CHEMISTRY

BOOKS - KUMAR PRAKASHAN KENDRA CHEMISTRY (GUJRATI ENGLISH)

CHEMICAL BONDING AND MOLECULAR STRUCTURE

Section A Questions

1. What is chemical bonding ? How it is formed and give its types. OR

Explain the formation of a chemical bond.

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2. What is electrovalent (Ionic) bond ? Explain with any two example.

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3. What is electro valency of ion ? Give example .

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4. Write the postulate of Kossol for formation of Ionic bond.

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5. What is the main difference between ionic bond and covalent bond ?

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6. Write Lewis dot symbols for atoms of the following elements :

Mg, Na, B, O, N , Br

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7. Write Lewis symbols for the following atoms and ions S and S^{2-}, Al and Al^{3+}, H and H^{+}

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8. Use Lewis symbols to show electron transfer between the following atoms to form cations and anions (a) K and S (b) Ca and O (c) Al nnd N

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9. Define octet rule. Write its significance and limitation. (Exercise - 4.5)

OR

What is electronic theory of chemical bonding?

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10. What is covalent bond ? Explain by one example.

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11. State number of covalent bond in H_2O and CCl_4 and give bond structure and Lewis structure in H_2O &CCl_4

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12. What is multiple bond ? Give difference between single bond, double bond and triple bond.

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13. Which multiple bond present in CO_2, C_2H_4, N_2 and C_2H_2? Draw Lewis and simple bond structure of these molecules.

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14. Give conditions for covalent bond formation by lewis dot structure.

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15. Explain : Lewis dots Representation. OR State the points require in Lewis dot representation.

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16. Draw Lewis structures of following molecules and ions. H_2S, $SiCl_4$, BeF_2, CO_3^{2-}, HCOOH

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17. Write Lewis representation of following molecules / Ions.

(i) H_2 (ii) O_2 (iv) NF_3 (iv) CO_3^{2-} (vi) HNO_3

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18. The skeletal structure of CH_3COOH as shown below is correct, but some of the bonds are shown incorrectly. Write the correct Lewis structure for acetic acid.

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19. What is formal charge ? Explain by example.

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20. Write the formal charges on atoms in CO_3^{2-} and HNO_3.

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21. Define octet rule write its significance and limitations.

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22. Write the favourable factors for the formatJon of ionic bond.

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23. Explain crystal structure of sodium chloride (NaCl).

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24. What is Lattice enthalpy ? Give example.

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25. Define the bond length. (Exercise - 4.10) OR What is bond length ? How it ls measured ?

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26. Explain covalent radius and ven der Waal's radius.

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27. What is Bond Angle ? Explain.

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28. What is bond enthalpy? Explain bond enthalpy in polyatomic molecule like H_2O .

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29. What is bond order according to Lewis ? Write structure and bond order of H_2, O_2, N_2, CO, NO.

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30. Isoelectronic molecules and ions have identical bond orders. Explain by examples.

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31. How do you express the bond strength in terms of bond order ?

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32. What is Resonance structure ? Why the resonances structure required explain with' suitable example. OR

Give resonance of O_3 , its requirement, delimitation and advantages

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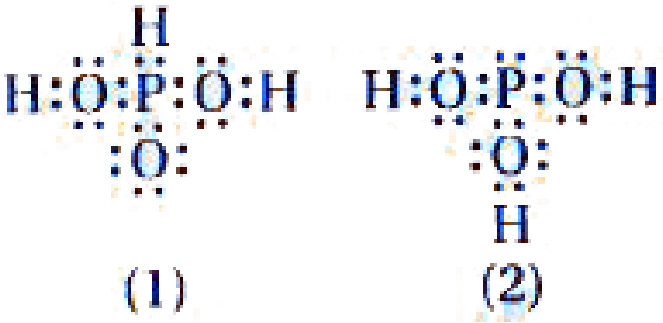
33. H_3PO_3 can he represented by structure 1 and 2 shown below. Can these two structures be taken as the canonical forms of the resonance

hybrid representing H_3PO_3? If not, give reasons for the same .



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34. Write the resonance structure for SO_3, NO_2 and NO_3^- .

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35. Which points required in resonance structure?

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36. What is correct for resonance structure ?

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37. Explain : Non polar and polar covalent bond.

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38. What is dipole moment (μ) of bond ? Explain by example.

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39. What is dipole moment in molecule ? Write about dipole moment of two atom containing molecule.

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40. Explain dipole moment of triatomic molecule (AB_2). OR

Write a·bout dipole moment of AB_2 Linear molecule (BeF_2) and AB_2

angular molecule (H_2O).

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41. Although both CO_2 and H_2O are triatomic molecular , the shape of H_2O molecule is bent while that of CO_2 is liner. Explain this on the bases of dipole moment.

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42. Explain why BeH_2 molecuJe has a zero dipole moment although the Be - H bonds are polar.

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43. Which out of NH_3 and NF_3 has higher dipole moment and why ?

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44. Arrange the bonds in order of increasing ionic character in the molecules : LiF, K_2O, N_2, SO_2 and CIF_3.

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45. Apart from tetrahedral geometry, another possible geometry for CH_4 is square planar with the four H atoms at the corners of the square and the O atom at its centre. Explain why CH_4 is not square planar ?

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46. Write the significance/applications of dipole moment.

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47. Give Fajans rules for the partial covalent character of ionic bonds.

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48. What do you understand by bond pairs and lone pairs of electrons ? illustrate by giving one example of each type.

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49. Write limitation of lewis concept and main postulates of VSEPR theory.

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50. State the contribution of Nyholm & Gillespie in VSEPR theory.

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51. Give the shape of molecule in which only bonding pair is present.

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52. Write ahoul shape (geometry) of smne simple molecules/lons with central lons having one or more lone pairs of electron (E).

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53. Discuss the shape of the following molecules using the VSEPR model.

$BeCl_2$, BCl_2, $SiCl_4$, AsF_5, H_2S, PH_3

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54. Although geometries of NH_3 and H_2O molecules are distorted terahedral bond angle in water is less than that of ammonia. Discuss.

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55. Explain the formation of H_2 molecule on the basis of valence bond Theory.

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56. Explain valence bond theory.

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57. What is overlapping of atomic orbitals ? When the bond is formed ?

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58. Explain directional properties of bonds by VB theory.

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59. Explain overlapping of atomic orbitals with diagram.

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60. Explain the significance of the +ve and -ve sign

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61. Write the significance of a plus and a minus sign shown in representing the orbitals.

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62. State difference both sigma (σ) and (π) bond.

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63. Give explanation of σ and π bonds mention by overlapping of which orbitals are σ and π bonds formed.

OR Explain σ bond form by s-s, s-p and p-p over lapping.

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64. Which one is strong form σ & π bond ? Why ?

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65. What is hybridization ?

Give example. What is the meaning of hybridization?

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66. Give main characteristics of hybridization.

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67. Give the requirement to form hybridization.

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68. Differentiate atomic orbitals and hybrid orbitals.

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69. Explain Shape of sp, sp^2 and sp^3 hybrid orbitaJs

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70. Describe the change in hybridization (if any) of the Al atom in the following reaction.

$AlCl_3 + Cl^- \rightarrow AlCl_4^{-1}$

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71. Is there any change in the hybridization of B and N atoms as a result of the following reaction?

$BF_3 + NH_3 \rightarrow F_3B.NH_3$

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72. Draw diagrams showing the formation of a double bond and a triple bond between carbon atoms in C_2H_4 and C_2H_2 molecules.

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73. State σ and π bond in following molecules ?

(a) C_2H_2 (b) C_2H_4

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74. Considering X-axis as the internuclear axis which out of the following will not form a sigma bond and why ?

(a) 1s and 1s (b) 1s and $2p_x$

(c) $2p_y$ and $2p_y$ (d) 1s and 2s

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75. What is sp hybridization ? Give characteristics of it.

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76. Explain the bond formation by sp orbitals. OR Explain the bond formation in $BeCl_2$ explain why $BeCl_2$ is linear.

