Chapter 02

# Chemical Bonding

## TOPIC WISE QUESTIONS

### VALENCY

**Q.1** Which of the species follows octet rule:
(1) $IBr_5$ (2) $N^{3-}$ (3) $SF_4$ (4) $Pb^{+4}$

**Q.2** Which of the following compound exist –
(1) $B_2F_6$ (2) $B_2H_6$ (3) $Al_2F_6$ (4) $B_2Cl_6$

**Q.3** Which one of the following element will never be obeyed octet rule:
(1) Na (2) F (3) S (4) H

**Q.4** In which of the following molecule electron of 2s in carbon is not promoted to 2p sub shell:
(1) HCN (2) $CO_2$ (3) $CS_2$ (4) CO

**Q.5** What is the oxidation state of C in CO molecule:
(1) +2 (2) +3 (3) +4 (4) +1

**Q.6** Which is not an exception to octet rule ?
(1) $BF_3$ (2) $SnCl_4$ (3) $BeI_2$ (4) $ClO_2$

**Q.7** Which of the following pair has electron deficient compounds :
(1) $B_2H_6$, $AlCl_3$ (2) $C_2H_6$, $Al_2Cl_6$
(3) $SF_2$, $Cl_2O$ (4) $NaBH_4$, ICl

**Q.8** Valency expresses generally :
(1) Total $e^-$ in an atom
(2) Atomicity of an element
(3) Oxidation number of an element
(4) Combining capacity of an element

**Q.9** Which element do not have valency equals to its group no :
(1) Sodium (2) Aluminium
(3) Oxygen (4) Carbon

**Q.10** An oxide of chlorine which is an odd electron molecule is :
(1) $ClO_2$ (2) $Cl_2O_6$ (3) $Cl_2O_7$ (4) $Cl_2O$

### VBT AND OVERLAPPING

**Q.11** In a triple bond there is sharing of :
(1) 3–electrons (2) 4–electrons
(3) Several electrons (4) 6–electrons

**Q.12** The triple bond in $C \overleftarrow{\equiv} O$ is made up of :
(1) Three sigma bonds
(2) Three $\pi$–bonds
(3) One sigma and two $\pi$–bonds
(4) Two sigma and one $\pi$–bond

**Q.13** The strength of bonds by 2s - 2s, 2p - 2p and 2p - 2s overlapping has the order :-
(1) s – s > p – p > s – p
(2) s – s > p – s > p – p
(3) p – p > s – p > s – s
(4) p – p > s – s > p – s

**Q.14** Which of the following configuration shows second excitation state of Iodine:-
(1) 
(2) 
(3) 
(4) 

**Q.15** Variable covalency is exhibited by:-
(1) P and S (2) N and O
(3) N and P (4) F and Cl

**Q.16** A sigma bond is formed by the overlapping of :
(1) s-s orbital only
(2) s and p orbitals only
(3) s–s, s–p or p–p orbitals along internuclear axis
(4) p–p orbital along the sides

**Q.17** Which of the following bonds will have directional character ?
(1) Ionic bond
(2) Metallic bond
(3) Covalent bond
(4) Both covalent & metallic

**Q.18** Which is not characteristic of $\pi$-bond ?
(1) $\pi$ - bond is formed when a sigma bond already formed
(2) $\pi$ - bond are formed from hybrid orbitals

(3) $\pi$ - bond may be formed by the overlapping of p-orbitals
(4) $\pi$-bond results from lateral overlap of atomic orbitals

**Q.19** Which of the following statements is not correct?
(1) Double bonds is shorter than a single bond
(2) $\sigma$ – bond is weaker than a $\pi$ bond
(3) Double bond is stronger than a single bond
(4) Covalent bond is stronger than a hydrogen bond

**Q.20** The boiling point of ICl is nearly 40°C higher than that of $Br_2$ although the two substances have the same relative molecular mass. This is because:-
(1) ICl is ionic compound
(2) I-Cl bond is stronger than Br - Br bond
(3) ICl is polar covalent molecule while $Br_2$ is non polar
(4) IP of Iodine is less than that of Br.

