

## 4

## ADVANCED CHEMICAL BONDING

## CHAPTER

## EXERCISE-1

## [SINGLE CORRECT CHOICE TYPE]

STRUCTURE DRAWING & OXY ACID

- Q.1 Hypophosphoric acid is having \_\_\_\_\_ number of replaceable H-atom.  
(A) Four (B) Two (C) Three (D) Five
- Q.2 Which of the following acid can not form acidic salt.  
(A) Pyrosulphuric acid (B) Hypophosphorous acid  
(C) Hypophosphoric acid (D) Carbonic acid
- Q.3 The number of identical P–O bonds in  $\text{P}_2\text{O}_6^{4-}$  is  
(A) Four (B) Six (C) Five (D) Three
- Q.4 Which of the following species/molecule is not having X–X linkage (X are the central atom).  
(A) Hypophosphoric acid (B) Symmetrical molecule of  $\text{N}_2\text{O}_3$   
(C) Thiosulphurous acid (D) Thiosulphuric acid
- Q.5 The number of P – O – P linkages in  $\text{P}_4\text{O}_{10}$  and  $\text{P}_4\text{O}_6$  are respectively.  
(A) 6, 6 (B) 6, 8 (C) 8, 6 (D) 8, 8
- Q.6 The state of hybridisation of 'B' atoms in borax ( $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ ) is  
(A) All  $\text{sp}^2$  hybridised (B) Three  $\text{sp}^2$  and one  $\text{sp}^3$  hybridised  
(C) One  $\text{sp}^3$  and three  $\text{sp}^3$  hybridised (D) Two  $\text{sp}^2$  and two  $\text{sp}^3$  hybridised
- Q.7 The lowest number of X–O–X linkage is the following molecule / species  
(A)  $(\text{P}_3\text{O}_9)^{3-}$  (B)  $\text{P}_3\text{O}_{10}^{5-}$  (C)  $\text{S}_3\text{O}_9$  (D)  $\text{B}_3\text{O}_6^{3-}$
- Q.8 Which of the following species is having same number of X – O – X linkage.  
(I)  $\text{S}_4\text{O}_6^{2-}$  (II)  $\text{S}_3\text{O}_9$  (III)  $\text{S}_2\text{O}_5^{2-}$  (IV)  $\text{P}_3\text{O}_9^{3-}$   
(A) II & IV (B) II & III (C) I & III (D) I & IV

- Q.9 Which of the following molecule has P–P bond.  
(A)  $\text{H}_3\text{PO}_5$  (B)  $\text{P}_4$  (C)  $\text{P}_4\text{O}_6$  (D)  $\text{H}_6\text{P}_4\text{O}_{13}$
- Q.10 Which of the following molecule has peroxy linkage.  
(A)  $\text{HClO}_4$  (B)  $\text{H}_2\text{SO}_4$  (C)  $\text{H}_2\text{S}_2\text{O}_3$  (D) None of these
- Q.11 What is the ratio between  $\sigma$  and  $\pi$  bonds in  $\text{H}_2\text{S}_5\text{O}_6$ .  
(A) 2.5 (B) 3 (C) 2 (D) 1.5
- Q.12 What is the oxidation state of S in  $\text{H}_2\text{S}_2\text{O}_3$ .  
(A) +6, –2 (B) +4, 0 (C) +2, +2 (D) +6, 0
- Q.13 Oxy acid which shows cis and trans isomers.  
(A)  $\text{H}_2\text{S}_2\text{O}_3$  (B)  $\text{H}_4\text{P}_2\text{O}_6$  (C)  $\text{H}_6\text{Si}_2\text{O}_7$  (D)  $\text{H}_2\text{N}_2\text{O}_2$
- Q.14 Number of p-orbitals involved in hybridisation of central atom of  $\text{H}_3\text{PO}_4$ .  
(A) 1 (B) 2 (C) 3 (D) zero
- Q.15  $\text{H}_6\text{P}_6\text{O}_{18}$  has how many P–O–P linkages.  
(A) one (B) Two (C) Three (D) six
- Q.16 Number of  $\sigma$  -bond in  $\text{P}_4\text{O}_{10}$  are :  
(A) 16 (B) 8 (C) 4 (D) 3
- Q.17 The number of  $\sigma$ -bond present in sulphuric acid are:  
(A) 4 (B) 6 (C) 8 (D) 9
- Q.18 How may S–O–S and S–S bonds are present in trimer of  $\text{SO}_3$  respectively?  
(A) 3,0 (B) 0,3 (C) 3,3 (D) 0,0
- Q.19 Which of the following contains 'S' in different oxidation states?  
(A)  $\text{H}_2\text{S}_2\text{O}_6$  (B)  $\text{H}_2\text{S}_2\text{O}_8$  (C)  $\text{H}_2\text{S}_2\text{O}_7$  (D)  $\text{H}_2\text{S}_4\text{O}_6$

- Q.20  $\text{H}_4\text{P}_2\text{O}_6$  exists in two forms : X and Y. 'X' has P–O–P linkage and its basicity is 3 whereas 'Y' has P–P linkage and its basicity is 4. Select the correct statement.
- (A) Average oxidation state of P in both X and Y is same.  
 (B) Number of  $p\pi-d\pi$  linkage is same in both X and Y.  
 (C) Hybridisation of P in both X and Y is same.  
 (D) All of these.
- Q.21 Which of the following is **correct** formula of sodium di hydrogen pyrophosphate?
- (A)  $\text{Na}_4\text{P}_2\text{O}_7$  (B)  $\text{Na}_2\text{H}_2\text{P}_2\text{O}_7$  (C)  $\text{Na}_4\text{P}_2\text{O}_8$  (D)  $\text{Na}_2\text{H}_2\text{P}_2\text{O}_6$
- Q.22 Strongest acid among the following :
- (A)  $\text{HClO}_4$  (B)  $\text{HClO}_3$  (C)  $\text{HClO}_2$  (D)  $\text{HOCl}$
- Q.23 Which of the following pair of species having same basicity?
- (A)  $\text{NaH}_2\text{PO}_2$  and  $\text{NaNH}_4\text{HPO}_4$  (B)  $\text{NaH}_2\text{PO}_3$  and  $\text{NaH}_2\text{PO}_2$   
 (C)  $\text{NaH}_2\text{PO}_3$  and  $\text{NaNH}_4\text{HPO}_4$  (D)  $\text{NaHSO}_4$  and  $\text{NaH}_2\text{PO}_3$
- Q.24 In a polythionic series ( $\text{H}_2\text{S}_n\text{O}_6$ ) if  $[n = 4]$ . Which of the following option is incorrect?
- (A) Absolute oxidation state of S is +5 as well as zero.  
 (B) Number of S–S linkage are three  
 (C) It has four  $\text{sp}^3$  sulphur atom.  
 (D) It has only non-polar bonds.
- Q.25 Find the ratio of  $\pi$  bond in Marshall's acid to Caro's acid?
- (A) 2 (B) 4 (C) 3 (D) 8
- Q.26 Which of the following compounds does not have peroxide bond?
- (A)  $\text{H}_2\text{SO}_5$  (B)  $\text{H}_2\text{S}_2\text{O}_7$  (C)  $\text{H}_2\text{S}_2\text{O}_8$  (D)  $\text{CrO}_5$
- Q.27 What is the formula of sodium hydrogen phosphate?
- (A)  $\text{Na}_2\text{HPO}_4$  (B)  $\text{NaH}_2\text{PO}_4$  (C)  $\text{Na}_3\text{PO}_4$  (D) None of these

### BACK BOND

- Q.28 Choose the correct order for barrier to rotation around the B–N bond of the following compounds.
- (A)  $\text{BH}(\text{NR}_2)_2 > \text{B}(\text{NR}_2)_3 > \text{BH}_2\text{--NR}_2$  (B)  $\text{BH}_2\text{NR}_2 > \text{B}(\text{NR}_2)_3 > \text{BH}(\text{NR}_2)_2$   
 (C)  $\text{BH}_2\text{--NR}_2 > \text{BH}(\text{NR}_2)_2 > \text{B}(\text{NR}_2)_3$  (D)  $\text{B}(\text{NR}_2)_3 > \text{BH}(\text{NR}_2)_2 > \text{BH}_2\text{--NR}_2$

Q.29 In which of the following compounds B–F bond length is shortest?

- (A)  $\text{BF}_4^-$  (B)  $\text{BF}_3 \leftarrow \text{NH}_3$  (C)  $\text{BF}_3$  (D)  $\text{BF}_3 \leftarrow \text{N}(\text{CH}_3)_3$

Q.30 Which of the following is correct skeleton for Ge–N–C–O in  $\text{H}_3\text{GeNCO}$  molecule



Q.31 The compound in which the mentioned bond angle in parenthesis is found to be greater than expected not due to back bonding.

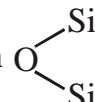
- (A)  $\text{H}_3\text{SiNCS}$  ( $\angle \text{Si–N–C}$ ) (B)  $\text{BI}_3$  ( $\angle \text{I–B–I}$ )  
(C)  $\text{MeNCS}$  ( $\angle \text{CNC}$ ) (D) None of these

Q.32 In which of following cases the extent of back bonding is most effective.

- (A)  $\text{BeF}_2$  (B)  $(\text{CH}_3)_2\text{O}$  (C)  $\text{AsF}_3$  (D)  $\text{Cl}_3\text{C}^-$

Q.33 Which of the following has planar shape with respect to the central atom?

- (A)  $\text{P}(\text{SiH}_3)_3$  (B)  $\text{N}(\text{CH}_3)_3$  (C)  $\text{N}(\text{SiH}_3)_3$  (D)  $\text{NCl}_3$

Q.34 If skeleton  of  $\text{O}(\text{SiH}_3)_2$  lies in XY plane, then nodal plane of  $2p\pi \rightarrow 3d\pi$  back bond from

oxygen to silicon atom lies in

- (A) XZ (B) YZ (C) XY (D) Cannot be predicted

Q.35 Both  $\text{N}(\text{SiH}_3)_3$  and  $\text{NH}(\text{SiH}_3)_2$  compounds have trigonal planar skeleton. **Incorrect** statement about both compounds is

- (A)  $\widehat{\text{SiNSi}}$  bond angle in  $\text{NH}(\text{SiH}_3)_2 > \widehat{\text{SiNSi}}$  bond angle in  $\text{N}(\text{SiH}_3)_3$   
(B) N–Si bond length in  $\text{NH}(\text{SiH}_3)_2 > \text{N–Si}$  bond length in  $\text{N}(\text{SiH}_3)_3$   
(C) N–Si bond length in  $\text{NH}(\text{SiH}_3)_2 < \text{N–Si}$  bond length in  $\text{N}(\text{SiH}_3)_3$   
(D) Back bonding strength in  $\text{NH}(\text{SiH}_3)_2 > \text{Back bonding strength in } \text{N}(\text{SiH}_3)_3$

Q.36 Hybridisation of central atom does not change due to  $(2p\pi-3d\pi)$  back bonding.

- (A)  $\text{O}(\text{SiH}_3)_2$  (B)  $\text{H}_3\text{BO}_3$  (C)  $\text{PF}_3$  (D)  $\text{H}_3\text{SiNCS}$

Q.37 The geometry with respect to the central atom of the following molecules are :

- $\text{N}(\text{SiH}_3)_3$  ;  $\text{Me}_3\text{N}$  ;  $(\text{SiH}_3)_3\text{P}$
- (A) Planar, Pyramidal, Planar (B) Planar, Pyramidal, Pyramidal  
(C) Pyramidal, Pyramidal, Pyramidal (D) Pyramidal, Planar, Pyramidal

Q.38 Number of Boron atom(s) which participate in back bonding in borax ( $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ )

- (A) 4 (B) 3 (C) 2 (D) 1

Q.39 Select **incorrect** statement / order.

- (A)  $d_{\text{B-N}}$  in  $\text{B}_3\text{N}_3\text{H}_6 > d_{\text{C-C}}$  in  $\text{C}_6\text{H}_6$   
(B)  $d_{\text{B-H}}$  in  $\text{B}_3\text{N}_3\text{H}_6 > d_{\text{C-H}}$  in  $\text{C}_6\text{H}_6$   
(C)  $\text{B}_3\text{N}_3\text{H}_6$  undergoes addition reaction with  $\text{HBr}$  but  $\text{C}_6\text{H}_6$  does not  
(D)  $\pi$ -electron cloud is symmetrically distributed over all atoms in both  $\text{B}_3\text{N}_3\text{H}_6$  and  $\text{C}_6\text{H}_6$

Q.40 **Incorrect** order for :  $\text{B}(\text{OH})_3$  and  $\text{B}(\text{OH})_4^-$  is:

- (A)  $d_{\text{B-O}} : \text{B}(\text{OH})_4^- > \text{B}(\text{OH})_3$   
(B)  $\angle \text{OBO} : \text{B}(\text{OH})_3 > \text{B}(\text{OH})_4^-$   
(C) Bond order of  $\text{B-O} > \text{B}(\text{OH})_3 > \text{B}(\text{OH})_4^-$   
(D)  $\angle \text{HOB} > 109^\circ$  in both  $\text{B}(\text{OH})_3$  and  $\text{B}(\text{OH})_4^-$

Q.41 For which of the following molecule observed bond length is more longer than theoretically determined bond length.

- (A)  $\text{BF}_3$  (B)  $\text{CF}_4$  (C)  $\text{NF}_2^+$  (D)  $\text{OF}_2$

Q.42 Among following molecules, in which molecule N-Si bond length is shortest.

- (A)  $\text{N}(\text{SiH}_3)_3$  (B)  $\text{NH}(\text{SiH}_3)_2$   
(C)  $\text{NH}_2(\text{SiH}_3)$  (D) All have equal N-Si bond length

Q.43 Select **incorrect** order:

- (A)  $\text{SiH}_3\text{OH} > \text{CH}_3\text{OH}$  (Arrhenius acidic character)  
(B)  $\text{CHCl}_3 > \text{CHF}_3$  (Arrhenius acidic character)  
(C)  $\text{BF}_3 > \text{BI}_3$  (Lewis acidic character)  
(D)  $\text{N}(\text{CH}_3)_3 > \text{N}(\text{SiH}_3)_3$  (Lewis base character)

Q.44 Select the **incorrect** order in the following :

- (A)  $\text{O}(\text{CH}_3)_2 < \text{O}(\text{SiH}_3)_2$  : Reactivity towards lewis acid  
(B)  $\text{SO}_3 < \text{SO}_2 < \text{SO}_4^{2-} < \text{SO}_3^{2-}$  : Order of S-O bond length  
(C)  $(\text{SiH}_3)_3\text{N} < (\text{SiH}_3)_3\text{P} < (\text{CH}_3)_3\text{N}$  : Order of lewis base character  
(D)  $\text{S}_2\text{O}_6^{2-} < \text{S}_2\text{O}_5^{2-} < \text{S}_2\text{O}_4^{2-}$  : Order of S-S bond length

- Q.45 Which of the d-orbital(s) of silicon atoms can form back bond in  $\text{N}(\text{SiH}_3)_3$ . If  $\text{N}(\text{SiH}_3)_3$  is present in xy plane
- (I)  $d_{xy}$  (II)  $d_{xz}$  (III)  $d_{yz}$  (IV)  $d_{x^2-y^2}$
- (A) All I, II, III, IV (B) Only I, II, III (C) Only II, III, IV (D) Only II, III
- Q.46 Which of the following molecules have back bond
- (I)  $\text{P}_4\text{O}_{10}$  (II)  $(\text{SiH}_3)_3\text{N}$  (III)  $\text{P}_4\text{O}_6$  (IV)  $\text{N}_2\text{O}_3$
- (A) I, II and III only (B) II & IV only (C) I & III only (D) I & II only
- Q.47 Boron forms  $\text{BX}_3$  type of halides. The correct decreasing order of Lewis-acid strength of these halides is
- (A)  $\text{BF}_3 > \text{BCl}_3 > \text{BBr}_3 > \text{BI}_3$  (B)  $\text{BI}_3 > \text{BBr}_3 > \text{BCl}_3 > \text{BF}_3$
- (C)  $\text{BF}_3 > \text{BI}_3 > \text{BCl}_3 > \text{BBr}_3$  (D)  $\text{BF}_3 > \text{BCl}_3 > \text{BI}_3 > \text{BBr}_3$

### BRIDGE BOND

- Q.48 In which example vacant orbital take part in hybridisation :
- (A)  $\text{B}_2\text{H}_6$  (B)  $\text{AlCl}_3$  (C)  $\text{C}_2\text{H}_5\text{Cl}$  (D)  $\text{H}_3\text{BO}_3$
- Q.49 In which of compounds octet is complete and incomplete for all atoms.  
*Note:* C for complete octet and 'IC' for incomplete octet.
- |     | $\text{Al}_2\text{Cl}_6$ | $\text{Al}_2(\text{CH}_3)_6$ | $\text{AlF}_3$ | Dimer of $\text{BeCl}_2$ | Dimer of $\text{BeH}_2$ |
|-----|--------------------------|------------------------------|----------------|--------------------------|-------------------------|
| (A) | IC                       | IC                           | IC             | C                        | C                       |
| (B) | C                        | IC                           | IC             | C                        | IC                      |
| (C) | C                        | IC                           | C              | IC                       | IC                      |
| (D) | IC                       | C                            | IC             | IC                       | IC                      |
- Q.50 The state of hybridisation of central atom in dimer form of both  $\text{BH}_3$  and  $\text{BeH}_2$  is
- (A)  $sp^2, sp^2$  (B)  $sp^3, sp^2$  (C)  $sp^3, sp^3$  (D)  $sp^2, sp^3$
- Q.51 Find out the similarities between  $\text{I}_2\text{Cl}_6$  and  $\text{Al}_2\text{Cl}_6$ .
- (A) both have coordinate bond  
 (B) both have  $sp^3$  hybridisation for the central atom  
 (C) both are non planar  
 (D) All are correct
- Q.52 Hybridisation of central atom is independent of the phase/state of the compound in case of
- (A)  $\text{BeH}_2$  (B)  $\text{N}_2\text{O}_5$  (C)  $\text{XeF}_6$  (D)  $\text{PF}_5$

- Q.53 In which of the dimerisation process the achievement of the octet is the driving force  
 (A)  $2 \text{BeH}_2 \longrightarrow \text{Be}_2\text{H}_4$  (B)  $2 \text{AlCl}_3 \longrightarrow \text{Al}_2\text{Cl}_6$   
 (C)  $2 \text{AlH}_3 \longrightarrow \text{Al}_2\text{H}_6$  (D) None of these
- Q.54 Which of the following overlapping is involved in polymer of  $[\text{Be}(\text{Me})_2]_n$   
 (A)  $\text{sp} - \text{sp}^2 - \text{sp}^3$  (B)  $\text{sp}^2 - \text{sp}^3 - \text{sp}^2$   
 (C)  $\text{sp}^2 - \text{sp} - \text{sp}^2$  (D)  $\text{sp}^3 - \text{sp}^3 - \text{sp}^3$
- Q.55 Which of the following molecule has  $3c - 2e^\ominus$  bond  
 (A)  $\text{BeH}_2$  (B)  $\text{AlCl}_3$  (C)  $\text{AlBr}_3$  (D) None of these
- Q.56 The number of two centre, two electron bonds in a molecule of diborane is:  
 (A) 2 (B) 0 (C) 4 (D) 6
- Q.57 Which of the following molecule having  $3c - 2e$  bond -  
 (A)  $\text{C}_2\text{H}_6$  (B)  $\text{N}_2\text{H}_4$  (C)  $\text{Be}_2\text{H}_4$  (D)  $\text{Al}_2\text{Br}_6$
- Q.58 Which of the following species is planar and has presence of coordinate bond  
 (A)  $\text{BeCl}_2(\text{solid})$  (B)  $\text{BeH}_2(\text{solid})$  (C) Dimer of  $\text{AlCl}_3$  (D) Dimer of  $\text{ICl}_3$
- Q.59 In which of the following molecular species both  $\sigma$ -dative and  $\pi$ -dative bonds are present.  
 (A)  $\text{BF}_4^-$  (B)  $\text{Be}_2\text{Cl}_4$  (C)  $\text{NH}_4^+$  (D)  $[\text{BeF}_4]^{2-}$
- Q.60 Correct set of electron deficient species is  
 (i)  $\text{BeCl}_2(\text{s})$  (ii)  $\text{AlCl}_3(\text{s})$  (iii)  $\text{BeH}_2(\text{s})$  (iv)  $\text{AlH}_3(\text{s})$   
 (A) i, ii, iii, iv (B) only ii, iii, iv (C) only iii, iv (D) only (iii)
- Q.61 Select correct statement  
 (A)  $\text{BMe}_3$  is stabilised by dimerization  
 (B) In  $\text{B}_2\text{H}_6$ , all B-H bond are equivalent  
 (C) Hybridisation of boron in  $\text{BF}_3$  changes due to back bonding  
 (D)  $\text{Al}_2\text{Cl}_6$  is not electron deficient but  $\text{Al}_2\text{H}_6$  is electron deficient compound
- Q.62 The type of BACK BOND in compound (X) in following reaction is :  
 $\text{B}_2\text{H}_6 + 2\text{NH}_3 \rightarrow [\text{BH}_2(\text{NH}_3)_2]^+ [\text{BH}_4]^- \xrightarrow{200^\circ\text{C}} (\text{X})$   
 (A)  $(2p\pi - 2p\pi)$  symmetrical distribution of  $e^-$  density  
 (B)  $(2p\pi - 2p\pi)$  unsymmetrical distribution of  $e^-$  density  
 (C)  $(2p\pi - 3p\pi)$  unsymmetrical distribution of  $e^-$  density  
 (D)  $(2p\pi - 3p\pi)$  symmetrical distribution of  $e^-$  density