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77. What is sp^2 hybridization ? Give characteristics of it .

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78. Explain bond formation in BCl_3. Explain it is symmetrical trigonal molecute.

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79. What is sp^2 hybridization ? Give characteristics of it.

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80. Explajin formation of four sigma bond with example. OR

Explain shape of methane.

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81. Which hybrid orbitals are used by carbon atom in the following molecules ?

(a) $CH_3 - CH_3$ (d) $CH_3 - CHO$

(b) $CH_3 - CH = CH_2$ (e) CH_3COOH

(c) $CH_3 - CH_2 - OH$

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82. Explain: The geometry of NH_3 molecule is trigonal pyramidal.

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83. Explain : The shape of H_2O is V (angular).

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84. Explain hybridization and bond structure of ethane (C_2H_6) molecule.

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85. Explain hybridization of carbon and bond structure of ethene (C_2H_4) OR

Explain: Ethene is planar molecule.

Sub. Que. Explain sp^2 hybridization of carbon in ethene.

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86. Sub. Que. : Explain σ-bond formation in ethene.

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87. Sub Que. : Explain the formation π-bond in ethene.

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88. Sub Que : Give Bond length, Bond angle in ethene.

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89. Explain hybridization of carbon and bond structure in ethyne (C_2H_2) molecule.

Sub Que, : Explain sp hybridization in ethyene.

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90. Sub que : Explain σ-bond formation in ethyne .

View Text Solution

91. Sub. Que. : Explainπ -bond formation in ethyne,

View Text Solution

92. Sub. Que : Give number, bond angle and bond length in ethyne.

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93. Which hybridization is possible with d orbitals ? And which are not possible ? Explain.

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94. Give examples of hybridization with s, p, and d carbon orbitals.

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95. Describe the hybridization in case of Pci_5 Why are the axial bonds longer as compared to equtiorial bonds ?

OR

Explain sp^3d hybridization by suitable example. Discuss about hybridization and shape of PCl_5 .

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96. Electron sp^3d^2 hybridization by suitable example.

OR

Explain geometry of SF_6.

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97. Give features of Molecular orbital MO) theory.

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98. What is indicated by Ψ for atomic and molecular orbitals ? How the molecular orbital is obtained by Schrodinger wave equation ?

OR What is LCAO.

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99. Explain Linear combination of atomic orbitals by suitable example

OR

Exaplain H_2 molecule by molecular orbitals theory.

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100. Give difference: Bonding molecular orbital and antibonding molecular orbitals.

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101. Write the important conditions required for the linear combination of atomic orbitals to formn molecular orbitals.

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102. Which are the type of molecular orbitals ? Give information in short.

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103. Explain energy level diagram for molecular orbital form by 1s orbitals.

OR

Explain formation of H_2 and energy level diagram of H_2 molecule.

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104. Give energy level diagram obtained by over lapping of $2p_z$ orbitals.

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105. Give energy level diagram of molecular orbital obtained by overlapping of $2p_x^1$ orbital of two atoms .

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106. Give answer of following questions.

(i) Give molecular orbitals and type form by LCAO from 2s, $2p_x, 2p_y$ and $2p_z$

(ii) $Li_2, Be_2, C_2, N_2, O_2, F_2$ for the these molecule give energy other.

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107. Which information obtained by electronic conflguratJon of Molecule In MO ?

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108. Write electron configuration, bond order and Magnetic property of Hydrogen (H_2) molecule.

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109. What Is bond order ? Explain by example.

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110. What is meant by the term bond order ?

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111. Use molecular orbital theory to explain why the Be_2 Molecule does not exist.

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112. Calculate the bond order of N_2, O_2, O_2^+ and O_2^-

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113. Compare the relative stability of the following species and indicate the magnetic properties : O_2, O_2^+, O_2^- (supper oxide) : O_2^{2-} (Peroxide)

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114. Give electron configuration, bond order and magnetic property, energy diagram in MO for Helium (He_2) molecule.

OR

(He_2) molecule is not possible .

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115. Give electron configuration, bond order magnetic property and energy diagram for Lithium (Li_2) molecule.

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116. Give electron configuration, bond order, magnetic property and energy diagram for berilium (Be_2) molecule and writ about it existence.

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117. Give electron configuration, bond order,Magnetic property and energy diagram for Baron (B_2) Molecule and write about it existence.

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118. Give electron configuration, Magnetic property, bond order and energy diagram for carbon (C_2).

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119. Give electron configuration, magnetic property bond order and energy diagram for Nitrogen (N_2) molecule.

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120. Give electron configuration,magnetic property bond order and energy diagram for oxygen (O_2) molecule.

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121. Give electron configuration, magnetic property, bond order and energy diagram for fluorine (F_2) molecule.

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122. Give MO diagram and explain Ne_2 molecule is not possible.

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123. Explain in Short : MO occupancy and molecular properties for $B_2, C_2, N_2, O_2, F_2, Ne_2$.

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124. Define hydrogen hond : Is it weaker or stronger than the van der Waals forces ?

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125. How the hydrogen bond form ? Give the reason 10 form hydrogen bond with example.

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126. State factors affecting Hydrogen bond.

View Text Solution

127. Explain types of Hydrogcn bond example and its effect on physical properties.

OR

Give difference between intermolecular hydrogen bond and intramolecular hydrogen bond.

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128. Write Lewis dot structure of CO molecule.

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129. Wrlle Lewis structure of Nitrite ion. NO_2^{-1}

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130. Explain the structure of CO_3^{2-} ion in terms of resonance.

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131. Bxplaln the structure of CO_2.

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Try Your Self 3

1. In Cl_2 molecule covalent radius is 99 pm and van-dar-Walls radius is 180 pm what is the distance between two nucleus and distance between two molecules ?

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Try Your Self 4

1. Write only arrangement of electron and its shape of the following.

$HgCl_2$ (ii) BF_3 (iii) NH_4^+ $(iv)PCl_5$

(v) SF_6 (vi) SO_2 (vii)NH_3 (viii)H_2O

(ix)SF_4 (x)CIF_3 (xi)BrF_5 (xii)XeF_4

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Section B Objective Questions

1. Who had given explanation of chemical bonding with respect to electron ?

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2. What is Kernel ?

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3. Lewis symbol for second period

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4. Which hybridization occurs in the square planar, octahedral and linear shape ?

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5. What is co-ordinate covalent bond ?

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6. Give molecular structure of SO_2 and calculate formal charge.

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7. State the formal charge of each atom in N_2O

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8. In which octet rule is obeyed· or not ?

(1) PCl_5 (2) SF_6 (3) PF_5 (4) NH_4^+

(5) $BeCl_2$ (6) NCl_3 (7) BeF_4^{2-} (8) BF_3

(9) NO (10) NH_3

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9. State limitations of octet rule.

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10. Who had give information of covalent bond ?

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11. Who refined the Lewis concept ?

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12. How the covalent bond is form according to lewis & langmuir ?

View Text Solution

13. Wlten the multiple bond is form between two atoms?

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14. Which are the multiple bond ? Why ?

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15. What change would be observed when covalent bond is form ?

View Text Solution

16. How many electrons are there in covalent oond ?

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17. State on of covalent bond in H_2O, NH_3 and CCl_4.

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18. Why there are three covalent bond in NH_3 ? And not triple bond.

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19. Why there is tripal bond or three bonds In N_2 ?

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20. How many bonds present with carbon and oxygen in CO_2 ?

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21. Is there multiple bond in CO_2 ? Which is ?

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22. How many single and double bond are there in ethene C_2H_4 ?

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23. Which multiple bond is in ethine (C_2H_2) ? Why ?

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24. What is the specific in Lewis structure of CO ?

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25. What is the difference in NO_2 and NO_2^- ?

View Text Solution

26. State the difference in Lewis dot structure.

$(i) BCl_3$ and BH_3 (ii) $BeCl_2$ and BeH_2

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27. From NO, NO_2, CO, CO_2 which has odd electron ?

