NAAHAR PUBLIC SCHOOL (CBSE) SENIOR SECONDARY
ACADEMIC YEAR(2022-2023)

CLASS:XI **DATE:19.11.2022**
SUBJECT: CHEMISTRY **MARKS:50**
TEACHER'S INITIAL: Mrs.UMA **DUR:40 Mins**

I.MULTIPLE CHOICE QUESTIONS **10x1=10**

1)The bond length between hybridised carbon atom and other carbon atom is minimum in
(a) Propane (b) Butane (c) Propene (d) Propyne
2.The number of nodal planes present in s × s antibonding orbitals is
(a) 1 (b) 2 (c) 0 (d) 3
3) Which one of the following does not have sp^2 hybridised carbon?
(a) Acetone (b) Acetic acid (c) Acetonitrile (d) Acetamide
4)Which of the following will have the lowest boiling point?
(a) 2-MethylButane (b) 2-MethylPropane (c) 2,2-Dimethylpropane (d) n-Pentane
5)Among the following the maximum covalent character is shown by the compound
(a) $MgCl_2$ (b) $FeCl_2$ (c) $SnCl_2$ (d) $AlCl_3$
6)Among the following mixtures, dipole-dipole as the major interaction, is present in
(a) benzene and ethanol (b) acetonitrile and acetone
(c) KCl and water (d) benzene and carbon tetrachloride
7).The value of n in the molecular formula $Be_nAl_2Si_6O_{18}$ is
(a) 3 (b) 5 (c) 7 (d) 9
8)Which of the following types of hybridisation leads to three dimensional geometry of bonds around the carbon atom?
(a) sp (b) sp^2 (c) sp^3 (d) None of these
9).An atom of an element A has three electrons in its outermost orbit and that of B has six electrons in its outermost orbit. The formula of the compound between these two will be
(a) A_3B_6 (b) A_2B_3 (c) A_3B_2 (d) A_2B
10)The maximum number of hydrogen bonds that a molecule of water can have is
(a) 1 (b) 2 (c) 3 (d) 4

II.ASSERTION AND REASONING **5x1=5**

Directions : Each of these questions contain two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.
(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.
Q.1. Assertion : The bond order of helium is always zero.
Reason : The number of electrons in bonding molecular orbital and antibonding molecular orbital is equal.
Q.2. Assertion : The lesser the lattice enthalpy more stable is the ionic compound.
Reason : The lattice enthalpy is greater, for ions of highest charge and smaller radii.
Q.3. Assertion : Atoms can combine either by transfer of valence of electrons from one atom to another or by sharing of valence electrons.
Reason : Sharing and transfer of valence electrons is done by atoms to have an octet in their valence shell.
Q.4. Assertion : BF_3 molecule has zero dipole moment.
Reason : F is electronegative and B–F bonds are polar in nature.
Q.5. Assertion : CH_2Cl_2 is non-polar and CCl_4 is polar molecule.
Reason : Molecule with zero dipole moment is non-polar in nature.

III.CASE STUDY BASED QUESTIONS **5x1=5**

The covalent bond may be classified into two types depending upon the types of overlapping:
(i) Sigma(σ) bond, and (ii) pi(π) bond
i) Sigma(σ) bond : This type of covalent bond is formed by the end to end (head-on)overlap of bonding orbitals along the inter nuclear axis. This is called as head on overlap or axial overlap. This can be formed by any one of the following types of combinations of atomic orbitals.

s-s overlapping : In this case, there is overlap of two half filled s-orbitals along the inter nuclear axis.

s-p overlapping: This type of overlap occurs between half filled s-orbitals of one atom and half filled p-orbitals of another atom.

p–p overlapping : This type of overlap takes place between half filled p-orbitals of the two approaching atoms.

(ii) pi(π) bond : In the formation of π bond the atomic orbitals overlap in such a way that their axes remain parallel to each other and perpendicular to the inter nuclear axis. The orbitals formed due to sidewise overlapping consists of two saucer type charged clouds above and below the plane of the participating atoms. Basically the strength of a bond depends upon the extent of overlapping. In case of sigma bond,the overlapping of orbitals takes place to a larger extent. Hence, it is stronger as compared to the pi bond where the extent of overlapping occurs to a smaller extent. Further, it is important to note that in the formation of multiple bonds between two atoms of a molecule, pi bond(s) is formed in addition to a sigma bond. In order to explain the characteristic geometrical shapes of polyatomic molecules like CH_4,NH_3 and H_2O etc., Pauling introduced the concept of hybridisation. According to him the atomic orbitals combine to form new set of equivalent orbitals known as hybrid orbitals.Unlike pure orbitals, the hybrid orbitals are used in bond formation. The phenomenon is known as hybridisation which can be defined as the process of intermixing of the orbitals of slightly different energies so as to redistribute their energies, resulting in the formation of new set of orbitals of equivalent energies and shape.For example when one 2s and three 2p-orbitalsof carbon hybridise, there is the formation off our new sp^3 hybrid orbitals. Salient features of hybridisation: The main features of hybridisation are as under number of hybrid orbitals is equal to the number of the atomic orbitals that get hybridised.The hybridised orbitals are always equivalent in energy and shape.

