# CHEMISTRY-1

## Chemical bonding and Molecular Structure

## [Set-1]

**SECTION-A**

1. Which of the molecule has a highest value of the dipole moment?

   (i) $CO_2$ (ii) $SO_2$ (iii) $NH_3$ (iv) $H_2O$

2. The molecule with maximum number of lone pairs of electrons on the central atom is

   (i) $NF_3$ (ii) $SO_3$ (iii) $XeF_2$ (iv) $ClF_3$

3. Each of the following molecule/ion is attracted towards the magnetic field except

   (i) $O_2$ (ii) $N_2^+$ (iii) $H_2$ (iv) $N_2^-$

4. In which of the following species, the central atoms has $sp^2$ hybridisation?

   (i) $NH_2^-$ (ii) $H_3O^+$ (iii) $CO_3^{2-}$ (iv) All of these

5. **Match the following:**

| **Column-I (molecule/ion)** | **Column-II (Shape)** |
|---|---|
| A. $I_3^-$ | 1. Linear |
| B. $PH_4^+$ | 2. Bent |
| C. CS | 3. Trigonal planar |
| D. $SF_4$ | 4. Tetrahedral |
| | 5. See-saw |

| | A | B | C | D |
|---|---|---|---|---|
| (i) | 2 | 3 | 1 | 5 |
| (ii) | 1 | 4 | 1 | 5 |
| (iii) | 2 | 4 | 1 | 4 |
| (iv) | 1 | 5 | 2 | 4 |

**Assertion-Reason type Questions:**

(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true and R is not the correct explanation of A

(c) A is true but R is false

(d) A is false but R is true



6. A: Nitrate ion, $NO_3^-$ has a zero net dipole moment although each N – O bond is polar.

   R: $NO_3^-$ has a trigonal planar geometry.

7. A: $NH_4^+$ and $H_3O^+$ both ions contain dative sigma bond.

   R: Both the ions have a central atom $sp^3$ hybridised.

**Passage bases questions:**

Atoms do participate in the bond formation either by sharing electrons or loss or gain of electrons in order to have eight electrons in their valence shell (Lewis octet rule). The species in which the central atom has less than eight electrons are called hypovalent molecules. The molecules with more than eight electrons in the valence shell of central atom are called hypervalent molecules or having an expanded octet. The molecules which obey Lewis rule tends to be stable.

8. The molecule in which the central atom has an expanded octet is

   (i) $PH_4^+$ (ii) $BrF_3$ (iii) $AlCl_3$ (iv) $NH_3$

9. The least stable amongst the following is

   (i) $NO_2^-$ (ii) $H_3C-\overset{+}{C}O$ (iii) $CO_3^{2-}$ (iv) $N_2$

10. The hypovalent molecules tends to behave as Lewis acids (electron pair acceptor). The Lewis acid amongst the following is

    (i) $CCl_2$ (ii) $BeCl_2$ (iii) $AlCl_3$ (iv) All of these

**SECTION-B**

11. Explain the hybridization of nitrogen in $NH_3$ using orbital diagram. How does the hybridisation of nitrogen changes when $NH_3$ changes to $NH_4^+$ ion?

12. Define resonance.

    Draw the resonating structures of nitrite ion, $NO_2^-$

**OR**

Name the different types of bonds present in $NaBH_4$ after drawing its structure. Also predict the hybrdisation of boron.

13. Define bond order

    How does the bond order changes in the following transformation?

    (i) $N_2 \longrightarrow N_2^+ + e^-$

    (ii) $O_2 \longrightarrow O_2^+ + e^-$

14. Arrange the following in order of increasing property indicated:

(i) $C_2$, $O_2$, $F_2^-$ (paramagnetic properties)

(ii) $BF_3$, $NH_3$, $ClF_3$ (bond angle)

(iii) $CO_2$, $SO_2$, OCS (dipole moment)

**OR**

(i) Give four points to distinguish between the sigma and pi bonds.

(ii) Why is $PCl_5$ highly reactive?

15. (i) Arrange the following in order of increasing melting point

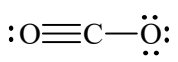
$MgCl_2$, $AlCl_3$, NaCl

(ii) Give reasons:

(a) $NO^+$ is more stable than NO

(b) $H_2O$ has a higher boiling point than HF

(iii) Calculate the formal charge on each atom on



**OR**

(i) Draw the shape of $SF_6$ and write the hybridization of sulphur.

(ii) Give reason:

(a) $Be_2$ molecule does not exist

(b) $BeH_2$ molecule has a zero dipole moment although Be – H bonds are polar.

(iii) On the basis of Fajan's rules, predict which one is more covalent in each pair

(a) $FeCl_2$ or $FeCl_3$

(b) MgO or $Al_2O_3$

