HYDROGEN BOND

1. The states of hybridization of boron and oxygen atoms in boric acid (H_3BO_3) are respectively

(A) sp^3 and sp^2 (B) sp^2 and sp^3

(C) sp^2 and sp^2 (D) sp^3 and sp^3

2. The correct order of the hybridization of the central atom in the following species NH_3, $[PtCl_4]^{2-}$, PCl_5 and BCl_3 [2001]

(A) dsp^2, dsp^3, sp^2 and sp^3 (B) sp^3, dsp^2, dsp^3, sp^2

(C) dsp^2, sp^2, sp^3, dsp^3 (D) dsp^2, sp^3, sp^2, dsp^3

3. Specify the coordination geometry around and hybridization of N and B atoms in a 1: 1 complex of BF_3 and NH_3 [2002]

(A) N: tetrahedral, sp^3; B: tetrahedral, sp^3 (B) N: pyramidal, sp^3; B: pyramidal, sp^3

(C) N: pyramidal, sp^3; B: planar, sp^2 (D) N: pyramidal, sp^3: tetrahedral, sp^3

4. The linear structure is assumed by: [1991]

(A) $SnCl_2$ (B) NH_3 (C) CO_2 (D) NO_2

5. Which of the following statements are correct?

(A) The bond angle of NCl_3 is greater than that of NH_3.

(B) The bond angle in PH_3 is greater than that of PF_3.

(C) and are isostructural

(D) It is not necessary that in TBP structure the lone pairs always would occupy the equatorial positions.

5. The geometry of H_2S and its dipole moment are [1999]

(A) angular and non-zero (B) angular and zero

(C) linear and non-zero (D) linear and zero

7. The bond order in NO is 2.5 while that in NO^+ is 3. Which of the following statements is true for these two species?

(A) Bond length in NO^+ is equal to that in NO (B) Bond length in NO is greater than in NO^+

(C) Bond length in NO^+ is greater than in NO (D) Bond length is unpredictable

8. Which of the following molecules/ions does not contain unpaired electrons?

(A) N_2^+ (B) O_2 (C) O_2^{2-} (D) B_2

9. The cyanide ion, CN^- and N_2 are isoelectronic. But in contrast to CN^-, N_2 is chemically inert, because of [1992]

(A) Low bond energy

(B) absence of bond polarity

(C) unsymmetrical electron distribution

(D) presence of more number of electrons in bonding orbitals

10. Among KO_2, AlO_2^-, BaO_2 and NO_2^+, unpaired electron is present in [1997]

(A) NO_2^+ and BaO_2 (B) KO_2 and AlO_2^-

(C) KO_2 only (D) BaO_2 only

11. The correct order of increasing C—O bond length of CO, CO_3^{2-}, CO_2 is [1999]

(A) $CO_3^{2-} < CO_2 < CO$ (B) $CO_2 < CO_3^{2-} < CO$

(C) $CO < CO_3^{2-} < CO_2$ (D) $CO < CO_2 < CO_3^{2-}$

12. The common features among the species CN^-, CO and NO^+ are [2001]

(A) bond order three and isoelectronic

(B) bond order three and weak field ligands

(C) bond order two and π-acceptors

(D) isoelectronic and weak field ligands

13. Which of the following are isoelectronic and isosteructural? NO_3^-, CO_3^{2-}, SO_3 [2003]

(A) NO_3^-, CO_3^{2-} (B) SO_3, NO_3^- (C) ClO_3^-, CO_3^{2-} (D) CO_3^{2-}, SO_3

14. Among the following, the paramagnetic compound is [2007]

(A) Na_2O_2 (B) O_3 (C) N_2O (D) KO_2

15. The species having bond order different from that in CO is [2007]

(A) NO^- (B) NO^+ (C) CN^- (D) N_2

16. Planar structure is shown by [AIIMS2007]

A) CO_3^{2-} B) BCl_3 C) $N(SiH_3)3$ D)all

17. Which of the following does not have a co –ordinate covalent bond? [CPMT2008]

(A) SO_2 (B) H N O_3 (C) H_2 SO_3 (D) HNO_2

18. In which of the following, the central atob does not have Sp3 hybridisation? [AIPMT2010]

A. CH_4 B. SF_4 C. BF_4^- D. NH_4^+

19. Which of the following is Linear? [AFMC2008]

A. XeF_4 B. XeF_2 C. SO_2 D. ClF_3

20. Among the following molecules, SO_2 , ClF_3, XeF_4 SF_4 , Which of the following does not describe the shape of any of these is [AIPMT2011]