- Q.63 If dimer for of  $AX_3$  molecule is planar, then 'A' and 'X' should be  
(A) A = Al and X = Cl (B) A = B and X = X = H  
(C) A = I and X = Cl (D) A = Al and X = OH
- Q.64 The structure of diborane ( $B_2H_6$ ) contains  
(A) Four ( $2C-2e^-$ ) bonds and two ( $2C-3e^-$ ) bonds  
(B) Two ( $2C-2e^-$ ) bonds and two ( $3C-2e^-$ ) bonds  
(C) Four ( $2C-2e^-$ ) bonds and four ( $3C-2e^-$ ) bonds  
(D) None of these

### SILICATE SILICONE

- Q.65 In which of the following silicates, only two corners per tetrahedron are shared :  
(i) Pyrosilicate (ii) Cyclic silicate  
(iii) Double chain silicate (iv) Single chain silicate  
(v) 3 D silicate (vi) Sheet silicate  
(A) (i), (ii) and (v) (B) (iv) and (vi) only (C) (i) and (vi) only (D) (ii) and (iv) only
- Q.66 The silicate anion in the mineral kinoite is a chain of three  $SiO_4$  tetrahedra, that share corners with adjacent tetrahedra. The charge of the silicate anion is  
(A) -4 (B) -8 (C) -6 (D) -2
- Q.67 In which of the following structure, the number of shared O-atom per tetrahedron is two and half.  
(A) Pyroxene chain silicate (B) Amphibole chain silicate  
(C) Cyclic silicate (D) Sheet silicate
- Q.68 Amphibole silicate structure has 'x' number of corner shared per tetrahedron. The value of 'x' is:  
(A) 2 (B)  $2\frac{1}{2}$  (C) 3 (D) 4
- Q.69 In which of the following silicate structure, the number of corner shared is minimum.  
(A) Pyrosilicate (B) Amphibole chain silicate  
(C) 3D-silicate (D) Six membered cyclic silicate
- Q.70 A cyclic silicate anion is represented as  $[Si_3O_9]^{n-}$   
The value of 'n' is  
(A) 3 (B) 4 (C) 6 (D) 8
- Q.71 In which of following silicate structure, the number of corner shared per tetrahedron is '2'.  
(A) Four membered cyclic silicate (B) Pyrosilicate  
(C) Orthosilicate (D) 2D-Silicate



- Q.72 If 25  $[\text{SiO}_4]^{4-}$  units are arranged in chain form then what will be the formula of that chain.  
 (A)  $[\text{Si}_{25}\text{O}_{75}]^{50-}$  (B)  $[\text{Si}_{25}\text{O}_{76}]^{52-}$  (C)  $[\text{Si}_{25}\text{O}_{100}]^{100-}$  (D) None
- Q.73 Which of the following is an example of sheet silicate.  
 (A)  $\text{Zn}_4(\text{Si}_2\text{O}_7)(\text{OH})_2$  (B)  $\text{BaTi}(\text{Si}_3\text{O}_9)$   
 (C)  $\text{Mg}_3(\text{Si}_2\text{O}_5)_2(\text{OH})_2$  (D)  $\text{Na}_2\text{Fe}_3\text{Fe}_2(\text{Si}_8\text{O}_{22})(\text{OH})_2$
- Q.74 In silicate mineral :  $\text{Mg}_5\text{Ca}_2(\text{Si}_4\text{O}_{11})_x(\text{OH})_y$ , the values of x and y are respectively:  
 (A) x = 2, y = 2 (B) x = 3, y = 1 (C) x = 1, y = 1 (D) x = 2, y = 1
- Q.75 Select correct match  
 (A) Beryl  $\text{Be}_3\text{Al}_2\text{Si}_6\text{O}_{18}$ , cyclic silicate (B) Zeolite  $\text{Na}\cdot\text{AlO}_2\cdot\text{SiO}_2$ , Alumino silicate  
 (C)  $(\text{CH}_3)_{12}\text{Si}_6\text{O}_6$ , cyclic silicone (D) All are correct
- Q.76 Which of the following general formula represent to pyroxenes:  
 (A)  $(\text{Si}_2\text{O}_5)_n^{2n-}$  (B)  $(\text{SiO}_3)_n^{2n-}$  (C)  $\text{SiO}_4^{4-}$  (D)  $\text{Si}_2\text{O}_7^{6-}$
- Q.77 Incorrect statement for a silicate having formula  $\text{Al}_2(\text{Si}_2\text{O}_5)(\text{OH})_4$  is :  
 (A) Each Si-atom is bonded to one monovalent oxygen.  
 (B) It has slippery nature  
 (C) Some Si-atoms are substituted by Al  
 (D)  $\text{Al}^{3+}$  cation neutralizes charge of monovalent oxygen
- Q.78 Incorrect match is:  
 (A)  $\text{Ca}_2\text{Mg}_5\text{Si}_8\text{O}_{22}(\text{OH})_2$  : Single chain silicate  
 (B) Zeolites : Alumino Silicate  
 (C)  $\text{Ca}_3\text{Si}_3\text{O}_9$  : Cyclic structure  
 (D)  $\text{Al}_2(\text{Si}_2\text{O}_5)(\text{OH})_4$  : 2-D Silicate

### MOLECULAR ORBITAL THEORY(MOT)

- Q.79  $\text{N}_2$  and  $\text{O}_2$  are converted to monocations  $\text{N}_2^+$  and  $\text{O}_2^+$  respectively, which is wrong statement  
 (A) In  $\text{N}_2^+$ , the N–N bond weakens (B) In  $\text{O}_2^+$ , the O–O bond order increases  
 (C) In  $\text{O}_2^+$ , the paramagnetism decreases (D)  $\text{N}_2^+$  becomes diamagnetic

- Q.80 Which is incorrect according to MOT.
- (A)  $\text{H}_2^+$  and  $\text{He}_2^+$  have same stability  
(B)  $\text{H}_2$  is stabler than  $\text{H}_2^+$   
(C)  $\text{He}_2^+$  may exist while  $\text{He}_2$  cannot  
(D) same bond order of two species do not mean they have same bond energy
- Q.81 Pick out the incorrect statement
- (A)  $\text{N}_2$  has greater dissociation energy than  $\text{N}_2^+$   
(B)  $\text{O}_2$  has lower dissociation energy than  $\text{O}_2^+$   
(C) Bond length of  $\text{N}_2^+$  is less than  $\text{N}_2$   
(D) Bond length of  $\text{NO}^+$  is less than in  $\text{NO}$ .
- Q.82 Which of the following is true for  $\text{O}_2$  and  $\text{C}_2$  molecules according to M.O.T.
- (A) both are having 1  $\sigma$  and 1  $\pi$  bond (B) both are of same bond length  
(C) both are having same bond order (D) both are having two  $\pi$  bonds
- Q.83 According to MOT (Molecular Orbital Theory), the molecular orbitals are formed by mixing of atomic orbitals through LCAO (linear combination of atomic orbitals). The correct statement(s) about molecular orbitals is/are
- Statement (a)** : bonding molecular orbitals are formed by addition of wave-functions of atomic orbitals  
**Statement (b)** : anti-bonding molecular orbitals are formed by subtraction of wave-functions of atomic orbitals  
**Statement (c)** : non-bonding molecular orbitals do not take part in bond formation because they belong to inner shells  
**Statement (d)** : anti-bonding molecular orbitals provide stability to molecules while bonding molecular orbitals make the molecules unstable.
- (A) Statement a, d (B) Statement a, b, c (C) Statement a, b, d (D) Statement a, b
- Q.84 In which of the following ionization processes, the bond order has increased and the magnetic behaviour has changed?
- (A)  $\text{C}_2 \rightarrow \text{C}_2^+$  (B)  $\text{NO} \rightarrow \text{NO}^+$  (C)  $\text{O}_2 \rightarrow \text{O}_2^+$  (D)  $\text{N}_2 \rightarrow \text{N}_2^+$
- Q.85 Which of the following species exhibits the diamagnetic behaviour?
- (A)  $\text{O}_2^{2-}$  (B)  $\text{O}_2^+$  (C)  $\text{O}_2$  (D)  $\text{NO}$

Q.86 In which of the following processes magnetic moment and Bond order, both are changed.  
 (A)  $\text{NO} \rightarrow \text{NO}^+$  (B)  $\text{O}_2^+ \rightarrow \text{O}_2$  (C)  $\text{N}_2 \rightarrow \text{N}_2^-$  (D) All of the above

Q.87 Which of following species will have highest bond length.

- (A)  $\text{O}_2^-$  (B)  $\text{O}_2^{2-}$  (C)  $\text{F}_2$  (D)  $\text{O}_2^+$

Q.88 Which is incorrect in the following :

- (A) Ionisation energy of  $\text{F}_2$  molecule is more than that of F-atom.  
 (B) Ionisation energy of F-atom is more than that of Cl-atom  
 (C) Electron gain enthalpy of F-atom is less (–)ve than that of Cl-atom  
 (D) Ionic mobility of fluoride ion is less than chloride ion in water.

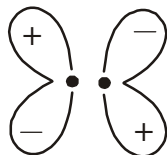
Q.89 When  $\text{O}_2^+$  is formed from  $\text{O}_2$  then electron is removed from

- (A) B.M.O (B) A.B.M.O (C) N.B.M.O (D) None of these

Q.90 The common features among the species  $\text{CN}^-$ ,  $\text{CO}$  and  $\text{NO}^+$  are

- (A) Bond order three (B) Isoelectronic  
 (C) All are  $\sigma$ -donor and  $\pi$ -acceptor (D) All of these

Q.91 Choose the correct statement regarding the given molecular orbital.



- (A) It is formed by constructive overlap. (B) It represents anti-bonding molecular orbital  
 (C) It has only one nodal plane (D) All of these

Q.92 Select the species having bond order equal to one

- (A)  $\text{Li}_2$  (B)  $\text{B}_2$  (C)  $\text{F}_2$  (D) All of these

Q.93 Paramagnetic nature is exhibited by

- (A)  $\text{N}_2$  and  $\text{O}_2$  (B)  $\text{O}_2$  and  $\text{C}_2$  (C)  $\text{NO}_2$  and  $\text{N}_2$  (D)  $\text{NO}_2$  and  $\text{O}_2$

Q.94 Which of the following pair of species are paramagnetic as well as fractional bond order?

- (A)  $\text{N}_2^+$  &  $\text{N}_2^-$  (B)  $\text{H}_2$  &  $\text{H}_2^+$  (C)  $\text{NO}^+$  &  $\text{CO}^+$  (D)  $\text{O}_2$  &  $\text{O}_2^+$

Q.95 In which of the following conversion bond length increases?

- (I)  $\text{NO} \rightarrow \text{NO}^+$  (II)  $\text{N}_2^+ \rightarrow \text{N}_2^-$   
 (III)  $\text{O}_2 \rightarrow \text{O}_2^+$  (IV)  $\text{H}_2 \rightarrow \text{H}_2^+$   
 (A) I & II (B) II & III (C) II & IV (D) I, II & III

- Q.96 Which of the following would have same magnetic nature whether sp mixing is operative or not?  
(A)  $C_2$  (B)  $B_2$  (C)  $O_2$  (D) All of these
- Q.97 In which of the following option magnetic behaviour is change:  
(A)  $O_2 \rightarrow O_2^-$  (B)  $O_2 \rightarrow O_2^+$  (C)  $He_2 \rightarrow HeH$  (D)  $NO \rightarrow NO^-$
- Q.98 In molecular orbital diagram of CO the HOMO is called as -  
(A)  $\sigma(sp)$  (B)  $\sigma^*(sp)$  (C)  $\pi 2p_y$  (D) NBMO
- Q.99 Select the correct order of (O – O) bond length in following ion / molecule.  
(A) Superoxide ion > Peroxide ion > Oxygen molecule  
(B) Peroxide ion > Superoxide ion > Oxygen molecule  
(C) Oxygen ion > Superoxide ion > Peroxide ion  
(D) Superoxide ion = Peroxide ion > Oxygen molecule
- Q.100 The O – O bond length is maximum in :  
(A)  $O_2$  (B)  $O_2[AsF_4]$  (C)  $O_2F_2$  (D)  $H_2O_2$
- Q.101 The correct order of X – X bond length in  $Cl_2^+$ ,  $Cl_2$  and  $Cl_2^-$  follows the order?  
(A)  $Cl_2^+ < Cl_2 < Cl_2^-$  (B)  $Cl_2 < Cl_2^+ < Cl_2^-$   
(C)  $Cl_2^- < Cl_2 < Cl_2^+$  (D)  $Cl_2^- < Cl_2^+ < Cl_2$
- Q.102 Which of the following has fractional bond order?  
(A)  $He_2^+$  (B)  $H_2^+$  (C)  $Li_2^+$  (D) All of these
- Q.103 Which of the following species have bond order of 2 as well as diamagnetic?  
(A) CN (B) BN (C)  $SiF^+$  (D)  $I_2^+$
- Q.104 In which the following interaction form nonbonding molecular orbital, when z-axis is the bonding axis.  
(A)  $d_{yz} + d_{z^2}$  (B)  $d_{yz} + d_{xy}$  (C)  $d_{x^2-y^2} + d_{xy}$  (D) All are form N.B.M.O.
- Q.105 Select the correct order of bond length.  
(A)  $Li_2 > B_2 > F_2 > H_2$  (B)  $Li_2 > F_2 > B_2 > H_2$   
(C)  $Li_2 > F_2 > H_2 > B_2$  (D)  $F_2 > Li_2 > B_2 > H_2$

- Q.106 The correct statement for  $\text{NO}[\text{BF}_4]$  molecule is  
(A) It contains  $5\sigma$  and  $1\pi$  bond  
(B) 'N–O' bond length is greater in nitric oxide than in  $\text{NO}[\text{BF}_4]$   
(C) It is a paramagnetic species  
(D) 'B–F' bond length is greater in  $\text{BF}_3$  than  $\text{NO}[\text{BF}_4]$
- Q.107 Among  $\text{KO}_2$ ,  $\text{AlO}_2^-$ ,  $\text{BaO}_2$  and  $\text{NO}_2^+$  unpaired electron is present in:  
(A)  $\text{KO}_2$  only  
(B)  $\text{NO}_2^+$  and  $\text{BaO}_2$   
(C)  $\text{KO}_2$  and  $\text{AlO}_2^-$   
(D)  $\text{BaO}_2$  only
- Q.108 Pick out the **incorrect** statement?  
(A)  $\text{N}_2$  has greater dissociation energy than  $\text{N}_2^+$   
(B)  $\text{O}_2$  has lower dissociation energy than  $\text{O}_2^+$   
(C) Bond length in  $\text{N}_2^+$  is less than  $\text{N}_2$   
(D) Bond length in  $\text{NO}^+$  is less than in  $\text{NO}$
- Q.109 A simplified application of MO theory on the hypothetical 'molecule'  $\text{OF}$  would give its bond order as :  
(A) 2  
(B) 1.5  
(C) 1.0  
(D) 0.5
- Q.110 Which of the following species is paramagnetic?  
(A)  $\text{NO}^-$   
(B)  $\text{O}_2^{2-}$   
(C)  $\text{CN}^-$   
(D)  $\text{CO}$
- Q.111 Bond order of  $\text{Be}_2$  is:  
(A) 1  
(B) 2  
(C) 3  
(D) 0
- Q.112 The bond order depends on the number of electrons in the bonding and antibonding orbitals. Which of the following statements is/are **correct** about bond order?  
(A) Bond order cannot have a negative value.  
(B) It always has an integral value.  
(C) It is a nonzero quantity.  
(D) It can assume any value-positive or integral or fractional. including zero upto four
- Q.113 In the formation of  $\text{N}_2^+$  from  $\text{N}_2$ , the electron is removed from  
(A)  $\sigma$ -orbital  
(B)  $\pi$ -orbital  
(C)  $s^*$ -orbital  
(D)  $p^*$ -orbital

Q.114 Which of the following is true?

- (A). Bond order  $\propto \frac{1}{\text{bond length}} \propto \text{bond energy}$   
(B) Bond energy  $\propto \text{bond length} \propto \frac{1}{\text{bond energy}}$   
(C) Bond order  $\propto \frac{1}{\text{bond length}} \propto \frac{1}{\text{bond energy}}$   
(D) Bond order  $\propto \text{bond length} \propto \text{bond energy}$

Q.115 In which of the following processes magnetic moment and Bond order, both are changed?

- (A)  $\text{NO} \rightarrow \text{NO}^+$  (B)  $\text{O}_2^+ \rightarrow \text{O}_2$  (C)  $\text{N}_2 \rightarrow \text{N}_2^-$  (D) All of the above

Q.116 Which of the following has fractional bond order?

- (A)  $\text{O}_2^{2+}$  (B)  $\text{O}_2^{2-}$  (C)  $\text{F}_2$  (D)  $\text{H}_2^-$

Q.117 How many unpaired electrons are present in  $\text{N}_2^+$ ?

- (A) 1 (B) 2 (C) 3 (D) 4

Q.118 Using MO theory predict which of the following species has the shortest bond length?

- (A)  $\text{O}_2^{2+}$  (B)  $\text{O}_2^+$  (C)  $\text{O}_2^-$  (D)  $\text{O}_2^{2-}$

Q.119 The molecule having one unpaired electron, is

- (A) NO (B) CO (C)  $\text{CN}^-$  (D)  $\text{O}_2$

Q.120 Which of the following pair of molecular species has same bond order?

- (A)  $\text{N}_2^+$  and  $\text{O}_2^+$  (B)  $\text{F}_2$  and  $\text{Ne}_2$  (C)  $\text{O}_2$  and  $\text{B}_2$  (D)  $\text{C}_2$  and  $\text{N}_2$

Q.121 The correct order of increasing N-N bond stability of  $\text{N}_2^{2-}$ ,  $\text{N}_2$ ,  $\text{N}_2^+$ ,  $\text{N}_2^-$  is :

- (A)  $\text{N}_2^{2-} > \text{N}_2 > \text{N}_2^- > \text{N}_2^+$  (B)  $\text{N}_2 > \text{N}_2^+ > \text{N}_2^- > \text{N}_2^{2-}$   
(C)  $\text{N}_2^{2-} > \text{N}_2^- = \text{N}_2^+ > \text{N}_2$  (D)  $\text{N}_2^{2-} > \text{N}_2 = \text{N}_2^- > \text{N}_2^+$

Q.122  $\text{RbO}_2$  is :

- (A) Peroxide and paramagnetic (B) Peroxide and diamagnetic  
(C) Superoxide and paramagnetic (D) Superoxide and diamagnetic

ODD ELECTRONS

Q.123 Which is not correct regarding  $\text{NO}_2$  molecule

- (A) It's paramagnetic behaviour decreases when it undergoes in dimerisation.
- (B) It is coloured in its dimeric form
- (C) It's colour is due to presence of unpaired electron
- (D) It's free electron is present in the one  $\text{sp}^2$  hybrid orbital

Q.124 Which of the following molecule has least tendency for dimerization.

