CLASS 10- SCIENCE

CHAPTER 5- PERIODIC CLASSIFICATION OF ELEMENTS

PART 4- INTEXT ACTIVITIES

ACTIVITY 5.1

- Hydrogen resembles both group I and group VII elements and so could not be assigned a fixed position in the Mendeleev's Periodic Table. This was one of the limitation of this table.
- Hydrogen could be assigned group I or group VII and period 1 in the periodic table, but this was not justified earlier and was proved later. Therefore, it was alloted a fixed position in group I and period 1 in the Modern Periodic Table.

ACTIVITY 5.2

- Isotopes of Chlorine are Cl-35 and Cl-37
- According to Mendeleev's Periodic Law, "the properties of elements are the periodic function of their atomic masses". So, Cl-35 and Cl-37 could be placed in different slots, but this was one of the drawbacks of Mendeleev's periodic table.
- Isotopes are the atoms of same element with same atomic number but different atomic mass, and so they show same chemical properties. Therefore, we would place the isotopes in the same position.

ACTIVITY 5.3

- In Modern Periodic Table the elements are arranged in the increasing order of their atomic number. As Cobalt has atomic number 27 and Nickel has 28, so they are placed in their correct order of increasing atomic number.
- As isotopes are the atoms of same elements having same atomic number but different atomic mass, so no separate place is assigned to them in the Modern Periodic Table.
- No, it is not possible to have an element with atomic number 1.5, as it is always a whole number and cannot be in fractions.
- Hydrogen should be placed in Group I, as it has one valence electron like other elements of this group and also its atomic number is 1 so as to start the table.

ACTIVITY 5.4

- Elements present in group I are H, Li, Na, K, Rb, Cs, Fr
- Electronic configuration of hydrogen(H) = 1

  Electronic configuration of lithium(Li) = 2,1

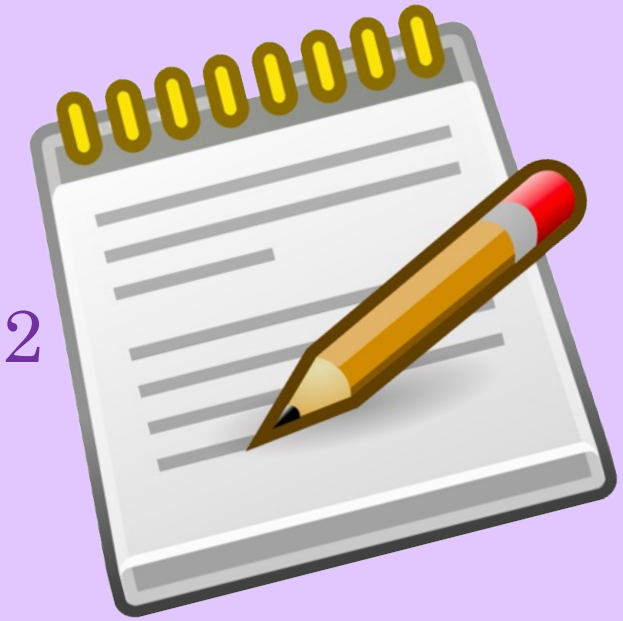
  Electronic configuration of sodium(Na) = 2,8,1
- All three elements show similarity by having the same number of valence electrons.
- All three elements have one valence electron.

ACTIVITY 5.5

- Electronic configuration of elements of second period are-

  Li = 2,1 ; Be = 2,2 ; B = 2,3 ; C = 2,4 ; N = 2,5 ;

  O = 2,6 ; F = 2,7 ; Ne = 2,8
- No, the elements of second period do not have the same number of valence electrons as the number of valence electrons increases by one unit on moving from left to right in a period.
- Yes, they contain the same number of shells i.e. 2 namely K and L shells. The number of shells remain same in a period.



ACTIVITY 5.6

- Valency is the number of electrons gained or lost or shared to form bonds between the atoms i.e. it is the combining capacity of an element. So, if the electronic configuration is known then its valency can be calculated.
- Magnesium- Atomic number= 12

  Electronic configuration= 2,8,2

  Valency= 2

Sulphur - Atomic number= 16

Electronic configuration= 2,8,6

Valency= 6 or 2

ACTIVITY 5.6 (cont.)

