

MODERN PERIODIC TABLE AND ITS CLASSIFICATIONS

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INTRODUCTION

- ✓ According to atomic theory the elements were made on the basis of “Atomic weight”
- ✓ Dobereiner arranged elements into three groups called “triads”
- ✓ It contain only limited number of elements
- ✓ In 1869, A Russian Chemist Mendeleeff, arranged elements in the order of increasing atomic weight

Conti....

- ✓ Moseley revealed that the atomic number is the fundamental property of the atom not the atomic weight
- ✓ He to proposed Modern Periodic Law
- ✓ According to modern periodic law, the properties of elements are a periodic function of their atomic numbers

GROUPS

- ✓ 18 vertical columns of periodic table are called groups
- ✓ They are numbered as IA, IB, IIA, IIB....VIIA, VIIB, VII and 0
- ✓ Elements of group IA, IIA...VIIA receive electron in their incomplete outermost shells. These are called “Normal elements”
- ✓ Elements of group IB, IIB...VIIB and VIII, their outermost as well as penultimate shell is incomplete
- ✓ The electrons occupy in them as $(n+1)d$ subshell
- ✓ Elements of group 18 is termed as Noble or Inert gases

PERIODS

- ✓ 7 Horizontal rows of periodic table is called “Periods”
- ✓ 1st period – containing two elements (H-He)
- ✓ 2nd, 3rd period- containing eight elements (H-He and Na-Ar)
- ✓ 4th, 5th period- containing eighteen elements (K-Kr and Rb-Xe)
- ✓ 6th period- containing thirty two elements (Cs-Rn) including Lanthanide series (Ce-Lu)
- ✓ 7th period is an incomplete series including Actinide series (Th-Lr)

PERIODIC TABLE

1A		ATOMIC NUMBER										ATOMIC MASS										8A			
1 1.008 H Hydrogen											2 4.003 He Helium											2 4.003 He Helium			
2A												3A		4A		5A		6A		7A					
3 6.941 Li Lithium	4 9.012 Be Beryllium											5 10.811 B Boron	6 12.011 C Carbon	7 14.007 N Nitrogen	8 15.999 O Oxygen	9 18.998 F Fluorine	10 20.180 Ne Neon								
11 22.990 Na Sodium		12 24.305 Mg Magnesium		CHEMICAL NAME										13 26.982 Al Aluminum		14 28.086 Si Silicon		15 30.974 P Phosphorus		16 32.066 S Sulfur		17 35.453 Cl Chlorine		18 39.948 Ar Argon	
				3B		4B		5B		6B		7B		8B		1B		2B							
19 39.098 K Potassium	20 40.078 Ca Calcium	21 44.956 Sc Scandium	22 47.88 Ti Titanium	23 50.942 V Vanadium	24 51.996 Cr Chromium	25 54.938 Mn Manganese	26 55.933 Fe Iron	27 58.933 Co Cobalt	28 58.693 Ni Nickel	29 63.546 Cu Copper	30 65.39 Zn Zinc	31 69.732 Ga Gallium	32 72.61 Ge Germanium	33 74.922 As Arsenic	34 78.972 Se Selenium	35 79.904 Br Bromine	36 84.80 Kr Krypton								
37 84.468 Rb Rubidium	38 87.62 Sr Strontium	39 88.906 Y Yttrium	40 91.224 Zr Zirconium	41 92.906 Nb Niobium	42 95.95 Mo Molybdenum	43 98.907 Tc Technetium	44 101.07 Ru Ruthenium	45 102.906 Rh Rhodium	46 106.42 Pd Palladium	47 107.868 Ag Silver	48 112.411 Cd Cadmium	49 114.818 In Indium	50 118.71 Sn Tin	51 121.760 Sb Antimony	52 127.6 Te Tellurium	53 126.904 I Iodine	54 131.29 Xe Xenon								
55 132.905 Cs Cesium	56 137.327 Ba Barium	57-71 Lanthanides	72 178.49 Hf Hafnium	73 180.948 Ta Tantalum	74 183.85 W Tungsten	75 186.207 Re Rhenium	76 190.23 Os Osmium	77 192.22 Ir Iridium	78 195.08 Pt Platinum	79 196.967 Au Gold	80 200.59 Hg Mercury	81 204.383 Tl Thallium	82 207.2 Pb Lead	83 208.980 Bi Bismuth	84 208.982 Po Polonium	85 209.987 At Astatine	86 222.018 Rn Radon								
87 223.020 Fr Francium	88 226.025 Ra Radium	89-103 Actinides	104 (261) Rf Rutherfordium	105 (262) Db Dubnium	106 (266) Sg Seaborgium	107 (264) Bh Bohrium	108 (269) Hs Hassium	109 (268) Mt Meitnerium	110 (269) Ds Darmstadtium	111 (272) Rg Roentgenium	112 (277) Cn Copernicium	113 unknown Uut Ununtrium	114 (289) Fl Flerovium	115 unknown Uup Ununpentium	116 (298) Lv Livermorium	117 unknown UUs Ununseptium	118 unknown Uuo Ununoctium								