- (A)  $\dot{\text{C}}\text{H}_3$                       (B)  $\dot{\text{ClO}}_2$                       (C)  $\dot{\text{NO}}_2$                       (D)  $\dot{\text{NO}}$

Q.125 Which of the following set of species are paramagnetic?

- (A)  $\text{ClO}_2$ ,  $\text{O}_3$ ,  $\text{NO}_2$     (B)  $\text{ClO}_2$ ,  $\text{O}_2$ ,  $\text{NO}_2$     (C)  $\text{O}_3$ ,  $\text{O}_2$ ,  $\text{P}_4$                       (D)  $\text{N}_2$ ,  $\text{B}_2$ ,  $\text{C}_2$

Q.126 Which of the following option is correct about  $\text{NO}_2$  &  $\text{ClO}_2$ ?

- (i) Both are paramagnetic species                      (ii) Both compounds dimerised readily
  - (iii) Both have  $\text{sp}^2$  hybridisation                      (iv) Both have Bent shape.
- (A) (i), (ii)                      (B) (i), (iii), (iv)                      (C) (ii), (iii), (iv)                      (D) only (i)

Q.127 Which of the following set of species, central atom has  $\text{sp}^2$  hybridisation?

- (A)  $\text{ClO}_2$ ,  $\bullet\text{CH}_3$ ,  $\text{O}_3$ ,  $\text{I}_3^+$                       (B)  $\text{NO}_2$ ,  $\text{O}_3$ ,  $\text{ClO}_2$ ,  $\bullet\text{CF}_3$
- (C)  $\text{NO}_2$ ,  $\text{O}_3$ ,  $\text{ClO}_2$ ,  $\bullet\text{CH}_3$                       (D)  $\text{ClO}_3$ ,  $\text{NO}_2$ ,  $\text{O}_3$ ,  $\text{ClO}_2$

Q.128 Choose the **incorrect** statement regarding  $\text{ClO}_2$  molecule :

- (A) It is paramagnetic in nature.
- (B) Odd electron is present in pure d-orbital.
- (C) Completion of octet is the driving force for formation of dimer.
- (D) It has one  $\text{p}\pi\text{-p}\pi$  and one  $\text{p}\pi\text{-d}\pi$  bonds.

Q.129 Incorrect order of bond angle is :

- (A)  $\text{NO}_2^+ > \text{NO}_2 > \text{NO}_2^-$                       (B)  $\text{ClO}_3 > \text{ClO}_3^-$
- (C)  $\text{ClO}_2^+ > \text{ClO}_2 > \text{ClO}_2^-$                       (D)  $\text{PF}_3 > \text{PCl}_3 > \text{PBr}_3$

Q.130 Hybridization of central atom changes for which of the following molecule when undergoes dimerization.

- (A)  $\text{CF}_3$                       (B)  $\text{ClO}_3$                       (C)  $\text{NO}_2$                       (D)  $\text{CH}_3$

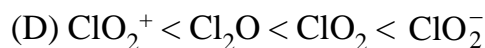
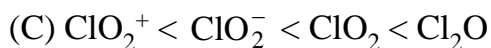
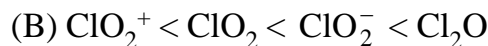
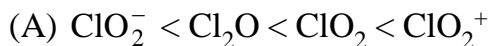
Q.131 Correct order of bond angle is :

- (A)  $\dot{\text{C}}\text{H}_3 > \dot{\text{C}}\text{F}_3$                       (B)  $\text{CH}_3^- > \text{CH}_3^+$                       (C)  $\text{CH}_4 > \text{CF}_4$                       (D)  $\text{CH}_4 > \dot{\text{C}}\text{H}_3$

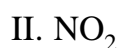
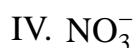
Q.132 The correct order of bond angle is :



Q.133 Cl–O bond length in  $\text{ClO}_2^-$ ,  $\text{Cl}_2\text{O}$ ,  $\text{ClO}_2^+$  and  $\text{ClO}_2$  follows the order.



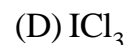
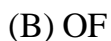
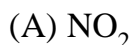
Q.134 Match list I with list II and select the correct answer:

**List I****List II**1.  $180^\circ$ 2.  $132^\circ$ 3.  $120^\circ$ 4.  $115^\circ$ 5.  $109^\circ$ 

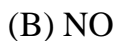
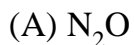
	I	II	III	IV
(A)	5	4	3	2
(C)	1	2	4	3

	I	II	III	IV
(B)	5	2	4	3
(D)	1	4	3	2

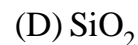
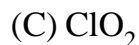
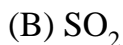
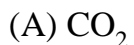
Q.135 Dimer of which of the following molecule is non-planar?



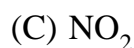
Q.136 Which oxide of nitrogen is coloured gas



Q.137 Which one of the following oxides is expected to exhibit paramagnetic behaviour



Q.138 Which of the following oxides of nitrogen is paramagnetic



Q.139 Which one of the following coloured oxides of nitrogen dimerises into a colourless solid/liquid on cooling





Q.140 Which blue liquid is obtained on reacting equimolar amounts of two gases at  $-23^{\circ}\text{C}$  ?

- (A)  $\text{N}_2\text{O}$  (B)  $\text{N}_2\text{O}_3$  (C)  $\text{N}_2\text{O}_4$  (D)  $\text{N}_2\text{O}_5$

Q.141 Which statement is wrong for NO ?

- (A) It is anhydride of nitrous acid (B) Its dipole moment is 0.22 D  
(C) It forms dimer at very low temp. (D) It is paramagnetic

### IONIC BOND

Q.142 Select the **correct** order of mobility in aqueous medium.

- (A)  $[\text{Li}(\text{H}_2\text{O})_x]^+ > [\text{Be}(\text{H}_2\text{O})_y]^{+2}$  (B)  $[\text{Li}(\text{H}_2\text{O})_x]^+ < [\text{Be}(\text{H}_2\text{O})_y]^{+2}$   
(C)  $[\text{Li}(\text{H}_2\text{O})_x]^+ = [\text{Be}(\text{H}_2\text{O})_y]^{+2}$  (D) Informations are not sufficient to predict the mobility

Q.143 Choose the correct statement :

- (A)  $\text{Na}^+_{(\text{g})} > \text{Mg}^{2+}_{(\text{g})} > \text{Al}^{3+}_{(\text{g})}$  (Hydration energy)  
(B)  $\text{Li}^+_{(\text{aq})} < \text{Na}^+_{(\text{aq})} < \text{K}^+_{(\text{aq})}$  (Ionic Mobility)  
(C)  $\text{F}^-_{(\text{aq})} < \text{Cl}^-_{(\text{aq})} < \text{Br}^-_{(\text{aq})}$  (Hydrated radius)  
(D)  $\text{CaF}_2 > \text{CaO}$  (Lattice energy)

Q.144 Which of the following has maximum hydration energy?

- (A)  $\text{NH}_4\text{Cl}$  (B)  $(\text{CH}_3)_4\text{N}^+\text{Cl}^-$  (C)  $\text{NH}_4\text{Br}$  (D)  $\text{NH}_4\text{I}$

Q.145 Which of the following order is correct of the given property.

- (A)  $\text{NaCl} > \text{KCl} > \text{RbCl} > \text{CsCl} > \text{LiCl}$  : melting point order  
(B)  $\text{BeF}_2 < \text{MgF}_2 < \text{CaF}_2 < \text{SrF}_2 < \text{BaF}_2$  : solubility order  
(C)  $\text{NO}^{2-} > \text{NO}^- > \text{NO} = \text{NO}^{2+} > \text{NO}^+$  : bond length order  
(D)  $\text{BaO} > \text{SrO} > \text{CaO} > \text{BeO} > \text{MgO}$  : basic character order

Q.146 "Solubility of **Alkali metal fluorides** increases down the group" Select correct explanation for given statement.

- (A) Hydration energy increases and lattice energy decreases down the group  
(B) Both energy decrease down the group but decrease in hydration energy is rapid  
(C) Both energy decrease down the group but decrease in lattice energy is rapid  
(D) Both energy increase down the group but increase in hydration energy is rapid

Q.147 The correct solubility order is / are

- (I)  $\text{CaCO}_3 > \text{SrCO}_3 > \text{BaCO}_3$  (II)  $\text{Li}_2\text{CO}_3 < \text{Na}_2\text{CO}_3 < \text{K}_2\text{CO}_3$   
(III)  $\text{K}_2\text{CO}_3 < \text{Rb}_2\text{CO}_3 < \text{Cs}_2\text{CO}_3$  (IV)  $\text{Na}_2\text{CO}_3 > \text{K}_2\text{CO}_3 > \text{Rb}_2\text{CO}_3$   
(A) II, IV (B) I, IV (C) II, III, IV (D) I, II, III

Q.148 Which of following statement is **incorrect** ?

- (A) AgCl is less soluble than AgF in water
- (B) KCl is less soluble than KI in acetone.
- (C)  $\text{BeC}_2\text{O}_4$  is less soluble than  $\text{BaC}_2\text{O}_4$  in water
- (D)  $\text{CaCrO}_4$  is more soluble than  $\text{BaCrO}_4$  in water

Q.149 Among the following fluorides, which is least soluble in water?

- (A)  $\text{BeF}_2$
- (B)  $\text{MgF}_2$
- (C)  $\text{CaF}_2$
- (D)  $\text{SrF}_2$

Q.150 The correct order of thermal stability is

- (A)  $\text{BeCO}_3 < \text{MgCO}_3 < \text{CaCO}_3 < \text{SrCO}_3 < \text{BaCO}_3$
- (B)  $\text{BeCO}_3 > \text{MgCO}_3 > \text{CaCO}_3 > \text{SrCO}_3 > \text{BaCO}_3$
- (C)  $\text{MgCO}_3 < \text{CaCO}_3 < \text{SrCO}_3 < \text{BaCO}_3 < \text{BeCO}_3$
- (D)  $\text{MgCO}_3 < \text{BeCO}_3 < \text{CaCO}_3 < \text{SrCO}_3 < \text{BaCO}_3$

Q.151 The compound(s) which does/ do not exist is / are :

- (A)  $\text{BiCl}_5$
- (B)  $\text{PbI}_4$
- (C)  $\text{SCl}_6$
- (D) All of these

Q.152 Select the pair of compound in which first compound has more lattice energy as compare to second compound but solubility is less.

- (A)  $\text{BeCl}_2$ ,  $\text{BaCl}_2$
- (B)  $\text{LiF}$ ,  $\text{CsF}$
- (C)  $\text{KHCO}_3$ ,  $\text{NaHCO}_3$
- (D)  $\text{BeSO}_4$ ,  $\text{BaSO}_4$

Q.153 Bicarbonate of which of the following cation can exist in solid state at room temperature.

- (A)  $\text{Cs}^+$
- (B)  $\text{Li}^+$
- (C)  $\text{Ca}^{2+}$
- (D)  $\text{Be}^{2+}$

Q.154 Select the incorrect order of solubility

- (A)  $\text{CaCO}_3 > \text{SrCO}_3 > \text{BaCO}_3$
- (B)  $\text{CaSO}_4 < \text{SrSO}_4 < \text{BaSO}_4$
- (C)  $\text{Ca(OH)}_2 < \text{Sr(OH)}_2 < \text{Ba(OH)}_2$
- (D)  $\text{CaF}_2 < \text{SrF}_2 < \text{BaF}_2$

Q.155 In which of the following set of compounds, the basic strength of 1<sup>st</sup> species is more than 2<sup>nd</sup> species.

- (A)  $\text{CrO}_3$ ,  $\text{Cr}_2\text{O}_3$
- (B)  $\text{Li}_2\text{O}$ ,  $\text{Na}_2\text{O}$
- (C)  $\text{BeO}$ ,  $\text{Al}_2\text{O}_3$
- (D)  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$

Q.156 Which of the following bicarbonates does not exist in solid state?

- (A)  $\text{NaHCO}_3$
- (B)  $\text{KHCO}_3$
- (C)  $\text{RbHCO}_3$
- (D)  $\text{Ca(HCO}_3)_2$

Q.157 Which is **incorrect** order ?

- (A)  $\text{LiOH} < \text{NaOH} < \text{KOH}$  : Basic character  
(B)  $\text{LiOH} < \text{NaOH} < \text{KOH}$  : Thermal stability  
(C)  $\text{Li}_2\text{CO}_3 < \text{Na}_2\text{CO}_3 < \text{K}_2\text{CO}_3$  : Thermal stability  
(D)  $\text{KHCO}_3 < \text{NaHCO}_3 < \text{CaCO}_3$  : Solubility in water

Q.158 Which compound does not give paramagnetic gas on heating?

- (A)  $\text{KClO}_4$  (B)  $\text{NaNO}_3$  (C)  $\text{LiNO}_3$  (D)  $\text{H}_3\text{PO}_4$

Q.159 Nitrogen dioxide can not be obtained by heating.

- (A)  $\text{KNO}_3$  (B)  $\text{Pb}(\text{NO}_3)_2$  (C)  $\text{Cu}(\text{NO}_3)_2$  (D)  $\text{AgNO}_3$

Q.160 Which is correct order :

- (1)  $\text{CaCO}_3 < \text{NaHCO}_3 < \text{KHCO}_3$  : Order of solubility  
(2)  $\text{BeCO}_3 < \text{MgCO}_3 < \text{CaCO}_3$  : Order of solubility  
(3)  $\text{Zn}(\text{OH})_2 < \text{Mg}(\text{OH})_2 < \text{NaOH} < \text{KOH}$  : Order of basic character  
(4)  $\text{BeCl}_2 < \text{MgCl}_2 < \text{CaCl}_2$  : Order of ionic character

Correct code is :

- (A) 1, 2, 3 (B) 1, 3, 4 (C) 1, 2 (D) Only 3

Q.161 Which of the following compound is most acidic?

- (A)  $\text{Cl}_2\text{O}_7$  (B)  $\text{P}_4\text{O}_{10}$  (C)  $\text{SO}_3$  (D)  $\text{B}_2\text{O}_3$

Q.162 The order of increasing lattice energy of the following salt is :

- (A)  $\text{NaCl} < \text{CaO} < \text{NaBr} < \text{BaO}$  (B)  $\text{NaBr} < \text{NaCl} < \text{BaO} < \text{CaO}$   
(C)  $\text{NaCl} < \text{NaBr} < \text{BaO} < \text{CaO}$  (D)  $\text{NaBr} < \text{NaCl} < \text{CaO} < \text{BaO}$

Q.163 Which is correct order regarding alkaline earth metals?

- (1)  $\text{BeCO}_3 < \text{MgCO}_3 < \text{CaCO}_3$  : Order of thermal stability  
(2)  $\text{BaSO}_4 < \text{CaSO}_4 < \text{MgSO}_4$  : Order of solubility  
(3)  $\text{Be}(\text{OH})_2 < \text{Mg}(\text{OH})_2 < \text{Ca}(\text{OH})_2$  : Order of solubility  
(4)  $\text{Be}(\text{OH})_2 < \text{Mg}(\text{OH})_2 < \text{Ca}(\text{OH})_2$  : Order of thermal stability

Correct code is :

- (A) 1, 2, 3, 4 (B) 1, 3, (C) 1, 4 (D) 1, 2

Q.164 Incorrect order of basic character :

- (A)  $\text{Ag}_2\text{O} > \text{PbO}$  (B)  $\text{HgO} > \text{ZnO}$  (C)  $\text{Fe}_2\text{O}_3 > \text{Al}_2\text{O}_3$  (D)  $\text{Ag}_2\text{O} > \text{Cu}_2\text{O}$

Q.165 Which is incorrect order of thermal stability ?

- (A)  $\text{CaCO}_3 < \text{Na}_2\text{CO}_3 < \text{K}_2\text{CO}_3$  (B)  $\text{CsO}_2 < \text{RbO}_2 < \text{KO}_2$   
(C)  $\text{Mg}_3\text{N}_2 > \text{Ca}_3\text{N}_2 > \text{Sr}_3\text{N}_2 > \text{Ba}_2\text{N}_2$  (D)  $\text{LiOH} < \text{NaOH} < \text{KOH} < \text{RbOH}$

Q.166 Which of the following compound does not liberate oxygen on its thermal decomposition

- (A)  $\text{HgC}_2\text{O}_4$  (B)  $\text{Cu}(\text{OH})_2$  (C)  $\text{Mg}(\text{NO}_3)_2$  (D)  $\text{CaSO}_4$

Q.167 Basic gas is evolved on heating

- (A)  $\text{K}_2\text{Cr}_2\text{O}_7$  (B)  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$  (C)  $\text{NaH}_2\text{PO}_2$  (D)  $\text{NH}_4\text{NO}_3$

Q.168 Which of the following leaves amphoteric oxide on heating?

- (A)  $\text{Pb}(\text{NO}_3)_2$  (B)  $\text{LiNO}_2$  (C)  $\text{Cu}(\text{NO}_3)_2$  (D)  $\text{NaNO}_3$

Q.169 Which of the following order is incorrect :

- (A)  $\text{BeCO}_3 < \text{MgCO}_3 < \text{Na}_2\text{CO}_3 < \text{K}_2\text{CO}_3$  : Order of thermal stability  
(B)  $\text{CaCO}_3 < \text{NaHCO}_3 < \text{KHCO}_3$  : Order of solubility  
(C)  $\text{LiCl} > \text{CsCl} > \text{RbCl} > \text{NaCl}$  : Order of solubility  
(D)  $\text{MgS}_2\text{O}_3 < \text{CaS}_2\text{O}_3$  : Order of solubility

Q.170 Which of the following combination of ions does not bring redox reaction at room temperature

- (A)  $\text{Pb}^{2+}(\text{aq}) + 2\text{I}^-(\text{aq})$  (B)  $\text{Sn}^{2+}(\text{aq}) + \text{Hg}^{2+}(\text{aq})$   
(C)  $\text{Fe}^{3+}(\text{aq}) + 3\text{I}^-(\text{aq})$  (D)  $\text{Cu}^{2+}(\text{aq}) + 2\text{CN}^-(\text{aq})$

Q.171 Increasing order of stability of the +2 oxidation state of ions ?

- (A)  $\text{Ca}^{2+} < \text{Ba}^{2+} < \text{Sr}^{2+}$  (B)  $\text{Pb}^{2+} < \text{Ge}^{2+} < \text{Sn}^{2+}$   
(C)  $\text{Ge}^{2+} < \text{Sn}^{2+} < \text{Pb}^{2+}$  (D)  $\text{Cu}^{2+} < \text{Au}^{2+} < \text{Ag}^{2+}$

Q.172 Which of the following compound has maximum covalent character

- (A)  $\text{PbI}_2$  (B)  $\text{AgI}$  (C)  $\text{HgI}_2$  (D)  $\text{CsI}$

Q.173 Which of the following is most covalent.

- (A)  $\text{CuCl}$  (B)  $\text{NaCl}$  (C)  $\text{AgCl}$  (D)  $\text{AuCl}$

Q.174 Which of the following does not exist?

- (A)  $\text{Tl}(\text{I}_3)$  (B)  $\text{PbF}_4$  (C)  $\text{FeCl}_3$  (D)  $\text{SCl}_6$

Q.175 The most stable compound is

- (A)  $\text{PbF}_4$  (B)  $\text{PbCl}_4$  (C)  $\text{PbBr}_4$  (D)  $\text{BiCl}_5$

Q.176 Compound with maximum ionic character is formed from:

- (A) Na and Cl (B) Cs and F (C) Cs and I (D) Na and F

Q.177 Water insoluble salt is

- (A) KCl (B) NaCl (C)  $\text{NH}_4\text{Cl}$  (D)  $\text{BaSO}_4$

### WEAK FORCES

Q.178 Which of molecule is steam volatile

- (A) o-nitrophenol (B) m-nitrophenol  
(C) o-dichlorobenzene (D) para-hydroxybenzaldehyde

Q.179 Intramolecular hydrogen bonding is found in

- (A) Salicylaldehyde (B) Water (C) Phenol (D) Acetaldehyde

Q.180 Choose the correct code for the following statement.

