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CHEMICAL BONDING
&
MOLECULAR STRUCTURE

PREVIOUS QUESTIONS (EAMCET)

1) What is the bond order of N_2 ? (TS E - 2015)

a) 3 b) 4

c) 2 d) 1

2) **Number of bonding electron pairs and number f lone pairs of electrons in ClF_3, SF_4, BrF_5 respectively are.** **(TS E - 2015)**

a) 3, 2; 4, 2; 5, 2

b) 3, 1; 4, 1; 5, 2

c) 3, 1; 4, 2; 5, 1

d) 3, 2; 4, 1; 5, 1

3) Which of the following does not have triple bond between the atoms ?
(AP E - 2015)

a) N_2

b) CO

c) NO

d) C_2^{2-}

4) **In which one of the following pairs the two species have identical shape but differed in hybridization** **(AP E - 2015)**

a) I_3^-, $BeCl_2$

b) NH_3, BF_3

c) XeF_2

d) NH_4^+, SF_4

5) Which one of the following is not correct ? **(TS M - 2015)**

a) Formal charges help in the selection of the lowest energy structure of molecule

b) Formal charges indicate real charge separation within the molecule

c) Formal charges of each atom of polyatomic ion can be calculated

d) Number of unshared electrons on the atom is also considered for calculation of formal

6) The dipole moment of BF_3 is zero because (TS M - 2015)

a) It is covalent molecule

b) It is tetra atomic molecule

c) It is having trigonal planar geometry

d) The electronegativity difference between boron ans fluorine is more

7) CuCl has more covalent character than NaCl because (AP M - 2015)

a) Na^+ has more polarizing power than Cu^+

b) Cu^+ has more polarizing power than Na^+

c) Cl^- has pseudo inert gas electron configuration

a) Na^+ has pseudo inert gas electron configuration

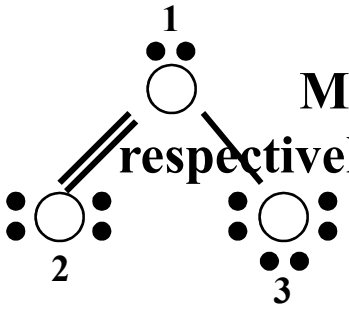
8) **The bond orders in the pairs of bonded oxygen atoms in ozone molecules are** **(AP M - 2015)**

a) (1, 2)

b) $\left(\frac{1}{2}, 1\frac{1}{2}\right)$

✓ $\left(1\frac{1}{2}, 1\frac{1}{2}\right)$

d) $\left(\frac{1}{2}, 2\frac{1}{2}\right)$

9. 

Molecule, the formal charges of oxygen atoms 1, 2, 3 are respectively (EAMCET : 2014)

a) -1, 0, +1

b) 0, -1, +1

c) 0, +1, -1

d) +1, 0, -1

10) The number of electrons in the valence shell of the central atom of a molecule is 8. The molecule is **(EAMCET : 2014)**

a) BeH_2 **b)** SCl_2

c) SF_6 **d)** BCl_3

Solution :

SCl_2 **Number of lone pairs on 'S'** $= \frac{6 - 2 \times 1}{2} = 2$

$\therefore$ Total number of pairs $= 2$ B. P $+ 2$ L.P $= e^-$

11) Which one of the following has longest covalent bond distance ?

(EAMCET : 2014)

a) C- H **b) C- N**

c) C - O **d) C - C**

Solution :

Both p & d orbitals form π - bonds

12) **Identify the correct set :** **(JEE MAINS : 2013)**

	Molecule	Hybridisation of central atom	Shape
a.	PCl_3	dsp^3	Square pyramidal
b.	$[Ni(CN)_4]^{-2}$	sp^3	tetrahedral
✓	SF_6	$sp^3 d^2$	octahedral
d.	IF_3	dsp^3	pyramidal

Solution :

SF_6

No. of lone pairs $= \frac{6-1\times 6}{2} = 0$

$\therefore$ Hybridiasation = 6 = 1+3+2 = sp^3d^2

13) Which one of the following statements is correct ?

