CHEMISTRY

BOOKS - SURA CHEMISTRY (TAMIL ENGLISH)

CHEMICAL BONDING

Evaluation I Choose The Best Answer

1. In which of the following compounds does the central atom obey the octet rule ?

A. XeF_4

B. $AlCl_3$

C. SF_6

D. SCl_2

Answer: d

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2. In the molecule $O_A = C = O_B$, the formal charge on O_AC and O_B are respectively.

A. $-1, 0, +1$

B. $+1, 0, -1$

C. $-2, 0, +2$

D. $0, 0, 0$

Answer: d

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3. Which of the following is electron deficient ?

A. PH_3

B. $(CH_3)_2$

C. BH_3

D. NH_3

Answer: c

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4. Which of the following molecule contains no π bond ?

A. SO_2

B. NO_2

C. CO_2

D. H_2O

Answer: d

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5. The ratio of number of sigma (σ) and pi (π) bonds in 2-butynal is

A. $8/3$

B. $5/3$

C. $8/2$

D. $9/2$

Answer: a

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6. Which one of the following is the likely bond angles of sulphur tetrafluoride molecule ?

A. $120^\circ, 80^\circ$

B. $109^\circ.28$

C. 90°

D. $89^\circ, 117^\circ$

Answer: d

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7. Assertion : Oxygen molecule is paramagnetic .

Reason : It has two unpaired electron in its bonding molecular orbital.

A. both assertion and reason are true and reason is the correct explanation of assertion

B. both assertion and reason are true but reason is not the correct explanation of assertion

C. assertion is true but reason is false

D. Both assertion and reason are false

Answer: c

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8. According to Valence bond theory, a bond between two atoms is formed when

A. fully filled atomic orbitals overlap

B. half filled atomic orbitals overlap

C. non-bonding atomic orbitals overlap

D. empty atomic orbitals overlap

Answer: b

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9. In ClF_3, NF_3 and BF_3 molecules the chlorine, nitrogen and boron atoms are

A. sp^3 hybridised

B. sp^3, sp^3 and sp^2 respectively

C. sp^2 hybridised

D. sp^3d, sp^3 and sp^2 hybridised respectively

Answer: d

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10. When one s and three p orbitals hybridise,

A. four equivalent orbitals at 90° to each other will be formed

B. four equivalent orbitals at $109^\circ 28'$ to each other will be formed.

C. four equivalent orbitals , that are lying the same plane will be formed

D. none of these

Answer: b

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11. Which of these represents the correct order of their increasing bond order.

A. $C_2^+ < C_2^{2-} < O_2^{2-} < O_2$

B. $C_2^{2-} < C_2^+ < O_2 < O_2^{2-}$

C. $O_2^{2-} < O_2 < C_2^{2-} < C_2^+$

D. $O_2^{2-} < C_2^+ < O_2 < C_2^{2-}$

Answer: d

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12. Hybridisation of central atom in PCl_5 involves the mixing of orbitals.

A. $s, p_x, p_y, d_{z^2}, d_{x^2-y^2}$

B. $s, p_x . p_y, p_{xy} . d_{x^2-y^2}$

C. $s, p_x, p_y, p_z, d_{z^2}$

D. $s, p_x, p_y, d_{xy}, d_{z^2}$

Answer: c

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13. The correct order of $O - O$ bond length in hyrdrogen peroxide, ozone and oxygen is

A. $H_2O_2 > O_3 > O_2$

B. $O_2 > O_3 > H_2O_2$

C. $O_2 > H_2O_2 > O_3$

D. $O_3 > O_2 > H_2O_2$

Answer: a

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14. Which one of the following is diamagnetic ?

A. O_2

B. O_2^{2-}

C. O_2^+

D. None of these

Answer: b

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15. Bond order of a species is 2.5 and the number of electons in its bonding molecular orbital is found to be 8 The no. of electons in its antibonding molecular orbital is

A. three

B. four

C. zero

D. can not be calculated with the given information.

Answer: a

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16. Shape and hybridisation of IF_5 are

A. Trigonal bipyramidal, sp^3d^2

B. Trigonal bipyramidal , sp^3d

C. Square pyramidal , sp^3d^2

D. Octahedral , sp^3d^2

Answer: c

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17. Pick out the incorrect statement from the following.