A.Bent B. Trigonal bi pyramidal C. See-saw D. T-shape

21. The shape of NH_2 molecule is (CPMT 2000: AIIMS2001)

a. Pyramidal b. Linear c. Tetrahedral d. Trigonal

22. **The shape of I F_5 is** **(CPMT2001)**

a. Pentagonal bipyramidal b. Square pyramidal

c. octahedral d. trigonal planar

23. **The As F_5 molecule is trigonal pyramidal The hybrid orbital used by the As-atom for bonding are** **(AIIMS2000)**

a. $d_{x^2-y^2}, s, p_y, p_z$ b. $s, p_x, p_y, p_z, d_{z^2}$

c. $d_{x^2-y^2}, d_{z^2}, s, p_x, p_y$ d. d_{xy}, s, p_x, p_y, p_z

24. **Ion which of the following the angle between the two covalent bonds is greatest?[JIPMER 2001]**

a. H_2O b. NH_3 c. CH_4 d. CO_2

25. BCl_3 **is a planar molecule because its hybridization is:** **[BHU 2000]**

a. SP^3 b. Sp^3d c. Sp^2 d. Sp

26. **The ratio of π and σ bonds in benzeneis:** **[BHU 2000]**

a. 1:3 b. 1:4 c. 1:6 d. 1:9

27. **Which of the following molecules will form a linear polymeric structure due to hydrogen bonding?** **[AIPMT 2000]**

a. NH_3 b. H_2O c. HCl d. HF

28. **Which of the following is not a paramagnetic?** **[AIPMT 2000]**

a. NO b. N_2^+ c. CO d. O_2^-

29. Which of the following two are isostructural? [AIPMT 2001][BHU 2007]

a. XeF_2, IF_2^- b. NH_3, BF_3 c. CO_3^{2-}, SO_3^{2-} d. PCl_5, ICI_5

30. In which of the following bond angle is maximum? [AIPMT 2001]

a. NH_3 b. NH_4^+ c. PCl_3 d. SCl_2

31. Which of the following has $p\pi - d\pi$ bonding? [AIPMT 2002]

a. No_3^- b. So_3^{2-} c. Bo_3^{3-} d. Co_3^{2-}

32. The number of σ and π-bonds present in 1-buten-3-yne are: [AFMC 2000]

a. 7σ and 5π b. 6σ and$4\,4\pi$ c. 6σ and 6π d. 7σ and 3π

33. Both BF_3 and NF_3 are covalent but BF_3 molecule is non-polar while NF_3 is polar because:

a. Boron is a metal while nitrogen is a gas

b. BF_3 is a planar but NF_3 is pyramidal

c. atomic size of boron is smaller than nitrogen

d. B-F bond has no dipole moment while N-F bond has dipole moment

34. NH_3 is added to BF_3 by: [AFMC 2001]

a. ionic bond b. Covalent bond

c. Dative bond d. Molecular bond

35. Ionic bond formation between Aand B can take place only if: **[AFMC 2001]**

a. ionization energy of A is less and electron affinity of B is more

b. If ionisation energy of both A and B are more

c. Both have equal electron affinities

d. none of the above

36. Ethene molecule contains: **[AMU 2000]**

a. One π-bondsd and five σ-bonds

b. Two π-bonds only

c. Two π-bonds and four σ-bonds

d. Four π-bonds and σ-bonds

37. Which of the following species is diamagnetics? **[AMU 2001]**

a. O_2 b. O_2^{2-} c. O_2^- d. O_2^+

38. MO configuration of He_2^- is: **[AMU 2001]**

a. $\sigma 1s^2 \sigma 1s^2 \sigma 2s^1$ b. $\sigma 1s^2 \sigma 1s^2 \sigma 2s^2$ c. $\sigma 1s^2 \sigma 1s^1 \sigma 2s^2$ d. $\sigma 1s^2 \sigma 1s^1 \sigma 2s^1$

39. The orbitals of same energy level providing the most efficient overlapping are:[PMT(HARYANA)2000]

a. sp-sp b. $sp^2 - sp^2$ c. $sp^3 - sp^3$ d. all of the these

40. What is the correct sequence of bond order? **[PMT (HARYANA) 2000; BHU 2004]**

a. $O_2^+ > O_2 > O_2^-$ b. $O_2^- > O_2^+ > O_2$ c. $O_2^- > O_2^+ > O_2$ d. $O_2 > O_2^+ > O_2^+$

41. The number of SP^3- hybrid carbons in 2- butyne is : : **[PMT(HARYANA)2001]**

a. 1 b. 2 c. 3 d. 4

42. Anti bonding molecular orbital is formed by (DPMT 2000)

a. addition opf wave function of atomic orbitals

b. subtraction of wav e functions of atomic orbitals.