(EAMCET : 2013)

a) Hybrid orbitals do not forms bonds ?

b) Lateral overlap of p – orbitals produces bond ?

c) The strength of bonds follows the order : $s_{p\text{-}p} < s_{s\text{-}s} < p_{p\text{-}p}$

d) S – orbitals do not forms bonds

Solution :

Both p & d orbitals form π- bonds

14) The formal charges of C and O atoms in CO_2 (:Ö = C = Ö:) are respectively ……. (E – 2012)

a) 1 , -1

b) -1 , 1

c) 2 , -2

d) 0 , 0

15) According to molecular orbitals theory, the total number of bonding electron pairs is O_2 is …… **(E – 2012)**

a) 2

b) 3

c) 5

d) 4

16) In which one of the following , the bond angle is the lowest …
(E – 2011)

a) N_2O

b) NH_4^+

c) F_2O

d) BCl_3

17) In the Born-haber cycle of the given reaction…….. (E – 2011)

$$Na_{(s)} + \frac{1}{2} Cl_{2_{(g)}} \longrightarrow NaCl_{(s)}$$

The number of endothermic and exothermic stages respectively are

a) 2 , 3

b) 3 , 1

c) 3, 2

d) 2 , 2

18) Match the following : **(E-2010)**

List-1 (Molecule)	List-2 (Number of pairs on central atom)
A) NH_3	I) Two
B) H_2O	II) Three
C) XeF_2	III) Zero
D) CH_4	IV) Four
	V) One

The correct answer is :

	A	B	C	D
1)	V	I	III	II
2)	III	I	II	V

	A	B	C	D
3)	V	I	II	III
4)	I	V	III	IV

19) The ratio of anion radius to cation radius of a crystal s 10 ; 9.3. Then , the coordination number of the cation in the crystal is : (E- 2010)

a) 2

b) 4

c) 6

d) 8

20) Dipole moment of HCl = 1.03D, HI = 0.38D, Bond length of HCl = 1.3A^0 and HI = 1.6A^0 The ratio of fraction of an electric charge , δ existing on each atom in HCl and HI is : ……

a) 1 : 2 : 1

b) 2.7 : 1

c) 3.3 : 1

d) 1 : 3.3

21) Which one of the following is correct set ? **(E – 2003 & 2008)**

a) H_2O, sp^3, angular

b) BCl_3, sp^3, angular

c) NH_4^+, dsp^2, square planar

d) CH_4, dsp^2, tetrahedral

22) The bond length of HCL molecule is 1.275A^0 and its dipole moment is 1.03D. The ionic character of the molecule (in percent) (change of the electron = 4.8 x 10^{-10} esu) (E – 2008)

a) 100

b) 67.3

c) 33.66

d) 16.83

23) Which of the following is not tetrahedral ? **(E-2007)**

a) BF_4^-

b) NH_4^+

✓ CO_3^{2-}

d) SO_4^{2-}

24) Hybridisation of Oxygen in diethyl ether is : (E-2007)

a) sp

b) sp^2

✔ sp^3

d) sp^3d

25) The decreasing order of bond dissociation energies of C-C, C-H and H-H bonds is : ….. **(E-2007)**

a) H-H > C-H > C-C

b) C-C > C-H > H-H

c) C-H > C-C > H-H

d) C-C > H-H > C-H

26) AB is an ionic solid. The ionic radii of A^+ and B^- are respectively r_c and r_a. Lattice energy of AB is proportional to …. **(E- 2006)**

a) $\frac{r_c}{r_a}$

b) $r_c + r_a$

c) $\frac{r_a}{r_c}$

d) $\frac{1}{r_c + ra}$

27) A molecule X has

i) four sigma bonds formed by the overlap of sp^2 and s orbitals

ii) One sigma bond formed by sp^2 and sp^2 orbitals

iii) One π bond formed by p_z and p_z orbitals. Which of the following is X ? **(E – 2006)**

a) C_2H_6 **b) C_2H_3Cl**

c) $C_2H_2Cl_2$ **d) C_2H_4** ✓

28) Which of the following is correct ? **(E – 2005)**

a) **The number of electrons present in the valence shell of S SF_6 is 12**

b) **The rate of ionic reactions are very slow.**

c) **According order of stability to form ionic molecule**

d) **The correct order of stability to form ionic compounds among Na^+, Mg^{2+} & Al^{3+} is $Al^{3+} > Mg^{2+} > Na^+$**