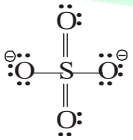
**Q.21** Covalent bond is formed by
(1) Combination of ions
(2) Combination of half filled orbitals
(3) Exchange of electrons by atom
(4) None of above

**Q.22** The type of bond formed between two electronegative atoms would be
(1) Covalent (2) Ionic
(3) Co-ordinate (4) All the above

**Q.23** Nitrogen does not form $NF_5$ because
(1) Nitrogen is member of V group
(2) It contains no empty d-orbital
(3) The bond energy of N ≡ N is very high
(4) Inert pair effect exists in the molecule

## RESONANCE AND FORMAL CHARGE

**Q.24** One of the resonating structure of $SO_4^{-2}$ is

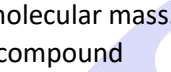
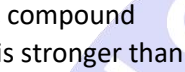


Which set of formal charge on oxygen and bond order is correct
(1) 0.5 and 1.5 (2) 1.5 and 3
(3) 2 and 3 (4) 1.5 and 1.5

**Q.25** The correct order of the O–O bond length in $O_2$, $H_2O_2$ and $O_3$is :
(1) $O_3 > H_2O_2 > O_2$ (2) $O_2 > H_2O_2 > O_3$
(3) $O_2 > O_3 > H_2O_2$ (4) $H_2O_2 > O_3 > O_2$

**Q.26** Higher is the bond order, greater is -
(1) Bond dissociation energy
(2) Covalent character
(3) Bond length
(4) Paramagnetism

**Q.27** In $PO_4^{3-}$, the formal charge on each oxygen atom and the P–O bond order respectively are :
(1) - 0.75, 0.6 (2) - 0.75, 1.0
(3) - 0.75, 1.25 (4) - 3, 1.25

**Q.28** In which of the following Lewis dot structure is written with incorrect formal charge?
(1)  (2) 
(3)  (4) 

**Q.29** The species having no p$\pi$-p$\pi$ bond but has bond order equal to that of $O_2$ :
(1) $ClO_3^-$ (2)$PO_4^{3-}$ (3) $SO_4^{2-}$ (4)$XeO_3$

**Q.30** Bond order and formal charge of perchlorate ion are:
(1) 1.75 and –1 (2) 1.75 and –0.33
(3) 1.66 and –0.33 (4) 1.50 and –0.50

## HYBRIDISATION, VSEPR THEORY AND GEOMETRY

**Q.31** In the protonation of $H_2O$, change occurs in
(1) Hybridisation state of oxygen
(2) Shape of molecule
(3) Hybridisation and shape both
(4) None

**Q.32** The d- orbitals involved in $sp^3d$ hybridisation is:-
(1) $d_{x^2-y^2}$ (2)$d_{z^2}$ (3) $d_{xy}$ (4)$d_{xz}$

**Q.33** A $sp^3$ hybrid orbital contains:-
(1) $\frac{3}{4}$ s – character (2) $\frac{1}{4}$ p – character
(3) $\frac{3}{4}$ p – character (4) $\frac{1}{2}$ s - character

**Q.34** Among the following species identify the isostructural pairs:-
$NF_3$, $NO_3^-$ ,$BF_3$, $H_3O^+$, $HN_3$
(1) [$NF_3$, $NO_3^-$] and [$BF_3$, $H_3O^+$]
(2) [$NF_3$, $HN_3$] and [$NO_3^-$, $BF_3$]
(3) [$NF_3$, $H_3O^+$] and [$NO_3^-$, $BF_3$]
(4) [$NF_3$, $H_3O^+$] and [$HN_3$, $BF_3$]

**Q.35** Which of the set of species have same hybridisation state but different shapes:-
(1) $NO_2^+$, $NO2$ , $NO_2^-$ (2)$ClO_4^-$, $SF_4$, $XeF_4$

(3) $NH_4^+, H_3O^+, OF_2$ (4) $SO_4^{-2}, PO_4^{-3}, ClO_4^-$

**Q.36** In which following set of compound/ion has linear geometry:-
(1) $CH_4, NH_4^+, BH_4^-$ (2) $CO_4^{-2}, NO_4^-, BF_3$
(3) $NO_2^+$, $CO_2$, $XeF_2$ (4) $BeCl_2$, $BCl_3$, $CH_4$

**Q.37** Which of the following set is not correct:
(1) $SO_3$, $O_3$, $NH_4^+$ all have coordinate bonds
(2) $H_2O$, $NO_2$, $ClO_2^-$, all are 'V' shape molecules
(3) $I_3^-$, $ICl_2^-$, $NO_2^+$; all are linear molecules
(4) $SF_4$, $SiF_4$ $XeF_4$ are tetrahedral in shape

**Q.38** Hybridisation in $XeOF_2$, $XeO_2F_2$ is $sp^3d$. But shape will be respectively:-
(1) T, 'V' shape
(2) T shape, See-Saw
(3) Both have T shape
(4) T shape, irregular octahedral