A. sp^3 hybrid orbitals are equivalent and are at an angle of $109^\circ, 28'$ with eachother

B. dsp^2 hybrid orbitals are equivalent and bond angle between any two of them is 90°

C. All five sp^3 d hybrid orbitals are not equivalent out of these five sp^3 d hybrid orbitals, three are at an angle of 120°, remainir two are perpendicular to the plane containing the other three

D. none of these

Answer: c

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18. The molecules having same hybridisation , shape and number of lone pairs of electons are

A. SeF_4, XeO_2F_2

B. SF_4, XeF_2

C. $XeOF_4, TeF_4$

D. $SeCl_4, XeF_4$

Answer: a

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19. In which of the following molecules / ions BF_3, NO_2^-, H_2 the central atom is sp^2 hybridised ?

A. NH_2^- and H_2O

B. NO_2^- and H_2O

C. BF_3 and NO_2^-

D. BF_3 and NH_2^-

Answer: c

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20. Some of the following properties of two species, NO_3^- and H_3O^+ are described below. Which one of them is correct ?

A. dissimilar in hybridisation for the central atom with different structure.

B. Isostructural with same hybridisation for the Central atom .

C. different hybridisation for the central atom with same structure

D. none of these

Answer: a

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21. The types of hybridiration on the five carbon atom from right to left in the , 2,3 pentadiene.

A. sp^3, sp^2, sp, sp^2, sp^3

B. sp^3, sp, sp, sp, sp^3

C. $sp^2, sp, sp^2, sp^2, sp^3$

D. $sp^3, sp^3, sp^2, sp^3, sp^3$

Answer: a

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22. XeF_2 is isostructural with

A. $SbCl_3$

B. $BaCl_2$

C. TeF_2

D. Icl_2^-

Answer: d

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23. The percentage of s-character of the hybrid orbitals in methane, ethane, ethene and ethyne are respectively

A. $25, 25, 33.3, 50$

B. $50, 50, 33.3, 25$

C. $50, 25, 33.3, 50$

D. $50, 25, 25, 50$

Answer: d

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24. Of the following molecules, which have shape similar to carbon dioxide ?

A. $SnCl_2$

B. NO_2

C. C_2H_2

D. All of these

Answer: c

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25. According to VSEPR theory, the repulsion between different parts of electrons obey the order .

A. $1.p-1.p>b.p-b.p>1.p-b.p$

B. $b.p-b.p>b.p-1.p>1.p-b.p$

C. $1.p-1.p>b.p-1.p>b.p-b.p$

D. $b.p-b.p>1.p-1.p>b.p-1.p$

Answer: c

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26. Shape of ClF_3 is

A. Planar triangular

B. Pyramidal

C. T' Shaped

D. none of these

Answer: c

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27. Non - zero dipole moment is shown by

A. CO_2

B. p-dichlorobenzene

C. carbontetrachloride

D. water

Answer: c

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28. Which of the following conditions is not correct for resonating structures?

A. the contribuiting structure must have the same number of unpaired electrons

B. the contribuiting structures should have similar energies

C. the resonance hybrid should have higher energy than any of the contributing structure.

D. none of these

Answer: c

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29. Among the following , the compound that contains, ionic , covalent and co-ordinate linkage is

A. NH_4Cl

B. NH_3

C. $NaCl$

D. none of these

Answer: a

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30. CaO and NaCl have the same crystal structure and approximately the same radii. It U is the lattice energy of NaCl, the approximate lattice energy of CaO is

A. U

B. 2U

C. $U/2$

D. $4U$

Answer: d

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Evaluation Ii Write Brief Answer To The Following Questions

1. Define the following

Bond order

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2. Define the following

Hybridisation

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3. Define the following

σ- bond

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4. What is a pi bond ?

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5. In CH_4, NH_3 and H_2O the central atom undergoes sp^3 hybridlsation - yet their bond angles are different.

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6. Explain sp^2 hybridisation in BF_3.

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7. Draw the M.O diagram for oxygen molecule calculate its bond order and show that O_2 is paramagnetic.

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8. Draw MO diagram of CO and calculate its bond order .

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9. What do you understand by linear combination of atomic orbitals in MO theory .

