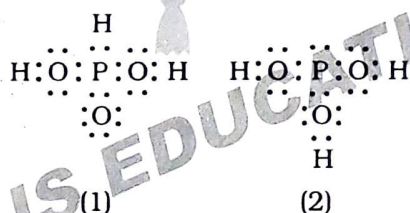


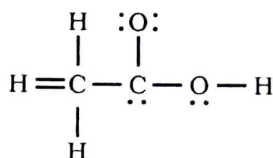
CHAPTER 4: CHEMICAL BONDING AND MOLECULAR STRUCTURE

NCERT EXERCISES

- 4.1 Explain the formation of a chemical bond.
- 4.2 Write Lewis dot symbols for atoms of the following elements : Mg, Na, B, O, N, Br.
- 4.3 Write Lewis symbols for the following atoms and ions:
S and S²⁻; Al and Al³⁺; H and H⁻
- 4.4 Draw the Lewis structures for the following molecules and ions :
H₂S, SiCl₄, BeF₂, CO₃²⁻, HCOOH
- 4.5 Define octet rule. Write its significance and limitations.
- 4.6 Write the favourable factors for the formation of ionic bond.
- 4.7 Discuss the shape of the following molecules using the VSEPR model:
BeCl₂, BCl₃, SiCl₄, AsF₅, H₂S, PH₃
- 4.8 Although geometries of NH₃ and H₂O molecules are distorted tetrahedral, bond angle in water is less than that of ammonia. Discuss.
- 4.9 How do you express the bond strength in terms of bond order ?
- 4.10 Define the bond length.
- 4.11 Explain the important aspects of resonance with reference to the CO₃²⁻ ion.
- 4.12 H₃PO₃ can be represented by structures 1 and 2 shown below. Can these two structures be taken as the canonical forms of the resonance hybrid representing H₃PO₃ ? If not, give reasons for the same.



- 4.13 Write the resonance structures for SO₃, NO₂ and NO₃⁻.
- 4.14 Use Lewis symbols to show electron transfer between the following atoms to form cations and anions : (a) K and S (b) Ca and O (c) Al and N.
- 4.15 Although both CO₂ and H₂O are triatomic molecules, the shape of H₂O molecule is bent while that of CO₂ is linear. Explain this on the basis of dipole moment.
- 4.16 Write the significance/applications of dipole moment.
- 4.17 Define electronegativity. How does it differ from electron gain enthalpy ?
- 4.18 Explain with the help of suitable example polar covalent bond.
- 4.19 Arrange the bonds in order of increasing ionic character in the molecules: LiF, K₂O, N₂, SO₂ and ClF₃.
- 4.20 The skeletal structure of CH₃COOH as shown below is correct, but some of the bonds are shown incorrectly. Write the correct Lewis structure for acetic acid.



- 4.21 Apart from tetrahedral geometry, another possible geometry for CH_4 is square planar with the four H atoms at the corners of the square and the C atom at its centre. Explain why CH_4 is not square planar ?
- 4.22 Explain why BeH_2 molecule has a zero dipole moment although the Be-H bonds are polar.
- 4.23 Which out of NH_3 and NF_3 has higher dipole moment and why ?
- 4.24 What is meant by hybridisation of atomic orbitals? Describe the shapes of sp , sp^2 , sp^3 hybrid orbitals.
- 4.25 Describe the change in hybridisation (if any) of the Al atom in the following reaction.
 $\text{AlCl}_3 + \text{Cl}^- \rightarrow \text{A}$
- 4.26 Is there any change in the hybridisation of B and N atoms as a result of the following reaction ?
 $\text{BF}_3 + \text{NH}_3 \rightarrow \text{F}_3\text{B} \leftarrow \text{NH}_3$
- 4.27 Draw diagrams showing the formation of a double bond and a triple bond between carbon atoms in C_2H_4 and C_2H_2 molecules.
- 4.28 What is the total number of sigma and pi bonds in the following molecules ?
 (a) C_2H_2 (b) C_2H_4
- 4.29 Considering x-axis as the internuclear axis which out of the following will not form a sigma bond and why? (a) $1s$ and $1s$ (b) $1s$ and $2p_x$; (c) $2p_y$ and $2p_y$ (d) $1s$ and $2s$.
- 4.30 Which hybrid orbitals are used by carbon atoms in the following molecules ?
 $\text{CH}_3\text{-CH}_3$; (b) $\text{CH}_3\text{-CH=CH}_2$; (c) $\text{CH}_3\text{-CH}_2\text{-OH}$; (d) $\text{CH}_3\text{-CHO}$ (e) CH_3COOH
- 4.31 What do you understand by bond pairs and lone pairs of electrons ? Illustrate by giving one example of each type.
- 4.32 Distinguish between a sigma and a pi bond.
- 4.33 Explain the formation of H_2 molecule on the basis of valence bond theory.
- 4.34 Write the important conditions required for the linear combination of atomic orbitals to form molecular orbitals.
- 4.35 Use molecular orbital theory to explain why the Be_2 molecule does not exist.
- 4.36 Compare the relative stability of the following species and indicate their magnetic properties:
 $\text{O}_2, \text{O}_2^+, \text{O}_2^-$ (superoxide), O_2^{2-} (peroxide)
- 4.37 Write the significance of a plus and a minus sign shown in representing the orbitals.
- 4.38 Describe the hybridisation in case of PCl_5 . Why are the axial bonds longer as compared to equatorial bonds ?
- 4.39 Define hydrogen bond. Is it weaker or stronger than the van der Waals forces?
- 4.40 What is meant by the term bond order ? Calculate the bond order of : $\text{N}_2, \text{O}_2, \text{O}_2^+$ and O_2^- .