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28. For the given of which molecule resonance is possible ? Why ?

CO_2, NO_2, O_3, CH_4

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29. When the resonance structure represented ?

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30. State the conditions for resonance structure.

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31. What is similarity and difference between Lewis structure of H_2SO_4 and SO_4^{2-} ?

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32. Write the steps and energy change of formation of ionic bond.

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33. Give steps and enthalpy of formation of NaCl (Sodium chloride).

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34. What is the difference between van der Waals radius and covalent radius ?

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35. What is the covalent and van der Waals radius in Cl_2 ?

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36. The distance between two atoms in Cl_2 is 198 pm, than what will be lhe radius ?

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37. The van der Waals radius in chlorine is 180 pm. What is the distance between two molecule of Cl_2?

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38. Arrange, C - O, C - N and C - C in increasing order of bond length and give reason.

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39. Which bond is short C = O, or N = O ? Why ?

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40. Arrange $-\overset{|}{\underset{|}{C}}-\overset{|}{\underset{|}{C}}-$, $\overset{|}{\underset{|}{C}}-C\equiv C-$ in decreasing order of bond length and give reason.

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41. Arrange HF, HCl, HBr, HI in decreasing order of bond length and give reason.

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42. Arrange H_2, O_2, N_2 in decreasing order of bond enthalpy.

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43. Which is the unit of Dipole moment ?

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44. Write equation of Dipole moment.

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45. What is the meaning, "Dipole moment is a vector quantity." How it is express ?

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46. Give dipole arrow of the following molecules.

(i) HF (ii) CO (iii)

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47. Give relation of polarity of polyatomic molecules and its bond polarity.

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48. Show dipole moment of H_2O and BeH_2 by figure .

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49. What is the difference of dipole moment of NH_3 and NF_3 molecules ?

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50. Show difference of polarity of N - 11 bond and N - F bond .

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51. How can decide which triatomic molecules are linear of the following ?

$H_2O, F_2O, BeH_2, BeCl_2, H_2S, CO_2$

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52. If AB_3 (For atom) molecule posses dipole moment zero and not zero than what is it indicate ?

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53. Which dipole moment of the following will zero ? NH_3, PH_3, BH_3, AIH_3 ?

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54. The μ of CH_4 and CCl_4 is zero. Than prediction of its shape and give reason of its right shape.

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55. Give Fajan rule.

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56. By which factor, the percentage of covalent character is decide ?

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57. Give order of repulsion of electron with central atom in covalent molecule.

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58. Which scientist are the VSEPR theory ?

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59. What is the meaning of VSEPR ?

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60. From AB_4, AB_4F, AB_4E, SF_4 is which type ?

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61. CIF_3 is which type from AB_3, AB_3E_2, AB_3E? How ?

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62. State the structure and shape of SF_4 and CIF_3.

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63. Give the different arrangement of electron pair in SF_4.

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64. Give the different arrangement of electron pair in CIF_3.

View Text Solution

65. Give the shape with electron pair inH_2O, NH_2, SO_2.

View Text Solution

66. State the limitations of Lewis theory.

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67. Which information is obtained by VSEPR and what is its limitation ?

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68. The direction of bond on central atom depends on which factor ?

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69. When the bond form according to VB theory ?

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70. When the bond not form between two atom as per VB theory ? Give e.g.

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71. In formation of methane the outermost p orbitals of carbon are at 90° still bond angle is not 90° ?

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72. Give number of π bond and sigma hond of the following.

(i) Methane (ii) Ethane (iii) Ethene (iv) Ethyne (v) dioxygen (vi) dinitrogen (vii) Benzene (viii) Ozone

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73. Which type of hybridization of the central atom in the following ?

PCl_5, SF_6, CCl_4, NH_3, $BeCl_2$, CO_2, BH_3, BCl_3

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74. Which orbitals of the following are overlapped and form σ bond ?

$1s-1s, 2s-2s, 1s-2s, 2p_x-2p_x, 2p_y-2p_y, 2p_z-2p_z$

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75. Which orbital are overleap and form π -bond ? When?

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76. Which type of shape have sp, sp^2, sp^3..... Hybrid orbitals ?

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77. Which type of covalent bond is form by hybrid orbitals ?

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78. Which orhital Is more negative form sp, sp^2 and sp^3 ? Why ?

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79. How it is decide the hybridization of atom is sp, sp^2 or sp^3 ?

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80. How the hybridization of carbon is decide on the base of structure in organic compounds ?

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81. Give bond angle and bond length of ethene.

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82. What is the value of bond angle in PCl_5 ?

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83. How the formation of molecular orbitals ?

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84. What is Ψ ?

View Text Solution

85. Which combination is not give molecular orbital from 1s - 1s and 1 s - 2s ? Why ?

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86. Which bond is formed by overlapping of $2p_x$ with $2p_y$? Why ?

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87. What is the similarity and difference in σ and π orbitals ?

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88. What is the difference in Mo energy level in Li_2 to N_2 and O_2 to Ne_2 ?

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89. Give bond length in Hydrogen, ethan, ethen, ethyne.

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90. Hydrogen bond is form in which molecules of the following ? Why ?

$CH_3OH, CH_3COOH, CH_3Cl, HF, C_6H_6, NH_3, NF_3$

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91. Give type of hydrogen bond in the following. Ice, water, liquid ammonia, O-nitrophenol, p-nitrophenol.

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92. State the relative stabiliry of N_2, N_2^+, N_2^- and N_2^{2+}.

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93. State tpe order of bond dissociation enthalpy in O_2, O_2^+, O_2^- and O_2^{2-}.

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94. Is Neyon molecule Ne_2 possible ? Why ?

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95. Give bond order of H_2^+, He_2^+, He_2^{2+}.

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96. Give bond order of NO, NO^+, CN, CN^- and CO.

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97. Why the similar bond order in N_2, NO^+, CN and CO ?

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98. Which bond angel is same in $H_2^+ He_2^-$ and He_2^{2-} ?

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99. Which are paramagnetic from O_2, O_2^- and O_2^2 ?

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100. Which contain more strong H-bond in the followi!)g pair ? (i) H_2O and H_2S (ii) NH_3 and PH_3 (iii) HF and HCl.

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101. In O_2^- and O_2^{2-} which has more bond order ?

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102. Which of the following molecule have least bond order ? O_2, O_2^+ and O_2^- ?

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103. When O_2^+ from O_2 and N_2^+ from N_2 are form then bond order is decrease or increase ?

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104. State the requirements to form hydrogen bond.

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105. Sigma bond is not f orme in which overlapping of the following ?

(i) $2p_y - 2p_y$(ii) $2p_z - 2p_z$ (iii) $2s - 2p_x$ (iv) $2p_x - 2p_x$

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106. Which bond angle is high from PH_3 and PH_4^+ ? Why ?

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107. How many total electrons are there in antibonding molecular orbital of O_2 ?

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Section C Multiple Choice Question Mcqs

1. Which of the following has maximum bond cell ?

A. H_2O

B. NH_3

C. CO_2

D. CH_4

Answer: C

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2. Which of the following is not a reason and structure of CO_2 ?

A. O = C = O

B. $^{+}O \equiv C - O^{-}$

C. $^{+}O - C \not\equiv O^{+}$

D. $^{-}O - C \equiv O^{+}$

Answer: C

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3. Which of the following has coordinate covalent bond?

A. H_2O

B. $CaCl_2$

C. O_3

D. N_2

Answer: C

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4. In which hybridization the maximum bond angle in following ?

A. sp

B. sp^2

C. sp^3

D. dsp^2

Answer: A

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5. Who proposed the valence bond theory ?

A. Powling

B. van der Waals

C. Lewis

D. Mulliken

Answer: D

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6. Which is the correct order number for bond length of C -O in CO, CO_3^{2-} and CO_2 ?