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10. Discuss the formation of N_2 molecule using MO theory

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11. What is dipole moment ?

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12. Linear form of carbondioxide molecule has two polar bonds. Yet the molecule has zero dipole moment why?

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13. Draw the Lewis structures for the following species.

NO_3^-

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14. Draw the Lewis structures for the following species.

SO_4^{2-}

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15. Draw the Lewis structures for the following species.

HNO_3

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16. Draw the Lewis structures for the following species.

O_3

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17. Explain the bond formation in $BeCl_2$.

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18. Explain the bond formation in $MgCl_2$.

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19. Which bond is stronger σ or π ? Why ?

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20. Define bond energy.

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21. Hydrogen gas is diatomic where as inert gases are monoatomic - explain on the basis of MO theory.

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22. What is polar covalent bond? Explain with example.

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23. Considering x- axis as molecular axis, which out of the following will form a sigma bond.

$(i) 1s$ and $2p_y$ $(ii) 2p_x$ and $2p_x$

(iii) $2p_x$ and $2p_z$ $(iv) 1s$ and $2p_z$

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24. Explain resonance with reference to carbonate ion.

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25. Explain the bond formation in ethylene and acetylene.

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26. What type of hybridisations are possible in the following geometeries ?

(a) octahedral

(b) tetrahedral

(c) square planar

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27. Explain VSEPR theory . Applying this theory to predict the shapes of IF_7, and SF_6.

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28. CO_2 and H_2O both are triatomic molecule but their dipole moment values are different. Why ?

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29. Which one of the following has highest bond order ?

N_2, N_2^+ or N_2^-

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30. Explain the covalent character in ionic bond.

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31. Describe fajan's rule.

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Additional Questions Choose The Correct Answers

1. Which of the following molecule has no dative bond ?

A. CO

B. SO_4^{2-}

C. CO_3^{2-}

D. None of these

Answer: c

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2. Identify the molecule which has more than 8 electrons in outermost orbit

A. SO_3

B. SO_2

C. P_2O_5

D. All of these

Answer: d

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3. Which among the following molecule obeys octet reule ?

A. NO

B. NO_2

C. N_2O_3

D. C/O_2

Answer: c

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4. How many lone pair of electrons (s) are present in N-atom in ammonium ion ?

A. Three

B. Two

C. One

D. Zero

Answer: d

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5. Calculate the formal charge on C-atom in carbonate ion.

A. -1

B. 0

C. $+1$

D. $+2$

Answer: b

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6. The total number of lone pair present in XeF_4 is

A. 10

B. 12

C. 14

D. 16

Answer: c

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7. Pick out the molecule having double bond.

A. O_2

B. N_2

C. He_2

D. H_2

Answer: a

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8. Expanded octet is present in

A. IF_7

B. PCl_5

C. both (a) & (b)

D. neither (a) nor (b)

Answer: c

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9. The correct sequence of increasing covalent character is

A. $LiCl < NaCl < BeCl_2$

B. $NaCl < LiCl < BeCl_2$

C. $BeCl_2 < LiCl < NaCl$

D. $BeCl_2 < NaCl < LiCl$

Answer: b

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10. Which compound has planar structure ?

A. XeF_4

B. $XeOF_2$

C. XeO_2F_2

D. XeO_4

Answer: a

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11. The geometry of electron pairs around S in SF_6 is

A. Octahedral

B. Trigonal bipyramidal

C. Square pyramidal

D. Linear

Answer: a

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12. Find out the most favourable conditon for electrovalent bonding .

A. Low ionization potential of one atom and high electron affinity of the other atom .

B. High electron affinity and high ionisation potential of both the aotms.

C. Low electron affinity and low ionisation potential of both the atoms.

D. High ionisation potential of one atom and low electron affinity of the other atom .

Answer: d

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13. The formula of the compound is A_2B_3. The number of electrons in the outermost orbits of and B respectively are ,

A. 3 and 6

B. 3 and 2

C. 2 and 3

D. 5 and 2

Answer: a

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14. Which of the following is not true about covalent compounds ?