**Q.39** The shape of $IF_4^+$ will be :-
(1) Square planar
(2) Tetrahedral
(3) Pentagonal bipyramidal
(4) Distorted tetrahedral

**Q.40** Hybridisation state of I in $ICl_2^+$ is
(1) $dsp^2$ (2) sp (3) $sp^3$ (4) $sp^2$

**Q.41** The regular geometry of $XeO_2F_2$is :
(1) Plane triangular
(2) Trigonal bipyramidal
(3) Square planar
(4) Tetrahedral

**Q.42** Incorrect code regarding shape is :-
(1) Linear : $N_3^-$, $(CN)_2$, $ICl_2^-$
(2) Pyramidal : $CH_3^-$, $NH_3$, $XeO_3$
(3) Trigonal planar : $CH_3^{\oplus}$, $\dot{C}H_3$, $CH_3^{\ominus}$
(4) Tetrahedral : $SiH_4$, $XeO_4$, $PCl_4^+$

**Q.43** Hybridization involves
(1) Addition of an electron pair
(2) Mixing up of atomic orbitals
(3) Removal of an electron pair
(4) Separation of orbitals

**Q.44** Which is having maximum % of s character?
(1) C—C (2) C=C
(3) C≡C (4) None

**Q.45** The structure and hybridization of $Si(CH_3)_4$ is :
(1) bent, sp
(2) trigonal, $sp^2$
(3) octahedral, $sp^3d$
(4) tetrahedral, $sp^3$

**Q.46** Among the following compounds the one that is polar and has the central atom with $sp^3$ hybridisationis :
(1) $H_2CO_3$ (2) $SiF_4$ (3) $BF_3$ (4) $HClO_2$

**Q.47** Which of the following molecule has regular geometry –
(1) $H_2O$ (2) $PF_3$ (3) $SF_6$ (4) $XeF_6$

**Q.48** In sulphate ion the oxidation state of sulphur is +6 and hybridization state of sulphur is :
(1) $sp^2$ (2) $sp^3d^2$ (3) $dsp^3$ (4) $sp^3$

**Q.49** The xenon compound(s) that are iso-structural with $IBr_2^-$ and $BrO_3^-$ respectively are :
(1) Linear $XeF_2$ and pyramidal $XeO_3$
(2) Bent $XeF_2$ and pyramidal $XeO_3$
(3) Bent $XeF_2$ and planar $XeO_3$
(4) Linear $XeF_2$ and tetrahedral $XeO_3$

**Q.50** VSEPR theory does not state :
(1) The order of repulsion between different pair of electrons is /p – /p>/p – bp > bp – bp (/p = lone pair electrons, bp = bond pair of electrons)
(2) As the number of lone pair of electrons on central atom increase, the deviation in BA from normal BA (Bond-Angle) also increase
(3) The number of lone pair on O in $H_2O$ is 1 while on N in $NH_3$ is 2.
(4) The structure of Xenon-flurides and Xenon-oxyfluorides could be explained on the basis of VSEPR theory.

**BOND ANGLE**

**Q.51** When the hybridization state of carbon atom changes from $sp^3$, $sp^2$ and sp, the angle between the hybridized orbitals.
(1) decrease considerably
(2) increase progressively
(3) decrease gradually
(4) all of these

**Q.52** By the hybridization of one s & one p orbitals it will be obtained
(1) Two orbitals mutually at 90° angle
(2) two orbitals mutually at 180° angle
(3) Two orbitals mutually at 120° angle
(4) Two orbitals mutually at 150° angle

**Q.53** In compounds X, all the bond angles are exactly 109°28', X is :
(1) Chloromethane
(2) Carbon tetrachloride
(3) Iodoform
(4) Chloroform

**Q.54** Among the following orbital/bonds, the angle is minimum between :
(1) $sp^3$ bonds
(2) $p_x$ and $p_y$ orbitals
(3) H–O–H bond in water
(4) sp bonds

**Q.55** There is no effect of lone pair on bond angle in :
(1) $XeF_2$, $ICl_4^-$ (2) $BF_3$, $OF_2$
(3) $IF_5$, $NH_3$ (4) $I_3^-$, $I_3^+$

**Q.56** ∠F– As –F Bond angle in $AsF_3Cl_2$ molecules is :
(1) 90° and 180° (2) 120°
(3) 90° (4) 180°

## DIPOLE MOMENT

**Q.57** Which statement is correct:-
(1) All the compounds having polar bonds, have dipole moment
(2) $SO_2$ is non-polar
(3) $H_2O$ molecule is non polar, having polar bonds
(4) $PH_3$ is polar molecule having non polar bonds