29) Which of the following is a linear molecule ……. (E – 2005)

a) $BeCl_2$

b) H_2O

c) SO_2

d) CH_4

30) Match the following: **(E – 2004)**

List-1	List-2
A) Ethane	1) 2 sp carbons
B) Ethylene	2) 6 sp^2 carbons
C) Acetylene	3) 2 sp^3 carbons
D) Benzene	4) 2 sp^2 carbons
	5) 1 sp and 1 sp^2 carbons

The correct answer is

	A	B	C	D
1)	3	4	1	2
2)	4	5	3	2
3)	3	1	2	5
4)	3	4	1	5

31) Which of the following is not correct ……. (E – 2004)

a) Low ionisation potential is a favourable condition for the cataion

b) Coordination number of Cs in CsCl is 8

c) Ionic bond is directional

d) Ionic compounds have high melting point

32) Which of the following is a favourable factor for cation formation (E-2004)

a) High electro negatively

b) High electron affinity

c) Low ionisation potential

d) Smaller atomic size

33) Average C-H bond energy is 416 kJ.mol^{-1} . Which of the following is correct ? (E-2004)

a) $CH_4(g) + 416kJ \rightarrow C(g) + 4H(g)$

b) $CH_4(g) + C(g) \rightarrow 4H(g) + 416kJ$

✓ c) $CH_4(g) + 1664\ kJ \rightarrow C(g) + 4H(g)$

d) $CH_4(g) \rightarrow C(g) + 4H(g) + 1664kJ$

34) Which one of the following is the correct set with respect to molecule, hybridization and shape ? (E-2003)

a) $BeCl_2$, sp^2, linear

b) $BeCl_2$, sp^2, triangular planar

✓ c) BCl_3, sp^2, triangular planar

d) BCl_3, sp^2, tetrahedral

35) **If the bond length and dipolemoment of a diatomic molecule are $1.25A^0$ and 1.0D respectively, what is the percent ionic character of the bond ? (E-2003)**

a) 10.66

b) 12.33

✓ 16.66

d) 19.33

36) Which one of the following is correct set ? **(E – 2003)**

a) H_2O, sp^3, angular

b) H_2O, sp^3, linear

c) NH_4^+, dsp^2, square planar

d) CH_4, dsp^2, tetrahedral

37) Which one of the following is the set with reference to molecular formula, hybridization of central atom and shape of the molecule ?

(E – 2003)

a) CO_2, sp^2, bent

b) H_2O, sp^2, bent

c) $BeCl_2$, sp, linear ✓

d) H_2O, sp^3, linear

38) An element M reacts with chlorine to from a compound X. The bond angle in X is 120^0. What is M. (E – 2002)

a) Be

b) B

c) Mg

d) N

39) Which one of the following molecules contain both ionic and covalent bonds ? (E – 2002)

a) CH_2Cl_2

b) K_2SO_4 ✓

c) $BeCl_2$

d) SO_2

40) What is the hybridisation state of the central atom in the conjugate base of NH_4^+ ion ? …. (E – 2002)

a) sp

b) sp^3

c) sp^2

d) dsp^2

41) The bond energies (in KJ mol^{-1}. of P-H , As – H and N-H are respectively……. (E – 2002)

a) 247, 318 and 389

b) 247, 389 and 318

c) 318, 389 and 247

✓ d) 318, 247 and 389

42) Which of the following statement is true ? (E-2001)

a) Hybridisation of the central atom in NH_3 and CH_4 is sp^2

b) $BeCl_2$ has "V" shape while SO_2 is linear

c) SF_6 is octahedral and F-S-F bond angle is 90^0 `

d) CO_2 has dipole moment

43) Which of the following hydricarbon has least C-C bond length (E- 2002)

a) C_2H_6

b) C_2H_4

c) C_6H_6

d) C_2H_2

44) Which of the following gas has the lowest boiling point …..

