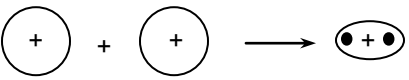
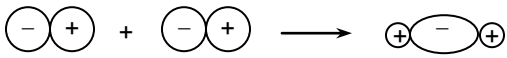
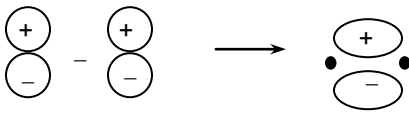

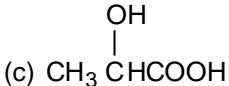



## TOPIC : CHEMICAL BONDING AND MOLECULAR STRUCTURE

1. Which combination of atomic orbitals is not allowed according to MO theory ?  
 (a)  $p_x - p_x$  (b)  $p_x - p_y$   
 (c)  $p_y - p_y$  (d)  $p_z - p_z$
2. A molecule  $MX_4$  has a square planar shape. The number of non-bonding pairs of electron is  
 (a) 2 (b) 1  
 (c) 3 (d) 0
3. In general, the d-orbital involved in  $sp^3d$  hybridization is  
 (a)  $d_{xy}$  (b)  $d_z^2$   
 (c)  $d_{x^2-y^2}$  (d)  $d_{yx}$
4. Which of the following liquid is miscible with water ?  
 (a)  $CS_2$  (b)  $C_2H_5Cl$   
 (c)  $CCl_4$  (d)  $C_2H_5OH$
5. Nucleus of an atom contains 17 protons, its maximum covalency should be  
 (a) 1 (b) 3  
 (c) 5 (d) 7
6. Which of the following pair of orbitals centred on two different atoms will constitute  $\pi$  bond ?  
 (a) s and  $p_z$   
 (b)  $p_x$  and  $p_y$   
 (c)  $p_x$  and  $p_z$   
 (d)  $p_y$  and  $p_y$
7. Which of the following molecule has three fold rotation axis of symmetry ?  
 (a)  $H_2S$  (b)  $NH_3$   
 (c)  $CO_2$  (d)  $CS_2$
8. Which type of bond is present in  $HNO_3$  molecule ?  
 (a) Covalent (b) Ionic  
 (c) Dative (d)  $p\pi - p\pi$
9. The bond angle around O in  $CH_3OH$  is  
 (a)  $> 110^\circ$   
 (b)  $< 180^\circ$  but  $> 120^\circ$   
 (c) lies between  $104^\circ$  and  $109^\circ$   
 (d) exactly  $90^\circ$
10. Which of the following overlap of orbitals is/are incorrect ?  
 I.   
 II.   
 III.   
 IV.   
 (a) I, II (b) II, III  
 (c) III, IV (d) I, IV
11. The type of bond not present in  $PH_4I$  are  
 (a) ionic (b) covalent  
 (c) co-ordinate (d) H-bonds
12. Which of the following has a covalent bond formed by donor-acceptor mechanism ?  
 (a)  $O_3$  (b)  $NH_3$   
 (c)  $CO_2$  (d)  $PH_3$
13. Which of the following species is not tetrahedral ?  
 (a)  $SO_2$  (b)  $NH_3$   
 (c)  $BF_4^-$  (d)  $ClO_4^-$
14. Which of the following molecule does not possess a mirror plane of symmetry ?  
 (a)  $N_2$  (b)  $C_2H_4$   
 (c)  (d)  $C_2H_2$
15. Which of the following molecular orbital has a node between the nuclei of participating atoms  
 (a)  $\sigma 2p_z$  (b)  $\pi 2p_x$   
 (c)  $\pi 2p_y$  (d)  $\pi^* 2p_x$
16. The species having highest bond order is  
 (a)  $O_3$  (b)  $O_2^-$   
 (c)  $O_2^+$  (d)  $O_2^{2-}$