A. $CO_2 < CO_3^{2-} < CO$

B. $CO < CO_3^{2-} < CO_2$

C. $CO < CO_2 < CO_3^{2-}$

D. $CO_3^{2-} < CO_2 < CO$

Answer: C

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7. Which of the following molecule/ion have not unpaired /single electron ?

A. N_2^+

B. O_2^{2-}

C. O_2

D. B_2

Answer: B

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8. In which one, all the bonds are not equal ?

A. BF_4^-

B. NH_4^+

C. C_2H_4

D. $SiCl_4$

Answer: C

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9. Which one has least energy in given molecular orbitals ?

A. σ_{2p_z}

B. σ_{1s}

C. σ_{2s}^*

D. π_{2p_x}

Answer: B

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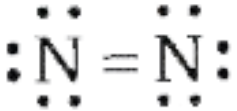
10. Which one is correct Lewis structure of N_2?

A.

B.

C.



D.

Answer: A

View Text Solution

11. In which molecule coordinate bond is not present?

A. H_3O^+

B. NH_4^+

C. BF_4^-

D. CO_3^{2-}

Answer: D

View Text Solution

12. In which molecule the bond is form by p - p overlapping ?

A. H_2

B. H_2O

C. HCl

D. Cl_2

Answer: D

View Text Solution

13. AB_3 molecule has trigonal pyramidal shape state no. of bonding and non bonding electrons ?

A. 3 and 1

B. 2 and 2

C. 1 and 3

D. 0 and 4

Answer: C

View Text Solution

14. In which hybridization 90° angle are more ?

A. dsp^2

B. sp^3d^2

C. dsp^3

D. sp^3 d

Answer: B

View Text Solution

15. Which one has strong H bonding from the following?

A. F - H .... F

B. O - H .... Br

C. O - H .... S

D. O - H ..... O

Answer: A

View Text Solution

16. Which compound has incomplete octet ?

A. BCl_3

B. NH_3

C. PCl_3

D. Icl

Answer: A

View Text Solution

17. Which compound has incomplete octet?

A. H_2O, sp^2, linear

B. $NH_4^+ dsp^2$ square planar

C. H_2O, sp^3 , angular

D. CH_4, dsp^3 tetrahedral

Answer: C

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18. Which one of the following is paramagnetic and having 0.5 bond order ?

A. O_2^-

B. N_2

C. F_2

D. H_2^+

Answer: D

View Text Solution

19. Which one is correct statement of the following?

A. H_2^+ and H_2^- both are equal stable

B. H_2^+ and H_2^- does not exist

C. H_2^+ is more stable than H_2^-

D. H_2^+ is less stable than H_2^-

Answer: A

View Text Solution

20. The bond length of H_2, F_2 and HF is 74 pm, 144 pm and 92 pm respectively. Which one is most stable ?

A. F_2

B. H_2

C. HF

D. All are equal

Answer: B

View Text Solution

21. State bond length of O - O and O = O in ozone.

A. 148, 121

B. 148188

C. 121, 108

D. 148, 148

Answer: A

View Text Solution

22. State nonbonding electron on P in PCl_5.

A. 5

B. zero

C. 3

D. 2

Answer: B

View Text Solution

23. What is the bond length in O_3 molecule ?

A. equal to O = O

B. equal to O - O

C. between O - O and O = O

D. All of these

Answer: C

View Text Solution

24. Which one has ions and covalent bond ?

A. KCl

B. KCN

C. O_2

D. C_2H_6

Answer: B

View Text Solution

25. Which orbitaJ has molecular symmetry ?

A. π

B. π^*

C. σ

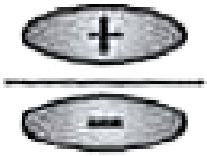
D. Ψ^*

Answer: C

View Text Solution

26. Which molecular orbital is form by positive overlapping of

A.



B.

C.

D. 

Answer: C

View Text Solution

27. As per MO theory last electron of N_2 filled in which molecular orbitaJ ?

A. σ_{MO}

B. π_{MO}

C. 2p

D. sp

Answer: A

View Text Solution

28. Which statement is not correct ?

A. σ -bond is weak than π - bond

B. σ-bond is strong than π-bond

C. C- C is shorter than C = C

D. double bond is stronger them single bond

Answer: A

View Text Solution

29. What is the correct bond order for given electron configuration ?

$(\sigma_{1s})^2(\sigma_{1s})^2(\sigma_{2s})^2(\sigma_{2s}^{\cdot})^2(\sigma_{2p_z})^1$

A. 0.5

B. 1

C. 0

D. 1.5

Answer: A

View Text Solution

30. What is correct for bond order ?

A. BO = ABMO no. of electrons - BMO no. of electrons no. of e^- in no. of e^- in

B. BO = $\frac{\text{BMO - ABMO}}{2}$ no. of e^- in no. of e^- in

C. $BO = \frac{\text{ABMO - BMO}}{2}$

D. BO = BMO - BMO

Answer: B

View Text Solution

Section C Mcqs Asked In Competitive Exam

1. Arrange according to bond order ?

A. NO $< C_2 < O_2^- < He^+$

B. $C_2 < NO < He^+ < O_2^-$

C. $He^+ < O_2^- < NO < C_2$

D. $He^+ < O_2^- < C_2 < NO$

Answer: D

View Text Solution

2. Which are has highest ONO bond angle ?

A. NO_3^-

B. NO_2^-

C. NO_2

D. NO_2^+

Answer: D

View Text Solution

3. Which is correct order of bond length ?

A. $O_2 < O_3 < O_2^{2-}$

B. $O_2 < O_2^{2-} < O_3$

C. $O_2^{2-} < O_3 < O_2$

D. $O = O_2^{2-} < O_3$

Answer: A

View Text Solution

4. Shape of XeF_4....

A. linear

B. pyramidal

C. tetrahedral

D. square planar

Answer: D

View Text Solution

5. Which one is correct order of dipole moment ?

A. $CH_4 < NF_3 < NH_3 < H_2O$

B. $NF_3 < CH_4 < NH_3 < H_2O$

C. $NH_3 < NF_3 < CH_4 < H_2O$

D. $H_2O < NH_3 < NF_3 < CH_4$

Answer: A

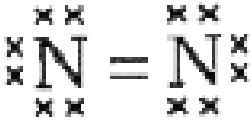
View Text Solution

6. Which is the correct Lewis structure of N_2 ?

A. 

B. 

C. 

D. 

Answer: A

View Text Solution

7. Which has strongest H-bond ?

A. S - H ..... O

B. O - H ..... S

C. F - H ..... F

D. O - H ..... N

Answer: C

View Text Solution

8. Shape of `PCl_(3) .....

A. Trigonal pyramidal

B. Tetrahedral

C. Pyramid

D. Square planar

Answer: C

View Text Solution

9. CaO and NaCl has same crystal structure and same radius if lattice enthalpy of NaCl is U than the lattice enthalpy of CaO is ?

A. $\frac{U}{2}$

B. U

C. 2U

D. 4U

Answer: D

View Text Solution

10. Which orbital's are equivalent in homonuclear molecule?

A. σ_{1s} and σ_{2s}

B. π_{2px} and π_{2py}

C. π_{2px} and σ_{2pz}

D. σ_{2px} and σ^*_{2pz}

Answer: B

View Text Solution

11. Which one is least evaporite?

A. HF

B. HCl

C. HI

D. HBr

Answer: A

View Text Solution

12. Max. H-bond in one molecule of water

A. 1

B. 2

C. 3

D. 4

Answer: D

View Text Solution

13. Which one is not tetrahedral ?

A. BF_4^-

B. NH_4^+

C. CO_3^{2-}

D. SO_4^{2-}

Answer: C

View Text Solution

14. Which one is diamagnetic ?

A. H_2^-

B. H_2^+

C. H_2

D. He_2^+

Answer: C

View Text Solution

15. When the chemical bond is formed .....

A. Electron and Nucleus repulsion increases.

B. Energy of system does not change.

C. Energy increases

D. Energy decreases.

Answer: D

View Text Solution

16. Melting point of covalent molecule is less because....

A. Molecules are attracted by van der Waals forces in covalent molecule.

B. Covalent bond are exothermic.

C. Covalent bond are weak than ionic bond.

D. Covalent molecule has definite shape

Answer: A

View Text Solution

17. Which one has highest melting point in given alkali chlorides ?

A. RbCl

B. KCl

C. NaCl

D. LiCl

Answer: C

View Text Solution

Section C Assertion And Reason Type Questions

1. Assertion: H_2 molecule is more stable than He.

Reason : Non-bonding pair in He make it unstable.