(E- 2002)

a) CH_4

b) H_2O

c) HF

d) C_2H_5OH

45) Which of the following has least bond energy ? (E-2000)

a) F_2

b) Cl_2

c) N_2

d) O_2

46) Which of the following is a correct pair ? **(E-2000)**

a) $BeCl_2$, linear

b) NH_3, linear

c) CO_2, tetrahedral

d) BF_3, octahedral

47) What is the crystal structure of CsCl ? (E-2000)

a) Body centered cubic

b) Face centered cubic

c) Tetrahedral

d) Octahedral

PREVIOUS QUESTIONS
(JEE MAINS)

1) The geometry of $XeOF_4$ by VSEPR theory is :
(J.M.O.L - 2015)

a) Octahedral

b) Pentagonal planar

✓ c) Square pyramidal

d) Trigonal bipyramidal

2) **Molecule AB has a bond length of $1.617A^0$ and a dipole moment of 0.38D. The fractional charge on each atom (absolute magnitude) is : ($e_0 = 4.805\times10^{-10}$ esu) (J.M.O.L - 2015)**

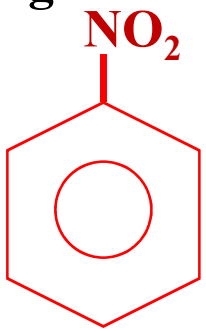
a) **0**

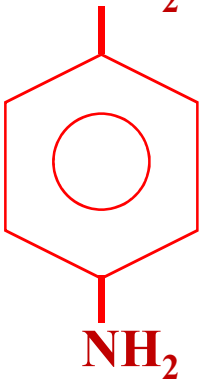
b) **0.05**

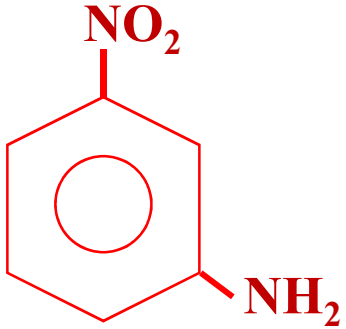
c) **0.5**

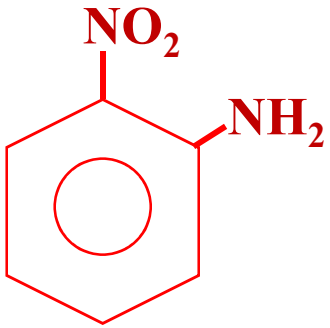
d) **1.0**

3) Which compound exhibits maximum dipole moment among the following ? (J.M.O.NO 2015)

a) 

b) 

c) 

d) 

4) The correct statement for the molecule. CsI_3.is (JEE MAINS - 2014)

a) It is a covalent molecule

b) ✓ It contains Cs^+ and I_3^- ions

c) It contains Cs^{3+} and I^- ions

d) It contains Cs^+, I^- and lattice I_2 molecule

5) Which of the following has unpaired electron(s) ?
(JEE MAINS- 2014)

a) N_2

b) O_2^-

c) N_2^{2+}

d) O_2^{2-}

6) The number and type of bonds in C_2^{2-} ion in CaC_2 are :

(JEE MAINS- 2014)

a) One σ bond and One π bond

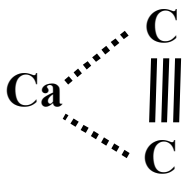
b) One σ bond and two π bonds

c) Two σ bonds and Two π bonds

d) Two σ bond s and One π bond

Solution :

The structure of CaC_2 is



7) The correct order of bond dissociation energy among N_2, O_2 and O_2^- is shown in which of the following arrangements ?

(JEE MAINS- 2014)

a) $N_2 > O_2^- > O_2$

b) $O_2^- > O_2 > N_2$

✓ $N_2 > O_2 > O_2^-$

d) $O_2 > O_2^- > N_2$

8) In allene (C_3H_4), the types of hybridization of the carbon atoms is (are): (JEE MAINS- 2014)

a) sp and sp^3

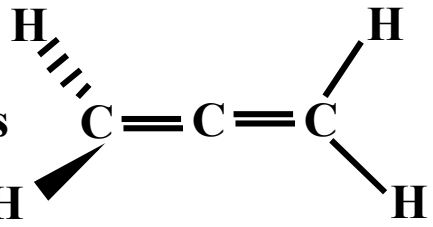
b) sp^2 and sp

c) only sp^2

d) sp^2 and sp^3

Solution :