A. They undergo molecular reactions

B. They possess low melting and bonding points

C. They undergo ionic reactions

D. They exhibit isomerism

Answer: c

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15. Identify the valence electron for CO_3^{2-}

A. 42

B. 24

C. 8

D. 20

Answer: b

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16. The sharing of valence electrons between the atoms will lead to the formation of _____

A. Ionic bond

B. Covalent bond

C. Co-ordinate bond

D. Hydrogen bond

Answer: b

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

A. $NO_2^+ < NO_2 < NO_2^-$

B. $NO_2^- < NO_2 < NO_2^+$

C. $NO_2^- < NO_2^+ < NO_2$

D. $NO_2^+ < NO_2^- < NO_2$

Answer: b

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18. In which of the following bond angle is maximum ?

A. NH_3

B. PCl_3

C. NH_4

D. SCl_2

Answer: c

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19. H_2O is polar , whereas BeF_2 is not It is because

A. The electronegativity of F is greater than that of O .

B. H_2O involves hydrogen bonding whereas BeF_2 is a discrete molecule

C. H_2O is linear and BeF_2 is angular .

D. H_2O is angular and BeF_2 is linear

Answer: c

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20. Which molecule among the following has both polar nad non-polar covalent bond ?

A. NH_4^+

B. H_2O_2

C. HCl

D. CH_4

Answer: b

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21. Which of the following statements are correct with respect to bond order ?

(i)Bond order of N_2 is 3.5

(ii) Bond order of O_2 is 2

(iii) Bond order of NO^+ is 3.0

(iv) Bond order of NO is 2.5

A. Only (i)

B. (i),(ii),(iv)

C. (ii),(iii),(iv)

D. (i),(ii),(iii),(iv)

Answer: c

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22. Which of the following is a polar molecule ?

A. BF_3

B. SiF_4

C. SF_4

D. XeF_4

Answer: c

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23. Identify the pair of species that possess same bond order .

A. O_2^{2-}, B_2

B. NO, CO

C. N_2, O_2

D. He_2, H_2

Answer: a

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24. In the formation of ethylene molecule , the carbon atom makes use of _____ hybridisation .

A. sp

B. sp^2

C. sp^3

D. dsp^2

Answer: b

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25. Statement I: $N_2, CO \text{ and } CN^-$ are having same bond order .

Statement II : Isoelectronic species always have same bond order .

A. Both statement I and II are true and statement II explains statement I.

B. Both statement I and II are true but statement I does not explain statement II .

C. Statement I is true , but statement II is false

D. Both - statement I and II are false

Answer: a

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26. Identify the correct order regarding the electro negativity of hybrid orbitals of carbon is

A. $sp < sp^2 < sp^3$

B. $sp > sp^2 > sp^3$

C. $sp > sp^2 > sp^3$

D. $sp < sp^2 > sp^3$

Answer: b

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27. Statement I : Bond angle of BF_3 and NF_3 are different

Statement II : Both the molecules are having different shapes .

A. Both statement I and II are true and statement II explains statement I .

B. Both statement I and II are true but statement I does not explain statement II .

C. Statement I is true, but statement II is false

D. Both - statement I and II are false

Answer: b

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28. Identify the incorrect statement with respect to hybridisation .

A. Hybridisation is intermixing of orbitals of nearly equal energies .

B. Shape of molecule depends upon type of hybridisation only .

C. Hybrid orbitals are identical in all aspects .

D. Hybrid orbitals can form σ and π bond .

Answer: d

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29. CO_2 is isostructural with

A. C_2H_2

B. $SnCl_2$

C. NO_2

D. SO_2

Answer: a

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30. The hybrididsation of S in SO_2 is

A. sp

B. sp^2

C. sp^3

D. None of these

Answer: d

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31. The atomic orbitals involved in hybridisation of SF_6 molecule is

A. $3s, 3_{px}, 3_{py}, 3_{pz}, 3d_z$

B. $4s, 4_{px}, 4_{py}, 4_{pz}, 3d_{x^2-y^2}, 3d_{xy}$

C. $3s, 3_{px}, 3_{py}, 3_{pz}, 3d_z^2, d_{x^2-y^2}$

D. $3s, 3_{px}, 3_{py}, 3d_{xy}, 3d_{yz}, 3d_{xz}$

Answer: b

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32. The molecules that linear structure is

A. CO_2

B. NO_2

C. SO_2

D. SiO_2

Answer: a

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33. Calculate the hybridisation of BF_3