A. Assertion (A) and Reason (R) both are correct and (R) gives correct explanation.

B. Assertion (A) and Reason (R) correct, but Reason is not proper reason.

C. Assertion is correct, but Reason is wrong.

D. Assertion and Reason both incorrect.

Answer: C

View Text Solution

2. Assertion : HF_z^- ions exist in solid and liquid state but not exist in equines solution.

Reason : The Hydrogen bond HF - HF is more but Jess strong them HF and H_2O .

A. Assertion (A) and Reason (R) both are correct and (R) gives correct explanation.

B. Assertion (A) and Reason (R) correct, but Reason is not proper reason.

C. Assertion is correct, but Reason is wrong.

D. Assertion and Reason both incorrect.

Answer: A

View Text Solution

3. Assertion : The compounds having delocalised electron are more stable than compound having localised electron.

Reason : Due to the delocalised electron compound got more stability which is called resonance energy.

A. Assertion (A) and Reason (R) both are correct and (R) gives correct explanation.

B. Assertion (A) and Reason (R) correct, but Reason is not proper reason.

C. Assertion is correct, but Reason is wrong.

D. Assertion and Reason both incorrect.

Answer: B

View Text Solution

4. Assertion : Bond order of F_2 is one .

Reaso : ABMO electrons are 2 unit less than BMO.

A. Assertion (A) and Reason (R) both are correct and (R) gives correct explanation.

B. Assertion (A) and Reason (R) correct, but Reason is not proper reason.

C. Assertion is correct, but Reason is wrong.

D. Assertion and Reason both incorrect.

Answer: A

View Text Solution

Section C Mcqs Asked In Jee Neet Aieee

1. In which of the following pairs, the two species are Iso-structure ?

A. SO_3^{2-} and NO_3^-

B. BF_3 and NF_3

C. BrO_3^- and XeO_3

D. SF_4 and XeF_4

Answer: C

View Text Solution

2. The correct order of C - 0 bond length among CO, CO_3^{2-} and CO_2 is

A. $CO < CO_3^{2-} < CO_2$

B. $CO_3^{2-} < CO_2 < CO$

C. $CO < CO_2 < CO_3^{2-}$

D. $CO_2 < CO_3^{2-} < CO$

Answer: C

View Text Solution

3. The angular shape of ozone molecule (O_3) consists of :

A. I sigma and 2 pi bonds

B. 2 sigma and 2 pi bonds

C. 1 sigma and 1 pi bonds

D. 2 sigma and 1 pi bonds

Answer: D

View Text Solution

4. 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. $NO_2^+ < NO_2^- < NO$

Answer: B

View Text Solution

5. What is the dominant intermolecular force or bond that must be overcome in converting liquid CH_3OH to a gas ?

A. Dipole-dipole interaction

B. Covalent bonds

C. London dispersion force

D. Hydrogen bonding

Answer: D

View Text Solution

6. In which of the following pairs of molecules/ ions, the central atoms have sp^2 hybridization ?

A. NO_2^- and NH_3

B. BF_3 and NO_2^-

C. NH_2^- and H_2O

D. BF_3 and NH_2^-

Answer: B

View Text Solution

7. In which one of the following species the central atom has the type of hybridization which is not the same as that present in the other three ?

A. SF_4

B. I_3^-

C. $SbCl_5^{2-}$

D. PCl_5

Answer: C

View Text Solution

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

A. Similar in hybridization for the central atom with different structures.

B. Dissimilar in hybridization for the central atom with different structures.

C. Isostructural with same hybridization for the central atom.

D. Isostructural with different hybridization for the central atom.

Answer: B

View Text Solution

9. In which of the following molecules the central atom does not have sp^3 hybridization ?

A. NH_4^+

B. CH_4

C. SF_4

D. BF_4^-

Answer: C

View Text Solution

10. Considering the state of hybridization of carbon atoms, find out the molecule among the following which is linear ?

A. $CH_3 - CH = CH - CH_3$

B. $CH_3 - C \equiv \ - C - CH_3$

C. $CH_2 = CH - CH_2 - C \equiv CH$

D. $CH_3 - CH_2 - CH_2 - CH_3$

Answer: B

View Text Solution

11. The charge/size ratio of a cation determines its polarizing power. Which one of the following sequences represents the increasing order of the polarizing power of the cationic species, $K^+, Ca^{2+}, Mg^{2+}, Be^{2+}$?

A. $Ca^{2+} < Mg^{2+} < Be^{2+} < K^{+}$

B. $Mg^{2+} < Be^{2+} < K^{+} < Ca^{2+}$

C. $Be^{2+} < K^{+} < Ca^{2+} < Mg^{2+}$

D. $K^{+} < Ca^{2+} < Mg^{2+} < Be^{2+}$

Answer: D

View Text Solution

12. Which of the following sets of quantuin numbers represents the highest energy of an atom ?

A. n = 3 , l = 0 , m = 0, s = + $\frac{1}{2}$

B. n = 3 , l =1 , m = 1 , s = + $\frac{1}{2}$

C. n = 3 , l = 2 , m = 1 , s = + $\frac{1}{2}$

D. n = 4, l = 0, m = 0, s = + $\frac{1}{2}$

Answer: C

View Text Solution

13. Which of the following hydrogen bonds is the strongest ?

A. O - H ---F

B. O - H ---H

C. F - H ---F

D. O - H ----O

Answer: C

View Text Solution

14. Which one of the following pairs of species have the same bond order ?

A. NO^+ and CN^+

B. CN^- and NO^+

C. CN^- and CN^+

D. O_2^- and CN^-

Answer: B

View Text Solution

15. Which one of the following constitutes a group of the isoelectronic species?

A. N_2, NO^+, CO

B. C_2^{2-}, O_2^-, CO, NO

C. $NO^+, C_2^{2-}, CN^-, N_2$

D. $CN^-, N_2, O_2^{2-}, C_2^{2-}$

Answer: C

View Text Solution

16. In which of the following pairs the two species are not isostructural ?

A. PCl_4^+ and $SiCl_4$

B. PF_5 and BrF_5

C. AlF_6^{3-} and SF_6

D. CO_3^{2-} and NO_3^-

Answer: B

View Text Solution

17. The molecule having smallest bond angle is

A. $AsCl_3$

B. $SbCl_3$

C. PCl_3

D. NCl_3

Answer: B

View Text Solution

18. The electrons identified by quantum numbers n and l :

(1) n = 4, l = 1 (2) n = 4 , l = 0

(3) n = 3, l = 2 (4) n = 3, l = 1

can be placed in order of increasing energy as

A. $(4) < (2) < (3) < (1)$

B. $(2) < (4) < (1) < (3)$

C. $(1) < (3) < (2) < (4)$

D. $(3) < (4) < (2) < (1)$

Answer: A

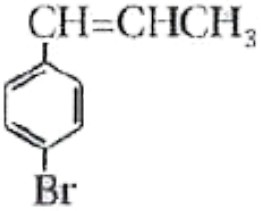
View Text Solution

19. The reaction of $C_6H_5CH = CHCH_3$ with HBr porduces :

A. $C_6H_5\underset{Br}{C}HCH_2CH_3$

B. $C_6H_5CH_2\underset{Br}{C}HCH_3$

C. $C_6H_5CH_2CH_2CH_2Br$

D. 