The structure of allene is



9) Which of the following molecules has two sigma(σ) and two pi(π) bonds ?
(JEE MAINS- 2014)

a) C_2H_4

b) N_2F_2

c) $C_2H_2Cl_2$

✓ d) HCN

10) Which of the following molecules is paramagnetic ? (JEE MAINS- 2014)

a) N_2

b) NO

c) CO

d) O_3

11) In which of the following ionization processes the bond energy has increased and also the magnetic behaviour has changed from paramagnetic to diamagnetic ? (J.M.O.L – 2013)

a) $C_2 \rightarrow C_2^+$

b) $NO \rightarrow NO^+$ ✓

c) $N_2 \rightarrow N_2^+$

d) $O_2 \rightarrow O_2^+$

Solution :

NO (bond order = 2.5, paramagnetic)

à NO^+ (bond order = 3, diamagnetic)

(no unpaired electrons)

12) Which one of the following molecules is polar ? (J.M.O.L-2013)

a) XeF_4

b) SbF_5

 IF_5

d) CF_4

Solution :

IF_5 is polar because all the I.F. bonds are polar and the net dipole moment is non – zero.

13) Bond order normally gives idea of stability of a molecular viz. H_2, Li_2 and B_2 have the same bond order yet they are not equally stable. Their stability order is : (J.M.O.L - 2013)

a) $H_2 > B_2 > Li_2$

a) $B_2 > H_2 > Li_2$

c) $Li_2 > B_2 > H_2$

d) $Li_2 > H_2 > B_2$

Solution : $H_2 > B_2 > Li_2$ they have same bond order but bases on size one predict bond energy.H_2 has 1s – 1s overlap, B-B has 2p-2p overlap but smaller in size compared to Lithium atom

14) Bond distance in HF is 9.17×10^{-11} m. Dipole moment of HF $6.104\times10^{-30}Cm$. The percent ionic character in HF will be (electron charge = 1.60×10^{-19}C) (J.M.O.L - 2013)

a) 61.0% b) 38.0%

c) 35.5% ✓ d) 41.5%

Solution :

% ionic character = (μ_{obs} / $\mu_{calculated}$) x 100 =

(6.104 x 10^{-30} / 1.602x10^{-19} x 9.17x10^{-11}) x100 = 41.55

15) In which of the following sets, all the given species are isostructureal ?
(J.M.O.L - 2013)

a) CO_2 , NO_2, ClO_2, SiO_2

a) PCl_3, $AlCl_3$, BCl_3, $SbCl_3$

c) BF_3, NF_3, PF_3, AlF_3

✓ BF_4^-, CCl_4, NH_4^+, PCl_4^+

Solution :

Iso-structural species have same structure. BF_4^+, CCl_4, NH_4^+ , PCl_4^+ are all sp^3 hybridisation and donot possess any lone pairs in them hence they have perfect tetrahedra; geometry or shape.

16) The internuclear distance in O-O bonds for O_2^+, O_2, O_2^- and O_2^{2-} respectively are (J.M.O.L - 2013)

a) 1.30 A^0, 1.49 A^0, 1.12 A^0, 1.21A^0

b) 1.49A^0, 1.21A^0, 1.12A^0, 1.30A^0

c) 1.21A^0, 1.12A^0, 1.49A^0, 1.30A^0

✓ 1.12A^0, 1.21A^0, 1.30A^0, 1.49A^0

Solution : It is based on bond order. Higher the bond order shorter the bond length.

O_2^+ < O_2 < O_2^- < O_2^{2-}

1.12A 1.21A 1.30A 1.49A

17) Stability of the species Li_2, Li_2^- and Li_2^+ increases in the order of :
(JEE MAINS : 2013)

a) $Li_2^- < Li_2^+ < Li_2$ b) $Li_2 < Li_2^- < Li_2^+$

c) $Li_2^- < Li_2 < Li_2^+$ d) $Li_2 < Li_2^+ < Li_2^-$

Solution :

$$Li_2(6) = \sigma 1s^2 \sigma 1s^2 \sigma 2s^2 = \text{B.O} = \frac{4-2}{2} = 1$$

$$Li_2^+(5) = \sigma 1s^2 \sigma 1s^2 \sigma 2s^2 = \text{B.O} = \frac{3-2}{2} = 0.5$$

$$Li_2^-(7) = \sigma 1s^2 \sigma 1s^2 \sigma 2s^2 \sigma 2s^1 = \text{B.O} = \frac{4-3}{2} = 0.5$$

Li_2^+ is more stable than Li_2^- because Li_2^-
Has more numbers of anti bonding electrons.