A. sp

B. sp^2

C. sp^3

D. None of these

Answer: b

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34. The shape of molecule having sp^3d^3 hybridisation is

A. Pentagonal bipyramidal

B. Octahedral

C. trigonal bipyramdial

D. square planar

Answer: a

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35. Bond order of 1.5 is shown by

A. O_2^{2-}

B. O_2

C. O_2^+

D. O_2^-

Answer: d

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36. The shape of IF_7 molecule is

A. square planar

B. tetrahedral

C. Pentagonal bipyramidal

D. linear

Answer: c

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37. For a molecule to be stable

A. $N_b < N_a$

B. $N_b = N_a$

C. $N_b > N_a$

D. $N_b \geq N_a$

Answer: c

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38. Which among the following cannot be formed ?

A. H_2

B. He_2

C. N_2

D. O_2

Answer: b

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39. Which of the following is paramagnetic ?

A. O_2

B. N_2

C. H_2

D. He_2

Answer: a

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40. Energy levels of molecular orbitals have been experimentally determined by _____ studies .

A. X- rays

B. Spectroscopic

C. Microscopic

D. Crystallographic

Answer: b

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41. For O_2 and heavier diatomic molecules orbital has maximum energy .

A. π_{2py}

B. σ_{2Pz}

C. σ^*_{2Pz}

D. π^*_{2Py}

Answer: c

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42. Paramagnetism is due to the presence of _____ electrons .

A. paired

B. unpaired

C. partially filled

D. fully filled

Answer: b

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43. The electronic configuration of He_2 molecule is

A. $\sigma_{1s}^2\sigma_{1s}^{*2}$

B. $\sigma_{1s}^2\sigma_{1s}^{*1}$

C. σ_{1s}^2

D. $\sigma_{1s}^2\sigma_{1s}^{*2}\sigma_{2s}^2$

Answer: a

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44. O_2 molecule has _____ bonds .

A. $1\sigma, 1\pi$

B. 2σ

C. 2π

D. $1\sigma, 1\delta$

Answer: a

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45. How many unpaired electrons are present in oxygen molecule ?

A. 0

B. 1

C. 2

D. 3

Answer: c

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46. Pick out the molecule which possess diamagnetic behaviour.

A. O_2

B. O_2^{2-}

C. O_2^-

D. O_2^+

Answer: b

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47. The pair of species with the same bond order is

A. NO, CO

B. NO^+, O_2^+

C. N_2, O_2

D. O_2^{2-}, B_2

Answer: d

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48. During change of O_2 to O_2^- ion, the electron adds on which one of the following orbitals ?

A. π orbitals

B. σ - orbitals

C. π^* orbitals

D. σ^*-orbitals

Answer: c

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49. Identify the correct order of the diatomic species arranged in their increasing order of bond roder .

A. $He_2^+ < O_2^- < NO < C_2^{2-}$

B. $C_2^{2-} < He_2^+ < O_2^- < NO$

C. $O_2^- < NO < C_2^{2-} < He_2^+$

D. $NO < O_2^{2-} < He_2^+$

Answer: a

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50. The inert gases are _____ atomic.

A. mono

B. di

C. tri

D. zero

Answer: a

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51. How the inter aotmic attractive forces which hold the constitution atoms/ions together in a molecule are called ?

A. σ bonds

B. π bonds

C. Chemical bonds

D. Hydrogen bonds

Answer: c

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52. Assertion (A) : The structure of water is 'V' shaped while that of the Carbon dioxide is linear .

Reason (R) : It can be answered using the principles of chemical bonding

.

A. Both (A) and (R) are true and (R) is the correct explanation of (A).

B. Both (A) and (R) are true and (R) is not the correct explanation of (A).

C. (A) true but (R) true.

D. Both (A) and (R) are false.

Answer: a

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53. The noble gases are stable due to their _____ outer shell electronic configuration .

A. pantly filled

B. partialy filled

C. completely filled

D. zero

Answer: c

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54. Who proposed that the attainment of stable electronic configuration in molecules are achieved by mutual sharing of electrons ?

A. G.N. Lewis

B. Pauling

C. Hess

D. Van't Hoff

Answer: a

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55. Which of the following is correct ?

