first just like in the musical note [Every eighth musical note is the same as the first mentioned note]. This can be illustrated as given below

sa	re	ga	ma	pa	dha	ni
Li	Be	B	C	N	O	F

Na

Mg

Al

Si

P

S

Cl

Limitations

1. This classification was successful up to the element calcium.

2. When noble gas elements were discovered at a later stage, their inclusion in these octaves disturbed the entire arrangement.

Lothar Meyer's Atomic Volume Curve (1869)

Meyer presented the classification of elements in the form of a curve between atomic volume and atomic masses and state that the properties of the

elements are the periodic functions of their atomic volumes.

[Here, atomic volume = molecular mass / density

He concluded that the elements with similar properties occupy similar position in the curve.

Mendeleef's Periodic Table

Mendeleef's Periodic Table is based upon

Mendeleef's periodic law which states 'The physical and chemical properties of the elements are a periodic function of their atomic masses.'

At the time of Mendeleef, only 63 elements were known.

K

■

■

■

■

2

Modern Periodic Table

s-Block Elements

p-Block Elements

Group 1 (New notation for long form) 17 18
 IA As version for modern periodic table. VIIA 0(zero)

Period	1	2	d-Block Elements										13	14	15	16	17	18
1	H Hydrogen 1.008	He Helium 4.003											B Boron 10.811	C Carbon 12.011	N Nitrogen 14.007	O Oxygen 15.999	F Fluorine 18.998	Ne Neon 20.180
2	Li Lithium 6.941	Be Beryllium 9.0121											Al Aluminum 26.982	Si Silicon 28.086	P Phosphorus 30.974	S Sulfur 32.065	Cl Chlorine 35.453	Ar Argon 39.948
3	Na Sodium 22.990	Mg Magnesium 24.305	3	4	5	6	7	8	9	10	11	12	Al Aluminum 26.982	Si Silicon 28.086	P Phosphorus 30.974	S Sulfur 32.065	Cl Chlorine 35.453	Ar Argon 39.948
4	K Potassium 39.098	Ca Calcium 40.078	Sc Scandium 44.956	Ti Titanium 47.867	V Vanadium 50.942	Cr Chromium 51.996	Mn Manganese 54.938	Fe Iron 55.845	Co Cobalt 58.933	Ni Nickel 58.693	Cu Copper 63.546	Zn Zinc 65.39	Ga Gallium 69.723	Ge Germanium 72.63	As Arsenic 74.922	Se Selenium 78.96	Br Bromine 79.904	Kr Krypton 83.80
5	Rb Rubidium 85.468	Sr Strontium 87.62	Y Yttrium 88.906	Zr Zirconium 91.224	Nb Niobium 92.906	Mo Molybdenum 95.94	Tc Technetium (98)	Ru Ruthenium 101.07	Rh Rhodium 102.906	Pd Palladium 106.42	Ag Silver 107.868	Cd Cadmium 112.411	In Indium 114.818	Sn Tin 118.710	Sb Antimony 121.757	Te Tellurium 127.6	I Iodine 126.905	Xe Xenon 131.29
6	Cs Cesium 132.905	Ba Barium 137.327	La Lanthanum 138.905	Hf Hafnium 178.49	Ta Tantalum 180.948	W Tungsten 183.84	Re Rhenium 186.207	Os Osmium 190.23	Ir Iridium 192.222	Pt Platinum 195.078	Au Gold 196.967	Hg Mercury 200.59	Tl Thallium 204.384	Pb Lead 207.2	Bi Bismuth 208.980	Po Polonium (209)	At Astatine (210)	Rn Radon (222)
7	Fr Francium (223)	Ra Radium (226)	Ac Actinium (227)	Rf Rutherfordium (261)	Db Dubnium (262)	Sg Seaborgium (266)	Bh Bohrium (264)	Hs Hassium (265)	Mt Meitnerium (268)	Ds Darmstadtium (269)	Rg Roentgenium (272)	Uub Ununbium (277)	Uuq Ununquadium (289)	Uuh Ununhexium (285)	Uuq Ununquadium (289)	Uuh Ununhexium (285)	Uuo Ununoctium (289)	Uuq Ununquadium (289)

Key to chart

STATE
 Gas (G)
 Liquid (L)
 Solid (S)
 Not found in nature (X)

Atomic number
 Symbol
 Name
 Atomic mass

Example: Oxygen (O) with atomic number 8, atomic mass 15.9994.

- Metals
- Metalloids
- Non-metals

f-Block Elements

58	59	60	61	62	63	64	65	66	67	68	69	70	71
Ce Cerium 140.12	Pr Praseodymium 140.908	Nd Neodymium 144.24	Pm Promethium (145)	Sm Samarium 150.36	Eu Europium 151.964	Gd Gadolinium 157.25	Tb Terbium 158.925	Dy Dysprosium 162.50	Ho Holmium 164.930	Er Erbium 167.26	Tm Thulium 168.934	Yb Ytterbium 173.04	Lu Lutetium 174.967
90	91	92	93	94	95	96	97	98	99	100	101	102	103
Th Thorium 232.038	Pa Protactinium 231.036	U Uranium 238.029	Np Neptunium (237)	Pu Plutonium (244)	Am Americium (243)	Cm Curium (247)	Bk Berkelium (247)	Cf Californium (251)	Es Einsteinium (252)	Fm Fermium (257)	Md Mendelevium (258)	No Nobelium (259)	Lr Lawrencium (262)

Digit	0	1	2	3	4	5	6	7	8	9
Root	nil	un	bi	tri	quad	pent	hex	sept	oct	enn
Abbreviation	<i>n</i>	<i>u</i>	<i>b</i>	<i>t</i>	<i>q</i>	<i>p</i>	<i>h</i>	<i>s</i>	<i>o</i>	<i>e</i>

Z	101	102	103	104	105	106	107	108	109	110
IUPAC name	Unnilunium	Unnilbium	Unniltrium	Unnilquadium	Unnilpentium	Unnilhexium	Unnilseptium	Unniloctium	Unnilennium	Ununnilium
Symbol	Unu	Unb	Unt	Unq	Unp	Unh	Uns	Uno	Une	Uun