- (I) Inter layer spacings is more than C – C bond length within the layer.  
(II) Graphite is more reactive compared to diamond.  
(III) Graphite is more stable compared to diamond.  
(IV) Graphite is sufficiently inert compared to other element.

- (A) TTFT (B) TFTF (C) TTTT (D) TTFF

Q.181 Intra molecular H-bonding present in which of the following molecule.

- (A) chloral (B) p-chlorotoluene (C) Salicylaldehyde (D) Acetic acid in benzene

Q.182 Choose the **incorrect** statement among the following.

- (A) HF is the most volatile acid among HX.  
(B)  $\text{Na}_2\text{O}_2$  is having ionic and covalent type of bonds.  
(C)  $\text{CH}_3\text{CO}_2\text{Na}$  is having identical C–O bond lengths while it is not true for  $\text{CH}_3\text{CO}_2\text{H}$ .  
(D) p-p overlap is more stronger compared to s-s overlap in axial type of bond formation

Q.183 In which of following molecule the intramolecular hydrogen bonding does not exist.

- (A) chloral hydrate (B) o-chlorophenol (C) chloral (D) salicylic acid

Q.184 Which of the following forces does not contribute to the vanderwaal's forces of attraction.

- (A) Dipole-dipole interaction  
(B) Dipole-induced dipole interaction  
(C) Instantaneous dipole induced dipole interaction  
(D) Electrostatic forces of attraction releasing the energy 72 kJ/mole.

Q.185 Which of the following is the correct order of strength of H-bonding in the given compound.

- (A)  $\text{HF} < \text{NH}_3$       (B)  $\text{H}_2\text{O} > \text{H}_2\text{O}_2$       (C)  $\text{H}_2\text{O}_2 > \text{H}_2\text{O}$       (D)  $\text{NH}_3 > \text{H}_2\text{O}$

Q.186 The correct order of strength of H-bonding is

- (A)  $\text{AH} \dots\dots \text{A} < \text{A}_1\text{H} \dots\dots \text{A}_1 < \text{BH} \dots\dots \text{B} < \text{B}_1\text{H} \dots\dots \text{B}_1$   
(B)  $\text{A}_1\text{H} \dots\dots \text{A}_1 > \text{AH} \dots\dots \text{A} < \text{B}_1\text{H} \dots\dots \text{B}_1 < \text{BH} \dots\dots \text{B}$   
(C)  $\text{AH} \dots\dots \text{A} > \text{BH} \dots\dots \text{B} > \text{A}_1\text{H} \dots\dots \text{A}_1 > \text{B}_1\text{H} \dots\dots \text{B}_1$   
(D)  $\text{A}_1\text{H} \dots\dots \text{A}_1 > \text{B}_1\text{H} \dots\dots \text{B}_1 > \text{BH} \dots\dots \text{B} > \text{AH} \dots\dots \text{A}$

Where B = First element of group 15

$\text{B}_1$  = First element of group 16

$\text{A}_1$  = First element of group 17

A = Second element of group 17

Q.187 Two ice cubes are pressed over each other and unite to form one cube, which force is responsible for holding them together?

- (A) Vander Waal's forces      (B) Covalent attraction  
(C) Hydrogen bond formation      (D) Ion - Dipole attraction

Q.188 Which of the following allotrope of carbon is thermodynamically more stable

- (A) Diamond      (B) Graphite  
(C) Both are equally stable      (D) Can't be compared

Q.189 Which of the following molecule has intramolecular H-bonding.

- (A) Ortho-nitrophenol      (B) Ortho-boric acid  
(C) Both (A) and (B)      (D) None of these

Q.190 Which of the following statement is incorrect.

- (A) Boiling point of  $\text{H}_2\text{O}_2$  is greater than that of  $\text{H}_2\text{O}$ .  
(B) Ethylene glycol is less viscous than glycerol.  
(C) Orthonitrophenol can be separated from its meta and para isomer using its steam volatile property.  
(D) In ice each oxygen atom is tetrahedrally surrounded by four hydrogen atoms, which are all equidistant from oxygen.

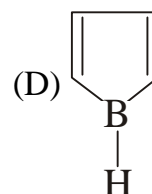
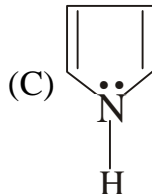
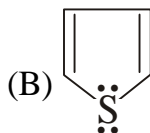
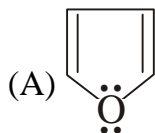
Q.191 Which of the following does not have hydrogen bond?

- (A) o-nitrophenol      (B) Liquid HF  
(C) Ice      (D)  $\text{CH}_3\text{Cl}$

Q.192 The correct order of boiling point is :

- (A)  $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$  (B)  $\text{HF} > \text{HI} > \text{HCl} > \text{HBr}$   
 (C)  $\text{HF} > \text{HBr} > \text{HI} > \text{HCl}$  (D)  $\text{HF} > \text{HI} > \text{HBr} > \text{HCl}$

Q.193 Which of the following compounds has highest boiling point?



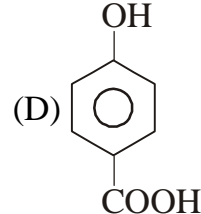
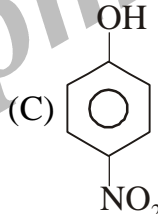
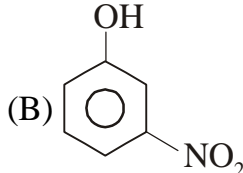
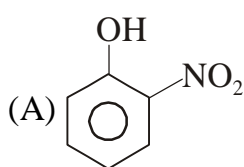
Q.194 The correct order of boiling point is

- (A)  $\text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Se} > \text{H}_2\text{Te}$  (B)  $\text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Te} > \text{H}_2\text{S}$   
 (C)  $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$  (D)  $\text{H}_2\text{O} > \text{H}_2\text{Te} > \text{H}_2\text{Se} > \text{H}_2\text{S}$

Q.195 The correct order of boiling point of  $\text{H}_2\text{O}$ ,  $\text{NH}_3$ ,  $\text{HF}$  is

- (A)  $\text{HF} > \text{H}_2\text{O} > \text{NH}_3$  (B)  $\text{H}_2\text{O} > \text{HF} > \text{NH}_3$   
 (C)  $\text{NH}_3 > \text{HF} > \text{H}_2\text{O}$  (D)  $\text{NH}_3 > \text{H}_2\text{O} > \text{HF}$

Q.196 Which of the following has minimum boiling point?



Q.197 Which of the following pair of species exist in the solid state / liquid due to the presence of intermolecular hydrogen bonding?

- (A)  $\text{H}_3\text{BO}_3$  &  $\text{C}_2\text{H}_5\text{OH}$  (B)  $\text{C}_2\text{H}_2$  &  $\text{NH}_3$   
 (C) Maleic acid & Fumaric acid (D)  $\text{CCl}_4$  &  $\text{CHCl}_3$

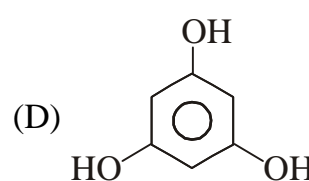
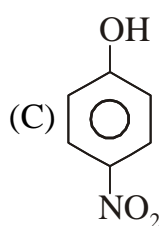
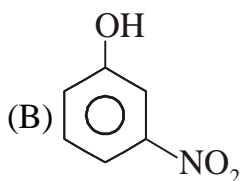
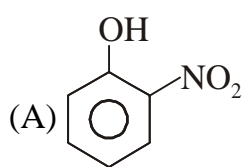
Q.198 Incorrect orders of boiling point is

- (A) o-nitrophenol < p-nitrophenol (B)  $\text{NH}_3 > \text{PH}_3$   
 (C)  $\text{H-F} > \text{HI}$  (D)  $\text{I-Cl} < \text{Br}_2$

Q.199 Which of the following can form intermolecular H-bonding between its molecules?

- (A)  $\text{CH}_3\text{OCH}_3$  (B)  $\text{CH}_3\text{COCH}_3$  (C)  $\text{CH}_3\text{Cl}$  (D)  $\text{N}_2\text{H}_4$

Q.200 The most volatile compound is



Q.201 Which of the following molecule exist in solid state due to H-bonding -

- (A)  $\text{I}_2$  (B) Diamond (C) Boric acid (D) Black phosphorous

Q.202 Hydrogen bonding plays a central role in the following phenomena :

- (A) Ice floats in water. (B) Borazone conduct electricity  
(C) Boron trifluoride exist in liquid state (D) HBr has more boiling point as compare to HCl

Q.203 The strongest force among the following is

- (A) London force (B) Ion-dipole interaction  
(C) Dipole-induced dipole interaction (D) Dipole-dipole interaction

Q.204 Xe can be liquified due to " \_\_\_\_\_ " with in molecules :

- (A) ion-dipole interaction  
(B) dipole - dipole interaction  
(C) dipole - induced dipole interaction  
(D) instantaneous dipole - induced dipole interaction

Q.205 Which of the following is correct regarding the melting point?

- (A)  $\text{SiO}_2 > \text{NaCl} > \text{Dry ice}$  (B)  $\text{SiO}_2 < \text{NaCl} < \text{Dry ice}$   
(C)  $\text{SiO}_2 < \text{NaCl} > \text{Dry ice}$  (D)  $\text{SiO}_2 > \text{NaCl} < \text{Dry ice}$

Q.206 Which of the following has maximum boiling point?

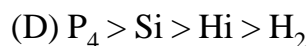
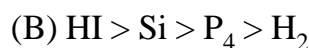
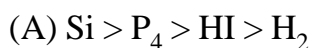
- (A)  $\text{CF}_4$  (B)  $\text{CCl}_4$  (C)  $\text{CH}_4$  (D)  $\text{SiCl}_4$

Q.207 Which of the following is true about the hydrides of 15<sup>th</sup> group elements on moving down the group?

- (A) H – M – H bond angle decreases (B) Lewis basic character increases  
(C) Boiling point increases (D) Intermolecular force of attraction increases.



Q.208 Correct order of melting point



Q.209 Which of the following is an example of covalent solid.

(A) Sulphur

(B)  $\text{CO}_2$

(C)  $\text{SiO}_2$

(D) White phosphorus

Q.210 The incorrect order is

(A) Melting point :  $\text{SiO}_2 > \text{ice} > \text{dry ice}$

(B) interaction between benzene and  $\text{CCl}_4$  : London dispersion forces

(C) Order of vapour pressure :  $\text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Se} > \text{H}_2\text{Te}$

(D) Order of boiling point in amines :  $\text{RNH}_2 > \text{R}_2\text{NH} > \text{R}_3\text{N}$

Q.211 How many hydrogen atoms surround each water molecule?

(A) two

(B) three

(C) four

(D) six

Q.212 Ortho-nitrophenol can be easily steam distilled, while para-nitrophenol cannot be, this is because of

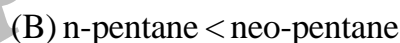
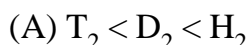
(A) Strong intermolecular hydrogen bonding in ortho-nitrophenol.

(B) Strong intramolecular hydrogen bonding in ortho-nitrophenol.

(C) Strong intramolecular hydrogen bonding in para-nitrophenol.

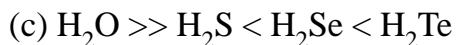
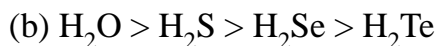
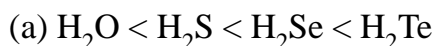
(D) Dipole moment of para-nitrophenol is larger than that of ortho-nitrophenol.

Q.213 The correct order of b.p. in the following option.



Q.214 Match **List-I** with **List-II** and select the correct answer using the codes given below.

**List-I**



(a) (b) (c)



**List-II**

1. Bond angle

2. melting and boiling point

3. acidic strength

(a) (b) (c)



Q.215 Which is the **correct** order for different forces?

- (A)  $E_D$  (dipole-induced dipole interaction)  $> E_K$  (Dipole-dipole interaction)  $> E_L$  (London force)  
 (B)  $E_K$  (Dipole-dipole interaction)  $> E_D$  (dipole-induced dipole interaction)  $> E_L$  (London force)  
 (C)  $E_D$  (dipole-induced dipole interaction)  $> E_L$  (London force)  $> E_K$  (Dipole-dipole interaction)  
 (D) All forces are equally strong.

Q.216 In which of the following case the strongest H-bonding is present.

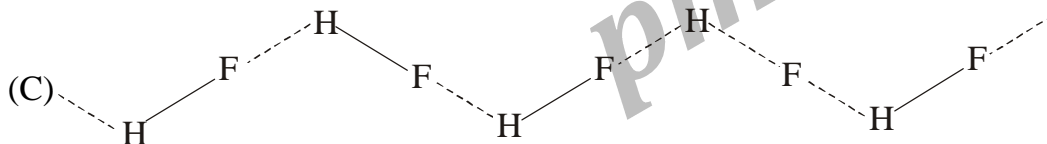
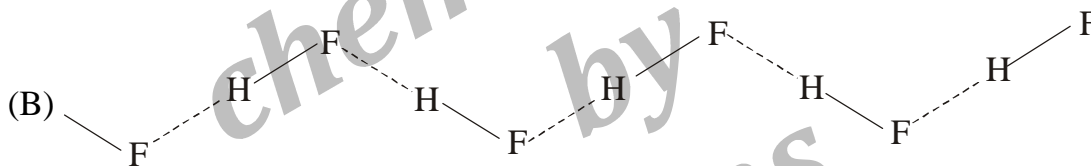
- (A)  $\text{NaHCO}_3(\text{s})$       (B)  $\text{KHF}_2$       (C) Dimer of phenol      (D)  $\text{HF}(\text{liq.})$

Q.217 Certain derivatives of phenol, e.g.  $\text{Kr}(\text{phenol})_2$ ,  $\text{Xe}(\text{phenol})_2$ ,  $\text{Rn}(\text{phenol})_2$  etc. may result due to

- (A) dipole-dipole interaction  
 (B) dipole-induced dipole interaction  
 (C) ion-dipole interaction  
 (D) instantaneous dipole-induced dipole interaction

Q.218 Which of the following is the correct representation of H-bonding in HF?

- (A)  $\text{---H} - \text{F} \text{---} \text{H} - \text{F} \text{---} \text{H} - \text{F} \text{---}$



- (D) All of these

Q.219 Which of the following compound does not have H-bonding?

- (A)  $\text{K}_2\text{HPO}_4$       (B)  $\text{K}_2\text{HPO}_3$       (C)  $\text{KHF}_2$       (D)  $\text{H}_2\text{O}$

Q.220 Choose the correct order of boiling point.

- (A)  $\text{ICl} < \text{Br}_2$       (B)  $\text{BMe}_3 < \text{BF}_3$       (C)  $\text{SiCl}_4 < \text{CCl}_4$       (D)  $\text{H}_2 < \text{He}$

Q.221 Which of the following molecules are expected to exhibit predominantly intermolecular H-bonding?

- (i) Acetic acid      (ii) o-nitrophenol      (iii) m-nitrophenol      (iv) o-boric acid  
 (A) i, ii, iii      (B) i, ii, iv      (C) i, iii, iv      (D) ii, iii, iv

Q.222 Which of the following models best describes the bonding within a layer of the graphite structure?

- (A) metallic bonding (B) ionic bonding  
(C) non-metallic covalent bonding (D) vander Waals forces

Q.223 The critical temperature of water is higher than that of  $O_2$  because the  $H_2O$  molecule has :

- (A) fewer electrons than  $O_2$  (B) two covalent bonds  
(C) V-shape (D) dipole moment

Q.224 The incorrect order of boiling point is

- (A)  $H_2O > CH_3OH$  (B)  $N(CH_3)_2 < CH_3OH$   
(C)  $H_3PO_4 > Me_3PO_4$  (D)  $CH_3N_3 > HN_3$

Q.225 The correct order of melting point of given compounds is

- (A)  $SiO_2 > LiF > H_2O > CCl_4 > H_2$  (B)  $SiO_2 > LiF > CCl_4 > H_2O > H_2$   
(C)  $LiF > CCl_4 > SiO_2 > H_2O > H_2$  (D)  $SiO_2 > CCl_4 > LiF > H_2O > H_2$

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## EXERCISE-2

## [MULTIPLE CORRECT CHOICE TYPE]

- Q.1 In which of the following option(s) all species contains X — O — X bond(s) in structure ( X = central atom)
- (A)  $\text{H}_2\text{S}_2\text{O}_5$ ,  $\text{S}_3\text{O}_9$ ,  $\text{S}_2\text{O}_6^{2-}$  (B)  $\text{P}_4\text{O}_{10}$ ,  $\text{P}_4\text{O}_6$ ,  $\text{H}_5\text{P}_3\text{O}_{10}$
- (C)  $\text{N}_2\text{O}_5$ ,  $\text{N}_2\text{O}$ ,  $\text{N}_2\text{O}_4$  (D)  $\text{S}_3\text{O}_9$ ,  $\text{P}_4\text{O}_6$ ,  $\text{Si}_2\text{O}_7^{6-}$
- Q.2 The compounds which on heating produce at least one polymeric product, are
- (A)  $\text{NaH}_2\text{PO}_4$  (B)  $\text{Na}(\text{NH}_4)\text{HPO}_4 \cdot 4\text{H}_2\text{O}$
- (C)  $\text{Na}_2\text{HPO}_4$  (D)  $(\text{NH}_4)_2\text{HPO}_4$
- Q.3 Which of the following statement is/are correct for polythionic acid series.
- (A) The average oxidation state of S-atom increases with decrease in number of S-atoms.
- (B) The absolute oxidation states of S-atoms increases with decrease in number of S-atoms.
- (C) The average oxidation state of S-atom decreases with increase in number of S-atoms.
- (D) The absolute oxidation state of S-atoms remain same with increase or decrease in number of S-atoms.
- Q.4 Select correct order(s) for  $\text{P}_4\text{O}_{10}$  and  $\text{P}_4\text{S}_{10}$
- (A) O—P—O bond angle in  $\text{P}_4\text{O}_{10} >$  S—P—S bond angle in  $\text{P}_4\text{S}_{10}$
- (B) P—O—P bond angle in  $\text{P}_4\text{O}_{10} >$  P—S—P bond angle in  $\text{P}_4\text{S}_{10}$
- (C) P—O bond length in  $\text{P}_4\text{O}_{10} <$  P—S bond length in  $\text{P}_4\text{S}_{10}$
- (D) Same number of  $p\pi - d\pi$  bonds are present in both  $\text{P}_4\text{O}_{10}$  and  $\text{P}_4\text{S}_{10}$
- Q.5 Rotation around the bond (between the underlined atoms) is restricted in
- (A)  $\underline{\text{N}}_2\text{F}_2$  (B)  $\text{H}_2\underline{\text{O}}_2$  (C)  $\underline{\text{O}}_2\text{F}_2$  (D)  $\underline{\text{S}}_2\text{F}_2$
- Q.6 Which of the following properties are same for  $\text{N}_2\text{H}_2$ ,  $\text{N}_2\text{F}_2$  and  $\text{H}_2\text{N}_2\text{O}_2$  compounds
- (A) All are having two isomers
- (B) All are having equal number of covalent bonds between both N-atoms
- (C) All are having equal bond energy of N-N bond
- (D) Oxidation state of N-atom is same for all compounds

Q.7 Which of the following statement is/are correct for  $\text{CCl}_3^-$  and  $\text{:CCl}_2$

- (A) Back bonding in both cases from Cl to C-atom
- (B) Back bonding in both cases from C to Cl-atom
- (C) Back bonding in  $\text{CCl}_3^-$  from C to Cl but reverse in  $\text{:CCl}_2$
- (D) Direction of back bonding is just opposite in two cases.

Q.8 Which of the following statements is **incorrect** regarding back bonding.

- (A) Due to back bonding, bond angle always increases.
- (B) Due to back bonding, bond length decreases.
- (C) Due to back bonding, bond angle decreases.
- (D) Due to back bonding hybridisation of central atom does not change always.