**Q.58** $BeF_2$ has zero dipole moment where as $H_2O$ has a dipole moment because :-
(1) Water is linear
(2) $H_2O$ is bent
(3) F is more electronegative than O
(4) Hydrogen bonding is present in $H_2O$

**Q.59** The dipole moment of $NH_3$ is:-
(1) Less than dipole moment of $NCl_3$
(2) Higher than dipole moment of $NCl_3$
(3) Equal to the dipole moment of $NCl_3$
(4) None of these

**Q.60** An example of a polar covalent molecule is
(1) $S_8$ (2) H— O—H
(3) $Na^+Cl^-$ (4) F — F

**Q.61** Which of the following molecules has polar character ?
(1) $CO_2$ (2) $CH_4$ (3) $PF_5$ (4) $NH_3$

**Q.62** $PCl_5$ is non polar because :-
(1) P – Cl bond is non-polar
(2) Its dipole moment is zero
(3) P – Cl bond is polar
(4) P & Cl have equal electronegativity

**Q.63** Which contains both polar and non-polar bonds?
(1) $NH_4Cl$ (2) HCN (3) $H_2O_2$ (4) $CH_4$

**Q.64** The correct order of dipole moment is :
(1) $CH_4 < NF_3 < NH_3 < H_2O$
(2) $NF_3 < CH_4 < NH_3 < H_2O$
(3) $NH_3 < NF_3 < CH_4 < H_2O$
(4) $H_2O < NH_3 < NF_3 < CH_4$

## COORDINATE BOND

**Q.65** Which species do not exists :
(1) $AlF_6^{-3}$ (2) $BF_4^-$ (3) $BeF_4^{-2}$ (4) $CCl_6^{2-}$

**Q.66** Which of the following contains Co-ordinate and covalent bonds :
(a) $N_2H_5^+$ (b) $H_3O^+$ (c) HCl (d) $H_2O$
**Correct answer is :**
(1) a & d (2) a & b (3) c & d (4) Only a

**Q.67** In Co-ordinate bond, the acceptor atoms must essentially contain in its valency shell an orbital :
(1) With paired electron
(2) With single electron
(3) With no electron
(4) With three electron

**Q.68** No. of σ and π bonds in $C_2(CN)_4$ are respectively:
(1) 9 σ, 9π (2) 8 σ, 7 π
(3) 1 σ, 1 π (4) 9 σ,8 π

**Q.69** Number of co-ordinate bond present in sulphuric acid are :
(1) 1 (2) 2 (3) 3 (4) 4

**Q.70** In the co-ordinate valence :
(1) electrons are equally shared by the atoms
(2) electrons of one atom are shared by two atoms
(3) hydrogen bond is formed
(4) none of the above

**Q.71** Which of the following has no co-ordinate bond ?
(1) $PH_3$ (2) $P_2H_6^{2+}$ (3) $P_2H_5^{\oplus}$ (4) $PH_4^+$

**Q.72** The compound containing co-ordinate bond is :
(1) $H_2SO_4$ (2) $O_3$
(3) $SO_3$ (4) All of these

## BACK BONDING

**Q.73** Which of the following is not possible due to back bonding:
(1) State of hybridisation may change
(2) Bond order increases
(3) Bond angle always decreases

(4) Lewis acidic strength decreases

**Q.74** Among following molecule N-Si bond length is shortest :
(1) $N(SiH_3)_3$
(2) $NH(SiH_3)_2$
(3) $NH_2(SiH_3)$
(4) All have equal N-Si bond length

**Q.75** The geometry with respect to the central atom of the following molecules are :
$N(SiH_3)_3$, $Me_3N$, $(SiH_3)_3P$
(1) Planar, pyramidal, planar
(2) planar, pyramidal, pyramidal
(3) pyramidal, pyramidal, pyramidal
(4) Pyramidal, planar, pyramidal

**Q.76** Back bonding is absent in :
(1) $(SiH_3)_3N$ (2) $H_3Si–N=C=O$
(3) $O(SiH_3)_2$ (4) $P(SiH_3)_3$

**IONIC BOND**

**Q.77** The compound which contains both ionic and covalent bonds is:
(1) $Al_4C_3$ (2) HCl (3) $NH_4Cl$ (4) KCl

**Q.78** An atom with atomic number 20 is most likely to combine chemically with the atom whose atomic number is :
(1) 11 (2) 16 (3) 18 (4) 10