A. Lewis introduced to simple scheme to represent the chemical bond and the electrons present in the outer shell of an atom.

B. In this scheme, the valence electrons of an element are represented as small dots around the symbol of the element .

C. The first four valence electrons are denoted as single dots around the four sides of the atomic symbol.

D. All of the above are correct.

Answer: d

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56. _____ is a pictorial representation of Covalent bonding between the combining atoms.

A. Lewis structure

B. Fisher structure

C. Saw horse structure

D. New mann structure

Answer: a

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57. The Lewis dot structure can be written by following the steps given below. Which one is incorrect?

A. Draw the skeletal structure of the molecule.

B. Calculate the specific number of valence electrons of all the atoms in the molecule.

C. Draw a single bond between the atoms in the skeletal structure of the molecule.

D. Distribute the remaining valence electrons as pairs .

Answer: b

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58. The best representation of Lewis structure can be selected by using following guidelines . Which one is correct ?

A. A structure in which all formal charges are zero preferred over the one with charges .

B. A structure with small formal charges is preferred over the one with higher formal charges.

C. A structure in which negative formal charges are placed on the most electro negative atom is preferred .

D. All of the above are correct.

Answer: d

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59. Which one exception to the Octet rule?

A. Molecules with electron deficient central atoms.

B. Molecules containing odd electrons .

C. Molecules with expanded valence shells.

D. All the above

Answer: d

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60. Match

A	Molecules with electron deficient central atoms	1	PCl_5
B	Molecules containing odd electrons	2	BF_3
C	Molecules containing expanded valence shells	3	NO_2

A.
A	B	C
1	2	3

B.
A	B	C
2	3	1

C.
A	B	C
2	1	3

D.

A	B	C
1	3	2

Answer: b

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61. In the formation of a _____ , both the combining atoms contribute one electron each and the these electrons are mutually shared among them.

A. Ionic bond

B. Coordination bond

C. Covalent bond

D. Hydrogen bond

Answer: c

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62. Assertion (A) : The combining atom which donates the pair of electron is called donor atom and the other atom an acceptor atom.

Reason (R) : This bond is denoted by an arrow starting from the donor atom pointing towards the acceptor atom .

A. Both (A) and (R) are true

B. (A) true but (R) false .

C. (A) false but (R) true.

D. Both (A) and (R) are false .

Answer: a

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63. Assertion (A) : The bond length depends on the size of the atom and the number of bonds between the combining atoms.

Reason (R) : The distance between the nuclei of the two Covalently bonded atoms is called bond length .

A. Both (A) and (R) are true and (R) is the correct explanation of (A) .

B. Both (A) and (R) are true and (R) is not the correct explanation of (A) .

C. (A) true but (R) false.

D. Both (A) and (R) are false .

Answer: a

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64. Match

	Bond type		Bond length (A°)
A	$C-H$	1	1.09
B	$C-C$	2	1.54
C	$C-N$	3	1.47
D	$C-O$	4	1.43

A.

A	B	C	D
1	2	3	4

B.

A	B	C	D
2	3	1	4

C.

A	B	C	D
3	2	1	4

D.

A	B	C	D
4	3	2	1

Answer: a

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Short Answers Questions

1. State Octet rule.

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2. How does the polarizing power of cations affect the covalent character imparted into the ionic bond ?

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3. Give reason for the higher melting point value of AlF_3 (solid) than SiF_4 (gas).

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4. Why rocksalt is harder than metallic sodium ?

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5. How is the bond order related to strength of the bond ?

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6. Why are ionic compounds soluble in water whereas covalent compounds of often insolube in water ?

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7. Melting and boiling point of ionic compounds are higher then covalent compounds .

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8. What are the number of bond pairs and lone pairs of electrons on N - atom in NO_3^- ?

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9. Give two cations that exhibity sp^3 hybridisation.

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10. Give two examples of molecules undergoing sp^3d^2 hybridisation and predict their shapes.

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11. Define chemical bond.

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12. Draw the Lewis structure of N, C, O and He.

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13. Write short note on classification of chemical bonds.

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14. Represent the bond formation in $\left[Fe(CN)_6\right]^{4-}$ and $BF_3 - NH_3$

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15. Answer the following :

How does the size of atom infiuence bond length ?