Q.9  $\text{H}_3\text{Si} \leftarrow \text{N} = \text{N}^+ = \ddot{\text{N}}:$   
(I) (II) (III)

If hybridisation of N (I) and N (II) nitrogen atoms are  $sp (s + p_x)$  and nodal plane of  $\pi$ -bond present between N(I) and N(II) lies in "xy" plane then which of the following overlapping is present in above compound.

- (A)  $p_y - d_{xy}$  sideways overlapping
- (B)  $p_y - p_y$  sideways overlapping
- (C)  $p_z - p_z$  sideways overlapping
- (D)  $sp^3 - sp (s + p_x)$  ovrelapping

Q.10 Due to back bonding observed dipole movement of whole molecule is found to be different than expected dipole moment

- (A)  $\text{R}_3\text{PO}$
- (B)  $\text{BF}_3$
- (C)  $\text{CO}$
- (D)  $\text{POF}_3$

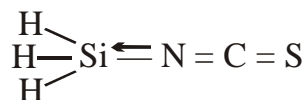
Q.11 Which type of overlapping is / are present in  $\text{H}_2\text{Si NCNSiH}_3$ . (If skeleton of NCN group is present on x-axis)

- (A)  $p_y - p_y$
- (B)  $p_z - p_z$
- (C)  $p_z - d_{xz}$
- (D)  $p_y - d_{xy}$

Q.12 In which of the following compound, observed bond angle is found to be greater than expected, but not due to back bonding.

- (A)  $\text{N}(\text{SiH}_3)_3$
- (B)  $\text{N}(\text{CH}_3)_3$
- (C)  $\text{O}(\text{CH}_3)_2$
- (D)  $\text{O}(\text{SiH}_3)_2$

Q.13 Consider the following compound



If hybridisation of “C” is  $sp$  ( $s + p_x$ ) and nodal plane of  $\pi$ -bond present between C and S is “XY” plane then which of the following statement(s) is / are **correct** regarding given information for above compound.

- (A)  $\pi$ -bond between N and C atom is formed by sideways overlapping of  $p_y$  orbitals  
 (B)  $(2p\pi-3d\pi)$  back bond between N and Si atom can be formed by  $(d_{xz}-p_z)$  orbital overlapping  
 (C)  $\sigma$ -bond between N and Si atom is formed by  $sp^3$  hybrid orbital of Si and  $sp_x$  hybrid orbital of N atom.  
 (D) Six atoms of given compound are lying in same plane.

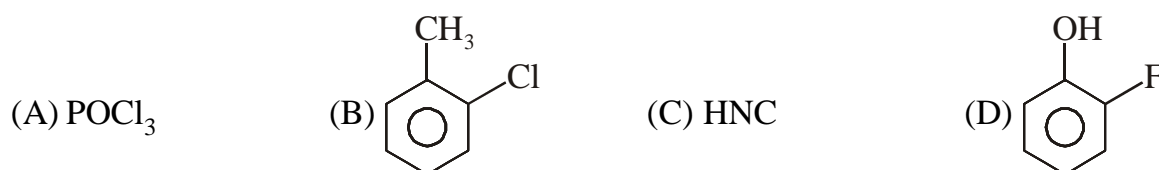
Q.14 Choose the correct statements:

- (A)  $\text{CH}_3\text{NCS}$  molecule is linear (B)  $\text{SiH}_3\text{NCS}$  molecule is linear  
 (C)  $\text{GeH}_3\text{NCS}$  molecule is bent (D)  $\text{P}(\text{SiH}_3)_3$  molecule is pyramidal

Q.15 Correct statement(s) for  $\text{B}(\text{OH})_3$  and  $\text{B}(\text{OH})_4^-$  is/are

- (A) Extent of back bonding :  $\text{B}(\text{OH})_3 > \text{B}(\text{OH})_4^-$   
 (B)  $\angle \text{OBO}$  :  $\text{B}(\text{OH})_3 > \text{B}(\text{OH})_4^-$   
 (C)  $\text{B}(\text{OH})_4^-$  does not form adduct with  $\text{NH}_3$   
 (D) Hybridization of O-atom in  $\text{B}(\text{OH})_4^-$  :  $sp^2$

Q.16 In which if the following molecules  $\mu_{\text{exp}}$ , (observed dipole moment) is found to be greater than  $\mu_{\text{th}}$ , (expected dipole moment)



Q.17 Which of the following statement is correct regarding  $\text{Be}_2\text{H}_4$  molecule.

- (A) It is nonplanar structure (B) It is having  $3c-2e$  bond  
 (C) It is nonpolar molecule (D) Momentarily octet is achieved for each Be-atom.

Q.18 Bridge bonding (either  $3c-2e$  or coordinate bond) is existing in which of the following molecules.

- (A)  $\text{Al}_2(\text{CH}_3)_6$  (B)  $\text{Si}_2\text{H}_6$  (C)  $\text{I}_2\text{Cl}_6$  (D)  $\text{B}_3\text{N}_3\text{H}_6$

Q.19 Which of the following has only bridge bond?

- (A)  $[\text{BeCl}_2]_n$  (B)  $[\text{BeH}_2]_n$  (C)  $[\text{SnCl}_2]_n$  (D)  $[\text{BH}_3]_2$

Q.20 Which of the following as a whole molecule (s) has/have planar structure?

- (A)  $\text{I}_3^-$  (B)  $\text{N}(\text{SiH}_3)_3$  (C)  $\text{Cl}_2\text{O}_6$  (D)  $\text{Be}_2\text{Cl}_4$

Q.21 X – X bond does not exists in which of the following compounds having general form of  $\text{X}_2\text{H}_6$  ?

- (A)  $\text{B}_2\text{H}_6$  (B)  $\text{Ga}_2\text{H}_6$  (C)  $\text{Al}_2\text{H}_6$  (D)  $\text{Si}_2\text{H}_6$

Q.22 Three centre – two electron bonds exist in

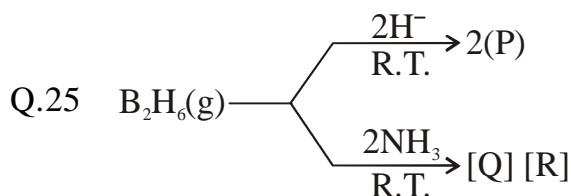
- (A)  $\text{B}_2\text{H}_6$  (B)  $\text{Al}_2(\text{CH}_3)_6$  (C)  $\text{BeH}_2(\text{s})$  (D)  $\text{BeCl}_2(\text{s})$

Q.23 Compounds are planar in its both monomer and dimer form.

- (A)  $2\text{NO}_2 \xrightarrow{\text{Dimer}} \text{N}_2\text{O}_4$  (B)  $2\text{ICl}_3 \xrightarrow{\text{Dimer}} \text{I}_2\text{Cl}_6$   
 (C)  $2\text{BeCl}_2 \xrightarrow{\text{Dimer}} \text{Be}_2\text{Cl}_4$  (D)  $2\text{OF} \xrightarrow{\text{Dimer}} \text{O}_2\text{F}_2$

Q.24 In which of the following compound(s) terminal ( $2\text{C} - 2\text{e}^-$ ) bond and bridge bonds are lying in same plane

- (A)  $\text{I}_2\text{Cl}_6$  (B)  $\text{Fe}_2\text{Cl}_4$  (C) solid  $\text{BeCl}_2$  (D)  $\text{Ga}_2\text{H}_6$



Correct statement(s) about P, Q, R is/are

- (A) Hybridisation of boron atom in P, Q, R is  $\text{sp}^3$   
 (B) B–H bond length in P and R is same in Isolated state  
 (C) B–H length in Q and R is not same  
 (D) N–H bond length in  $\text{NH}_3$  is greater than N–H bond length in Q

Q.26 In which of the following molecule six atoms are lying in a plane

- (A)  $\text{B}_2\text{H}_6$  (B)  $\text{Be}_2\text{Cl}_4$  (C)  $\text{I}_2\text{Cl}_6$  (D)  $\text{Al}_2\text{Br}_6$

- Q.27 In which of the following species terminal bonds are stronger than the bond present between central atoms  
 (A)  $\text{Ga}_2\text{H}_6$  (B)  $\text{N}_2\text{H}_4$  (C)  $\text{S}_2\text{O}_5^{2-}$  (D)  $\text{B}_2\text{H}_4$
- Q.28 Which of the given molecule has same type of bond formation during dimerization as in  $\dot{\text{C}}\text{F}_3$   
 (A)  $\text{BH}_3$  (B)  $\text{AlCl}_3$  (C)  $\text{NO}_2$  (D)  $\text{ClO}_3$
- Q.29 Which of the following specie(s) is / are having only one corner shared per tetrahedron.  
 (A)  $\text{Si}_2\text{O}_7^{6-}$  (B)  $\text{Cr}_2\text{O}_7^{2-}$  (C)  $\text{S}_2\text{O}_7^{2-}$  (D)  $\text{Si}_3\text{O}_9^{6-}$
- Q.30 The type of BACK BOND in compound (X) in following reaction is :  
 $\text{B}_2\text{H}_6 + 2\text{NH}_3 \longrightarrow [\text{BH}_2(\text{NH}_3)_2]^+ [\text{BH}_4]^- \xrightarrow{200^\circ\text{C}} (\text{X})$   
 (A)  $(2\text{p}\pi - 2\text{p}\pi)$  symmetrical distribution of  $\text{e}^-$  density  
 (B)  $(2\text{p}\pi - 2\text{p}\pi)$  unsymmetrical distribution of  $\text{e}^-$  density  
 (C)  $(2\text{p}\pi - 3\text{p}\pi)$  unsymmetrical distribution of  $\text{e}^-$  density  
 (D)  $(2\text{p}\pi - 3\text{p}\pi)$  symmetrical distribution of  $\text{e}^-$  density
- Q.31 If dimer form of  $\text{AX}_3$  molecule is planar, then 'A' and 'X' should be  
 (A)  $\text{A} = \text{Al} \ \& \ \text{X} = \text{Cl}$  (B)  $\text{A} = \text{B} \ \& \ \text{X} = \text{H}$  (C)  $\text{A} = \text{I} \ \& \ \text{X} = \text{Cl}$  (D)  $\text{A} = \text{Al} \ \& \ \text{X} = \text{OH}$
- Q.32 Which of the following as a whole molecule (s) has/have planar structure?  
 (A)  $\text{I}_3^-$  (B)  $\text{N}(\text{SiH}_3)_3$  (C)  $\text{Cl}_2\text{O}_6$  (D)  $\text{Be}_2\text{Cl}_4$
- Q.33 No X-X bond exists in which of the following compounds having general form of  $\text{X}_2\text{H}_6$  ?  
 (A)  $\text{B}_2\text{H}_6$  (B)  $\text{Ga}_2\text{H}_6$  (C)  $\text{Al}_2\text{H}_6$  (D)  $\text{Si}_2\text{H}_6$
- Q.34 Three centre-two electron bonds exist in :  
 (A)  $\text{B}_2\text{H}_6$  (B)  $\text{Al}_2(\text{CH}_3)_6$  (C)  $\text{BeH}_2(\text{S})$  (D)  $\text{BeCl}_2(\text{s})$
- Q.35 Compounds are planar in its both monomer and dimer form  
 (A)  $2\text{NO}_2 \xrightarrow{\text{Dimer}} \text{N}_2\text{O}_4$  (B)  $2\text{ICl}_3 \xrightarrow{\text{Dimer}} \text{I}_2\text{Cl}_6$   
 (C)  $2\text{BeCl}_2 \xrightarrow{\text{Dimer}} \text{Be}_2\text{Cl}_4$  (D)  $2\text{OF} \xrightarrow{\text{Dimer}} \text{O}_2\text{F}_2$



- Q.36 In which of the following compound(s) terminal ( $2C - 2e^-$ ) bond and bridge bonds are lying in same plane  
 (A)  $I_2Cl_6$  (B)  $Fe_2Cl_4$  (C) Solid  $BeCl_2$  (D)  $Ga_2H_6$
- Q.37 The CORRECT statement(s) regarding diborane ( $B_2H_6$ ) is/are  
 (A) Maximum six hydrogen atoms can lie in a plane  
 (B) Maximum six atoms can lie in a plane  
 (C) Bridging  $H_b - H_b$  bond is stronger than terminal  $B - H_t$  bond  
 (D) Terminal  $H_t - \hat{B} - H_t$  bond angle is greater than bridging  $H_b - \hat{B} - H_b$  bond angle
- Q.38 In the following Silicone, select the alkyl / aryl substituted silicon chlorides which are used in formation of given Silicones:
- $$\begin{array}{ccccccc}
 & R & & R & & R & & R \\
 & | & & | & & | & & | \\
 R - Si - O - Si - O - Si - O - Si - R \\
 & | & & | & & | & & | \\
 & R & & R & & R & & R
 \end{array}$$
- (A)  $R SiCl_3$  (B)  $R_2SiCl_2$  (C)  $R_3SiCl$  (D)  $R_4Si$
- Q.39  $Si_2O_7^{6-}$  anion is obtained when  
 (A) no oxygen of a  $SiO_4^{4-}$  tetrahedron is shared with another  $SiO_4^{4-}$  tetrahedron  
 (B) one oxygen of a  $SiO_4^{4-}$  tetrahedron is shared with another  $SiO_4^{4-}$  tetrahedron  
 (C) two oxygen of a  $SiO_4^{4-}$  tetrahedron are shared with another  $SiO_4^{4-}$  tetrahedron  
 (D) Pyrolysis of two molecules of  $H_4SiO_4$  followed by neutralization with strong base.
- Q.40 Select the **correct** statements regarding Silica molecule.  
 (A) Silicon atom has  $sp^3$  hybridisation. (B) It has 3-d network structure.  
 (C) It has  $p\pi-p\pi$  bonds. (D) It is solid in nature.
- Q.41 The ratio of 'Si' to monovalent 'O' atom in amphibole silicates is :  
 (A) 2 : 3 (B) 4 : 5 (C) 4 : 11 (D) 1 : 3
- Q.42 Which of the following is true for  $O_2$  and  $C_2$  molecules according to M.O.T.  
 (A) both are having 1  $\sigma$  and 1  $\pi$  bond (B) both are of same bond length  
 (C) both are having same bond order (D) both are having two  $\pi$  overlapping

- Q.43 Which of the following is paramagnetic as well as it has fractional bond?  
(A)  $O_2^+$  (B)  $B_2$  (C)  $O_2$  (D)  $N_2$
- Q.44 If sp mixing is not observed then which of the following species are paramagnetic and has bond order equal to two or fractional bond order greater than two.  
(A)  $O_2^+$  (B)  $F_2$  (C)  $C_2$  (D)  $N_2^-$
- Q.45 In which of the following molecule(s) (s-p) mixing occur  
(A)  $Li_2$  (B)  $B_2$  (C)  $C_2$  (D)  $H_2$
- Q.46 Which property is / are common between  $H_2^+$  and  $H_2^-$  molecular ion  
(A) Magnetic behaviour (B) Bond length  
(C) Bond order (D) Bond energy
- Q.47 Which of the following characteristics are correct for order :  $F_2 < O_2$   
(A) Bond length (B) Bond energy  
(C) HOMO has same symmetry (D) All molecular orbitals are not filled
- Q.48 Which of the following species having bond order is equal to three?  
(A) CO (B)  $N_2$  (C)  $O_2$  (D)  $S_2$
- Q.49 If internuclear axis 'y', then which of the following statement is incorrect :  
(A) In case of  $N_2^+$  formation, electron removal is from "Gerade MO"  
(B) In case of  $O_2^-$  formation, electron addition is into "Gerade MO"  
(C) In case of  $C_2^+$  formation, electron removal is from  $\pi_{2p_x}$  MO  
(D) In peroxide ion, all ungerade MOs are fully filled
- Q.50 Which of the following species has center of symmetry (COS) in its HOMO  
(A)  $B_2$  (B)  $C_2$  (C)  $F_2$  (D)  $O_2$
- Q.51 INCORRECT statement about halogens is  
(A) Colour in halogens is due to electronic transition from HOMO to LUMO  
(B) Energy gap between HOMO and LUMO :  $F_2 > Cl_2 > Br_2 > I_2$   
(C) In  $F_2$  molecule energy gap between HOMO and LUMO is directly proportional to frequency of violet colour  
(D) In  $O_2$  molecule energy gap between HOMO & LUMO is directly proportional to wavelength of yellow colour

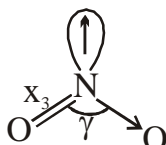
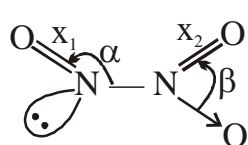
Q.52 In  $O_2$  molecule, which of the following molecular orbitals are lower in energy than  $\sigma_{2p_z}$  orbital

- (A)  $\pi_{2p_x}$  (B)  $\sigma_{2p_z}^*$  (C)  $\sigma_{2s}^*$  (D)  $\pi_{2p_y}^*$

Q.53 Which of the following molecules are formed by the combination of orbitals having sp mixed character

- (A) NO (B)  $O_2^-$  (C)  $N_2^+$  (D)  $N_2^-$

Q.54 Correct order(s) for following structures is/are



(where  $x_1, x_2, x_3$  are bond length)

- (A)  $x_2 > x_1$  (B)  $\gamma > \beta$  (C)  $\beta > \alpha$  (D)  $x_1 > x_3$

Q.55 Which of the following statement(s) is/are **correct** about  $NO_2$  and  $ClO_2$  molecules?

- (A) Both are paramagnetic species.  
 (B) In both oxides, the central atom is  $sp^2$  hybridized.  
 (C) Both molecules have bent shape.  
 (D) Both molecules have odd electron in their structures.

Q.56 Choose the correct statement(s) from the following option(s).

- (A) The free electron of  $ClO_3$  molecule is present in 3d-orbital of Cl-atom.  
 (B) The hybridisation of C-atom in  $\dot{C}F_3$  is  $sp^3$   
 (C)  $\dot{C}H_3$  undergoes dimerisation readily.  
 (D) The dimer of  $ClO_3$  is diamagnetic.

Q.57 The species having planar shape are :

- (A)  $\dot{C}F_3$  (B)  $\dot{C}H_3$  (C)  $XeF_4$  (D)  $XeF_5^-$

Q.58 Which of the following are linear?

- (A)  $(CN)_2$  (B)  $(SCN)_2$  (C)  $O_3$  (D)  $HgCl_2$

Q.59 Which of the following is/are incorrect about solubility trend in group I & II?

	Least soluble in water	Most soluble in water
(A) Hydroxides	: LiOH	CsOH
(B) Carbonates	: $\text{Cs}_2\text{CO}_3$	$\text{Li}_2\text{CO}_3$
(C) Fluoride	: $\text{BaF}_2$	$\text{BeF}_2$
(D) Sulphates	: $\text{BaSO}_4$	$\text{BeSO}_4$

Q.60 Which of following stability order is/are correct due to inert pair effect.

- (A)  $\text{Hg}^0 > \text{Hg}^{2+}$       (B)  $\text{Bi}^{3+} < \text{Bi}^{5+}$       (C)  $\text{Pb}^{2+} > \text{Pb}^{4+}$       (D)  $\text{Fe}^{2+} < \text{Fe}^{3+}$

Q.61 Which statement is correct

- (A) Higher is the polarisation, higher will be relative solubility in non-polar solvent  
 (B) Higher is the polarisation, higher will be the intensity of colour  
 (C) Diamagnetic substances some times become coloured due to HOMO-LUMO transition  
 (D) Higher is the polarisation in metal oxide, higher will be the basic character

Q.62 Choose the option(s) regarding correct order of acidic nature :

- (A)  $\text{MgO} < \text{ZnO} < \text{P}_2\text{O}_5 < \text{SO}_3$       (B)  $\text{MgO} < \text{ZnO} < \text{SO}_3 < \text{P}_2\text{O}_5$   
 (C)  $\text{Li}_2\text{O} < \text{NO} < \text{CO}_2 < \text{SO}_2$       (D)  $\text{Li}_2\text{O} < \text{BeO} < \text{CO}_2 < \text{NO}$

Q.63 Polarisation may be called as the distortion of the shape of an anion by an adjacent cation. Which of the following statements is/are **not correct**?