**Q.79** Least ionic bond is:
(1) P—Cl (2) S—Cl (3) I—Cl (4) Cl—Cl

**Q.80** Formula of a metal oxide is MO, formula of its phosphate will be :
(1) $M_3(PO_4)_2$ (2) $MPO_4$
(3) $M_2(PO_4)_2$ (4) $M_2(PO_4)_3$

**Q.81** Electrovalent compounds do not show stereoisomerism. The reason is :
(1) Presence of ions
(2) Strong electro static force of attraction
(3) Brittleness
(4) Non - directional nature of ionic bond

**Q.82** Nature of bond formed when two elements react, depends on :
(1) Ionisation potential
(2) Electronegativity
(3) Oxidation potential
(4) Electron - affinity

**Q.83** This is not the characteristics of ionic compound :
(1) Brittle nature
(2) Solubility in polar solvent
(3) Directional bond
(4) Conduction of electricity in fused state

**Q.84** The bond in which two atoms are bonded by coulombic attraction force is called :
(1) Hydrogen bond (2) Covalent bond
(3) Ionic bond (4) Co-ordinate bond

**Q.85** Consider two elements with atomic no. 37 and 53, the bond between their atoms would be :
(1) Covalent (2) Ionic
(3) Co-ordinate (4) Metallic

**Q.86** Which of the following pairs will form the most stable ionic bond ?
(1) Na and Cl (2) Mg and F
(3) Li and F (4) Na and F

**SOLUBILITY**

**Q.87** KCl easily dissolves in water because :
(1) It is a salt of K
(2) It reacts with water
(3) It hydrolysed with water
(4) Its ions are easily solvated

**Q.88** Capacity of solvent to neutralise charge on ionic compound is called:-
(1) Solvation energy (2) Dielectric constant
(3) Dipole moment (4) Solubility

**Q.89** The force responsible for dissolution of ionic compound in water is :
(1) Dipole – dipole forces
(2) Ion – dipole force
(3) Ion – ion force
(4) Hydrogen bond

**Q.90** The hydration of ionic compounds involves :
(1) Evolution of heat
(2) Weakening of attractive forces
(3) Dissociation into ions
(4) All

**MELTING POINT AND BOILING POINT :**

**Q.91** Which of the following has the lowest melting point
(1) $SrF_2$ (2) $BeF_2$ (3) $BaF_2$ (4) $MgF_2$

**Q.92** Which of the following substance will have highest b.p. ?
(1) He (2) CsF (3) $NH_3$ (4) $CHCl_3$

**Q.93** As compared to covalent compounds electrovalent compounds generally possess
(1) High m.p. and high b.p.
(2) Low m.p. and low b.p.

(3) Low m.p. and high b.p.
(4) high m.p. and low b.p.

**Q.94** Which of the following halides has the highest melting point ?
(1) NaCl (2) KCl (3) NaBr (4) NaF

**Q.95** In which of the following pair of compounds? Their melting point are closest to each other :
(1) LiCl, NaCl (2) RbCl, LiCl
(3) CsCl, NaCl (4) LiCl, CsCl

**FAJAN'S RULE**

**Q.96** The pair of elements which on combination are most likely to form an ionic compound is :
(1) Na and Ca (2) K and O
(3) O and Cl (4) Al and I

**Q.97** Out of the following the compound with maximum ionic nature are :
(1) Metal oxide (2) Metal chloride
(3) Metal phosphide (4) Metal sulphide

**Q.98** The most covalent halide is :
(1) $AlF_3$ (2) $AlCl_3$ (3) $AlBr_3$ (4) $AlI_3$

**Q.99** $AlCl_3$ is covalent, while $AlF_3$ is ionic. This is justified by :
(1) Molecular orbital theory
(2) Valency bond theory
(3) Fajan rule
(4) Lattice energy

**Q.100** Which pair in the following has maximum and minimum ionic character respectively?
(1) LiCl, RbCl (2) RbCl, $BeCl_2$
(3) $BeCl_2$, RbCl (4) AgCl, RbCl

**Q.101** Maximum covalent character will be shown by the compound is :
(1) $SiCl_4$ (2) $AlCl_3$ (3) $HgCl_2$ (4) NaCl

**Q.102** $CCl_4$ is more covalent than LiCl because:
(1) There is more polarization of Cl in $CCl_4$
(2) There is more polarization of Cl in LiCl
(3) $CCl_4$ has more weight
(4) None of above

