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Subject : Inorganic Chemistry

Unit : Chemical periodicity

Semester: II

Session : 2022-2023

PERIODIC TABLE OF ELEMENTS

1
H
Hydrogen
Nonmetal

Atomic Number
Symbol
Name
Chemical Group Block

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	*	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	**	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og
		*	57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
		**	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Why arrange elements in a table ?

- Seeing chemical elements arranged in the modern periodic table is as familiar as seeing a map of the world, but it was not always so obvious.
- The creator of the periodic table, Mendeleev, in 1869 began collecting and sorting known properties of elements, like he was playing a game, while traveling by train. He noticed that there were groups of elements that exhibited similar properties, but he also noticed that there were plenty of exceptions to the emerging patterns.

History of the Development of Periodic Table

- **Dobereiner's law of triads:**
- **Dobereiner's law of triads** stated by **Dobereiner** in 1817 is as follows “the atomic mass of the middle element of a **triad** is the arithmetic mean of the atomic masses of the other two elements”.
- Examples: such **triads are** lithium-sodium-potassium, chlorine-bromine-iodine, calcium-strontium-barium, and sulfur-selenium-tellurium etc.

History of the Development of Periodic Table

- Newland's law of octaves:
- Newland's law of octaves stated by Newland's in 1864 is as follows if the chemical elements are arranged according to increasing atomic weight, those with similar physical and chemical properties occur after each interval of seven elements.
- Examples: H to F & F to Cl are octaves of eight elements, the eighth element repeating the properties of the first.

HISTORY OF THE DEVELOPMENT OF PERIODIC TABLE

- Mendeleev's periodic law:
- **Mendeleev's periodic law stated by Mendeleev in 1869 is as follows** "The physical and chemical properties of all the elements are a periodic function of their atomic masses"
- **Demerits of Mendeleev's Periodic Table:**
- **Mendeleev** placed many elements in wrong order of their increasing atomic masses in order to place elements having similar properties in similar group.
- **Example**: The atomic mass of nickel is less than that of cobalt; in spite of that cobalt is placed before nickel.

HISTORY OF THE DEVELOPMENT OF PERIODIC TABLE

- **Modern Periodic Law:**
- The modern periodic law stated by Henry Moseley in 1912 is as follows
- "The physical and chemical properties of elements are periodic functions of their atomic numbers"
- This means that there occurs a periodic recurrence in physical and chemical properties of elements when they are arranged on the basis of their increasing atomic numbers

EFFECTIVE NUCLEAR CHARGE

- **Effective Nuclear Charge:**

The **effective nuclear charge** (often symbolized as Z_{eff}) is the net positive charge experienced by an electron in a poly electronic atom. The term "effective" is used because the shielding effect of negetively charged electrons prevents higher orbital electrons from experiencing the full nuclear charge of the nucleous due to the repelling effect of inner-layer-electrons.

Principle of Slater's Rules

- Principle of Slater's Rules :

  The general principle behind Slater's Rule is that the actual charge felt by an electron is equal to what you would expect the charge to be from a certain number of protons, but minus a certain amount of charge from other electrons.

- Slater's rules allow you to estimate the effective nuclear charge Zeff from the real number of protons in the nucleus and the effective shielding of electrons in each orbital shell

Steps of Slater's Rules

- Slater's Rules :
- **Step 1**: Write the electron configuration of the atom in the following form:
- (1s) (2s, 2p) (3s, 3p) (3d) (4s, 4p) (4d) (4f) (5s, 5p) . . .
- **Step 2**: Identify the electron of interest, and ignore all electrons in higher groups (to the right in the list from Step 1). These do not shield electrons in lower groups
- **Step 3**: Slater's Rules is now broken into two cases:
  - the shielding experienced by an s- or p- electron,
    - electrons within same group shield **0.35**, except the 1*s* which shield **0.30**
    - electrons within the n-1 group shield **0.85**
    - electrons within the n-2 or lower groups shield **1.00**
  - the shielding experienced by n*d* or n*f* valence electrons
    - electrons within same group shield **0.35**
    - electrons within the lower groups shield **1.00**

SHIELDING EFFECT AND PENETRATION

- **Shielding And Penetration:**
- Electrons are negatively charged and are pretty close to each other, which means that they can repel each other. The repulsion an electron feels is **shielding** and the attraction it feels to the nucleus is **penetration**.

- **Shielding Effect:** If an electron is far from the nucleus,then at any given moment, many of the other electrons present *between* that electron and the nucleus decreases the attractive interaction between it and the electron farther away. As a result, the electron farther away experiences an effective nuclear charge (Zeff) that is less than the actual nuclear charge Z. This effect is called electron shielding.

THANK

YOU