- (A) Minimum polarization is brought about by a cation of low radius  
 (B) A large cation is likely to bring about a large degree of polarisation  
 (C) Maximum polarization is brought about by a cation of high charge  
 (D) A small anion is likely to undergo a large degree of polarisation

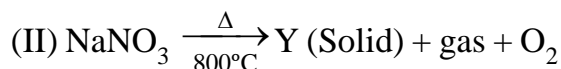
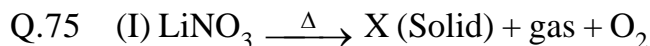
Q.64 Correct order of solubility for following ionic compounds in water is/are

- (A)  $\text{Be}(\text{OH})_2 < \text{Mg}(\text{OH})_2 < \text{Ca}(\text{OH})_2 < \text{Sr}(\text{OH})_2 < \text{Ba}(\text{OH})_2$   
 (B)  $\text{LiCl} < \text{NaCl} < \text{KCl} < \text{RbCl} < \text{CsCl}$   
 (C)  $\text{NaHCO}_3 > \text{KHCO}_3 > \text{RbHCO}_3 > \text{CsHCO}_3$   
 (D)  $\text{BeSO}_4 > \text{MgSO}_4 > \text{CaSO}_4 > \text{SrSO}_4 > \text{BaSO}_4$

Q.65 Common properties of product obtained by heating of  $\text{KMnO}_4$  and  $\text{K}_2\text{Cr}_2\text{O}_7$  is/are

- (A) Paramagnetic gas      (B) Amphoteric oxide  
 (C) Colourless gas      (D) Salt does not exist in acidic medium

- Q.66 Correct order(s) of thermal stability is/are  
(A)  $\text{BeF}_2 > \text{BaF}_2$  (B)  $\text{BaCO}_3 > \text{CaCO}_3$   
(C)  $\text{Cs}_2\text{O}_2 > \text{BaO}_2$  (D)  $\text{Be}(\text{NO}_3)_2 > \text{NaNO}_3$
- Q.67 Which order is/are correct  
(A) Thermal stability :  $\text{Li}_2\text{C}_2\text{O}_4 < \text{Na}_2\text{C}_2\text{O}_4 < \text{K}_2\text{C}_2\text{O}_4 < \text{Rb}_2\text{C}_2\text{O}_4 < \text{Cs}_2\text{C}_2\text{O}_4$   
(B) Basic nature :  $\text{ZnO} > \text{BeO} > \text{MgO} > \text{CaO}$   
(C) Solubility in water :  $\text{Li}_2\text{CO}_3 < \text{Na}_2\text{CO}_3 < \text{K}_2\text{CO}_3 < \text{Rb}_2\text{CO}_3 < \text{Cs}_2\text{CO}_3$   
(D) Melting point :  $\text{NaF} < \text{MgO} < \text{SiC}$
- Q.68 Oxygen gas is liberated by thermal decomposition of which of the following compounds:  
(A)  $\text{CaSO}_4$  (B)  $\text{NaNO}_3$  (C)  $\text{Mg}(\text{OH})_2$  (D)  $\text{K}_2\text{CO}_3$
- Q.69 If monoatomic  $\text{A}^+$  ion is larger than monoatomic  $\text{B}^{2+}$  ion and monoatomic anion  $\text{X}^{2-}$  is larger than monoatomic  $\text{Y}^-$  ion, then which of the following will be more covalent.  
(A)  $\text{AY}$  (B)  $\text{A}_2\text{X}$  (C)  $\text{BY}_2$  (D)  $\text{BX}$
- Q.70 Which of the following compound has lowest melting point  
(A)  $\text{AlF}_3$  (B)  $\text{AlCl}_3$  (C)  $\text{AlBr}_3$  (D) Black phosphorus
- Q.71 Consider the order of following metal hydroxides:  
 $\text{Be}(\text{OH})_2 < \text{Mg}(\text{OH})_2 < \text{Ca}(\text{OH})_2 < \text{Sr}(\text{OH})_2 < \text{Ba}(\text{OH})_2$   
Which of the given properties is following above order.  
(A) Basic character (B) Thermal stability (C) Solubility in water (D) All
- Q.72 Consider the order of following compounds:  
 $\text{BeF}_2 > \text{BeCl}_2 > \text{BeBr}_2 > \text{BeI}_2$   
Which of the given properties is following above order.  
(A) Thermal stability (B) melting point  
(C) Lewis acid character (D) All
- Q.73 Compound having lowest thermal stability is  
(A)  $\text{NaHCO}_3$  (B)  $\text{KHCO}_3$  (C)  $\text{RbHCO}_3$  (D)  $\text{CsHCO}_3$
- Q.74 Which of the following compound does not thermally decompose even at high temperature.  
(A)  $\text{AgNO}_3$  (B)  $\text{K}_3\text{PO}_4$  (C)  $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$  (D)  $\text{BaO}_2$



The INCORRECT statement regarding above reactions is

- (A) X and Y are respective metal oxides (B)  $\text{NO}_2$  is formed in (II) reaction  
(C) Both are redox reactions (D)  $\text{NO}_2$  is formed in (I) reaction

Q.76 Which of the following compound is/are predominantly ionic?

- (A) KCl (B)  $\text{Na}_2\text{S}$  (C)  $\text{BeF}_2$  (D) CaO

Q.77 On heating to  $400\text{--}500^\circ\text{C}$ , relatively unstable hydrides and carbonates decompose. Which of the following will decompose when heated to  $400\text{--}500^\circ\text{C}$ ?

- (A) LiH (B) NaH (C)  $\text{Li}_2\text{CO}_3$  (D)  $\text{BaCO}_3$

Q.78 Which of the following statements is/are true for BaO and MgO?

- (A) BaO is more ionic than MgO (B) MgO is more ionic than BaO  
(C) BaO is more basic than MgO (D) MgO is more basic than BaO

Q.79 Polarization may be called the distortion of the shape of an anion by an adjacently placed cation. Which of the following statements is/are incorrect:

- (A) Minimum polarization is brought about by a cation of low radius  
(B) A large cation is likely to bring about a large degree of polarization  
(C) Maximum polarization is brought about by a cation of high charge  
(D) A small anion is likely to undergo a large degree of polarization

Q.80 A, B, C are three substances. A does not conduct electricity in the solid, molten state and aqueous solution. B conducts electricity both in the fused and aqueous states, while C conducts electricity only in the aqueous state. In solid state neither B nor C conducts electricity. Which of the following statements is/are true regarding A, B and C?

- (A) A has polar covalent linkage (B) A has nonpolar covalent linkage  
(C) B is ionic in nature (D) Cation formed by C is highly polarizing

Q.81 Which of the following statement(s) is/are correct regarding ionic compounds?

- (A) They are good conductors of electricity at room temperature  
(B) They are always more soluble in polar solvents than covalent compounds  
(C) They consist of ions  
(D) They generally have high melting and boiling points

- Q.82 Most ionic compounds have:
- (A) high melting points and low boiling points  
 (B) high melting points and nondirectional bonds  
 (C) high solubilities in polar solvents and low solubilities in nonpolar solvents  
 (D) three-dimensional network structures, and are good conductors of electricity in the molten state

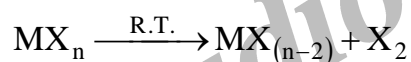
- Q.83 Among the following, the element which show inert-pair effect are:

(A) Bi (B) Sn (C) Pb (D) Tl

- Q.84 Which of the following has/have  $(18 + 2)$  electronic configuration(s) ?

(A)  $\text{Pb}^{2+}$  (B)  $\text{Cd}^{2+}$  (C)  $\text{Bi}^{3+}$  (D)  $\text{Tl}^{3+}$

- Q.85 Consider the following reaction



which of the given compound does NOT dissociate according to above reaction at room temperature

(A)  $\text{FeI}_3$  (B)  $\text{CuI}_2$  (C)  $\text{SnI}_4$  (D)  $\text{BiI}_5$

- Q.86 Which of the following can not be converted into anhydrous chloride only by heating?

(A)  $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$  (B)  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$  (C)  $\text{AlCl}_3 \cdot 6\text{H}_2\text{O}$  (D)  $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$

- Q.87 The compounds which produce CO gas finally on heating are

(A)  $\text{FeC}_2\text{O}_4$  (B)  $\text{SnC}_2\text{O}_4$  (C)  $\text{Ag}_2\text{C}_2\text{O}_4$  (D)  $\text{HgC}_2\text{O}_4$

- Q.88 Select the compound which are not exist in nature.

(A)  $\text{FeI}_3$  (B)  $[\text{CuI}_4]^{2-}$  (C)  $\text{SnCl}_6$  (D)  $\text{PbI}_4$

- Q.89 Which of the following molecules have intramolecular H-bonding.

(A)  $\text{CCl}_3\text{CHO} \cdot \text{H}_2\text{O}$  (B) ortho- $\text{C}_6\text{H}_4(\text{OH})\text{CHO}$   
 (C) ortho- $\text{C}_6\text{H}_4(\text{OH})\text{F}$  (D) para- $\text{C}_6\text{H}_4(\text{OH})\text{F}$

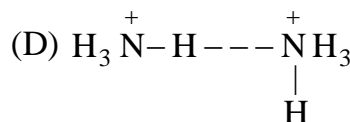
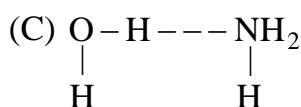
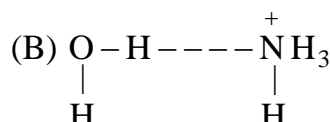
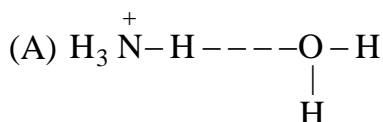
- Q.90 Which of the following statement(s) is /are **correct**?

(A) o-nitrophenol is more volatile than p-nitrophenol  
 (B)  $\text{HOCH}_2 - \text{CHOH} - \text{CH}_2\text{OH}$  is more viscous than water.  
 (C)  $\text{KHF}_2$  exists but  $\text{KHF}_2$  does not.  
 (D)  $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$  (C–O bond length)

- Q.91 Which of the following statement(s) is / are **incorrect**?
- (A) Glucose is less viscous than ethanol due to hydrogen bonding.  
(B) Diamond is more thermally stable than graphite.  
(C) Benzene and Borazole both are isoelectronic but not iso-structural.  
(D) Least reactive allotropes of phosphorus is white phosphorus.
- Q.92 Select the correct option in following -
- (A) Due to presence of H-bonding boric acid has slippery nature.  
(B) Due to presence of Vander waal force in between two layer of graphite, it has slippery nature.  
(C) In allotropes of phosphorous only white phosphorous conduct electricity.  
(D) Due to presence of H-bonding sulphuric acid is highly viscous in nature
- Q.93 Select incorrect reason for boiling point order :
- (A)  $\text{CH}_3\text{OCH}_3 < \text{CH}_3\text{SCH}_3$  : Vander waals forces  
(B)  $\text{HF} > \text{NH}_3$  : Strength of H-bond  
(C)  $\text{CH}_3\text{COOH} > \text{CH}_3\text{CONH}_2$  : Extent of H-bond  
(D) p-dichloro benzene < o-dichlorobenzene : Molecular weight
- Q.94 London force works in
- (A) Gaseous state (B) Solid state (C) Liquid state (D) None of these
- Q.95 Which of the following molecules does not consist intermolecular H-bonding?
- (A) Chloral hydrate (B) Acetic acid (Vapour)  
(C) Ortho chlorophenol (D) Para-hydroxy benzaldehyde
- Q.96 Compounds which has / have H-bond is / are:
- (A)  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  (B) Chloral hydrate  
(C) Ortho-nitrophenol (D) Chloral
- Q.97 Hydrogen bonding plays a central role in the following phenomena :
- (A) Boric acid has slippery nature. (B) Water has maximum density at  $0^\circ\text{C}$   
(C) Acetic acid form dimer in vapour state. (D) Alcohol is soluble in water.



Q.98 When  $\text{NH}_3$  gas and  $\text{NH}_4\text{Cl}$  are separately dissolved into water, then which of the following interaction will be mainly present in their respective solution



Q.99 Which of the following are true?

- (A) Vander Waals forces are responsible for the formation of molecular crystals
- (B) Branching lowers the boiling points of isomeric organic compounds due to decrease in vander Waals forces of attraction
- (C) In graphite, Vander Waals forces act between the carbon layers
- (D) In diamond, Vander Waals forces act between the carbon layers

**Q.100** Which of the following statement are correct ?

- (A) The crystal lattice of ice contains covalent as well as hydrogen bonds
- (B) The density of water increases when heated from  $0^{\circ}\text{C}$  to  $4^{\circ}\text{C}$  due to the change in the structure of the cluster of water molecules
- (C) Above  $4^{\circ}\text{C}$  the thermal agitation of water molecules increases. Therefore, intermolecular distance increases and water starts expanding
- (D) The density of water increases from  $0^{\circ}\text{C}$  to a maximum at  $4^{\circ}\text{C}$  and the entropy of the system increases

Q.101 Intermolecular hydrogen bonding increases the enthalpy of vapourization of a liquid due to the:

- (A) decrease in the attraction between molecules  
(B) increase in the attraction between molecules  
(C) decrease in the molar mass of unassociated liquid molecules'  
(D) increase in the effective molar mass of hydrogen -bonded molecules

Q.102 Which of the following molecules have intermolecular hydrogen bonds?

- (A)  $\text{KH}_2\text{PO}_4$       (B)  $\text{H}_3\text{BO}_3$       (C)  $\text{C}_6\text{H}_5\text{CO}_2\text{H}$       (D)  $\text{CH}_3\text{OH}$

Q.103 Intramolecular hydrogen bonds occur in :

- (A) 2-chlorophenol  
(B) salicylic acid  
(C) the enol form of acetylacetone  
(D) paranitrophenol

Q.104 Select the correct statement about the compound  $\text{NO}[\text{BF}_4]$

- (A) It has 5  $\sigma$  and 2  $\pi$  bond
- (B) Nitrogen-oxygen bond length is higher than nitric oxide (NO)
- (C) It is a diamagnetic specie
- (D) B–F bond length in this compound is lower than in  $\text{BF}_3$ .

Q.105 Which of the respective orders are **correct**?

- (A)  $\text{NH}_3 > \text{SbH}_3 > \text{AsH}_3 > \text{PH}_3$  : Thermal stability order
- (B) Liquid hydrogen < liquid helium : boiling point order
- (C)  $\text{BeCO}_3 > \text{SrCO}_3 > \text{BaCO}_3$  :  $K_p$  value order during their thermal dissociation in closed container
- (D)  $\text{O}_2 > \text{KO}_2 > \text{K}_2\text{O}_2$  : Magnetic moment order

Q.106 Identify the compound which has cage like structure –

- (A)  $\text{P}_4\text{O}_6$
- (B) ice
- (C)  $\text{P}_4$
- (D) Dry ice

### [PARAGRAPH TYPE]

#### Paragraph for question nos. 107 to 109

(X) is oxy acid of phosphorus having 5+ oxidation state. From one molecule of (X), following theoretical transformations are given.

- (X) – (One oxygen atom)  $\longrightarrow$  (Y)
- (Y) – (One oxygen atom)  $\longrightarrow$  (Z)
- (X) – (One water molecule)  $\longrightarrow$  (Z")

Q.107 (X) is

- (A)  $\text{H}_3\text{PO}_4$
- (B)  $\text{H}_3\text{PO}_3$
- (C)  $\text{H}_3\text{PO}_2$
- (D) None of these

Q.108 (Z") has the prefix

- (A) Ortho-
- (B) Meta-
- (C) Pyro-
- (D) None of these

Q.109 How many H-atoms are attached directly to phosphorus in the compound (Z)?

- (A) 1
- (B) 3
- (C) 4
- (D) 2

**Paragraph for question nos. 110 & 111**

Polythionic acids have the general formula :  $\text{HO}_3\text{S}-\text{S}_n-\text{SO}_3\text{H}$  ( $n = 1, 2, 3, \dots$ ) and their basicity is two. Each 'S' is  $\text{sp}^3$  hybridised and the oxidation state of individual 'S' is different. Salts of polythionic acids are named polythionates.

- Q.110 The difference in the oxidation numbers of the two types of sulphur atoms in  $\text{Na}_2\text{S}_4\text{O}_6$  is  
(A) 5 (B) 4 (C) 3 (D) 2
- Q.111 The total number of S–S linkages in polythionic acids, in general, would be equal to :  
(A)  $n$  (B)  $n - 1$  (C)  $n + 1$  (D)  $n - 2$

**Paragraph for question nos. 112 & 113**

The most common electronegative atoms in organic molecules are oxygen and nitrogen. Organic molecules containing O–H and N–H groups show H-bond their physical properties are chiefly due to O–H and –H groups. The nature of alkyl and aryl groups simply modify these properties. Select correct order of solubility in water.

- Q.112 Select correct order of solubility in water.  
(A)  $(\text{C}_2\text{H}_5)_3\text{N} < (\text{C}_2\text{H}_5)_2\text{NH} < \text{C}_2\text{H}_5\text{NH}_2$   
(B)  $(\text{C}_2\text{H}_5)_2\text{NH} < (\text{C}_2\text{H}_5)_3\text{N} < \text{C}_2\text{H}_5\text{NH}_2$   
(C)  $(\text{C}_3\text{H}_5)_2\text{NH} < \text{C}_2\text{H}_5\text{NH}_2 < (\text{C}_2\text{H}_5)_3\text{N}$   
(D)  $(\text{C}_2\text{H}_5)_3\text{N} < \text{CH}_3\text{CH}_2\text{NHCH}_3 < (\text{C}_2\text{H}_5)_2\text{NH}$
- Q.113 Select correct order(s) of boiling point which is/are explained by H-bonding.  
(i)  $\text{CH}_3\text{OH} < \text{C}_2\text{H}_5\text{OH} < \text{C}_3\text{H}_7\text{OH}$   
(ii)  $1^\circ > 2^\circ > 3^\circ$  : isomeric alcohols  
(iii)  $\text{CH}_3\text{NH}_2 < \text{C}_2\text{H}_5\text{NH}_2 < \text{C}_3\text{H}_7\text{NH}_2$   
(iv)  $1^\circ > 2^\circ > 3^\circ$  : isomeric amines  
(A) i, ii, iii, iv (B) only ii, iii, iv (C) only ii, iv (D) only iv

**Paragraph for question nos. 114 & 115**

Most of electron deficient molecules undergo stabilization by back bonding or dimerization provided certain conditions are fulfilled. Dimerization can be achieved by formation of bridge bond and pairing of unpaired electrons:

- Q.114 Incorrect order of Lewis basic character is  
(A)  $\text{NCl}_3 > \text{NF}_3$  (B)  $\text{PH}_3 > \text{PF}_3$  (C)  $\text{OMe}_2 < \text{O}(\text{SiH}_3)_2$  (D)  $\text{MeNCS} > \text{H}_3\text{SiNCS}$
- Q.115 Back bonding is present in dimer of  
(A)  $\text{BF}_3$  (B)  $\text{NO}_2$  (C)  $\text{AlF}_3$  (D)  $\text{BeCl}_2$

**Paragraph for question nos. 116 & 117**

Silicones are organo-silicon synthetic polymers. These are formed by the hydrolysis of alkyl or aryl substituted chloro silanes and their subsequent polymerisation. The alkyl and aryl substituted chloro silanes are prepared by the reaction of Grignard reagent and  $\text{SiCl}_4$ . The lower silicones are oily liquids but higher members containing long chains or ring structures are waxy and rubber like solids. They are good electrical insulators and are used in making vaseline like greases which are used as lubricants in aeroplanes.

Q.116 Find the value of  $n$ , for compound  $(\text{CH}_3)_n\text{Si}(\text{Cl})_{4-n}$  which on hydrolysis followed by polymerisation gives cross linked silicone.

- (A) 1 (B) 2 (C) 3 (D) None

Q.117 Which of the following is correct about silicones?