**Q.103** The correct order of decreasing polarisable ions is:
(1) $Cl^-$, $Br^-$, $I^-$, $F^-$ (2) $F^-$, $I^-$, $Br^-$, $Cl^-$
(3) $F^-$, $I^-$, $Br^-$, $Cl^-$ (4) $I^-$, $Br^-$,$Cl^-$, $F^-$

**Q.104** On the basis of concept of ionic potential ($\phi$), the tendency to form covalent bond in a group:
(1) increases
(2) decreases
(3) remains unchanged
(4) shows erratic/irregular change

**Q.105** According to Fajan's rules necessary condition to form covalent bond is :
(1) small cation and large anion
(2) small cation and small anion
(3) large cation and large anion
(4) large cation and small anion

**Q.106** Which is most ionic ?
(1) $P_2O_5$ (2) MnO (3) $CrO_3$ (4) $Mn_2O_7$

**Q.107** Which of the following order is incorrect?
(1) Ionic character = MCl< $MCl_2$< $MCl_3$
(2) Polarizability = $F^-$< $Cl^-$< $Br^-$ <$I^-$
(3) Polarising power = $Na^+$< $Ca^{+2}$< $Mg^{+2}$ <$Al^{+3}$
(4) Covalent character = LiF< LiCl <LiBr<LiI

**Q.108** According to Fajan's rules, electrovalent-bond formation is favoured :
(1) low positive charge, and small size of cations and large size of anions
(2) low positive charge, and large size of cations and small size of anions
(3) high negative charge, and large size of cations and large size of anions
(4) high positive charge, and small size of cations and small size of anions

**THERMAL DECOMPOSITION**

**Q.109** The most stable carbonate is :
(1) $Li_2CO_3$ (2) $BeCO_3$ (3) $CaCO_3$ (4) $BaCO_3$

**Q.110** Which of the following does not give an oxide on heating ?
(1) $MgCO_3$ (2) $Li_2CO_3$ (3) $ZnCO_3$ (4) $K_2CO_3$

**Q.111** Which decomposes on heating ?
(1) NaOH (2) KOH (3) LiOH (4) RbOH

**Q.112** Which of the following forms metal oxide on heating?
(1) $Na_2CO_3$ (2) $Li_2CO_3$
(3) $K_2SO_4$ (4) $NaHCO_3$

**Q.113** Increasing order of stability of :
I. $K_2CO_3$ II. $MgCO_3$ III. $Na_2CO_3$
(1) I < II < III (2) II < III < I
(3) II < I < III (4) I < III < II

**Q.114** Alkaline earth metal nitrates on heating decompose to give :
(1) $M(NO_2)$ and $O_2$ only
(2) MO, $N_2$ and $O_2$
(3) MO, $NO_2$ and $O_2$

(4) MO and $NO_2$ only

**Q.115** Which of the following is not correct for IIA metals?
(1) Thermal stability of carbonate, sulphate increases on moving down the group
(2) Thermal stability of all type of oxides decrease on moving down the group
(3) Solubility of Hydroxides increases on moving down the group
(4) Bicarbonate do not exist in solid state.

## MOLECULAR ORBITAL THEORY

**Q.116** The ion that is isoelectronic with CO and having same bond order is :-
(1) $CN^-$ (2) $O_2^+$ (3) $O_2^-$ (4) $N_2^+$

**Q.117** Which of the following is paramagnetic:-
(1) $O_2^-$ (2) $CN^-$ (3) CO (4) $NO^+$

**Q.118** Which has the bond order in fraction:-
(1) $O_2$ (2) $HeH^+$ (3) CO (4) CN

**Q.119** Bond order in $C_2^+$is:-
(1) $\frac{1}{2}$ (2) $\frac{2}{3}$ (3) $\frac{3}{2}$ (4) 1

**Q.120** Which of the following molecules have unpaired electron :-
(1) $H_2$ (2) $H_3O^+$ (3) $H_2O$ (4) HeH

**Q.121** In the following which of the two are paramagnetic
(a) $N_2$ (b) CO (c) $B_2$ (d) $NO_2$
Correct answer is :-
(1) a and c (2) b and c
(3) c and d (4) b and d

**Q.122** Increasing order of bond length in NO, $NO^+$ and $NO^-$is :-
(1) $NO > NO^- > NO^+$ (2) $NO^+ < NO < NO^-$
(3) $NO < NO^+ < NO^-$ (4) $NO < NO^+ = NO^-$