17. The carbon-carbon link in acetylene contains  
(a) One sigma and two pi bonds  
(b) Two sigma and three pi bonds  
(c) Two sigma and two pi bonds  
(d) Three sigma bonds
18. The bond angle around the atom which uses  $sp^2$  hybrid orbitals is  
(a)  $120^\circ$  (b)  $180^\circ$   
(c)  $105^\circ$  (d)  $109^\circ 28'$
19. The order of O-O bond length in  $O_2$ ,  $H_2O_2$ ,  $O_3$  is  
(a)  $O_2 > O_3 > H_2O_2$  (b)  $O_3 > H_2O_2 > O_2$   
(c)  $H_2O_2 > O_3 > O_2$  (d)  $O_2 > H_2O_2 > O_3$
20. Which of the following species is paramagnetic ?  
(a)  $CO_2$  (b) NO  
(c)  $O_2^{2-}$  (d)  $CN^-$
21. The bond order of NO molecule is  
(a) 1.5 (b) 2.0  
(c) 2.5 (d) 3.0
22. Which of the following pair contains a set of degenerate orbitals ?  
(a)  $\sigma_{2s}$ ,  $\sigma_{1s}$  (b)  $\pi 2p_x$ ,  $\pi^* 2p_x$   
(c)  $\pi 2p_x$ ,  $\pi 2p_y$  (d)  $\pi 2p_z$ ,  $\pi 2p_y$
23. The number of  $\sigma$  bonds in o-xylene are  
(a) 6 (b) 9  
(c) 12 (d) 18
24. Which of the following involves  $sp^2$  hybridization ?  
(a)  $CO_2$  (b)  $SO_2$   
(c)  $N_2O$  (d) CO
25. Select the molecule which has only one pi-bond.  
(a)  $CH \equiv CH$  (b)  $CH_2 = CH - CHO$   
(c)  $CH_3CH = CH_2$  (d)  $CH_3CH \equiv CHCOOH$
26. Which of the following hydride has the lowest boiling point ?  
(a)  $H_2O$  (b)  $H_2S$   
(c)  $H_2Se$  (d)  $H_2Te$
27. The geometry and hybrid orbitals present around the central atom in  $BF_3$  is  
(a) linear,  $sp$  (b) trigonal planar,  $sp^2$   
(c) tetrahedral,  $sp^3$  (d) pyramidal,  $sp^3$
28. Which of the following will be octahedral in shape?  
(a)  $SF_6$  (b)  $PCl_5$   
(c)  $BF_4^-$  (d)  $CO_3^{2-}$
29. Which of the following has strongest H-bonding ?  
(a) ethylamine (b) ammonia  
(c) ethylalcohol (d) diethyl ether
30. Maximum covalency of the atom is equal to the number of s and p-electrons of the outermost shell. Which of the following is exception to the above statement ?  
(a) Cl (b) P  
(c) O (d) S
31. Which of the following does not contain any dative bond ?  
(a)  $H_3O^+$  (b)  $NaBF_4$   
(c)  $HF_2^-$  (d)  $NH_4Cl$
32. How many O - H bonds are present in  $H_4PO_4$   
(a) one (b) two  
(c) zero (d) three
33. Which among the following have zero dipole moment ?  
(a) cis- $C_2H_2Cl_2$  (b) trans- $C_2H_2Cl_2$   
(c)  $PCl_3$  (d) 2-Pentene
34. The bond angle in  $H_2S$  is  
(a)  $> H_2O$   
(b)  $< H_2O$  but  $> H_2Se$   
(c)  $> NH_3$   
(d)  $> H_2O$  as well as  $NH_3$
35. Which of the following halide has maximum ionic character ?  
(a)  $BaCl_2$  (b)  $BeCl_2$   
(c)  $MgCl_2$  (d)  $CaCl_2$
36. Which of the following species assumes planar structure ?  
(a)  $:CH_3^-$  (b)  $CH_3^+$   
(c)  $BF_4$  (d)  $CH_4$
37. A molecular  $AB_3$  exhibits a dipole moment = 0, then the hybrid state of A ( $Z < 21$ ) should be  
(a)  $sp^2$  (b)  $sp$   
(c)  $sp^3d$  (d)  $sp^3$

