Self Practice Paper (SPP)

1. If the electronic configuration of an element is $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^2\ 4s^2$, then the electrons involved in bonding will be.
(1) $3p^6$ (2) $3p^6\ 4s^2$ (3) $3p^6\ 3d^2$ (4) $3d^2\ 4s^2$

2. A Bond formed between two same atoms cannot be
(1) Ionic (2) Covalent (3) Metallic Bond (4) None of these

3. A sigma bond may be formed by the overlap of 2 atomic orbitals of atoms A and B. If the bond is formed along as the x-axis, which of the following overlaps is acceptable ?
(1) s orbital of A and p_z orbital of B (2) p_x orbital of A and p_y orbital of B
(3) p_z orbital of A and p_x orbital of B (4) p_x orbital of A and s orbital of B

4. NH_3 and BF_3 combine readily because of the formation of :
(1) a covalent bond (2) a hydrogen bond (3) a coordinate bond (4) an ionic bond

5. Maximum bond energy is in :
(1) F_2 (2) N_2 (3) O_2 (4) equal in all

6. The structure of XeF_2 involves hybridization of the type :
(1) sp^3 (2) sp^3d^3 (3) sp^3d (4) sp^3d^2

7. The bond angle and hybridization in ether (CH_3OCH_3) is :
(1)106° 51', sp^3 (2) 104°31', sp^3 (3) 109°28' sp^3 (4) >109°28' sp^3

8. Which of the following have maximum boilling point
(1) CH_4 (2) CF_4 (3) CCl_4 (4) CD_4

9. In which of the following molecule / ion all the bonds are not equal ?
(1) XeF_4 (2) BeF_4^- (3) C_2H_4 (4) SiF_4

10. The correct order of increasing X – O – X bond angle is (X = H, F or Cl) :
(1) $H_2O > Cl_2O > F_2O$ (2) $Cl_2O > H_2O > F_2O$ (3) $F_2O > Cl_2O > H_2O$ (4) $F_2O > H_2O > Cl_2O$

11. Which of the following is paramagnetic ?
(1) O_2^- (2) CN^- (3) CO (4) NO^+

12. Which of the following is non-polar :
(1) NF_3 (2) BF_3 (3) PF_3 (4) SF_4

13. Strongest hydrogen bond present in :
(1) O – H ------ S (2) S – H ------ O (3) F – H ------ F (4) F – H ------ O

14. Resonance structure of a molecule should not have
(1) Identical bond position (2) Identical arrangements of atoms
(3) Nearly the same energy content (4) The same number of paired electrons

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

16. The boiling point of a compound is raised by -
(1) intermolecular hydrogen bonding (2) High volatility
(3) Intramolecular hydrogen bonding (4) Non-polarity

17. BCl_3 in non polar because :
(1) B – Cl bond is non-polar (2) Its dipole moment is zero
(3) B – Cl bond is polar (4) B & Cl have equal electronegativity

18. The hybrid states of central atom in diaborane, diamond and graphite are respectively :
(1) sp^2, sp^3, sp^2 (2) sp^3, sp^3, sp^2 (3) sp^3, sp^3, sp^3 (4) sp, sp^2, sp^3

19. Which of the set of species have same hybridization state but different shapes:
(1) NO_2^+, NO_2, NO_2^- (2) ClO_4^-, SF_4, XeF_4 (3) NH_4^+, H_3O^+, OF_2 (4) SO_4^{-2}, PO_4^{-3}, ClO_4^-

20. The bonds present in N_2O_5 are :
(1) Only ionic (2) Covalent & coordinate
(3) Only covalent (4) Covalent & ionic

21. The correct statement for the reaction-
$NH_3 + H^+ \longrightarrow NH_4^+$
(1) Hybridisation state is changed (2) Bond angle increases
(3) NH_3 act as a Lewis acid (4) Regular geometry is changed

22. The correct order of decreasing polarisabality of ions is :
(1) $Cl^- > Br^- > I^- > F^-$ (2) $F^- > I^- > Br^- > Cl^-$ (3) $F^- > Cl^- > Br^- > I^-$ (4) $I^- > Br^- > Cl^- > F^-$

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

24. An ionic compound $A^+ B^-$ is most likely to be formed when -
(1) Ionization energy of A is low (2) Electron affinity of B is high
(3) Electron affinity of B is low (4) Both (1) and (2)