**Q.123** Bond order of $Li_2$ is :-
(1) 0 (2) 1 (3) 2 (4) 3

**Q.124** In which of the following set, the value of bond order will be 2.5:-
(1) $O_2^+$, NO, $NO^{+2}$, CN (2) CN, $NO^{+2}$, $CN^-$, $F_2$
(3) $O_2^+$, $NO^{+2}$, $O_2^{+2}$, $CN^-$ (4) $O_2^{-2}$, $O_2^-$, $O_2^+$ $O_2$

**Q.125** When two atomic orbitals combines, it forms :-
(1) One molecular orbital
(2) Two molecular orbital
(3) Two bonding molecular orbitals
(4) Two anti bonding molecular orbitals

**Q.126** The paramagnetic property of oxygen is well explained by:-
(1) Molecular orbital theory
(2) Resonance theory
(3) Valence bond theory
(4) VSEPR theory

**Q.127** Which of the following has fractional bond order?
(1) $O_2^{2+}$ (2) $O_2^{2-}$ (3) $F_2^{2-}$ (4) $H_2^-$

**Q.128** The diamagnetic molecule is
(1) Super oxide ion
(2) Oxygen molecule
(3) Carbon molecule
(4) Unipositive ion of nitrogen molecule

**Q.129** The energy of $\sigma 2s$ orbital is greater, than $\sigma 1s^*$ orbital because
(1) $\sigma 2s$ orbital is bigger than $\sigma 1s^*$ orbital
(2) $\sigma 2s$ orbital is a bonding orbital where as$\sigma 1s^*$ is an antibonding orbital
(3) $\sigma 2s$ orbital has a greater value of n than $\sigma 1s^*$ orbital
(4) None

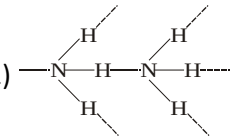
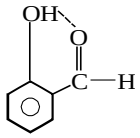
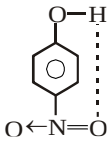
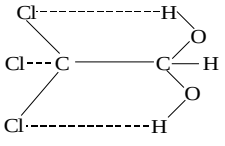
## HYDROGEN BOND

**Q.130** The hydrogen bond is strongest in:-
(1) O – H - - - S (2) S – H - - - O
(3) F – H - - - F (4) O – H - - - O

**Q.131** $H_2O$ boils at higher temperature than $H_2S$, because it is capable of forming:-
(1) Ionic bonds (2) Covalent bonds
(3) Hydrogen bonds (4) Metallic bonds

**Q.132** Intermolecular hydrogen bonds are not present in:
(1) $CH_3CH_2OH$ (2) $CH_3COOH$
(3) $C_2H_5NH_2$ (4) $CH_3OCH_3$

**Q.133** In which of the following molecule, the shown hydrogen bond is not possible:-

(1) 
(2) 
(3) 
(4) 

**Q.134** Correct order of volatility is:-

(1) HF > HCl > HBr > HI
(2) HCl > HBr > HI> HF
(3) HI> HBr > HCl > HF
(4) HBr < HCl < HI< HF

**Q.135** Glycerol is more viscous than glycol the reason is :-
(1) Higher molecular wt.
(2) More covalent
(3) More extent of hydrogen bonding
(4) Complex structure

**Q.136** The correct order of volatility is:-
(1) $NH_3 < H_2O$
(2) p– nitro phenol < o– nitro phenol
(3) $CH_3OH > CH_3 – O– CH_3$
(4) HF > HCl

**Q.137** Maximum number of H–bonding is shown by
(1) $H_2O$ (2) $H_2Se$ (3) $H_2S$ (4) HF

**Q.138** Intramolecular H–bond :-
(1) Decreases Volatility
(2) Increases melting point
(3) Increases viscosity
(4) Increases vapour pressure

**Q.139** The crystal lattice of ice is mostly formed by:-
(1) Ionic forces
(2) Covalent bonds
(3) Inter molecular H–bonds
(4) Covalent as well as H–bonds

**Q.140** Acetic acid exists as dimer in benzene due to:-
(1) Condensation reaction
(2) Hydrogen bonding
(3) Presence of carboxyl group
(4) None of the above

**Q.141** Which of the following does not form a hydrogen bond with water
(1) $(CH_3)_2CO$ (2) $CH_3CN$
(3) $CH_3OH$ (4) $C_2H_6$