Lanthanides

57 138.906 La Lanthanum	58 140.115 Ce Cerium	59 140.908 Pr Praseodymium	60 144.24 Nd Neodymium	61 144.913 Pm Promethium	62 150.36 Sm Samarium	63 151.966 Eu Europium	64 157.25 Gd Gadolinium	65 158.925 Tb Terbium	66 162.50 Dy Dysprosium	67 164.930 Ho Holmium	68 167.26 Er Erbium	69 168.934 Tm Thulium	70 173.04 Yb Ytterbium	71 174.967 Lu Lutetium
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Actinides

89 227.028 Ac Actinium	90 232.038 Th Thorium	91 231.036 Pa Protactinium	92 238.029 U Uranium	93 237.048 Np Neptunium	94 244.064 Pu Plutonium	95 243.061 Am Americium	96 247.070 Cm Curium	97 247.070 Bk Berkelium	98 251.080 Cf Californium	99 (254) Es Einsteinium	100 257.095 Fm Fermium	101 258.1 Md Mendelevium	102 259.101 No Nobelium	103 (262) Lr Lawrencium
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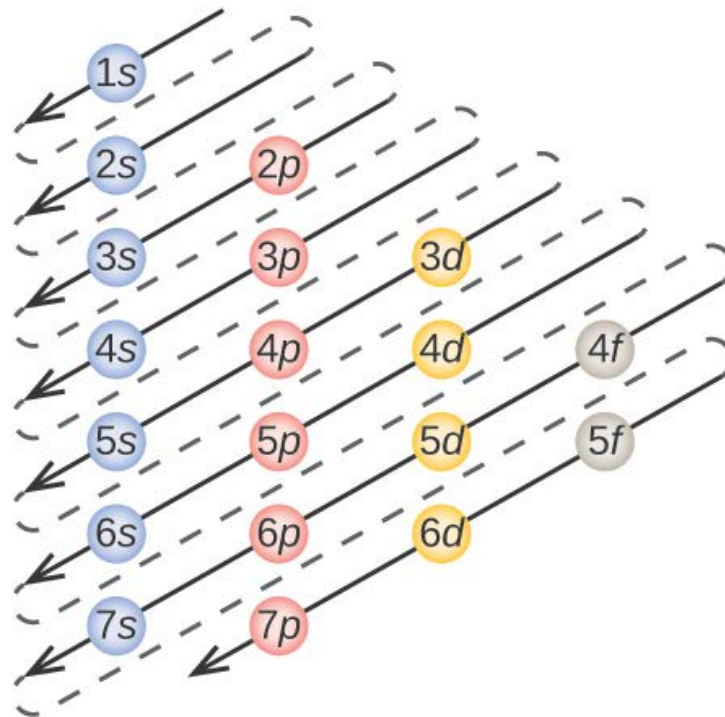
Alkali Metal	Alkaline Earth	Basic Metal	Halogen	Noble Gas	Non Metal	Rare Earth	Semi Metal	Transition Metal
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ELECTRONIC CONFIGURATION