25. Among the following which compounds will show the highest lattice energy ?
(1) KF (2) NaF (3) CsF (4) RbF

26. The correct sequence of increasing covalent character is represented by -
(1) $BeCl_2$ < NaCl < LiCL (2) NaCl < LiCl < $BeCl_2$
(3) $BeCl_2$ < LiCl < NaCl (4) LiCl < NaCl < $BeCl_2$

27. The correct order of increasing bond angle in the following species is :
(1) $ClO_2^- < Cl_2O < ClO_2$ (2) $Cl_2O < ClO_2 < ClO_2^-$
(3) $ClO_2 < Cl_2O < ClO_2^-$ (4) $Cl_2O < ClO_2^- < ClO_2$

28. Which of the follwing species contains three bond pairs and one lone pair around the central atom ?
(1) NH_2^- (2) PCl_3 (3) H_2O (4) BF_3

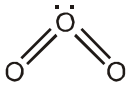
29. During change of O_2 to O_2^- ion, the electron adds on which one of the following orbitals ?
(1) σ^* $2p_z$ orbital (2) σ $2p_z$ orbital
(3) π^* $2p_x$ / π^* $2p_y$ orbital (4) π $2p_x$ / π $2p_y$ orbital

30. Lattice energy of an ionic compound depends upon
(1) charge of the ion only (2) size of the ion only
(3) packing of the ion only (4) charge and size of the ion

31. Which one of the following compounds has covalent as well as coordinate bond ?
(1) $F_3B.NH_3$ (2) $C_5H_5N.SF_4$ (3) $BH_3.CO$ (4) all

32. Consider the following statements ;
S_1 : N_2H_4 is pyramidal about each N atom
S_2 : NH_2OH is pyramidal about the N atom and bent about the O atom
S_3 : CH_3COCl is trigonal about the carbon atom (attached to O and Cl)
and out of these select the correct one.
(1) S_1 and S_2 only (2) S_1 and S_3 only (3) S_2 and S_3 only (4) S_1 , S_2 and S_3

33. Which reaction involves a change in the electron–pair geometry for the under lined element ?
(1) $\underline{B}F_3 + F^- \longrightarrow \underline{B}F_4^-$ (2) $\underline{N}H_3 + H^+ \longrightarrow \underline{N}H_4^+$
(3) $2\,\underline{S}O_2 + O_2 \longrightarrow 2\,\underline{S}O_3$ (4) $H_2\underline{O} + H^+ \longrightarrow H_3\underline{O}^+$

34. Which of the following statements are correct ?
(I)  structure is not allowed because octet around 'O' can not be expanded.
(II) H_2O_2 is ionic compound
(III) In B_2 molecule, the highest occupied molecular orbital is σ molecular orbital.
(IV) The lp–bp repulsion is stronger than bp–bp repulsion.
(1) (I) and (III) (2) (II) and (III) (3) (I) and (IV) (4) (III) and (IV)

35. **S-1 :** Simple ionic compounds show isomerism and isomorphism due to the directional nature of the electrovalent bond.
S-2 : Covalent bond formed by hybrid orbitals are more stronger than those of formed by pure atomic orbitals.
S-3 : CO_3^{2-} anion has (i) bonds of unequal length
(ii) sp^2hybridisation of carbon atom with same OCO bond angles.
S-4 : The number of lone pair(s) of electrons present on Xe in XeO_2F_2, $XeOF_4$, XeO_3 and XeO_4 are 1, 1, 1 and 0 respectively.
(1) FFFF (2) TTTT (3) FTFT (4) FTTT

36. Which species whould be least likely to act as a Lewis base ?

(1) CN^- (2) PCl_3 (3) I^+ (4) SCl_2

37. Select the correct order of the strength of acids given below :

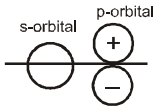
(1) $HClO_4 < HClO_3 < HClO < HClO_2$ (2) $HClO_4 < HClO_3 < HClO_2 < HClO$

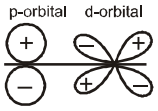
(3) $HClO < HClO_2 < HClO_3 < HClO_4$ (4) none of these

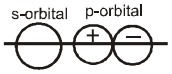
38. Which of the following is not an ionic compound ?