18) Which one of the following molecules is expected to exhibit diamagnetic …..

(JEE MAINS : 2013)

- ✓ **a)** N_2
- **b)** O_2
- **c)** S_2
- ✓ **d)** C_2

Solution :

(a) & (d) both are correct answers.

N_2 → **Diamagnetic**

O_2 → **Paramagnetic**

S_2 → **Paramagnetic**

C_2 → **Diamagnetic**

19) **In which of the following pairs molecules / ions, both the species are not likely to exist ?** **(JEE MAINS- 2013)**

a) H_2^-, He_2^{2-}

b) H_2^{2+}, He_2 ✓

c) H_2^-, He_2^{2+}

d) H_2^+, He_2^{2-}

Solution :

Bond order of H_2^{2+} and He_2 is zero, thus their existence is not possible.

20) The molecule having smallest bond angle is ….. (A- 2012)

a) NCl_3

b) $AsCl_3$

✔ $SbCl_3$

d) PCl_3

21) In which of the following pairs the two species are not isostructural ? (A- 2012)

a) PF_5 and BrF_5

b) AlF_6^{-3} and SF_6

c) CO_3^{2-} and NO_3^-

d) PCl_4^+ and $SiCl_4$

22) Ortho-Nitrophenol is less soluble in water than p-and m – Nitrophenols because ….. (A- 2012)

a) o-Nitrophenol shows Intermolecular H- bonding

b) melting point of o-Nitrophenol is lower than those of m-and p - isomers

c) o – Nitrophenol is more volatile in steam than those of m- and p-isomers

d) o – Nitroohenol shows Intramolecular H – bonding

23) Among the following the maximum covalent character is shown by the compound…. **(A- 2011)**

a) $FeCl_2$

b) $SnCl_2$

✓ $AlCl_3$

d) $MgCl_2$

24) The hybridisation of orbitals of N atom is NO_3^- , NO_2^+ , and NO_4^+ are respectively …. **(A – 2011)**

a) sp, sp^2, sp^3

b) sp^2, sp, sp^3 ✓

c) sp, sp^3, sp^2

d) sp^2, sp^3, sp

25) Using MO theory, predict which of the following species has the shortest bond length ? (A- 2008)

a) O_2^+

b) O_2^-

c) O_2^{2-}

✓ O_2^{2+}

26) Which one of the following pairs of species have the same bond order (A- 2008)

a) CN^- and NO^+

b) CN^- and CN^+

c) O_2^- and CN^-

d) NO^+ and CN^+

27) The bond dissociation energy of B-F in BF_3 is 646 k.j.mole^{-1}. where as that of C-F in CH_4 is 515 kj mole-1. The correct reason for higher B-F bond dissociation energy as compared to that of C-F is .. (A-2008)

a) Stronger σ bond between B and F in BF_3 as compared to that between C and F in CF_4

b) significant pπ – p π interaction between B and F in BF3 where as there is no possibility of such interaction between C and F in CF_4

c) Lower degree of pπ – p π interaction between B and F in BF_3 than that between C and F in CF_4

d) Smaller size of B – atom as compared to that of C-atom.