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16. Answer the following :

On what factors does the bond energy value depend ?

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17. Where does the new attractive and repulsive force arise in the hydrogen molecule ?

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18. Distinguish sigma and pi - bonds.

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19. Write a short note on hybridisation .

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20. Give the bond order for hydrogen molecule, nitrogen molecule and NO.

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21. What is covalent bond ? Give suitable examples to represent single , double and triple covalent bonds.

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22. Define co-ordinate covalent bond.

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Long Answers Questions

1. Discuss the stepwise determination of the (Lewis) structure of nitric acid .

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2. Categorise the molecules which disobey the octet rule and explain them with suitable example.

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3. What type of bond is formed between K^+ and Cl^- ? Explain the bond formation .

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4. Write short note on the following bond parameter .

Bond length

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5. Write short note on the following bond parameter .

Bond order

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6. Write short note on the following bond parameter .

Bond angle

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7. Write short note on the following bond parameter .

Bond enthalpy

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8. Write short note on the following bond parameter .

Resonance

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9. Discuss the salient features of VBT.

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10. Write a detailed account on the postulates of MOT.

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11. 

Comment and explain your observation obtained from the above graph.

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12. Calculate the bond order and predict the magnetic nature of the following molecules.

(i) H_2^+ $(ii) Li_2^-$ $(iii) Li_2$ $(iv) B_2$ $(v) C_2^+$

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13. Draw the Lewis dot structure for the following .

$(i) SO_3$ $(ii) NH_3$ $(iii) CH_4$ $(iv) N_2O_5$ $(v) HNO_3$

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Creative Questions Hots

1. X, Y and Z elements have 4, 5 and 7 valence electrons . Draw the structure of XH_4, YH_5YH_3 and $H - Z$.

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2. Which of these compounds possess highest dipole moment ?

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3. On the basis of VSEPR theory predict the shape of the Ozone .

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4. H_3PO_3 can be represented by structures I and II shown below, can these two structures baken as the canonical forms of the resonance hybrid representing H_3PO_3? If not, give reasons for the same.

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5. Predict the geometry of BF_3, SF_6, SO_2 and NH_3

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6. How may lone pairs and bond pairs are present in SO_4^{2-} and H_3O^+?

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7. Calculate the number of bond pairs and lone pairs in Icl_4^-.

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8. Does H_2O and H_2S possess same bond angle ? Explain

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9. Arrange the bonds in order of increasing ionic chargacter in the molecules , LiF, K_2O, N_2, SO_2 and ClF_3

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10. Explain the equal bond lengths of C - O bonds in CO_3^2 ion .

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11. Draw the resonating structure of

Phenoxide ion .

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12. Draw the resonating structure of

Nitrate ion.

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13. The type of overlap given below do not involve in bond formation - Why ?

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14. Why σ bond is stronger than π bond ?

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15. How many σ and π bonds are present in each of the following molecules ?

$CH_3 - CH_2 - C^{\circ} N$

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16. How many σ and π bonds are present in each of the following molecules ?

$CH_2 = C = CH_2$

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17. What is the type of hybridisation of each carbon in $CH_3 - CH = CHCN$

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18. Indicate the σ and π bonds in the following molecules.

$C_6H_6, \quad CH_2Cl_2, \quad CH_3NO_2, \quad CH_2 = C = CH_2$

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19. Identify the type of hybridisation present in c-atoms of diamond.

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20. Predict the shapes and hybridisation of the following molecules CO_2.

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21. Consider the molecules NH_2^-, NH_3, NH_4^+ . Arrange them in the decreasing order of bond angles and give reason for your arrangement.

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22. Identify the magnetic nature of the anion of Na_2O_2.

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23. How is the sequence of energy levels of molecular orbitals written in case of heavier diatomic molecules?

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24. Bond order increases with loss of electron in bonding molecular orbital - State True or False and give reason .

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25. Predict the magnetic nature of the following heteronuclear diatomic molecules .

NO .

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26. Predict the magnetic nature of the following heteronuclear diatomic molecules .

CO .

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27. How does the effect of the process $C_2 \rightarrow C_2^+ + e^-$ affect the bond order ?

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28. Give reasons for the following :

Covalent bonds are directional while ionic bonds are non -directional .