Answer: A

View Text Solution

20. The correct bond order in the following specie is :

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

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

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

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

Answer: D

View Text Solution

21. Which of the following pairs of ions are isoelectronic and isostructural ?

A. CO_3^{2-}, SO_3^{2-}

B. ClO_3^-, CO_3^{2-}

C. SO_3^{2-}, NO_3^-

D. CIO_3^-, SO_3^{2-}

Answer: D

View Text Solution

22. Which of the following options represents the correct bond order ?

A. $O_2^- > O_2 > O_2^+$

B. $O_2^- < O_2 < O_2^+$

C. $O_2^- > O_2 < O_2^+$

D. $O_2^- < O_2 > O_2^+$

Answer: B

View Text Solution

23. Decreasing order of stability of O_2, O_2^-, O_2^+ and O_2^{2-} is :

A. $O_2 > O_2^+ > O_2^{2-} > O_2^-$

B. $O_2^- > O_2^{2-} > O_2^+ > O_2$

C. $O_2^+ > O_2 > O_2^- > O_2^{2-}$

D. $O_2^{2-} > O_2^- > O_2 > O_2^+$

Answer: C

View Text Solution

24. The nun1ber of water molecules is maximum in :

A. 18 gram of water

B. 18 moles of water

C. 18 molecules of water

D. 1.8 gram of water

Answer: B

View Text Solution

25. The variation of the boiling points of the hydrogen halides is in the order HP $> HI > HBr > HCl.$

What explains the higher boiling point of hydrogen fluoride?

A. The bond energy of HF molecules is greater than in other hydrogen halides.

B. The effect of nuclear shielding is much reduced in fluorine which polarises the HF molecule.

C. The electronegat:ivity of fluorine is much higher than for other elements in the group

D. There is strong hydrogen bonding between HF molecules.

Answer: D

View Text Solution

26. Predict the correct order among the following:

A. lone pair - lone pair $>$ bond pair - bond pair $>$ lone pair - bond pair

B. bond pair - bond pair $>$ lone pair - bond pair $>$ lone pair - lone pair

C. lone pair - bond pair $>$ bond pair - bond pair $>$ lone pair - lone pair

D. lone pair - lone pair $>$ lone pair - bond pair $>$ bond pair - bond pair

Answer: D

View Text Solution

27. Consider the molecules CH_4, NH_3 and H_2O. Which of the given statements is false ?

A. The H-0-H bond angle in H_2O is larger than the H-C-H bond angle in CH_4.

B. The H-0--H bond angle in H_2O is smaller than the H-N-H bond angle in NH_3 .

C. The H-C- H bond angle in CH_4 is larger than the H- N -H bond angle in NH_3.

D. The H-C-H bond angle in CH_4, the H - N - H bond angle in NH_3, and the H-O-H bond angle in H_2O are all greater than 90°.

Answer: A

View Text Solution

28. Which one of the following compounds shows the presence of intra molecular hydrogen bond?

A. Cellulose

B. Concentrated acetic acid

C. H_2O_2

D. HCN

Answer: A

View Text Solution

29. The hybridizations of atomic orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ respectively are

A. sp, sp^2, sp^3

B. sp^2, sp, sp^3

C. sp, sp^3, sp^2

D. sp^2, sp^3, sp

Answer: A

View Text Solution

30. Which o f the following species is not paramagnetic ?

A. NO

B. CO

C. O_2

D. B_2

Answer: B

View Text Solution

31. Which of the following hydrides has the largest bond angle ?

A. H_2S

B. H_2Te

C. H_2O

D. H_2Se

Answer: C

View Text Solution

Section C Mcqs Asked In Board Exam

1. Which of the following statement is not correct ?

A. Linear combination of s - s and s - p type of orbital gives σ and π type molecular orbitals respectively.

B. Combining atoms must be near as possible to the bond axis

C. Symmetry of the atomic orbitals of combining atoms must be same.

D. Atomic orbitals of the combining atoms must possess similar energies.

Answer: A

View Text Solution

2. What is the molecular type of T-shaped molecule ?

A. AB_4E_2

B. AB_2E_2

C. AB_3E_2

D. AB_4E

Answer: C

View Text Solution

3. What will be the molecular orbital order of CO molecule ?

A. $\pi 2p_x = \pi 2p_y > \sigma 2p_z$

B. $\pi 2p_x = \pi 2p_y < \sigma 2p_z$

C. $\pi 2p_x = \pi * 2p_y > \sigma \cdot 2p_z$

D. (A) and (C) are correct

Answer: B

View Text Solution

4. Which type of bond is observed in O-Chlorophenol ?

A. Metallic bond

B. Intrarnolecular Hydrogen bond

C. Ionic bond

D. Intermolecular Hydrogen bond

Answer: B

View Text Solution

5. 1n which of the following compounds the rule , of octet is not obeyed ?

A. H_2O

B. PCl_5

C. NH_3

D. CH_4

Answer: B

View Text Solution

6. Which one of the following has both ionic and covalent bond ?

A. CH_4

B. KCN

C. O_2

D. KCl

Answer: B

View Text Solution

7. Which one of the following statement is incorrect ?

A. Stability decreases with increase in size of central atom.

B. Resonance structure give S!ability to a I molecule.

C. Bond polarity can be explained on the basis of Lewis principle.

D. Geometrical shape of BF_4^{-1} is tetrahedral.

Answer: C

View Text Solution

8. Which type of bond is observed in Ethane 1, 2-diol in the given option ?

A. Co-ordinate covalent bond

B. Ionic bond

C. Intra molecular H-bond

D. Inter molecular H-bond

Answer: C

View Text Solution

9. Identify the molecule with zero dipole moment.

A. CCl_4

B. NF_3

C. $CHCl_3$

D. H_2 S

Answer: A

View Text Solution

10. Which of the following species has diamagnetic property ?

A. O_2^{2+}

B. O_2^{1-}

C. O_2

D. O_2^{1+}

Answer: A

View Text Solution

11. Which of the following molecular type will have seesaw shape ?

A. AB_2E_2

B. AB_3E

C. AB_3E

D. AB_5E

Answer: C

View Text Solution

12. The difference in geometrical shape of the molecule is not dependent on...

A. Hybridization

B. Bonding electron pair

C. Non-bonding electron pair

D. Resonance

Answer: D

View Text Solution

13. A covalent molecule AB_3 has trigonal pyramidal structure. The number of lone pair and bonding pair of electrons in the molecule are ..... .

A. 2 and 2

B. 3 and 1

C. 1 and 3

D. 0 and 4

Answer: C

View Text Solution

14. Which of the following molecules is polar and possesses zero dipole moment ?

A. Cl_2

B. BF_3

C. NH_3

D. HCl

Answer: B

View Text Solution

15. In ..... the intramolecular H-bond is present.

A. p- chlorophenol

B. ethan-1, 2- diol

C. HF

D. All of these

Answer: B

View Text Solution

16. Identify the wrong statement from the statements given below.

A. Geometrical structwe of BrF_5 is square pyramidal.

B. Bond order and Bond energy of a molecule are directly related

C. H-O-H bond angle in water molecule is $104^\circ.30'$ because O atom is sp^3 hybridized.

D. Strength of σ bond is related to the magnitude of overlap of atomic orbitals.

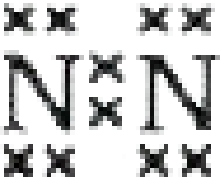
Answer: C

View Text Solution

17. Which of the following is shown the Lewis formation of N_2 ?

A. 

B. 

C. 

D. 