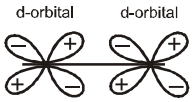
(1) $NaNO_3$ (2) $CaCO_3$ (3) $CaBr_2$ (4) P_4S_3

39. Which of the following leads to bonding ?

(1) 

(2) 

(3) 

(4) 

40. Which does not form linear structure ?

(1) CO_2 (2) NO_2 (3) C_2H_2 (4) $BeCl_2$

41. In which of the following molecule are all the bonds not equal ?

(1) NF_3 (2) ClF_3 (3) BF_3 (4) AlF_3

42. Match the lists – I and II and write the correct matching

List – I (species)	**List – II (Geometry)**
A. H_3O^+	1. Planar
B. $H_2C=NH$	2. Angular
C. ClO_2^-	3. Tetrahedral
D. NH_4^+	4. trigonal bipyramidal
E. PCl_5	5. Pyramidal

(1) A-2, B-1, C-3, D-5, E-4 (2) A-1, B-5, C-2, D-3, E-4

(3) A-5, B-1, C-2, D-3, E-4 (4) A-3, B-1, C-4, D-5, E-2

43. Match List I and List – II and pick out correct matching codes from the given choices.

List – I (compound)	**List – II (structure)**
A. ClF_3	1. square planar
B. PCl_3	2. tetrahedral
C. IF_5	3. Trigonal bipyramidal
D. CCl_4	4. square pyramidal
E. XeF_4	5. T-shaped

(1) A-5, B-4, C-3, D-2, E-1 (2) A-5, B-3, C-4, D-2, E-1

(3) A-4, B-3, C-5, D-2, E-1 (4) A-3, B-4, C-1, D-5, E-2

44. Four diatomic molecules/species are listed below in different sequences. Which one of these represents the correct order of their increasing bond order ?

(1) $C_2^{2-} < He_2^+ < NO < O_2^-$ (2) $He_2^+ < O_2^- < NO < C_2^{2-}$

(3) $O_2^- < NO < C_2^{2-} < He_2^+$ (4) $NO < C_2^{2-} < O_2^- < He_2^+$

45. The correct order of increasing bond angles in the following triatomic species is

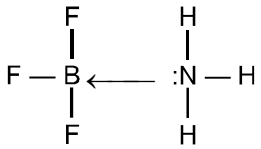
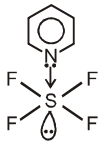
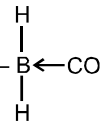
(1) $NO_2^+ < NO_2 < NO_2^-$ (2) $NO_2^+ < NO_2^- < NO_2$

(3) $NO_2^- < NO_2^+ < NO_2$ (4) $NO_2^- < NO_2 < NO_2^+$

SPP Answers

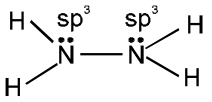
1.	(4)	**2.**	(1)	**3.**	(4)	**4.**	(3)	**5.**	(2)	**6.**	(3)	**7.**	(4)
8.	(3)	**9.**	(3)	**10.**	(2)	**11.**	(1)	**12.**	(2)	**13.**	(4)	**14.**	(1)
15.	(1)	**16.**	(1)	**17.**	(2)	**18.**	(2)	**19.**	(3)	**20.**	(2)	**21.**	(2)
22.	(4)	**23.**	(1)	**24.**	(4)	**25.**	(2)	**26.**	(2)	**27.**	(4)	**28.**	(2)
29.	(3)	**30.**	(4)	**31.**	(4)	**32.**	(4)	**33.**	(1)	**34.**	(3)	**35.**	(3)
36.	(3)	**37.**	(3)	**38.**	(4)	**39.**	(3)	**40.**	(2)	**41.**	(2)	**42.**	(3)
43.	(2)	**44.**	(2)	**45.**	(4)								

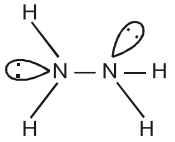
SPP Solutions

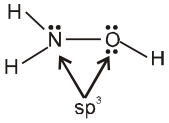
31. (1)  (2)  (3) 

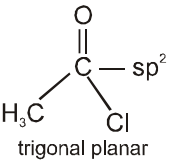
32. S_1 : $NH_2 - NH_2$ or N_2H_4 (hydrazine)

Structure is similar to that of ethane. Each N atom is tetrahedrally surrounded by one N, two H and a lone pair. Hence, N_2H_4 is pyramidal about each N atom as given below in the figures.





