

Hydrogen Bond

- 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
- The correct order of the hybridization of the central atom in the following species NH_3 , $[\text{PtCl}_4]^{2-}$, 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
- 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 ; B: tetrahedral, sp^3
- The linear structure is assumed by: [1991]**
(A) SnCl_2 (B) NH_3 (C) CO_2 (D) NO_2
- 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

19. Which of the following is Linear? [AFMC2008]
a. XeF₄ b. XeF₂ c. SO₂ d. ClF₃
20. Among the following molecules, SO₂, ClF₃, XeF₄, SF₄ 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 NH₂ molecule is (CPMT 2000: AIIMS2001)
a. Pyramidal b. Linear c. Tetrahedral d. Trigonal
22. The shape of IF₅ is (CPMT2001)
a. Pentagonal bipyramidal b. Square pyramidal
c. Octahedral d. Trigonal planar
23. The As F₅ 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. H₂O b. NH₃ c. CH₄ d. CO₂
25. BCl₃ is a planar molecule because its hybridization is: [BHU 2000]
a. SP³ b. Sp³d c. Sp² d. Sp
26. The ratio of π and σ bonds in benzene is [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. NH₃ b. H₂O 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, ICl_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 4π 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 [AFMC 2001]
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 A and 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. Ethane molecule contains [AMU 2000]
a. One π -bond 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 diamagnetic? [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 of wave function of atomic orbitals
b. Subtraction of wave 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 MX_2 bonds at 180° 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 discrete 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 ClF_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. CCl_4 b. PCl_5 c. BF_3 d. SF_6

60. The number of σ and π bonds in Allyl Isocyanide are [CPMT 2006]
[$CH_2=CH-CH_2:-NC$]

- a. $9\sigma, 3\pi$ b. $9\sigma, 9\pi$ c. $3\sigma, 4\pi$ d. $5\sigma, 7\pi$

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