28) The species having diamagnetic nature and bond order 1.0 is : .. (A-2007)

a) O_2^{2-}

b) O_2^{+}

c) NO

d) O_2

29) In which one of the following ionisation process the bond order has increased and the magnitude bahaviour has changed ? (A – 2007)

a) $C_2 \rightarrow C_2^+$

b) $NO \rightarrow NO^+$

c) $O_2 \rightarrow O_2^+$

d) $N_2 \rightarrow N_2^+$

30) Which of the following hydrogen bonding is the strongest ?
(A – 2007)

a) O – H - N

b) F – H - F

c) O – H - O

d) O – H - F

31) Which of the following molecules / ions does not contain unpaired electrons ? (A- 2006)

a) O_2

b) O_2^{2-}

c) B_2

d) N_2^+

32) Among the following mixtures, dipole – dipole as the major interaction, is present in … (A-2006)

a) Benzene , CCl_4

b) Benzene, Ethanol

c) Acetonitrile and acetone

d) KCl and water

33) A metal, M forms chlorides in its +2 and +4 oxidation states. Which one of the following statements about these chlorides is correct ? (A-2006)

a) MCl_2 is more easily hydrolyzed than MCl_4

b) MCl_2 is more volatile than MCl_4

c) MCl_2 is more soluble in anhydrous ethanmol than MCl_4

d) MCl_2 is more ionic than MCl_4

34) The decreasing values of bond angles from NH_3 to SbH_3 down group 15 of the periodic table is due to ; (A-2006)

a) Decreasing electronegativity

b) Increasing bp – bp repulsions

✓ c) Increasing p – orbital character in sp^3

d) Decreasing 1p – bp repulsions

35) In which of the following molecules / ions are all the bonds not equal ? (A-2006)

a) BF_4^-

b) SF_4

c) SiF_4

d) XeF_4

36) Molecular shape of SF_4, CF_4 & XeF_4 are :….. (A-2005)

a) **Same with 2,0 and 1 lp respectively**

b) **Same wit 1, 1 and 1 lp respectively**

c) **Different with 0,1 and 2 lp respectively**

✓ d) **Different with 1 , 0 and 2 lp respectively**

37) Which one of the following species is diamagnetic in nature ….
(A-2005)

a) He_2^+

b) H_2

c) H_2^+

d) H_2^-

38) Lattice energy of an ionic compound depends upon…..
(A-2005)

a) Charge on the ions only

b) Size of the ions only

c) Packing of the ions only

✓ d) Charge and size of the ions

39) Which of the following does not contain iso-electronic species ? (A-2005)

a) $PO_4^{3-}, SO_4^{2-}, ClO_4^-$

b) CN^-, N_2, C_2^{2-}

✓ $SO_3^{2-}, CO_3^{2-}, NO_3^-$

d) $BO_3^{3-}, CO_3^{2-}, NO_3^-$

40) The correct order of bond angles : (A-2004)

a) $H_2S < NH_3 < BF_3 < SiH_4$

b) $NH_3 < H_2S < SiH_4 < BF_3$

✓ c) $H_2S < NH_3 < SiH_4 < BF_3$

d) $H_2S < SiH_4 < NH_3 < BF_3$

41) The states of hybridisation of B and O in H_3BO_3 respectively (A-2004)

a) sp^3, sp^3

b) sp^2, sp^3

c) sp^3, sp^2

d) sp^2, sp^2

42) The bond order in NO is 2.5, while that in NO^+ is 3. Which statement is true ? (A-2004)

a) **Bond length is unpredictable**

b) **Bond length in NO > NO^+**

c) **Bond length in NO^+ = NO**

d) **Bond length in NO^+ > NO**

43) The maximum number of 90^0 angles between bond pair- bond of electron is observed in ….. **(A-2004)**

a) sp^3d^2 hybridisation

b) sp^3d hybridisation

c) dsp^2 hybridisation

d) dsp^3 hybridisation

44) Which has regular tetrahedral geometry ? (A-2004)

a) SF_4

b) BF_4^-

c) XeF_4

d) $[Ni(CN)_4]^{2-}$

45) An ether is more volatile than alcohol having same molecular formula. This is due to : (A-2003)

a) Intermolecular H – bonding in ethers

b) Intermolecular H – bonding in alcohos

c) Dipolar character of ether

d) Resonance structure in alcohols

46) Which among the following has smallest bond angle ? **(A-2003)**

a) H_2S

b) NH_3

c) SO_2

d) H_2O

47) **Which one of the following pairs of molecules will have permanent dipolemoments for both members ?** **(A-2003)**

a) SiF_4 and CO_2

b) SiF_4 and NO_2

c) NO_2 and CO_2

✓ d) NO_2 and O_3

48) The pair of species having identical shape is : … **(A-2003)**

a) BF_3 , PCl_3

b) PF_5, IF_5

c) CF_4 , SF_4

✓ d) XeF_2 , CO_2

49) In the anion $HCOO^-$, the carbon – oxygen bonds are found to be of equal length. This is due to :… (A-2003)

a) The anion $HCOO^-$ has two resonating structures

b) The anion is obtained by removal of a proton from acid molecule

c) Electronic orbitals of carbon are hybridised

d) The C = O bond is weaker than C-O bond.