- (A) Silicones are organo silicon compounds containing Si–O–Si linkage.  
(B)  $\text{R}_3\text{SiCl}$  on hydrolysis followed by subsequent polymerisation gives linear silicones.  
(C)  $\text{RSiCl}_3$  on hydrolysis followed by subsequent polymerisation gives linear silicones.  
(D) When water is eliminated from the terminal –OH groups of linear silicones, cross linked silicone is formed.

**Paragraph for question nos. 118 to 120**

According to molecular orbital theory atomic orbitals of nearly same energy of different atoms are combined and form molecule in homonuclear molecule two atomic orbitals which have wave function  $\psi_A$  and  $\psi_B$  are combined in two ways  $(\psi_A \pm \psi_B)$ . They have two type of electron density, one is bonding  $[(\psi_A + \psi_B)^2]$  where  $e^-$  density increase between nucleus and another is antibonding  $[(\psi_A - \psi_B)^2]$  where  $e^-$  density decreases between nucleus. These molecular orbitals are filled according to Hund, Pauli, Aufbau principle.

Q.118 Correct trend about bond energy is :

- (A)  $\text{N}_2^- > \text{N}_2^+$  (B)  $\text{N}_2^+ > \text{N}_2^-$  (C)  $\text{N}_2^+ = \text{N}_2^-$  (D) Not comparable

Q.119 In which of the following molecular species s and p orbitals mixing does not occur?

- (A)  $\text{CN}^-$  (B)  $\text{O}_2^{2+}$  (C)  $\text{N}_2^{2-}$  (D)  $\text{B}_2^{2-}$

Q.120 Which of the following paramagnetic species have highest bond order with maximum number of antibonding electrons?

- (A)  $\text{N}_2^+$  (B)  $\text{O}_2^+$  (C)  $\text{F}_2$  (D)  $\text{C}_2^+$

## Paragraph for question nos. 121 &amp; 122

Bent's rule is consistent with VSEPR theory. According to Bent's rule, the more electronegative substituent attaches itself to hybrid orbital that contains more p-character or less s-character.

Q.121 Find the species which is not perfectly planar:

- (A)  $\dot{\text{C}}\text{H}_3$  (B)  $\dot{\text{C}}\text{HF}_2$  (C)  $:\text{CH}_2$  (D)  $\dot{\text{N}}\text{O}_2$

Q.122 Select the correct order of percentage s-character in following molecules:

Given:  $\cos 134 = -0.69$  and  $\cos 117 = -0.45$



- (A)  $x < y$  (B)  $y < x$  (C)  $x = y$  (D) Can not be predicted

## Paragraph for question nos. 123 to 125

Ionic compounds are formed by complete transfer of electrons from one atom to the other atom. Their crystal lattice are formed by electrostatic forces of attraction, but it is also true that no ionic compound is 100% ionic, partial covalent character is developed due to polarisation of ions as per Fajan's Rule.

Q.123 Polarisation of the electron cloud of cation is less than anion because

- (A) e/p ratio is less than one for anion.  
 (B) e/p ratio is greater than one for cation.  
 (C) e/p ratio is less than one for cation by which electrons are relatively loosely held compared to anion  
 (D) e/p ratio is less than one for cation while greater than one for anion by which electron cloud is relatively loosely held for anion.

Q.124 What is **incorrect** related to polarisation?

- (A) Covalent character will increase with increase in polarisation  
 (B) Melting point order will be always affected by the polarisation.  
 (C) Intensity of colour may increase with higher extent of polarisation.  
 (D) Acidic nature of metal oxide will increase with increase in polarisation.

Q.125 Choose the correct order for the given property.

- (A)  $\text{NaX} > \text{KX} > \text{RbX} > \text{CsX} > \text{LiX}$  ; (X = F, Cl, Br) : melting point order  
 (B)  $\text{BeF}_2 > \text{MgF}_2 > \text{CaF}_2 > \text{SrF}_2 > \text{BaF}_2$  : Lattice energy order  
 (C)  $\text{BeF}_2 > \text{MgF}_2 > \text{CaF}_2 > \text{SrF}_2 > \text{BaF}_2$  : Solubility order  
 (D)  $\text{MgO} > \text{BeO} > \text{CaO} > \text{SrO} > \text{BaO}$  : Covalent charecter order

**Paragraph for question nos. 126 to 128**

The rule governing the transition from ionic to covalent bonding are called Fajan's rules. They are based on the deformation of the interacting ions in the bond  $A^+B^\ominus$  (Polarization of ions)

Q.126 Select the correct statement.

- (A) Solubility of hydroxides of group I A increases down the group while for group II A, it decreases down the group.
- (B) Solubility of hydroxides of s-block metal cations increases down the group.
- (C) Solubility of carbonates of s-block metal cation decreases down the group.
- (D) All are correct.

Q.127 Select the correct statement.

- (A) Solubility of bicarbonates of  $Na^+$ ,  $K^+$ ,  $Rb^+$ ,  $Cs^+$  decreases down the group
- (B) Thermal stability of nitrates of group I A cations decreases down the group
- (C) Solubility of chromates of group II A cation increases down the group
- (D) Melting point of fluorides of  $Na^+$ ,  $K^+$ ,  $Rb^+$ ,  $Cs^+$  decreases down the group

Q.128 In which of the following compound has highest thermal stability.

- (A) NaCl
- (B) CsCl
- (C) KCl
- (D) LiCl

**Paragraph for question nos. 129 to 131**

"No ionic compound is 100 % ionic 'as well as' no covalent compound is 100% covalent."

Q.129 Correct solubility order is

- (A)  $CaCrO_4 > BaCrO_4$
- (B)  $BeCO_3 < BaCO_3$
- (C)  $LiNO_3 < CsNO_3$
- (D)  $NaClO_4 < KClO_4$

Q.130 Choose the incorrect order of the given properties:

- (A)  $BeCl_2 < LiCl$  : Electrical conductivity
- (B)  $NaF < MgF_2 < AlF_3$  : Covalent character order
- (C)  $BeSO_4 < MgSO_4 < CaSO_4$  : Thermal stability order
- (D)  $HgCl_2 < HgBr_2 < HgI_2$  : Solubility order in water

Q.131 Which of the following option gives incorrect melting point order.

- (A)  $H_2 < T_2$
- (B)  $He > T_2$
- (C)  $D_2 > He$
- (D)  $T_2 > D_2$

**Paragraph for question nos. 132 to 134**

The nature of bond between  $A^+$  and  $B^-$  depends on the effect, one ion has on the other. The positive ion attracts the electrons on the negative ion and at the same time it repels the nucleus, thus distorting the negative ion, called polarization also, electrons are drawn from the negative ion towards the positive ion, resulting in high concentration of electrons between the two nuclei, and a large degree of covalent character results.

- (I) Small positive ions (II) Large negative ions.  
 (III) Large charge on either ion. (IV) Polarisation is favoured if the positive ion doesn't have a noble gas configuration.

Q.132 Which of the following molecule is having highest melting point?

- (A) NaF (B) NaI (C) NaCl (D) NaBr

Q.133  $I^-$  is one of the bigger anionic species, which of the following cationic species produces maximum polarisation on  $I^-$ ?

- (A)  $Li^+$  (B)  $Na^+$  (C)  $Mg^{2+}$  (D)  $Be^{2+}$

Q.134 Which of the following is the correct order of polarisation.

- (A)  $PbF_2 > PbCl_2 > PbBr_2 > PbI_2$  (B)  $PbF_2 = PbCl_2 < PbBr_2 > PbI_2$   
 (C)  $PbF_2 < PbCl_2 < PbBr_2 < PbI_2$  (D)  $PbF_2 < PbCl_2 < PbBr_2 > PbI_2$

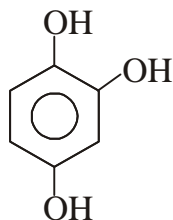
**Paragraph for question nos. 135 to 137**

The intermolecular forces of attraction (i.e. H-bonding and Vander Waals forces) exist among polar and non-polar species which affect melting point, boiling point, solubility and viscosity of covalent compounds.

Q.135 Melting and boiling point of halogen increase down the group due to

- (A) increase in London dispersion forces (B) increase in extent of polarity  
 (C) increase in molecular mass (D) Both (A) and (C)

Q.136 The type of molecular force of attraction present in the following compound is



- (A) intermolecular H-bonding (B) Intramolecular H-bonding  
 (C) Vander waals force (D) All

Q.137 Select the incorrect order of boiling point between the following compounds:

- (A)  $N_3H < CH_3N_3$  (B)  $Me_2SO_4 < H_2SO_4$   
 (C)  $Me_3BO_3 < B(OH)_3$  (D)  $BF_3 < BI_3$

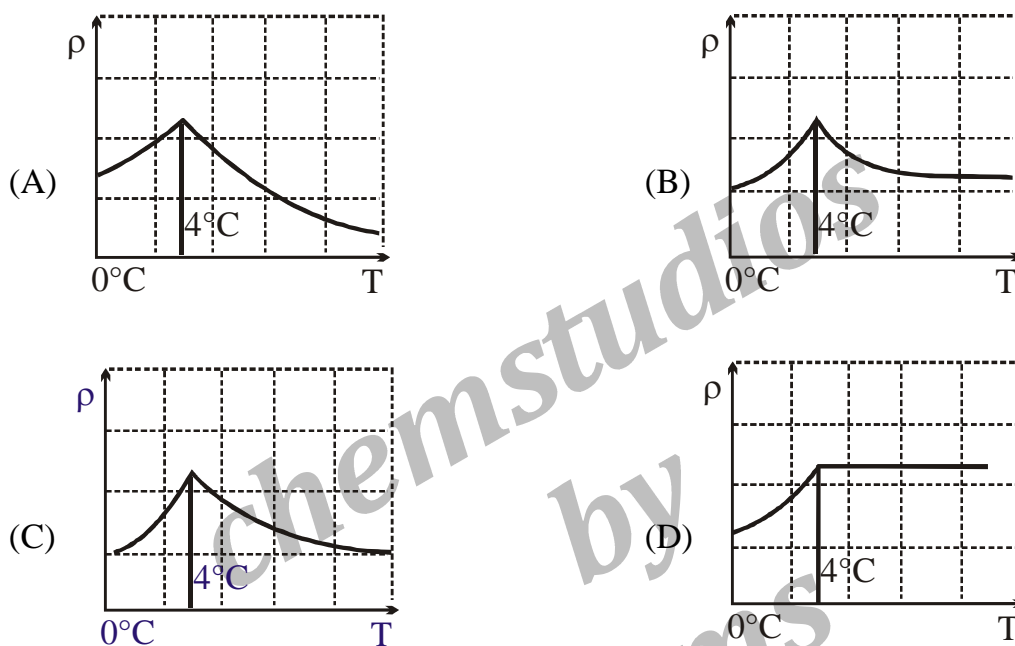
**Paragraph for question nos. 138 to 140**

Hydrogen bonding originates from the dipole-dipole interaction between H-atom and any of the other atom like F, O, N and in some cases with Cl atom. There are two types of H-bonding like intermolecular and intramolecular H-bonding.

Q.138 Which of the following molecule does not consist of intramolecular H-bonding.

- (A) chloral (B) chloral hydrate  
(C) ortho hydroxy benzaldehyde (D) ortho chlorophenol

Q.139 Which of the following plot for  $\rho$  (density) v/s  $T$  (temperature) for liquid  $H_2O$  is correct:



Q.140 Which of following statement is incorrect.

- (A) Boiling point of  $H_2O_2$  is greater than that of  $H_2O$   
(B) Ethylene glycol is less viscous than glycerol  
(C) o-nitrophenol can be separated from its meta and para isomer using its steam volatile property  
(D) in ice each 'O' atom is tetrahedrally arranged by four H-atoms which are all equidistant



**[MATCH LIST TYPE]**

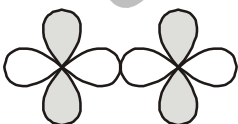



Q.141 Which of the following options represent **correctly** matched **List I** and **List II**.

<b>List I</b>		<b>List II</b>	
(P)	$P_4O_{10}$	(1)	4 $\sigma$ -bond and 1 $\pi$ -bond in center atom
(Q)	$P_4O_6$	(2)	3 $\sigma$ -bond and 1 l.p. $e^-$ in center atom
(R)	$S_3O_9$	(3)	4 $\sigma$ -bond and 2 $\pi$ -bond are in center atom
(S)	$SF_6$	(4)	6 $\sigma$ -bond only

**Code :**

	<b>P</b>	<b>Q</b>	<b>R</b>	<b>S</b>
(A)	1	4	3	2
(B)	2	1	4	3
(C)	2	4	1	3
(D)	1	2	3	4

Q.142 Match the orbital overlap figures shown in **List-I** with the description given in **List-II** and select the correct answer using the code given below the lists.

<b>List-I</b>		<b>List-II</b>	
<b>P.</b>		<b>1.</b>	p – d $\pi$ antibonding
<b>Q.</b>		<b>2.</b>	s – p $\sigma$ bonding
<b>R.</b>		<b>3.</b>	d – d $\pi$ bonding
<b>S.</b>		<b>4.</b>	p – p $\sigma$ antibonding

**Code:**

	<b>P</b>	<b>Q</b>	<b>R</b>	<b>S</b>
(A)	3	1	4	2
(B)	3	1	2	4
(C)	1	3	2	4
(D)	1	3	4	2

## Q.143 List-I

- (P)  $\text{XeO}_3$   
 (Q)  $\text{CF}_4$   
 (R)  $\text{XeF}_2$   
 (S)  $\text{CO}_2$

## List-II

- (1) Planar and lone pair is present on central atom.  
 (2) Planar and lone pair is not present on central atom.  
 (3) Non-planar and lone pair is not present on central atoms.  
 (4) Non-planar and lone pair is present on central atoms.

Code :

	P	Q	R	S
(A)	3	2	1	4
(B)	4	3	1	2
(C)	2	1	4	3
(D)	1	2	3	4

## Q.144

## List-I

- (P)  $\text{SiH}_3\text{OH} > \text{CH}_3\text{OH}$   
 (Q)  $\text{BF}_3 > \text{BCl}_3 > \text{BBr}_3$   
 (R)  $\text{SiF}_4 > \text{SiCl}_4 > \text{SiBr}_4$   
 (S)  $\text{PH}_3 > \text{AsH}_3$

## List-II

- (1) Lewis acidic character  
 (2) Lewis basic character  
 (3) Thermal stability  
 (4) Arrhenius acidic character

Codes :

	P	Q	R	S
(A)	3	1	4	2
(B)	4	3	1	2
(C)	4	1	3	2
(D)	1	3	4	2

Q.145 Match the ionization processes in List-I with the changes observed in List - II. For this, use the codes given below:

## List-I

- (P)  $\text{N}_2 \rightarrow \text{N}_2^+$   
 (Q)  $\text{O}_2^+ \rightarrow \text{O}_2^{2+}$   
 (R)  $\text{B}_2 \rightarrow \text{B}_2^+$   
 (S)  $\text{NO}^- \rightarrow \text{NO}$

## List-II

- (1) bond order increases and magnetic property is changed  
 (2) bond order decreases and magnetic property remains same.  
 (3) bond order increases and magnetic property remains same.  
 (4) bond order decreases and magnetic property is changed.

Code:

	P	Q	R	S
(A)	1	3	2	4
(B)	4	1	2	3
(C)	4	3	1	2
(D)	1	3	4	2

## Q.146 List I

*(Compound pair)*

- (P)  $\text{NH}_3$  and Kr  
 (Q)  $\text{H}_2\text{O}$  and NaCl  
 (R)  $\text{CH}_4$  and  $\text{Cl}_2$   
 (S) I-Cl and Br-F

**Code:**

	P	Q	R	S
(A)	1	4	3	2
(B)	3	2	1	4
(C)	2	3	4	1
(D)	3	4	1	2

## List II

*(Most dominating force of interaction)*

- (1) London forces  
 (2) Keesom forces  
 (3) Debey forces  
 (4) Ion dipole forces

**[MATCH THE COLUMN]**

## Q.147 Column I

**(Number of electron pair around the central atom)**

- (A) 2  
 (B) 3  
 (C) 4  
 (D) 5

## Column II

**(Probable geometry)**

- (P) Bent  
 (Q) Linear  
 (R) Sea Saw  
 (S) Trigonal Pyramidal

## Q.148

## Column I

- (A) Ammonium sulphate  
 (B)  $\text{N}_2\text{O}_5$  (Solid)  
 (C) Calcium carbonate

## Column II

- (P) Central atom of cationic and anionic part has same hybridisation.  
 (Q) All bond length are equal in anionic part  
 (R) Co-ordinate bond is present  
 (S) Anionic part has only  $\sigma$ -bond according to Lewis dot structure.

## Q.149

## Column I

*(Molecules)*

- (A)  $(\text{CN})_2$   
 (B)  $\text{C}_2(\text{CN})_2$   
 (C)  $\text{C}_2(\text{CN})_4$

## Column II

*(Orbitals involved in overlapping)*

- (P)  $\text{sp} - \text{sp}$   
 (Q)  $\text{sp} - \text{p}$   
 (R)  $\text{p} - \text{p}$   
 (S)  $\text{sp}^2 - \text{sp}^2$

- Q.150**
- | Column I |          | Column II (Solid State) |   |
|----------|----------|-------------------------|---|
| (A)      | $N_2O_5$ | (P)                     | Cation has $sp^3d^2$ hybridisation of central atom. |
| (B)      | $I(CN)$  | (Q)                     | Anion has linear shape                              |
| (C)      | $PBr_5$  | (R)                     | Anion has trigonal planar shape                     |
| (D)      | $XeF_6$  | (S)                     | Cation is linear                                    |
|          |          | (T)                     | Cation has tetrahedral shape                        |
- 
- Q.151**
- | Column I |  | Column II |                  |
|----------|--|-----------|------------------|
| (A)      | Aromatic                                   | (P)       | $C_3N_3Cl_3$     |
| (B)      | Compound having $sp$ -hybridized N-atom    | (Q)       | $B_3N_3H_6$      |
| (C)      | whole molecule is planar                   | (R)       | $C_3N_3(N_3)_3$  |
| (D)      | $l.p.$ of N-atom present in hybrid orbital | (S)       | $C_3N_3(NH_2)_3$ |
- 
- Q.152**
- | Column-I |            | Column-II |   |
|----------|------------|-----------|---|
| (A)      | $PF_3Cl_2$ | (P)       | All 'P-F' bonds are identical (when P-F bonds are $> 1$ )   |
| (B)      | $PF_2Cl_3$ | (Q)       | All 'P-Cl' bonds are identical (when P-Cl bonds are $> 1$ ) |
| (C)      | $PFC l_4$  | (R)       | $d_{P-Cl(axial)} > d_{P-Cl(equatorial)}$                    |
| (D)      | $PF_4Cl$   | (S)       | $d_{P-Cl(equatorial)} > d_{P-F(axial)}$                     |
|          |            | (T)       | $d_{P-F(axial)} > d_{P-F(equatorial)}$                      |
- 
- Q.153**
- | Column I |                       | Column II |  |
|----------|-----------------------|-----------|--|
| (A)      | $H_3\underline{P}O_4$ | (P)       | Lewis structure has at least one $\pi$ -bond     |
| (B)      | $H_2\underline{S}O_4$ | (Q)       | Pyro-acid exists.                                |
| (C)      | $H\underline{N}O_3$   | (R)       | Central atom (under lined) is $sp^3$ hybridised. |
|          |                       | (S)       | Planar shape around the under lined atom.        |
- 
- Q.154**
- | Column I |                                    | Column II |   |
|----------|------------------------------------|-----------|---|
| (A)      | Sodium dihydrogen tripolyphosphate | (P)       | Compound has P–O–P linkage                            |
| (B)      | Sodium dihydrogen hypophosphate    | (Q)       | Phosphorous atom has only odd number oxidation state. |
| (C)      | Sodium hydrogen pyrophosphite      | (R)       | It has not $p\pi-p\pi$ bond.                          |
|          |                                    | (S)       | Central atom involve 'd' orbital in bonding           |

Q.155	Column I (Compound)	Column II (Properties)
(A)	$S_2O_7^{2-}$	(P) $sp^3$ hybridised center atom
(B)	$S_2O_5^{2-}$	(Q) S – O – S bond is present
(C)	$S_2O_8^{2-}$	(R) S – S bond is present
		(S) Oxidation state of 'S' is 6+
Q.156	Column-I	Column-II
(A)	$B(OH)_3$	(P) Most acidic
(B)	$Al(OH)_3$	(Q) Most basic
(C)	$BaO$	(R) Amphoteric
(D)	$H_2SO_4$	(S) Monoprotic acid in aqueous medium
		(T) Diprotic acid
Q.157	Column-I	Column-II
(A)	$B_2H_6$	(P) $(3C - 2e^-)$ bond
(B)	$Be_2Cl_4$	(Q) Co-ordinate bond
(C)	$Al_2Cl_6$	(R) $(2C - 2e^-)$ bond
(D)	$Be_2H_4$	(S) Non-Polar
		(T) Nonplanar
Q.158	Column I (Molecules given)	Column II (Correct properties)
(A)	$B_3O_6^{3-}$	(P) Molecule / species is planar
(B)	$Al_2(CH_3)_6$	(Q) Molecule / specie is associated with back bonding or bridge bonding.
(C)	$I_2Cl_6$	(R) Molecule / specie is non polar
(D)	$C_3N_3Cl_3$	(S) Molecule / specie is non planar
		(T) All central atom(s) is / are $sp^3$ hybridised.