- ✓ The electrons are added one by one to various orbitals as we move from one element to the next element in the order of increasing atomic number
- ✓ Each main shell can hold a maximum of $2n^2$ electron where n is the shell number
- ✓ Each orbital can accommodate two electrons
- ✓ Electron pairing in any orbital is not possible until all the available orbitals of a given set contain one electron each. (Hund's rule)
- ✓ According to Aufbau principle, electrons enter the various orbitals in the order of increasing energy

ORDER OF INCREASING ENERGY OF ORBITALS

- ✓ 1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 4f, 5d, 6p, 7s, 5f, 6d, 7p, 8s....



CLASSIFICATION OF ELEMENTS

- ✓ Based on their electronic configuration the elements of periodic table are grouped into four different type
- ✓ s block
- ✓ p block
- ✓ d block
- ✓ f block

S-BLOCK ELEMENTS

- ✓ In which all the inner orbitals are completely filled but the outermost s-orbital is completely filled or half filled
- ✓ All elements of IA , IIA and H, He are belongs to this block
- ✓ Totally this block contain 14 elements
- ✓ Except H and He other s block elements are highly reactive metals

P-BLOCK ELEMENTS

- ✓ All the inner atomic orbitals are completely filled but the outermost p-orbitals are filled progressively from one to six electrons
- ✓ All elements of IIIA, IVA...VIIA groups and rare gases except He belong to this block
- ✓ Totally this block containing 30 elements

D-BLOCK ELEMENTS

- ✓ In which only the penultimate d-orbital is filled progressively from one to ten electrons and all the other orbitals are completely filled
- ✓ It otherwise called transition metal
- ✓ The group of elements such as IB, IIB....VIIB and VIII are belongs to this block
- ✓ It contain four series

- ✓ 1st series belongs to 4th period contains 10 elements
- ✓ It starts from scandium (21) to zinc(30)
- ✓ The last electrons enters into the incomplete 3d-orbital
- ✓ 2nd series belongs to 5th period contains 10 elements
- ✓ It starts from Yttrium (39) to Cadmium (48)
- ✓ The last electrons enters into the incomplete 4d-orbital

- ✓ 3rd series belongs to 6th period contains 10 elements
- ✓ It starts from Lanthanum (57) to Mercury (80) in between the 14 elements are leaving out these are called lanthanide series
- ✓ The last electrons enters into the incomplete 5d-orbital

F-BLOCK ELEMENTS

- ✓ In which the inner d and f-orbitals are incomplete whereas all the other orbitals are completely filled
- ✓ The last electron enters into the inner f-orbital
- ✓ Totally it containing 28 elements
- ✓ 4f series – Lanthanide series
- ✓ 5f series – Actinide series

- ✓ 4th series belongs to 7th period and it is an incomplete series contains only three elements
- ✓ It starts from Actinium (89) continues from Rf and ends with Db
- ✓ The in between 14 elements are leaving out is called Actinides
- ✓ The last electrons enters into the incomplete 6d-orbital

- ✓ 4f-series start with Ce (58) end with Lu (71)
- ✓ Both 4f and 5d orbitals remain incomplete and the last electron enters into the incomplete 4f-orbital
- ✓ 5f-series start with Th (90) end with Lr (103)
- ✓ Both 5f and 6d orbitals remain incomplete and the last electron enters into the incomplete 5f-orbital

- ✓ All the f-block elements are metallic in nature
- ✓ All the Actinides are radioactive elements
- ✓ Th (90), Pa (91), U (92) occur in nature
- ✓ The remaining 11 elements are known as transuranic elements
- ✓ Which are not occur naturally but they have been produced artificially in nuclear reaction



THANK YOU