c. multiplication of wave function of atomic orbitals

d. none of the above

43. In lewis formula of O_3 there are (DPMT 2000)

a. 2σ, 1π, 4 lone pairs b. 1σ, 2π ,, 1 lone pairs

c. 2σ, 2π, 3 lone pairs d. 2σ, 1π, 6 lone pairs

44. The number possible resonating structures for CO_3^{2-} ion is: [PMT (MP) 2000]

a. 9 b. 6 c. 3 d. 2

45. The correct order of bond angles in the molecule H_2O, NH_3, CH_4 and CO_2 is:

[PMT (KERALA) 2001]

a. $H_2O > NH_3 > CH_4 > CO_2$ b. $H_2O < NH_3 < CO_2 < CH_4$

C. $H_2O > NH_3 < CH_4 > CO_2$ d. $CO_2 > CH_4 > NH_3 > H_2O$

46. In OF_2, number of bond pairs and lone pairs of electrons are respectively : [DPMT 2002]

a. 2 , 6 b. 2, 8 c. 2, 10 d. 2, 9

47. Which of the following does not contain coordinate bond? [PMT (RAJASTHAN) 2002]

a. BH_4^- b. NH_4^+ c. CO_3^{2-} d. H_3O^+

48. Which of the following bonds requires the largest amount of energy to dissociate into the constituent atoms? [PMT (KERALA) 2003]

a. $H-H$ bond in H_2 b. $C-H$ bond in CH_4

c. $N \equiv N$ bond in N_2 d. $O=O$ bond in O_2

49. The ONO angle is maximum in: [AIIMS 2004]

a. NO_3^- b. NO_2^- c. NO_2 d. NO_2^+

50. Which statement is true for N_3^- ion? [AIIMS 2004]

a. It has a non – linear structure

b. It is called pseudohalogen

c. The average oxidation state of N in the ion is -1

d. It is isoelectronic with NO_2

51. Among the following, the pair in which two species are not isostructural is : [AIIMS 2004]

a. SiF_4 and SF_4 b. IO_3^- and XeO_3 c. BH_4^- and NH_4^+ d. PF_6^- and SF_6

52. In regular octahedral molecule MX_6 , the number of XMX bonds at 180^0 is : [AIPMT 2004]

a. 3 b. 2 c. 6 d. 4

53. H_2O is dipolar whereas BeF_2 is not , It is because : [AIPMT 2004]

a. electro negativity of F is greater than that of O

b. H_2O involves H – bonding whereas BeF_2 is a discrere unit

c. H_2O is linear and BeF_2 is angular

d. H_2O is angular and BeF_2 is linear

54. In BrF_3 molecule, the lone pairs occupy equatorial position around Br atom to minimize.

a. lone pair – bond pair repulsions only

b. lone pair – lone pair repulsions only[AIPMT 2004]

c. bond pair – bond pair repulsions only

d. lone pair – bond pair as well as lone pair – lone pair repulsions

55. **Which hybridizations has sulphur in SO_2 ?** **[PMT (HARYANA) 2003]**

a. sp^2 b. sp^3d^2 c. sp^3 d. sp

56. **The hybridizations of nitrogen in NO_2^+ , NO_3^- and NH_4^+ are respectively : [PMT(HARYANA)2005]**

a. sp , sp^3 and sp^2 b. sp , sp^2 and sp^3

c. sp^2 , sp and sp^3 d. sp^2 sp^3 and sp

57. **The correct sequence of hybridization of methane, ethane and acetylene is: [CPMT 2003]**

a. sp^2, sp^3, sp b. sp, sp^2, sp^3

c. sp^3, sp^2 , sp d. sp^3, sp, sp^2

58. **Hybridizations present in CIF_3 is:** **[CPMT 2005]**

a. s^2d^2 b. sp^3 c. dsp^2 d. sp^3d

59. **Electron deficient molecule is :** **[CPMT 2005]**

a. CCI_4 b. PCl_5 c. BF_3 d. SF_6

60. **The number of σ and π bonds in allyl isocyanide are [CH_2= CH- CH_2:-NC] [CPMT 2006]**

a. 9σ , 3π b. 9σ , 9π

c. 3σ , 4π d. 5σ , 7π

KEY

1) a 2)b 3) a 4) c 5)c 6) a 7) d 8) c 9) b 10) c

11) d 12) a 13) a 14) d 15) a 16) d 17) d 18) a 19) b 20) b

21) a 22) b 23) b 24) d 25) c 26) b 27) d 28) c 29) a 30) b

31) b 32) d 33) b 34) c 35) a 36) a 37) b 38) a 39) a 40) a

41) 2 42) b 43) d 44) c 45) d 46) b 47) c 48)c 49)d 50) b

51) a 52) a 53) d 54) d 55) a 56) b 57) c 58) d 59) c 60) a