- Q.159**
- | <b>Column I</b>  | <b>Column II</b>             |
|--|------------------------------|
| (A) Having general formula of $(\text{SiO}_3)_n^{2n-}$ | (P) Pyroxene chain silicate  |
| (B) At least two corners are shared per tetrahedron    | (Q) Amphibole chain silicate |
| (C) Overall structure is nonplanar                     | (R) Cyclic silicate          |
|  | (S) 2D-Silicate              |
- 
- Q.160**
- | <b>Column - I</b>                    | <b>Column - II</b>   |
|--------------------------------------|----------------------|
| (A) $d_{x^2-y^2}$ atomic orbital     | (P) One nodal plane  |
| (B) $p_y$ atomic orbital             | (Q) Two nodal planes |
| (C) $\sigma_{p_x}$ molecular orbital | (R) Y (g) [gerade]   |
| (D) $\pi_{p_y}^*$ molecular orbital  | (S) Y(u) [Ungerade]  |
- 
- Q.161**
- | <b>Column-I</b>              | <b>Column-II</b>                                  |
|------------------------------|---|
| Ionic compounds              | Observation on thermal decomposition              |
| (A) $\text{HgCO}_3$          | (P) Acidic gas evolves                            |
| (B) $\text{FeSO}_4$          | (Q) Metallic residue is obtained as final product |
| (C) $\text{BeC}_2\text{O}_4$ | (R) Metal cation of salt undergoes redox reaction |
| (D) $\text{AgNO}_3$          | (S) Metallic oxide can be obtained                |
|                              | (T) Neutral gas is evolved                        |
- 
- Q.162**
- | <b>Column - I</b>                             | <b>Column -II</b>    |
|---|----------------------|
| (A) $\text{NH}_4\text{Cl}$                    | (P) Hydrogen bond    |
| (B) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ | (Q) Co-ordinate bond |
| (C) HNC                                       | (R) Ionic bond       |
| (D) Liquid. $\text{H}_2\text{O}_2$            | (S) Covalent bond    |

Q.163	Column-I (Compound)	Column-II (Intermolecular force)
(A)	H-F	(P) Keesom force
(B)	H <sub>3</sub> C - F	(Q) London force
(C)	$\begin{array}{c} \text{H} \\ \diagdown \\ \text{C} = \text{O} \\ \diagup \\ \text{H} \end{array}$	(R) Debye force
(D)	CCl <sub>4</sub>	(S) H-Bonding
		(T) Ion-dipole interaction

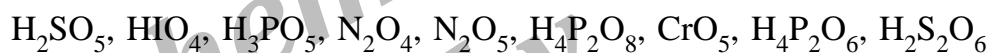
## [INTEGER TYPE]

Q.164 Find the number of P-O bonds of identical length in hypophosphate ion.

Q.165 Calculate the total number of  $\pi$ -bond in the S<sub>3</sub>O<sub>9</sub>.

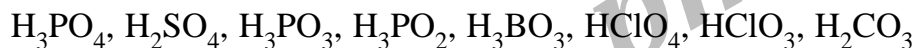
*If your answer is 2, write the answer as 0002.*

Q.166 Find the number of compounds having peroxy linkages.

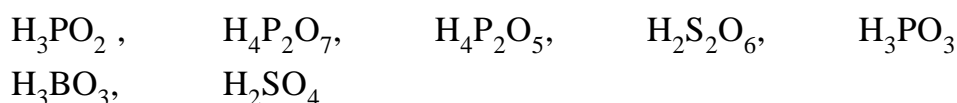


Q.167 Find the number of S - S linkages in H<sub>2</sub>S<sub>4</sub>O<sub>6</sub>.

Q.168 Find the number of acid which has tetrahedral shape w.r.t. central atom.



Q.169 Find the number of acid(s) from the following in which X - H bond is/are present. Given X is central atom



Q.170 In borax Na<sub>2</sub>[B<sub>4</sub>(OH)<sub>4</sub>(O)<sub>5</sub>].8H<sub>2</sub>O how many boron atoms are sp<sup>2</sup> hybridised.

Q.171 How many of the following will exhibit back bonding?

- |                                      |                                  |                                      |   |
|--------------------------------------|----------------------------------|--------------------------------------|---|
| (a) SiH <sub>3</sub> NCS             | (b) OCl <sub>2</sub>             | (c) BF <sub>3</sub>                  | (d) B(OC <sub>2</sub> H <sub>5</sub> ) <sub>3</sub> |
| (e) B(CH <sub>3</sub> ) <sub>3</sub> | (f) PCl <sub>3</sub>             | (g) O(CH <sub>3</sub> ) <sub>2</sub> | (h) O(SiH <sub>3</sub> ) <sub>2</sub>               |
| (i) PF <sub>3</sub>                  | (j) BF <sub>4</sub> <sup>-</sup> | (k) CO                               |   |

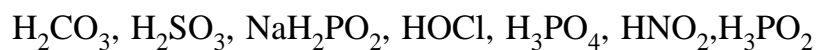
*[If your answer is 4 so write 0004.]*

Q.172 Find total number of linkage having  $\pi$  character in F<sub>2</sub>BN(SiH<sub>3</sub>)<sub>2</sub>

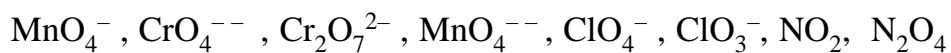
- Q.173 The maximum number of halogen atoms are present in one plane for dimer of  $\text{ICl}_3$ .
- Q.174 In which of the following compounds bridging bonds and terminal bonds are lying in same plane  
 $\text{Be}_2\text{H}_4$ ,  $\text{Be}_2\text{Cl}_4$ ,  $\text{I}_2\text{Cl}_6$ ,  $\text{Al}_2\text{Cl}_6$ ,  $\text{Fe}_2\text{Cl}_4$ ,  $\text{Al}_2\text{H}_6$ ,  $\text{Al}_2(\text{NH}_2)_6$ ,  $\text{Al}_2(\text{OH})_6$
- Q.175 Length of chain silicone can be controlled by adding  $\text{R}_n\text{S}(\text{OH})_{4-n}$  unit, then find out correct value of n.
- Q.176 How many total number of molecular orbitals which are known as gerade(g).  
 $\sigma 1s$ ,  $\pi 2p_y$ ,  $\sigma 3s$ ,  $\pi^* 2p_y$ ,  $\sigma^* 2p_z$ ,  $\pi 2p_x$ ,  $\sigma^* 2s$ ,  $\pi^* 2p_x$
- Q.177 How many nodal plane(s) is / are present in  $\pi_{2p_y}^*$  antibonding molecular orbital.
- Q.178 Which of the following are paramagnetic?  
 $\text{O}_2$ ,  $\text{O}_2^+$ ,  $\text{N}_2$ ,  $\text{N}_2^+$ ,  $\text{Cl}_2$ ,  $\text{F}_2$ ,  $\text{B}_2$ ,  $\text{C}_2$ ,  $\text{O}_2^{2+}$ ,  $\text{O}_2^{2-}$ ,  $\text{O}_2^-$ ,  $\text{N}_2^-$   
*[If your answer is 4 so write 0004.]*
- Q.179 Which of the following is paramagnetic and has fractional bond order?  
 $\text{O}_2$ ,  $\text{O}_2^+$ ,  $\text{O}_2^-$ ,  $\text{C}_2^+$ ,  $\text{B}_2^+$ ,  $\text{H}_2^+$ ,  $\text{He}_2^+$ ,  $\text{N}_2$ ,  $\text{N}_2^{2+}$ ,  $\text{NO}^+$   
*[If your answer is 1 so write 0001.]*
- Q.180 How many species of the following would involve sp mixing ?  
 $\text{B}_2$ ,  $\text{O}_2$ ,  $\text{F}_2$ ,  $\text{N}_2$ ,  $\text{O}_2^+$ ,  $\text{F}_2^-$ ,  $\text{C}_2$ ,  $\text{O}_2^-$   
*[If your answer is 6 write the answer as 0006.]*
- Q.181 How many of the following are paramagnetic having  $\mu_{\text{spin}}$  (Magnetic moment) 2.8 BM ?  
 $\text{N}_2$ ,  $\text{O}_2$ ,  $\text{B}_2$ ,  $\text{C}_2$ ,  $\text{C}_2^{2+}$ ,  $\text{N}_2^{2-}$ ,  $\text{F}_2$ ,  $\text{O}_2^-$ ,  $\text{Li}_2^+$ ,  $\text{B}_2^-$   
*If your answer is 2, write the answer as 0002.*
- Q.182 Find out the total number of species where the central atom is  $\text{sp}^2$  hybridised.  
 $\text{ClO}_2$ ,  $\text{NO}_2$ ,  $\text{SO}_2$ ,  $\text{ClO}_3$ ,  $\bullet\text{CF}_3$ ,  $\bullet\text{CH}_3$ ,  $\text{C}_3\text{O}_2$ ,  $(\text{CN})_2$ ,  $\text{N}_2\text{H}_4$
- Q.183 Which of following substance is having higher lattice energy than NaBr.  
 $\text{CaCl}_2$ ,  $\text{NaI}$ ,  $\text{CsBr}$ ,  $\text{LiF}$ ,  $\text{MgO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{TiO}_2$
- Q.184 Which of the following compound(s) is/are white and water insoluble.  
 $\text{BaCO}_3$ ,  $\text{Fe}_2\text{O}_3$ ,  $\text{AgBr}$ ,  $\text{PbCrO}_4$ ,  $\text{CaC}_2\text{O}_4$ ,  $\text{BaCl}_2$ ,  $\text{KMnO}_4$ ,  $\text{Na}_2\text{CrO}_4$ ,  $\text{Pb}(\text{CH}_3\text{COO})_2$ ,



Q.185 Find the number of species which would undergo disproportionation on heating?



Q.186 Which of the following is tetrahedral and paramagnetic?



*[If your answer is 5 so write 0005.]*

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**[ANSWER KEY]****EXERCISE-1**

Q.1	A	Q.2	B	Q.3	B	Q.4	B	Q.5	A
Q.6	D	Q.7	B	Q.8	A	Q.9	B	Q.10	D
Q.11	B	Q.12	A	Q.13	D	Q.14	C	Q.15	D
Q.16	A	Q.17	B	Q.18	A	Q.19	D	Q.20	D
Q.21	B	Q.22	A	Q.23	D	Q.24	D	Q.25	A
Q.26	B	Q.27	A	Q.28	C	Q.29	C	Q.30	D
Q.31	C	Q.32	A	Q.33	C	Q.34	C	Q.35	B
Q.36	C	Q.37	B	Q.38	C	Q.39	D	Q.40	D
Q.41	D	Q.42	C	Q.43	C	Q.44	A	Q.45	D
Q.46	D	Q.47	B	Q.48	A	Q.49	C	Q.50	B
Q.51	A	Q.52	D	Q.53	B	Q.54	D	Q.55	D
Q.56	C	Q.57	C	Q.58	D	Q.59	B	Q.60	C
Q.61	D	Q.62	B	Q.63	C	Q.64	D	Q.65	D
Q.66	B	Q.67	B	Q.68	B	Q.69	A	Q.70	C
Q.71	A	Q.72	B	Q.73	C	Q.74	A	Q.75	D
Q.76	B	Q.77	C	Q.78	A	Q.79	D	Q.80	A
Q.81	C	Q.82	C	Q.83	D	Q.84	B	Q.85	A
Q.86	D	Q.87	B	Q.88	A	Q.89	B	Q.90	D
Q.91	B	Q.92	D	Q.93	D	Q.94	A	Q.95	C
Q.96	C	Q.97	C	Q.98	D	Q.99	B	Q.100	D
Q.101	A	Q.102	D	Q.103	B	Q.104	D	Q.105	A
Q.106	B	Q.107	A	Q.108	C	Q.109	B	Q.110	A
Q.111	D	Q.112	D	Q.113	A	Q.114	A	Q.115	D
Q.116	D	Q.117	A	Q.118	A	Q.119	A	Q.120	A
Q.121	B	Q.122	C	Q.123	B	Q.124	B	Q.125	B
Q.126	B	Q.127	C	Q.128	C	Q.129	D	Q.130	D
Q.131	A	Q.132	C	Q.133	B	Q.134	C	Q.135	B
Q.136	D	Q.137	C	Q.138	C	Q.139	D	Q.140	B
Q.141	A	Q.142	A	Q.143	B	Q.144	A	Q.145	A
Q.146	C	Q.147	D	Q.148	C	Q.149	B	Q.150	A
Q.151	D	Q.152	B	Q.153	A	Q.154	B	Q.155	D
Q.156	D	Q.157	D	Q.158	D	Q.159	A	Q.160	B
Q.161	A	Q.162	B	Q.163	A	Q.164	D	Q.165	B
Q.166	A	Q.167	C	Q.168	A	Q.169	D	Q.170	A
Q.171	C	Q.172	C	Q.173	D	Q.174	D	Q.175	A

Q.176 B	Q.177 D	Q.178 A	Q.179 A	Q.180 C
Q.181 C	Q.182 A	Q.183 C	Q.184 D	Q.185 B
Q.186 D	Q.187 C	Q.188 B	Q.189 A	Q.190 D
Q.191 D	Q.192 D	Q.193 C	Q.194 D	Q.195 B
Q.196 A	Q.197 A	Q.198 D	Q.199 D	Q.200 A
Q.201 C	Q.202 A	Q.203 B	Q.204 D	Q.205 A
Q.206 B	Q.207 A	Q.208 A	Q.209 C	Q.210 C
Q.211 C	Q.212 B	Q.213 D	Q.214 C	Q.215 B
Q.216 B	Q.217 B	Q.218 B	Q.219 B	Q.220 C
Q.221 C	Q.222 C	Q.223 D	Q.224 D	Q.225 A

## EXERCISE-2

Q.1 BD	Q.2 ABD	Q.3 ACD	Q.4 BCD	Q.5 ABCD
Q.6 AB	Q.7 CD	Q.8 AC	Q.9 ABCD	Q.10 ACD
Q.11 ABCD	Q.12 BC	Q.13 ABC	Q.14 CD	Q.15 ABC
Q.16 ABC	Q.17 BC	Q.18 AC	Q.19 AB	Q.20 AD
Q.21 ABC	Q.22 ABC	Q.23 ABC	Q.24 AB	Q.25 ABCD
Q.26 ABD	Q.27 BD	Q.28 CD	Q.29 ABC	Q.30 B
Q.31 C	Q.32 AD	Q.33 ABC	Q.34 ABC	Q.35 ABC
Q.36 AB	Q.37 BCD	Q.38 BC	Q.39 BD	Q.40 ABD
Q.41 AB	Q.42 CD	Q.43 ABC	Q.44 ACD	Q.45 ABC
Q.46 AC	Q.47 BCD	Q.48 AB	Q.49 B	Q.50 CD
Q.51 D	Q.52 C	Q.53 ACD	Q.54 ABC	Q.55 ABCD
Q.56 BCD	Q.57 BCD	Q.58 AD	Q.59 BC	Q.60 AC
Q.61 ABC	Q.62 AC	Q.63 ABD	Q.64 AD	Q.65 ABCD
Q.66 ABC	Q.67 ACD	Q.68 AB	Q.69 D	Q.70 C
Q.71 D	Q.72 A	Q.73 A	Q.74 B	Q.75 B
Q.76 ABD	Q.77 BC	Q.78 AC	Q.79 ABD	Q.80 BCD
Q.81 CD	Q.82 BCD	Q.83 ACD	Q.84 AC	Q.85 ABC
Q.86 ABC	Q.87 AB	Q.88 ABCD	Q.89 ABC	Q.90 ABCD
Q.91 ABCD	Q.92 ABD	Q.93 CD	Q.94 ABC	Q.95 AC
Q.96 ABC	Q.97 CD	Q.98 AC	Q.99 ABC	Q.100 ABCD
Q.101 BD	Q.102 ABCD	Q.103 ABC	Q.104 AC	Q.105 CD
Q.106 ABC	Q.107 A	Q.108 B	Q.109 D	Q.110 A
Q.111 C	Q.112 A	Q.113 D	Q.114 C	Q.115 D
Q.116 A	Q.117 A	Q.118 B	Q.119 B	Q.120 B
Q.121 B	Q.122 B	Q.123 D	Q.124 B	Q.125 B
Q.126 B	Q.127 D	Q.128 D	Q.129 A	Q.130 D

- |  |         |                                       |  |            |
|--|---------|---------------------------------------|--|------------|
| Q.131 B  | Q.132 A | Q.133 D                               | Q.134 C                                  | Q.135 D    |
| Q.136 D  | Q.137 A | Q.138 A                               | Q.139 A                                  | Q.140 D    |
| Q.141 D  | Q.142 B | Q.143 B                               | Q.144 B                                  | Q.145 B    |
| Q.146 D  |         |                                       |  |            |
| Q.147 (A) Q (B) P, Q (C) P,Q,S (D) P,Q,R                     |         |                                       | Q.148 (A) PQRS, (B) QR, (C) Q            |            |
| Q.149 (A) PQR (B) PQR (C) QRS                                |         |                                       | Q.150 (A) RS , (B) Q, (C) T , (D) P      |            |
| Q.151 (A) P,Q,R,S; (B) R ; (C) P,Q,R,S; (D) P,R,S            |         |                                       | Q.152 (A) QST; (B) PQS; (C) RS; (D) S,T; |            |
| Q.153 (A) Q,R (B) Q,R (C) P,S                                |         |                                       | Q.154 (A) PQRS (B) RS (C) PQRS           |            |
| Q.155 (A) PQS, (B) PR (C) PS                                 |         |                                       | Q.156 (A) S (B) R (C) Q (D) P,T          |            |
| Q.157 (A) P, R, S, T; (B) Q,R,S; (C) Q, R, S, T; (D) P, R, S |         |                                       |  |            |
| Q.158 (A) P,Q,R (B) Q,R,S,T (C) P,Q,R (D) P,R                |         | Q.159 (A) P,R (B) P,Q,R,S (C) P,Q,R,S |  |            |
| Q.160 (A) Q, R, (B) P, S , (C) R , (D) Q, R                  |         |                                       |  |            |
| Q.161 (A) PQRST; (B) PRST; (C) PST, (D) PQRST                |         |                                       |  |            |
| Q.162 (A) Q,R,S, (B) P,Q,R,S, (C) Q,S, (D) P,S               |         |                                       |  |            |
| Q.163 (A) PQRS (B) PQR (C) PQR (D) Q                         |         | Q.164 6                               |  | Q.165 0006 |
| Q.166 4  | Q.167 3 | Q.168 5                               | Q.169 3                                  | Q.170 2    |
| Q.171 0007   | Q.172 5 | Q.173 8                               | Q.174 4                                  | Q.175 3    |
| Q.176 4  | Q.177 2 | Q.178 0006                            | Q.179 0006                               | Q.180 0003 |
| Q.181 0004   | Q.182 4 | Q.183 5                               | Q.184 2                                  | Q.185 5    |
| Q.186 0001   |         |                                       |  |            |