- Valency of first twenty elements

ELEMENT	ATOMIC NUMBER	ELECTRONIC CONFIGURATION	VALENCY
HYDROGEN	1	1	1
HELIUM	2	2	0
LITHIUM	3	2,1	1
BERYLLIUM	4	2,2	2
BORON	5	2,3	3
CARBON	6	2,4	4
NITROGEN	7	2,5	3
OXYGEN	8	2,6	2
FLOURINE	9	2,7	1
NEON	10	2,8	0

ELEMENT	ATOMIC NUMBER	ELECTRONIC CONFIGURATION	VALENCY
SODIUM	11	2,8,1	1
MAGNESIUM	12	2,8,2	2
ALUMINIUM	13	2,8,3	3
SILICON	14	2,8,4	4
PHOSPHORUS	15	2,8,5	3
SULPHUR	16	2,8,6	2
CHLORINE	17	2,8,7	1
ARGON	18	2,8,8	0
POTASSIUM	19	2,8,8,1	1
CALCIUM	20	2,8,8,2	2

ACTIVITY 5.6 (cont.)

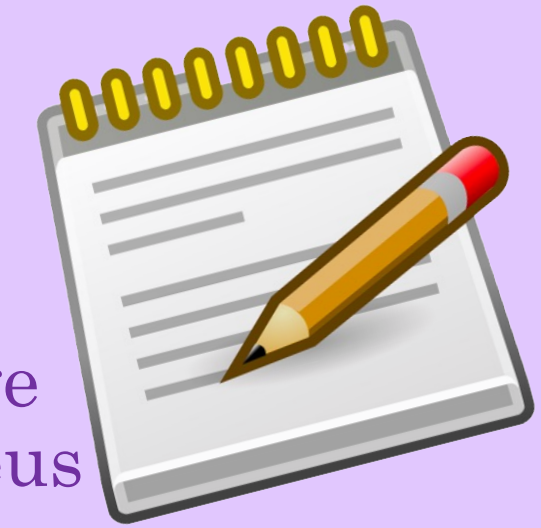
- Valency of the elements increases from 1 to 4 and then decreases from 4 to 0 as we move from left to right in a period.
- Valency remains the same for all the elements in a group.

ACTIVITY 5.7

- Period II elements- B Be O N Li C

  Atomic radii (pm)- 88 111 66 74 152 77
- Period II elements arranged in the decreasing order of their atomic radii shows-

  Li > Be > B > C > N > O
- Yes, the elements are now arranged in the pattern of a period in the periodic table.
- Lithium(Li) has the largest atom and Oxygen(O) has the smallest atom in this period.
- The atomic radius decreases as we move from left to right in a period. This is so because the nuclear charge increases which pulls the electrons closer to the nucleus thereby reducing the size of the atom.



ACTIVITY 5.8

- Group I elements arranged in an increasing order of their atomic radii shows-

  $Li < Na < K < Rb < Cs$

- Lithium(Li) has the smallest atom and Caesium(Cs) has the largest atom.
- The atomic size increases because new shells are added as we go down the group. This increases the distance between the valence electrons and the nucleus which results in increasing the atomic size.

ACTIVITY 5.9

- Na, Mg, Al are metals

  Si is metalloid

  P, S, Cl, Ar are non-metals
- Metals are present on the left hand side of the periodic table.
- Non-metals are present on the right hand side of the periodic table.

ACTIVITY 5.10

- The tendency to lose electrons increases down a group as the effective nuclear charge experienced by the valence shell electrons decreases. This is so because the valence electrons are farther away from the nucleus.
- The tendency to lose electrons decreases across a period because the effective nuclear charge acting on the valence shell electrons increases as we move from left to right in/ across a period.

ACTIVITY 5.11

- The tendency to gain electrons increases as we move from left to right across a period. This is so because the non-metals are electronegative and have the tendency to form bonds by gaining electrons.
- The tendency to gain electrons decreases as we go down a group. This is so because the non-metallic property of elements decreases as we move from top to bottom in a group.

THANK YOU