38. Which among following species is most stable ?  
 (a)  $\text{He}_2$  (b)  $\text{He}_2^+$   
 (c)  $\text{He}_2^+$  (d)  $\text{H}_2$
39. Glycerol ( $\text{CH}_2\text{OHCHOHCH}_2\text{OH}$ ) is more viscous than ethanol because  
 (a) hydrogen bonding is more extensive in ethanol  
 (b) hydrogen bonding is more extensive in glycerol  
 (c) glycerol has higher molecular mass  
 (d) intramolecular H-bonding occurs in glycerol
40. Which of the following pair of species are tetrahedral ?  
 (a)  $\text{SiF}_4$ ,  $\text{NH}_4^+$  (b)  $\text{NH}_4^+$ ,  $\text{ICl}_4^-$   
 (c)  $\text{CH}_4$ ,  $\text{SF}_4$  (d)  $\text{XeF}_4$ ,  $\text{CH}_4$
41. Pyramidal shape is associated with which pair of species ?  
 (a)  $\text{NH}_4^+$ ,  $\text{NH}_3$  (b)  $\text{NF}_3$ ,  $\text{ClF}_3$   
 (c)  $\text{BF}_3$ ,  $\text{NF}_3$  (d)  $\text{PBr}_3$ ,  $\text{NF}_3$
42. Which pair contains molecules having two sigma and two  $\pi$  bonds ?  
 (a)  $\text{N}_2$ ,  $\text{HCN}$  (b)  $\text{HCN}$ ,  $\text{CO}_2$   
 (c)  $\text{C}_2\text{H}_2$ ,  $\text{CO}_2$  (d)  $\text{CO}_2$ ,  $\text{CO}$
43. Which of the following molecules do not have regular geometry ?  
 I.  $\text{IF}_5$  II.  $\text{H}_2\text{O}$   
 III.  $\text{BF}_3$  IV.  $\text{CCl}_4$   
 (a) I, IV (b) I, II  
 (c) I, III (d) II, IV
44. Which among the following molecules have dipole moment greater than zero ?  
 I, 2, 2-dimethylpropane  
 II. trans 2-Hexene  
 III. cis-3-Hexene  
 IV. 2, 2, 3, 3-Tetramethylbutene.  
 (a) II, IV (b) II, III  
 (c) I, III (d) I, IV
45. Which pair consists of molecules that are trigonal planar ?  
 (a)  $\text{PBr}_3$ ,  $\text{NH}_3$  (b)  $\text{NH}_3$ ,  $\text{PH}_3$   
 (c)  $\text{AlCl}_3$ ,  $\text{SO}_3$  (d)  $\text{SO}_3$ ,  $\text{NH}_3$
46. The polarisability of halide ion increases in order :  
 (a)  $\text{F}^- < \text{I}^- < \text{Br}^- < \text{Cl}^-$  (b)  $\text{F}^- < \text{Cl}^- < \text{Br}^- < \text{I}^-$   
 (c)  $\text{I}^- < \text{Br}^- < \text{Cl}^- < \text{F}^-$  (d)  $\text{Br}^- < \text{Cl}^- < \text{F}^- < \text{I}^-$
47. The bond angle in  $\text{PH}_3$  is closest to  
 (a)  $120^\circ$  (b)  $90^\circ$   
 (c)  $180^\circ$  (d)  $60^\circ$
48. Carbon dioxide molecule is isostructural with which of the following :  
 (a)  $\text{HgCl}_2$  (b)  $\text{H}_2\text{O}$   
 (c)  $\text{SnCl}_2$  (d)  $\text{NO}_2^-$
49. In the resonating structure of benzene the number of  $\sigma$  and  $\pi$  bond are  
 (a)  $3\pi$  and  $12\sigma$  (b)  $3\sigma$  and  $12\pi$   
 (c)  $6\pi$  and  $6\sigma$  (d)  $12\pi$  and  $12\sigma$
50. The structure of  $\text{ICl}_2^-$  is  
 (a) Trigonal (b) Trigonal bipyramidal  
 (c) Octahedral (d) Square planar
51. In piperidine,  NH, the hybrid state assumed by N is  
 (a)  $\text{sp}$  (b)  $\text{sp}^2$   
 (c)  $\text{sp}^3$  (d)  $\text{dsp}^2$
52. The maximum number of H-bonds in which water molecule can participate is  
 (a) 1 (b) 3  
 (c) 2 (d) 4
53. The correct increasing order of C – O bond lengths among  $\text{CO}$ ,  $\text{CO}_3^{2-}$  and  $\text{CO}_2$  is  
 (a)  $\text{CO}_3^{2-} < \text{CO}_2 < \text{CO}$  (b)  $\text{CO}_2 < \text{CO}_3^{2-} < \text{CO}$   
 (c)  $\text{CO} < \text{CO}_3^{2-} < \text{CO}_2$  (d)  $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$
54. In which pair of species, the octet rule is not obeyed ?  
 (a)  $\text{PF}_5$  and  $\text{POCl}_3$  (b)  $\text{BCl}_3$  and  $\text{PCl}_5$   
 (c)  $\text{CF}_4$  and  $\text{NF}_3$  (d)  $\text{NH}_3$  and  $\text{NCl}_3$
55. In which of the following molecules O – O bond is not present ?  
 (a)  $\text{H}_2\text{O}_2$  (b)  $\text{H}_2\text{SO}_5$   
 (c)  $\text{CH}_3\text{CO}_2\text{H}$  (d)  $\text{H}_2\text{S}_2\text{O}_8$

56. The species, amongst the following, having one unpaired electron is  
(a) NO (b)  $\text{C}_3\text{O}_2$   
(c)  $\text{CN}^-$  (d)  $\text{O}_2$
57. The molecule with highest dipole moment is  
(a)  $\text{NH}_3$  (b)  $\text{NF}_3$   
(c)  $\text{CO}_2$  (d)  $\text{BF}_3$
58. The compound  $\text{KHF}_2$  contains species  
(a)  $\text{K}^+$ ,  $\text{F}^-$  and  $\text{H}^+$  (b)  $\text{K}$ ,  $\text{F}^-$ ,  $\text{HF}$   
(c)  $\text{K}^+$ ,  $(\text{HF}_2)^-$  (d)  $[\text{KHF}]^+$ ,  $\text{F}^-$
59. The inability of N to form  $\text{NCl}_5$  is due to  
(a) non-availability of vacant orbital in valence shell of N  
(b) high ionization enthalpy of N  
(c) less negative electron gain enthalpy of N  
(d) small size of N atom
60. Which of the following is not paramagnetic ?  
(a) NO (b)  $\text{S}^{2-}$   
(c)  $\text{O}_2^-$  (d)  $\text{N}_2^+$

# ANSWERS KEY

1	B	11	D	21	C	31	B	41	C	51	C
2	A	12	A	22	C	32	D	42	B	52	D
3	B	13	A	23	D	33	B	43	A	53	D
4	D	14	C	24	B	34	B	44	B	54	B
5	D	15	D	25	C	35	A	45	C	55	C
6	D	16	C	26	B	36	B	46	B	56	A
7	B	17	A	27	B	37	A	47	B	57	A
8	B	18	A	28	A	38	D	48	A	58	C
9	C	19	C	29	C	39	B	49	A	59	A
10	B	20	B	30	A	40	A	50	B	60	B