Answer: D

View Text Solution

18. When N_2 molecule accept electron and form N_2^- then added electron enter in ..... orbital.

A. Antibonding (σ^*)molecular orbital

B. Bonding (π) molecular

C. Bonding (σ) molecular

D. Antibonding π^* molecular orbital

Answer: D

View Text Solution

19. Which of the following statements is correct for metallic bond.?

A. Metallic bond possesses directional property.

B. Metals have sufficient electrons to form covalent bond .

C. Positively charged part of the atom with the nucleus except valence orbit is called atomic kernel.

D. The repulsion between positively charged kernel and delocalised electron is known as metallic bond.

Answer: C

View Text Solution

20. Which of the following molecules has the electronic configuration ?

$(\sigma 1s)^2, (\sigma^* 1s)^2, (\sigma 2s)^2, (\sigma^* 2s)^2 (\pi 2p_x)^2 = (\pi 2p_y)^2, (\sigma 2p_z)^2$

A. CO

B. NO

C. O_2

D. F_2

Answer: A

View Text Solution

21. The hydrogen bond is strongest in ..... .

A. O - H----S

B. O - H---N

C. F - H----F

D. O - H---O

Answer: C

View Text Solution

22. Choose the correct option for bond order and stability for Be_2 molecule.

A. 2, stable

B. 2, unstable

C. 0, stable

D. 0, unstable

Answer: D

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23. On which of the following factors, inter- molecular force of attraction docs not depend ?

A. Shape of molecules

B. Number of electrons present in the molecule

C. Number of protons present in the molecule.

D. Contact surface of molecules.

Answer: C

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24. Which substance present in cotton cloth forms Hydrogen bond with Water ?

A. Nucleic acid

B. Cellulose

C. Phenol

D. RNA

Answer: B

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25. In which state of matter, hydrogen bond can exist?

A. Only solid

B. Only liquid

C. Only gas

D. Solid, Llquid, Gas

Answer: D

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26. The types of Carbon atoms present in isobutanc are ..... .

A. only 1° and 2° C-atoms

B. only 1° and 3° C- atoms

C. only $1^\circ, 2^\circ$ and 3° C-atoms

D. only $1^\circ, 3^\circ$ and 4° C -atoms

Answer: B

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Section D Solutions Of Ncert Exemplar Problems Mcqs

1. Isostructural species are those which have the same shape and hybridization. Among the given species identify the isostructural pairs.

A. $[NF_3 \text{ and } BF_3]$

B. $[BF_4^- \text{ and } NH_4^+]$

C. $[BCl_3 \text{ and } BrCl_3]$

D. $[NH_3 \text{ and } NO_3^-]$

Answer: B

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2. Polarity in a molecule and hence the dipole moment depends prl marily on electro- negativity of the constituent atoms and shape of a molecule. Which of the following has the highest dipole moment ?

A. CO_2

B. HI

C. H_2O

D. SO_2

Answer: C

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3. The types of hybrid orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ respectively are expected to be

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

Answer: B

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4. Hydrogen bonds are formed in many compounds e.g., H_2O, HF, NH_3. The boiling on the such compounds depends to a extent on the strength of hydrogen bond and the number of hydrogen bonds. The correct decreasing order of the boiling points of above compounds is :

A. $HF > H_2O > NH_3$

B. $H_2O > HF > NH_3$

C. $NH_3 > HF < H_2O$

D. $NH_3 > H_2O > HF$

Answer: B

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5. In PO_4^{3-} ion the formal charge on the oxygen atom of P-O bond is

A. $+1$

B. -1

C. -0.75

D. $+0.75$

Answer: C

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6. In NO_3^- ion, the number of bond pairs and lone pa1rs of electrons on nitrogen atom are

A. 2,2

B. 3,1

C. 1,3

D. 4,0

Answer: D

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7. Which of the following species has tetrahedral geometry ?

A. BH_4^-

B. NH_2^-

C. CO_3^{2-}

D. H_3O^+

Answer: A

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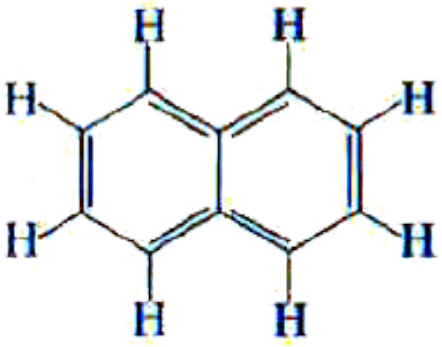
8. Number of π bonds and σ bonds in the following structure is



Biphenyl

A. 6,19

B. 4,20

C. 5,19

D. 5, 20

Answer: C

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9. Which molecule/ion out or the following does not contain unpaired electrons ?

A. N_2^+

B. O_2

C. O_2^{2-}

D. B_2

Answer: C

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10. In which of the following molecule/ion aU the bonds are not equal ?

A. XeF_4

B. BF_4^-

C. C_2H_4

D. SiF_4

Answer: C

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11. In which of the following substances will hydrogen bond be strongest ?

A. HCI

B. H_2O

C. HI

D. H_2S

Answer: B

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12. If the electronic configuration of an element is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$, the four electrons involved in chemical bond formation will be

A. $3p^6$

B. $3p^6, 4s^2$

C. $3p^6, 3d^2$

D. $3d^2, 4s^2$

Answer: D

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13. Which of the following angle corresponds to sp^2 hybridization ?

A. 90°

B. 120°

C. 180°

D. 109°

Answer: B

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14. Stable form of A may be represented by the formula :

A. A

B. A_2

C. A_3

D. A_4

Answer: A

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15. Stable form of C may be represented by the formula :

A. C

B. C_2

C. C_3

D. C_4

Answer: B

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16. The molecular fo rmula of the compound formed from 8 and C will be

A. BC

B. B_2C

C. BC_2

D. BC_3

Answer: D

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17. The bond between B and C will be ...

A. ionic

B. covalent

C. hydrogen

D. coordinate

Answer: B

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18. Which of the following order of energies of molecular orbitals of N_2 is correct ?

A. $(\pi 2p_y) < (\sigma 2p_z) < (\pi * 2p_x) = (\pi^* 2p_y)$

B. $(\pi 2p_y) > (\sigma 2p_z) > (\pi * 2p_x) = (\pi^* 2p_y)$

C. $(\pi 2p_y) < (\sigma 2p_z) < (\pi * 2p_x) = (\pi^* 2p_y)$

D. $(\pi 2p_y) > (\sigma 2p_z) < (\pi * 2p_x) = (\pi^* 2p_y)$

Answer: A

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19. Which of the following statement is not correct from the view point of molecular orbital theory ?

A. Be_2 is not a stable molecule

B. He_2 is not stable but He_2^+ is expected to exist .

C. Bond strength of N_2 is maximum amongst the homonuclear diatomic molecules belonging to the second period .

D. The order of energies of molecular orbitals in N_2 molecule is

$$\sigma 2s < \sigma^* 2s < \sigma 2p_z < \left(\pi 2p_x = \pi 2p_y\right) < \left(\pi^* 2p_x = \pi^* 2p_y\right) < \sigma 2p_z$$

Answer: D

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20. Which of the following options represents the correct bond order ?

A. $O_2^- > O_2 > O_2^+$

B. $O_2^- < O_2 < O_2^+$

C. $O_2^- > O_2 < O_2^+$

D. $O_2^- < O_2 > O_2^+$

Answer: B

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21. The electronic configuration of the outer most sheU of the most electronegative element is

A. $2s^2 2p^5$

B. $3s^2 3p^5$

C. $4s^2 4p^5$

D. $5s^2 5p^5$

Answer: A

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22. Amongst the following elements whose electronic configurations are given below, the one having the highest ionisation enthalpy is

A. [Ne] $3s^2 2p^1$

B. [Ne] $3s^2 3p^3$

C. [Ne]$3s^2 3p^2$

D. [Ar]$3d^{10} 4s^2 4p^3$

Answer: C

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Section D Solutions Of Ncert Exemplar Problems Mcqs More Than One Options

1. Which of the following have identical bond order ?

A. CN^-

B. NO^+

C. O_2^-

D. O_2^{2-}

Answer: A::B

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2. Which of the following attain the linear structure :

A. $BeCl_2$

B. NCO^+

C. NO_2

D. CS_2

Answer: A::D

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3. CO is isoelectronic with

A. NO^+

B. N_2

C. $SnCl_2$

D. NO_2^-

Answer: A::B

View Text Solution

4. Whk h of the following species have the same shape?

A. CO_2

B. CCl_4

C. O_3

D. NO_2^-

Answer: C::D

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5. Which of the following statements are correct about CO_3^{2-} ?