The hybrid orbitals are more effective informing stable bonds than the pure atomicorbitals.

These hybrid orbitals are directed in spacein some preferred direction to haveminimum repulsion between electronpairs and thus a stable arrangement.Therefore, the type of hybridisation indicates the geometry of the molecules. Important conditions for hybridisation.The orbitals present in the valence shell of the atom are hybridised.The orbitals undergoing hybridisation should have almost equal energy.Promotion of electron is not essential condition prior to hybridisation.It is not necessary that only half filled orbitals participate in hybridisation.some cases, even filled orbitals of valence shell take part in hybridisation.There are various types of hybridisation involving s, p and d orbitals. The different types of hybridisation are as under:

(i) sp hybridisation: This type of hybridisation involves the mixing of one s and one p orbital resulting in the formation of two equivalent sp hybrid orbitals. The suitable orbitals for sp hybridisation are s and pz, if the hybrid orbitals are to lie along the z-axis. Example of molecule having sphybridisation$BeCl_2$: The ground state electronic configuration of Be is $1s^2 2s^2$. In the exited state one of the 2s-electrons is promoted to vacant 2p orbital to account for its bivalency. One 2s and one 2p-orbital gets hybridised to form two sp hybridised orbitals.

(ii) sp2 hybridisation : In this hybridisation there is involvement of one s and two p-orbitals in order to form three equivalent sp2hybridised orbitals. For example, in BCl3molecule, the ground state electronic configuration of central boron atom is$1s^2 2s^2 2p^1$. In the excited state, one of the 2selectrons is promoted to vacant 2p orbital as a result boron has three unpaired electrons.These three orbitals (one 2s and two 2p)hybridise to form three sp2 hybrid orbitals.

(iii) sp^3 hybridisation: This type of hybridisation can be explained by taking the example of CH_4 molecule in which there is mixing of one s-orbital and three p-orbitals of the valence shell to form four sp^3 hybrid orbital of equivalent energies and shape. There is 25%s-character and 75% p-character in each sp^3hybrid orbital. The four sp^3 hybrid orbitals so formed are directed towards the four corners of the tetrahedron. The angle between sp^3hybrid orbital is 109.5° .

1) … introduced the concept of hybridisation.
(a) Pauling (b) Lewis (c) Nyholm (d) Gillespie

2) Which of the following is an example of sp3 hybridization?
(a) BeCl2 (b) Ch4 (c) BCl3 (d) C2H4

3)The angle between sp3 hybrid orbital is ….

(a) 5° (b) 9° (c) 5° (d) 120°

4) A sigma bond is formed by the overlapping of …

(a) s−s, (b) s−p (c) p−p (d) All the above

5) when one 2s and three 2p-orbitals of carbon hybridise, there is the formation of four new … hybrid orbitals.

(a) sp3 (b) sp2 (c) sp (d) None of above

IV.ANSWER THE FOLLOWING IN SHORT **4x2=8**

1)Arrange the following in order of increasing strengths of hydrogen bonding O, F, S, Cl, N.

2)Explain the shape of BrF_5.

3) Choose the compounds containing ionic, covalent, and coordinate bonds out of the following: MgO, CH_4, $CaCl_2$, HCl,NH^+_4,O_3.

4) Which of the following has the maximum bond angle? Why?

H_2O, CO_2, NH_3 CH_4.

V.ANSWER THE FOLLOWING IN BRIEF **4x3=12**

1) Which out of CH_3F and CH_3Cl has a higher dipole moment and why?

2) Define the term chemical bond. What are its different types?

3) Why covalent bonds are called directional bonds whereas ionic bonds are called non-directional?

4) Using the VSEPR theory identifies the type of hybridization and draw the structure of OF_2 What are oxidation states of O and F?

VI.ANSWER THE FOLLOWING IN DETAIL **5x2=10**

1) Use the molecular orbital energy level diagram to show that N_2 would be expected to have a triple bond, F_2, a single bond and Ne_2, no bond.

2) Discuss the significance/ applications of dipole moment.

(ii) Represent diagrammatically the bond moments and the resultant dipole moment in CO_2, NF_3 and $CHCI_3$.