Warm Greetings

Dear students I think previous uploaded notes are very useful to you. Now we learn about the Nomenclature of elements and Grouping of elements based on electronic configurations.

Nomenclature of Elements with Atomic Number Greater than 100

A new element is discovered, the discoverer suggests a name following IUPAC guidelines which will be approved after a public opinion. In the meantime, the new element will be called by a temporary name coined using the following IUPAC rules, until the IUPAC recognizes the new name.

- The name was derived directly from the atomic number of the new element using the following numerical roots.

Notation for IUPAC Nomenclature of element

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

- The numerical roots corresponding to the atomic number are put together and 'ium' is added as suffix.
- The final 'n' of 'enn' is omitted when it is written before 'nil' (enn + nil = enil) similarly the final 'i' of 'bi' and 'tri' is omitted when it written before 'ium' (bi + ium = bium; tri + ium =trium)
- The symbol of the new element is derived from the first letter of the numerical roots. The following table illustrates these facts.

Name of elements with atomic number abov

Atomic number	Temporary Name	Temporary Symbol	Name of the element	Symbol
101	Unnilunium	Unu	Mendelevium	Md
102	Unnilbium	Unb	Nobelium	No
103	Unniltrium	Unt	Lawrencium	Lr
104	Unnilquadium	Unq	Rutherfordiium	Rf
105	Unnilpentium	Unp	Dubnium	Db
106	Unnilhexium	Unh	Seaborgium	Sg
107	Unnilseptium	Uns	Bohrium	Bh
108	Unniloctium	Uno	Hassium	Hs

Atomic number	Temp. Name	Temp. Symbol	Name of the element	Symbol
109	Unnilennium	Une	Meitnerium	Mt
110	Ununnilium	Uun	Darmstadtium	Ds
111	Unununium	Uuu	Roentgenium	Rg
112	Ununbium	Uub	Copernicium	Cn
113	Ununtrium	Uut	Nihonium	Nh
114	Ununquadium	Uuq	Flerovium	Fl
115	Ununpentium	Uup	Moscovium	Mc
116	Ununhexium	Uuh	Livermorium	Lv
117	Ununseptium	Uus	Tennessine	Ts
118	Ununoctium	Uuo	Oganesson	Og

Grouping of Elements based on Electronic Configurations

In the modern periodic table, the elements are organized in 7 periods and 18 groups based on the modern periodic law. The placement of element in the periodic table is closely related to its outer shell electronic configuration. Let us analyse the change in the electronic configuration of elements along the periods and down the groups.

Variation of Electronic Configuration along the periods

- Each period starts with the element having general outer electronic configuration ns^1 and ends with ns^2; np^6 where n is the period number.
- The first period starts with the filling of valence electrons in 1s orbital, which can accommodate only two electrons.
- Hence, the first period has two elements, namely hydrogen and helium.
- The second period starts with the filling of valence electrons in 2s orbital followed by three 2p orbitals with eight elements from lithium to neon.
- The third period starts with filling of valence electrons in the 3s orbital followed by 3p orbitals.
- The fourth period starts with filling of valence electrons from 4s orbital followed by 3d and 4p orbitals in accordance with Aufbau principle.
- Similarly, we can explain the electronic configuration of elements in the subsequent periods.

Electronic configuration of elements in a period

Period number (n)	Filling of electrons in orbitals		Number of elements	Outer shell Electronic configuration	
	Starts from	Ends with		First element	Last element
1	1s	1s	2	H – $1s^1$	He – $1s^2$
2	2s	2p	8	Li – $2s^1$	Ne– $2s^2 2p^6$
3	3s	3p	8	Na – $3s^1$	Ar – $3s^2 3p^6$
4	4s → 3d	4p	18	K – $4s^1$	Kr– $4s^2 4p^6$
5	5s → 4d	5p	18	Rb – $5s^1$	Xe – $5s^2 5p^6$
6	6s → 4f → 5d	6p	32	Cs – $6s^1$	Rn – $6s^2 6p^6$
7	7s → 5f → 6d	7p	32	Fr – $7s^1$	Og – $7s^2 7p^6$

In the fourth period the filling of 3d orbitals starts with scandium and ends with zinc. These 10 elements are called first transition series. Similarly 4d, 5d and 6d orbitals are filled in successive periods and the corresponding series of elements are called second, third and fourth transition series respectively.

In the sixth period the filling of valence electrons starts with 6s orbital followed by 4f, 5d and 6p orbitals. The filling up of 4f orbitals begins with Cerium (Z=58) and ends at Lutetium (Z=71). These 14 elements constitute the first inner-transition series called Lanthanides. Similarly, in the seventh period 5f orbitals are filled, and it's -14 elements constitute the second inner-transition series called Actinides. These two series are placed separately at the bottom of the modern periodic table.

Variation of Electronic Configuration in the Groups

Elements of a group have similar electronic configuration in the outer shell. The general outer electronic configurations for the 18 groups. The groups can be combined as s, p, d and f block elements on the basis of the orbital in which the last valence electron enters.

The elements of group 1 and group 2 are called s-block elements, since the last valence electron enters the ns orbital. The group 1 elements are called alkali metals while the group 2 elements are called alkaline earth metals. These are soft metals and possess low melting and boiling points with low ionisation enthalpies. They are highly reactive and form ionic compounds. They are highly electropositive in nature and most of the elements imparts colour to the flame.

The elements of groups 13 to 18 are called p-block elements or representative elements and have a general electronic configuration ns^2, np^{1-6}. The elements of the group 16 and 17 are called chalcogens and halogens respectively. The elements of 18th group contain completely filled valence shell electronic configuration (ns^2, np^6) and are called inert gases or nobles gases. The elements of p-block have high negative electron gain enthalpies. The ionisation energies are higher than that of s-block elements. They form mostly covalent compounds and shows more than one oxidation states in their compounds.

The elements of the groups 3 to 12 are called d-block elements or transition elements with general valence shell electronic configuration ns^{1-2}, $(n-1)d^{1-10}$. These elements also show more than one oxidation state and form ionic, covalent and co-ordination compounds. They can form interstitial compounds and alloys which can also act as catalysts. These elements have high melting points and are good conductors of heat and electricity.

The lanthanides ($4f^{1-14}$, $5d^{0-1}$, $6s^2$) and the actinides ($5f^{0-14}$, $6d^{0-2}$, $7s^2$) are called f-block elements. These elements are metallic in nature and have high melting points. Their compounds are mostly coloured. These elements also show variable oxidation states.

General outer electronic configuration of elements in groups

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ns^1	ns^2	$ns^2 (n-1)d^1$	$ns^2 (n-1)d^2$	$ns^2 (n-1)d^3$	$ns^1 (n-1)d^5$	$ns^2 (n-1)d^5$	$ns^2 (n-1)d^6$	$ns^2 (n-1)d^7$	$ns^2 (n-1)d^8$	$ns^1 (n-1)d^{10}$	$ns^2 (n-1)d^{10}$	$ns^2 np^1$	$ns^2 np^2$	$ns^2 np^3$	$ns^2 np^4$	$ns^2 np^5$	$ns^2 np^6$
s Block elements		d-Block elements										p-Block elements					
f block elements		→ Lanthanides $4f^{1-14} 5d^{0-1} 6s^2$															
		→ Actinides $5f^{0-14} 6d^{0-2} 7s^2$															

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