50) Which of the following statements is true **(A-2002)**

a) HF is less polar than HBr

b) Absolutely pure water does not contain any ions

c) Chemical bond formation take place when forces of attraction overcome the forces of repulsion

d) In covalency transference of electron takes place

51) In XeF_2, XeF_4 & XeF_6 the number of lone pair of electrons on xenon are respectively : (A-2002)

a) 2 , 3 ,1

b) 1, 2, 3

c) 4, 1, 2

✓ d) 3, 2, 1

52) The correct order of bond strength is **(A-2002)**

a) $O_2^- < O_2 < O_2^+ < O_2^{2-}$

b) $O_2^{2-} < O_2^- < O_2 < O_2^+$

c) $O_2^- < O_2^{2-} << O_2 < O_2^+$

d) $O_2^+ < O_2 < O_2^- < O_2^{2-}$

53) In which of the following pairs bond angle is $109^0 28^1$? (A-2002)

a) NH_4^+, BF_4^-

b) NH_4^+, BF_3

c) NH_3, BF_4^-

d) NH_4, BF_3

54) In which of the following species, is the underlines carbon has sp^3 hybridisation ? **(A-2002)**

a) $CH_3\underline{C}OOH$

b) ✓ $CH_3\underline{C}H_2OH$

c) $CH_3\underline{C}OCH_3$

d) $CH_2 = \underline{C}H - CH_3$

55) Number of σ– bonds in P_4O_{10} is : **(A-2002)**

a) 6

b) 7

c) 17

d) 16

56) Among the following the molecule with the lowest dipole moment is …

a) CH_3Cl

b) $CHCl_3$

c) CH_2Cl_2

d) CCl_4

Solution :

Symmetric molecules have zero dipole moment

57) Which of the following has the square planar structure……..

a) NH_4^-

b) XeF_4

c) CCl_4

d) BF_4^-

58) Among the following the species having the smallest bond is ….

a) O_2

b) NO^-

c) NO^+

d) NO

Solution :

$$B.O \alpha \frac{1}{B.L}$$

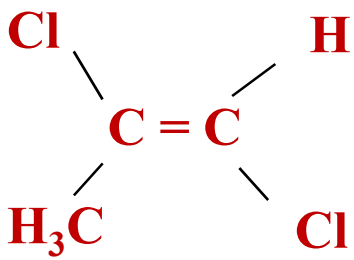
Bond order of $O_2 = 2$, $NO^+ = 3$, $NO^- = 2$, NO = 2.5

∴ NO^+ having highest bond order will have smallest bond.

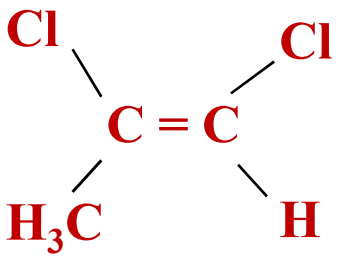
59) Among the following chloro-compound having the lowest dipole moment is …

a) CH_2Cl_2 **b)** CH_3Cl

c)



d)



Solution : **All bond dipoles are in same direction.**

60) **The formation of molecular complex $BF_3 – NH_3$ results in a change in hybridization of boron……**

a) **from sp^3 to sp^2**

b) **from sp^2 to sp^3**

c) **from sp^3 to sp^3d**

d) **From sp^2 to dsp^3**

Solution :

While forming complex covalency of boron changes from 3 to 4

61) Dipole moment is shown by ……

a) 1 , 4 – dichloro benzene

b) trons – 1, 2- dinitro ethene

c) 1,2- dichloro benzene

d) Trans – 2, 3 – dichloro – 2 – bueane

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