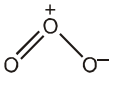
S_2 : NH_2OH (hydroxylamine) 



trigonal planar

33. (1) $\underline{B}F_3\,(sp^2) + F^- \longrightarrow \underline{B}F_4^-\ (sp^3)$. (2) $\underline{N}H_3\,(sp^3) + H^+ \longrightarrow \underline{N}H_4^+\,(sp^3)$

(3) $2\,\underline{S}O_2\,(sp^2) + O_2 \longrightarrow 2\,\underline{S}O_3\,(sp^2)$ (4) $H_2\underline{O}\,(sp^3) + H^+ \longrightarrow H_3\underline{O}^+\,(sp^3)$

34. (I) The electronic structure which is allowed is  as central oxygen has complete octet whereas in  the central atom has 10 electrons.

(II) H_2O_2 is covalent compound.

(III) $(\sigma 1s)^2\ (\sigma^* 1s)^2\ (\sigma 2s)^2\ (\sigma^* 2s)^2\ (\pi 2p^1_x = \pi 2p^1_y)\ (\sigma p_z)^0$

The highest occupied molecular orbital is π molecular orbital.

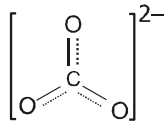
(IV) The repulsive interaction of electron pairs decreases in the order :

lone pair (ℓp) - lone pair (ℓp) > lone pair (ℓp) - bond pair (bp) > bond pair (bp) -bond pair (bp)

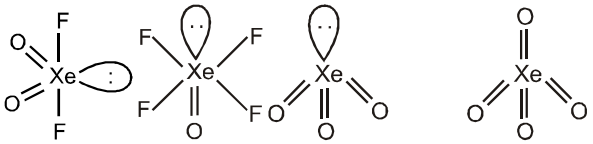
35. **S-1 :** Ionic compounds do not show isomerism due to the non-directional nature of ionic bonds.

S-2 : Hybrid orbitals are directional and has large area for overlapping. So they form stronger covalent bonds.

S-3 : (i) Same bond length due to resonance.

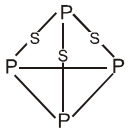
(ii) 

sp^2, bond angle = 120°

S-4 : 

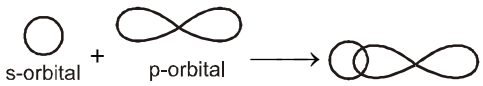
36. I^+ will have tendency to gain the electron. So it will act as Lewis acid rather than Lewis base.

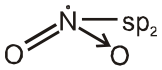
37. As stability of conjugate bases by more dispersion of negative charge increases, the acidity of conjugate acids increases. Hence the correct order of stability of conjugate base is ClO_4^- > ClO_3^- > ClO_2^- > $ClO^-$and acidity is $HClO_4$ > $HClO_3$ > $HClO_2$ > HClO.

38. 

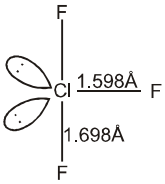
It is a covalent discrete molecule.

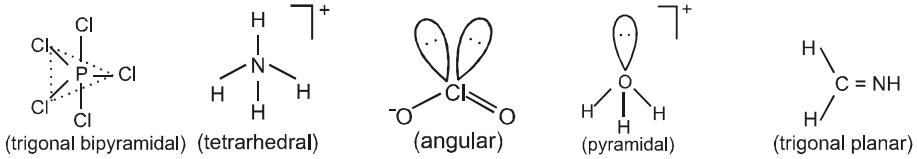
(1) Na^+, NO_3^- (2) Ca^{2+}, CO_3^{2-} (3) Ca^{2+}, $2Br^-$.

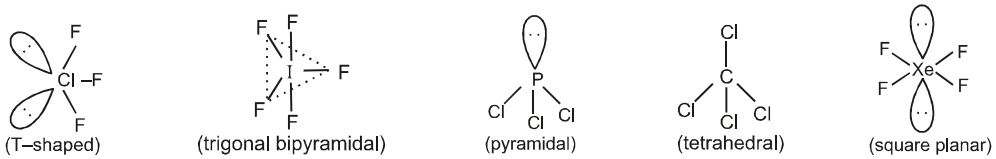
39. 

40. (1) O = C = O (sp) (2)  (bent)

(3) H – C ≡ C – H (sp) (4) Cl – Be – Cl (sp)

41. ClF_3 : 

42. 

43. 

44. C_2^{2-} Bond order = 3; He_2^+ = ½ ; NO = 2.5 O_2^- = 1.5

45.