

CHAPTER-7

Classification of Elements-The Periodic Table

Elements are classified on the basis of similarities in their Properties.

Dobereiner's law of Triads:

Döbereiner stated that when elements with similar properties are taken three at a time and arranged in the ascending order of their atomic weights, the atomic weight of the middle element is the average of the atomic weights of the first and third elements. This statement is called the Dobereiner's law of triads.

Dobereiner was the first scientist to classify elements, based on atomic weights

Examples of Dobereiner's triads:

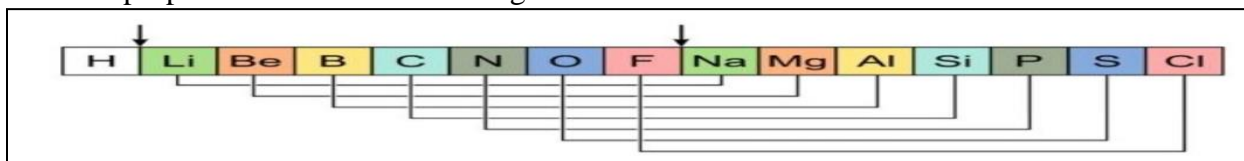
Group	Elements and their Atomic weight			Arithmetic mean of 1 st and 3 rd elements Atomic weight
A	Lithium (Li) 7.0	Sodium (Na) 23.0	Potassium (K) 39.0	$\frac{7.0 + 39.0}{2} = 23.0$
B	Calcium (Ca) 40.0	Strontium (Sr) 87.5	Barium (Ba) 137.0	
C	Chlorine (Cl) 35.5	Bromine (Br) 80.0	Iodine (I) 127.0	
D	Sulphur (S) 32.0	Selenium (Se) 78.0	Tellurium (Te) 125.0	
E	Manganese (Mn) 55.0	Chromium (Cr) 52.0	Iron (Fe) 56.0	

Limitations

- All the known elements at that time could not be arranged in the form of triads.
- The law failed for very low mass or for very high mass elements. (In case of F, Cl, Br, the atomic weight of Cl is not an arithmetic mean of atomic weights of F and Br.)
- As the techniques improved for measuring atomic masses accurately, the law was unable to remain strictly valid.

Newlands' law of Octaves

The law of octaves states that when elements are arranged in the ascending order of their atomic weights they fall into a pattern in which their properties repeat at regular intervals. Every eighth element starting from a given element resembles in its properties to that of the starting element



The Periodic Law (Mendeleeff's periodic law):

"The physical and chemical properties of the elements are the periodic functions of their atomic weights"

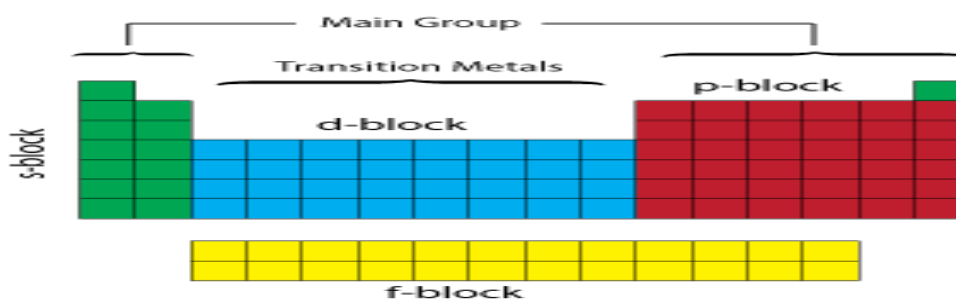
Moseley's periodic law:

"The physical and chemical properties of the elements are the periodic functions of their atomic numbers"

Modern periodic law:

"The physical and chemical properties of elements are the periodic functions of the electronic configurations of their atoms."

Block diagram of Modern Periodic Table:



The Modern Periodic Table of the Elements

1 <i>IA</i>																	18 <i>VIIIA</i>	
1	H 1 1.008 Hydrogen											B 5 10.81 Boron	C 6 12.01 Carbon	N 7 14.01 Nitrogen	O 8 16.00 Oxygen	F 9 19.00 Fluorine	He 2 4.00 Helium	
2	Li 3 6.94 Lithium	Be 4 9.01 Beryllium											Al 13 26.98 Aluminium	Si 14 28.09 Silicon	P 15 30.97 Phosphorus	S 16 32.07 Sulphur	Cl 17 35.45 Chlorine	Ar 18 39.95 Argon
3	Na 11 22.99 Sodium	Mg 12 24.31 Magnesium	<i>3 IIB</i>	<i>4 IVB</i>	<i>5 VB</i>	<i>6 VIB</i>	<i>7 VIIB</i>	<i>8</i>	<i>9 VIIIB</i>	<i>10</i>	<i>11 IB</i>	<i>12 IIB</i>	Ga 31 69.72 Gallium	Ge 32 72.61 Germanium	As 33 74.92 Arsenic	Se 34 78.96 Selenium	Br 35 79.90 Bromine	Kr 36 83.80 Krypton
4	K 19 39.10 Potassium	Ca 20 40.08 Calcium	Sc 21 44.96 Scandium	Ti 22 47.88 Titanium	V 23 50.94 Vanadium	Cr 24 52.00 Chromium	Mn 25 54.94 Manganese	Fe 26 55.85 Iron	Co 27 58.93 Cobalt	Ni 28 58.69 Nickel	Cu 29 63.55 Copper	Zn 30 65.39 Zinc	Ga 31 69.72 Gallium	Ge 32 72.61 Germanium	As 33 74.92 Arsenic	Se 34 78.96 Selenium	Br 35 79.90 Bromine	Kr 36 83.80 Krypton
5	Rb 37 85.47 Rubidium	Sr 38 87.62 Strontium	Y 39 88.91 Yttrium	Zr 40 91.22 Zirconium	Nb 41 92.91 Niobium	Mo 42 95.94 Molybdenum	Tc 43 (97.9) Technetium	Ru 44 (101.07) Ruthenium	Rh 45 (102.91) Rhodium	Pd 46 (106.42) Palladium	Ag 47 (107.87) Silver	Cd 48 (112.41) Cadmium	In 49 114.82 Indium	Sn 50 118.71 Tin	Sb 51 121.76 Antimony	Te 52 127.60 Tellurium	I 53 126.90 Iodine	Xe 54 131.29 Xenon
6	Cs 55 132.91 Caesium	Ba 56 137.33 Barium	La 57 138.91 Lanthanum	Hf 72 178.49 Hafnium	Ta 73 180.95 Tantalum	W 74 183.85 Tungsten	Re 75 186.21 Rhenium	Os 76 190.2 Osmium	Ir 77 192.22 Iridium	Pt 78 195.08 Platinum	Au 79 196.97 Gold	Hg 80 200.59 Mercury	Tl 81 204.38 Thallium	Pb 82 207.2 Lead	Bi 83 208.98 Bismuth	Po 84 (209) Polonium	At 85 (210) Astatine	Rn 86 (222) Radon
7	Fr 87 223.02 Francium	Ra 88 226.02 Radium	Ac 89 227.03 Actinium	Rf 104 (261) Rutherfordium	Db 105 (262) Dubnium	Sg 106 (263) Seaborgium	Bh 107 (262) Bohrium	Hs 108 (265) Hassium	Mt 109 (266) Meitnerium	Ds 110 (269) Darmstadtium	Rg 111 (272) Roentgenium	Cn 112 (277) Copernicium		Fl 114 (287) Flerovium		Lv 116 (289) Livermorium		Unnamed Discovery 118 Nov.1999
	ALKALI METALS		ALKALI EARTH METALS												HALOGENS		NOBLE GASES	
	LANTHANIDES		Ce 58 140.12 Cerium	Pr 59 140.91 Praseodymium	Nd 60 144.24 Neodymium	Pm 61 (145) Promethium	Sm 62 150.36 Samarium	Eu 63 152.97 Europium	Gd 64 157.25 Gadolinium	Tb 65 158.93 Terbium	Dy 66 162.50 Dysprosium	Ho 67 164.93 Holmium	Er 68 167.26 Erbium	Tm 69 168.93 Thulium	Yb 70 173.04 Ytterbium	Lu 71 174.97 Lutetium		
	ACTINIDES		Th 90 232.04 Thorium	Pa 91 231.04 Protactinium	U 92 238.03 Uranium	Np 93 237.05 Neptunium	Pu 94 (240) Plutonium	Am 95 243.06 Americium	Cm 96 (247) Curium	Bk 97 (248) Berkelium	Cf 98 (251) Californium	Es 99 252.08 Einsteinium	Fm 100 257.10 Fermium	Md 101 (257) Mendelevium	No 102 259.10 Nobelium	Lr 103 262.11 Lawrencium		

Construction/Describe/ Main features/Information of Long form of periodic table (Modern periodic table)

1. Based on the modern periodic law, this modern periodic table is proposed.
2. The modern periodic table has 18 vertical columns known as Groups and 7 horizontal rows known as Periods.
3. 18 groups represented by using Roman numeral I through VIII with letters A and B in traditional notation or 1 to 18 Arabic numerals.
4. 7 periods represented by 1 to 7 Arabic numerals.
5. 1st period contains 2 elements, 2nd and 3rd periods contains 8 elements each, 4th and 5th periods contains 18 elements each, 6th period contains 32 elements and 7th periods is incomplete.
6. The elements are classified as s,p,d and f block elements.
7. Inert or Noble or Rare gases elements are placed in 18th group.
8. Each period starting with metal and ending with inert gas.
9. Left side elements are metals and right side elements are non-metals.
10. s and p block elements are known as Representative elements.
11. d-block elements are called Transition elements.
12. f-block elements are called Inner transition elements.
13. f-block elements(lanthanoids and Actinoids) are placed separately at the bottom of the table.

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