**Q.142** Hydrogen bonding is formed in compounds containing hydrogen and :
(1) Highly electro-negative atoms
(2) Highly electro-positive atoms
(3) Metal atoms with d-orbitals occupied
(4) Metalloids

**Q.143** Strongest hydrogen bond is shown by :
(1) Water
(2) Ammonia
(3) Hydrogen fluoride
(4) Hydrogen sulphide

**VANDER WAALS FORCES**

**Q.144** In a molecule of water following bonds are present-
(1) Two hydrogen bond
(2) Two ionic bond
(3) One covalent and one ionic bond
(4) Two covalent bond

**Q.145** In dry ice the bond present between two molecules is
(1) Ionic bond (2) Covalent bond
(3) Hydrogen bond (4) Vander Waal

**Q.146** Which is the weakest among the following types of bonds ?
(1) Debye force
(2) Metallic bond
(3) Dipole-dipole bond
(4) Hydrogen bond

**Q.147** Covalent molecules are usually held in a crystal structure by :
(1) Dipole-dipole attraction
(2) Electrostatic attraction
(3) Hydrogen bond
(4) Van-der waal's attraction

**Q.148** In solid argon the atoms are held together :
(1) by ionic bonds
(2) by hydrogen bonds
(3) by Vander Waals forces
(4) by hydrophobic bonds

**Q.149** Which substance has the strongest London dispersion forces?
(1) $SiH_4$ (2) $CH_4$ (3) $SnH_4$ (4) $GeH_4$

**Q.150** Which force is least sensitive for distance?
(1) Ion–dipole attraction
(2) Dipole–induced dipole
(3) Ion-induced dipole
(4) Dispersion force

# ANSWER KEY

## TOPIC WISE QUESTIONS

| Que. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ans. | 2 | 2 | 2 | 4 | 1 | 2 | 1 | 4 | 3 | 1 | 4 | 3 | 3 | 3 | 1 |
| **Que.** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **30** |
| Ans. | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 4 | 1 | 3 | 2 | 4 | 1 |
| **Que.** | **31** | **32** | **33** | **34** | **35** | **36** | **37** | **38** | **39** | **40** | **41** | **42** | **43** | **44** | **45** |
| Ans. | 2 | 2 | 3 | 3 | 3 | 3 | 4 | 2 | 4 | 3 | 2 | 3 | 2 | 3 | 4 |
| **Que.** | **46** | **47** | **48** | **49** | **50** | **51** | **52** | **53** | **54** | **55** | **56** | **57** | **58** | **59** | **60** |
| Ans. | 4 | 3 | 4 | 1 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 4 | 2 | 2 | 2 |
| **Que.** | **61** | **62** | **63** | **64** | **65** | **66** | **67** | **68** | **69** | **70** | **71** | **72** | **73** | **74** | **75** |
| Ans. | 4 | 2 | 3 | 1 | 4 | 2 | 3 | 1 | 2 | 2 | 1 | 4 | 3 | 3 | 2 |
| **Que.** | **76** | **77** | **78** | **79** | **80** | **81** | **82** | **83** | **84** | **85** | **86** | **87** | **88** | **89** | **90** |
| Ans. | 4 | 3 | 2 | 4 | 1 | 4 | 2 | 3 | 3 | 2 | 2 | 4 | 2 | 2 | 4 |
| **Que.** | **91** | **92** | **93** | **94** | **95** | **96** | **97** | **98** | **99** | **100** | **101** | **102** | **103** | **104** | **105** |
| Ans. | 2 | 2 | 1 | 4 | 4 | 2 | 1 | 4 | 3 | 2 | 1 | 1 | 4 | 2 | 1 |
| **Que.** | **106** | **107** | **108** | **109** | **110** | **111** | **112** | **113** | **114** | **115** | **116** | **117** | **118** | **119** | **120** |
| Ans. | 2 | 1 | 2 | 4 | 4 | 3 | 2 | 2 | 3 | 4 | 1 | 1 | 4 | 3 | 3 |
| **Que.** | **121** | **122** | **123** | **124** | **125** | **126** | **127** | **128** | **129** | **130** | **131** | **132** | **133** | **134** | **135** |
| Ans. | 2 | 2 | 2 | 1 | **1** | 1 | 4 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 3 |
| **Que.** | **136** | **137** | **138** | **139** | **140** | **141** | **142** | **143** | **144** | **145** | **146** | **147** | **148** | **149** | **150** |
| Ans. | 1 | 1 | 4 | 4 | 2 | 4 | 1 | 3 | 4 | 4 | 1 | 3 | 3 | 3 | 1 |