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29. Give reasons for the following :

Water molecule has bent structure where as CO_2 has linear structure.

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30. Give reasons for the following :

Ethyne molecule is linear.

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31. In each of the following pairs of compounds, Identify the one with more covalent nature and why ?

LiCl and NaCl

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32. In each of the following pairs of compounds, Identify the one with more covalent nature and why ?

LiBe and LiI

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33. In each of the following pairs of compounds, Identify the one with more covalent nature and why ?

$FeCl_2$ and $FeCl_3$

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34. Bond angle in PH_4^+ is higher than in PH_3. Why ?

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35. Compare the bond angles of water and dimethyl ether and identify which one has the greater bond angle? Give appropriate reason for your answer .

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36. Comment on the following statements.

BF_3 is planar but NH_3 is not.

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37. Comment on the following statements.

SiF_4 and ClO_4^- are tetrahedral

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38. Comment on the following statements.

HSH bond angle in H_2S is 92° and HOH bond angle in H_2O is 104.5.

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39. Figure out the variation of bond order in the following conversions.

$NO \rightarrow (NO)^+ + e^-$

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40. Figure out the variation of bond order in the following conversions.

$C_2 + e^- \rightarrow C_2^-$

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41. Identify the paramagnetic species among the following using molecular orbital theory.

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42. Calculate the bond order of H_2 and B_2

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43. Show how the bond order is related to stability and bond length of the molecule.

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44. Answer briefly .

Arrange the following compounds as per their increasing covalent character and give reason. $MgCl_2$, $NaCl$, $AlCl_3$

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45. Answer briefly .

$NaCl$ is less covalent than LiCl - Justify .

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46. Answer briefly .

Compare the covalency of CuCl and NaCl.

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47. Give suitable answers for the following questions :

Arrange $NaCl, MgCl_2$ and $AlCl_3$ in the increasing order of covalnet character

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48. Give suitable answers for the following questions :

Among Na^+, Ca^{2+}, Mg^{2+}, Al^{3+} which has high polarising power ?

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49. Give suitable answers for the following questions :

CCl_4 is insoluble in water but NaCl is soluble Why ?

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50. Give suitable answers for the following questions :

Among NaCl, KCl and RbCl which one has highest lattice enthalpy? Why?

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51. Give suitable answers for the following questions :

What are the main conditions for the formation of an ionic bond?

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52. Write the resonating structures for the following molecules.

N_2O

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53. Write the resonating structures for the following molecules.

CO_2

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54. Write the resonating structures for the following molecules.

Benzene

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55. Write the resonating structures for the following molecules.

CO_3^{2-}

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56. Write the resonating structures for the following molecules.

O_3

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57. What are hybridisation states of each carbon atom in the following compounds ?

$CH_2 = C = O, CH_3CH = CH_2, \quad (CH_3)_2CO, \quad CH_2 = CHCN$ an

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58. Define ionic bond. Give suitable examples and distinguish between covalent bond and ionic bond.

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Evaluate Yourself

1. Draw the lewis structure for

Nitrous acid (HNO_2)

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2. Draw the lewis structure for

Phosphoric acid

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3. Draw the lewis structure for

Sulphur troxide (SO_3)

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4. Calculate the formal charge on each atom of carbonyl chloride $(COCl_2)$.

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5. Explain the ionic bond formation in (MgO) .

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6. Explain the ionic bond formation in CaF_2.

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7. Write the resonance structures for

Ozone molecule

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8. Write the resonance structures for

N_2O

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9. Of the two molecules OCS and CS_2 which one has higher dipole moment value ? Why ?

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10. Arrange the following in the decreasing order of Bond angle

CH_4, H_2O, NH_3

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11. Arrange the following in the decreasing order of Bond angle

C_2H_2, BF_3, CCl_4

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12. Bond angle in PH_+^4 higher than in PH_3. Why ?

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13. Explain the bond formation in SF_4 and CCl_4 using hybridisation concept.

SF_4

View Text Solution

14. Explain the bond formation in SF_4 and CCl_4 using hybridisation concept.

CCl_4

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15. The observed bond length of N_2^+ is larger than N_2 while the bond length in NO^+ is less than in NO. Why?

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16. Draw the MO diagram for acetylide ion C_2^{2-} and calculate its bond order .

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