A. The hybridization of central atom is sp^3 .

B. Its resonance structure has one C - O single bond and two C = O double bonds.

C. The average formal charge on each oxygen atom is 0.67 units

D. All C - O bond lengths are equal

Answer: C::D

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6. Diamagnetic species are those which contain no unpaired electrons. Which among the following are diamagnetic ?

A. N_2

B. N_2^{2-}

C. O_2

D. O_2^{2-}

Answer: A::D

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7. Species having same bond order are :

A. N_2

B. N_2^-

C. F_2^+

D. O_2^-

Answer: C::D

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8. Which of the following statements are not correct ?

A. NaCl being an ionic compound is a good conductor of electricity in the solid state.

B. In canonical structures there is a difference in the arrangement of atoms.

C. Hybrid orbitals form stronger bonds than pure orbitals.

D. VSEPR theory can explain the square planar geometry of XeF_4.

Answer: A::B

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Section D Solutions Of Ncert Exemplar Problems Short Answer Type Questions

1. Explain the non-linear shape of H_2S and a non-planer shape of PCl_3 using valence shell elecilron pair repuJsion theory.

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2. Using molecular orbital theory, compare the bond energy and magnetic character of O_2^+ and O_2^- species.

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3. Explain the shape of BrF_5.

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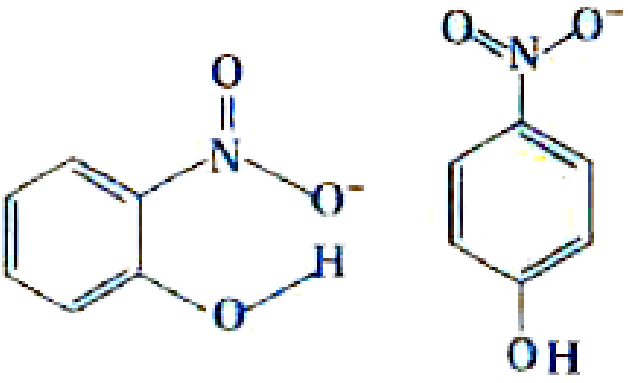
4. Structures of molecules of two compounds are given below :



(i) (ii)

(a) Which of the two compounds will have intennolecular hydrogen bonding and which compound is expected to show intramolecular hydrogen bonding.

(b) The melting point of a cornpound depends on, among other things, the extent of hydrogen bonding. On this basis explain which of the above two cornpounds will show higher melting point.

(c) Solubility of compounds in water depends on power to form hydrogen bonds with water. Which of the above compounds will form hydrogen bond with water easily and be more soluble in it.

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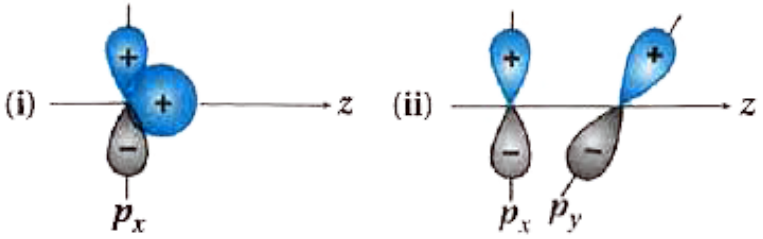
5. Why does type or overlap given in the following figure not result in bond formation ?



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6. Explain why PCl_5 is trigonal bipyramidal whereas IF_5 is square pyramidal.

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7. In both water and dJmethyl ether $\left(CH_3 - \ddot{\underset{\cdot\cdot}{O}} - CH_3\right)$, oxygen atom is central atom, and has the same hybridization, yet they have different bond angles. Which one has greater bond angle ? Give reason.

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8. Write Lewis structure or the following compounds and show formal charge on each atom . HNO_3, NO_2, H_2SO_4

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9. The energy of $\sigma 2p_z$ molecular orbital is greater than $\pi 2p_x$ and $\pi 2p_y$ molecular orbitals in nitrogen molecule. Write the complete sequence of energy levels in the increasing order of energy In the n1olecule. Compare the relative stability and the magnetic behaviour of the foUowing species : N_2, N_2, N_2^-, N_2^{2+}

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10. What is the effect of the following processes on the bond order in N_2 and O_2?

(A) $N_2 \rightarrow N_2^+ + e^-$ (B) $O_2 \rightarrow O_2^+ + e^-$

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

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12. Water molecule has bent structure whereas carbon dioxide molecule is linear

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13. Ethyne molecule is linear

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14. Whal is an ionic bond ? With two suitable examples explain the difference between an ionic and a covaJent bond ?

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15. Arrange the following bonds in order of increasing ionic character giving reason.

N - H , F - H , C - H and O - H

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16. Explain why $CO_{3^{2-}}$ ion cannot be represented by a single Lewis structure. How can it be best represented?

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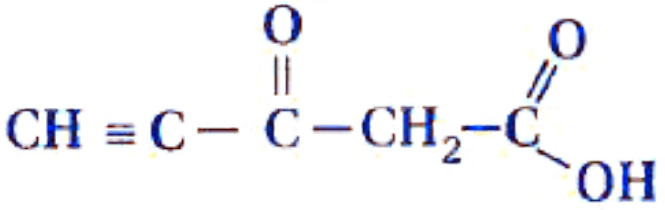
17. Predict the hybridization of each carbon in the molecule of organic compound given below. Also Indicate the total number of sigma and pi

bonds in this molecule.



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18. Group the following as linear and non-linear molecules: $H_2O, HOCl, BeCl_2, Cl_2O$

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19. Elements X, Y and Z have 4, 5 and 7 valence electrons respectively,

(a) Write the molecular formula of the compounds formed by these elements individually with hydrogen.

(b) Which of these compounds will have the highest dipole moment ?

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20. Draw the resonating structure of

(A) Ozone molecule (B) Nitrate ion

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21. Predict the shapes of the following molecules on the basis of hybridization.

BCl_3, CH_4, CO_2, NH_3

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22. All the C - O bonds in carbonate ion $\left(CO_3^{2-}\right)$ are equal in length - Explain.

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23. What is meant by the term average bond enthalpy ? Why is there difference in bond enthalpy of O - H bond in ethanol (C_2H_5OH) and water ?

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Section D Solutions Of Ncert Exemplar Problems Match The Columns

1. Match the species in Column-I with the type of hybrid orbitals in Column-II :

Column-I	Column-II
(A) SF_4	(1) sp^3d^2
(B) IF_5	(2) d^2sp^3
(C) NO_2^+	(3) sp^3d
(D) NH_4^+	(4) sp^3
	(5) sp

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2. Match the species in Column-I with the geometry/ shape in Column-II :

Column-I	Column-II
(A) H_2O^+	(1) Linear
(B) HC ≡ CH	(2) Angular
(C) ClO_2^-	(3) Tetrahedral
(D) NH_4^+	(4) Trigonal bipyramidal
	(5) Pyramidal

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3. Match the species in Column I with the bond order in Column II :

Column-I	Column-II
(A) NO	(1) 1.5
(B) CO	(2) 2.0
(C) O_2^-	(3) 2.5
(D) O_2	(4) 3.0

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4. Match the items given in Column-I with exrunples given in Column-II.

Column-I	Column-II
(A) Hydrogen bond	(1) C
(B) Resonance	(2) LiF
(C) Ionic solid	(3) H_2
(D) Covalent solid	(4) HF
	(5) O_3

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5. Match the shape of molecules in Column-I with the type of hybridization in Column-11.

Column-I	Column-II
(A) Tetrahedral	(1) sp^2
(B) Trigonal	(2) sp
(C) Linear	(3) sp^3

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Section D Solutions Of Ncert Exemplar Problems Assertion And Reason

1. Assertion (A) : Sodium chloride formed by the action of chlorine gas on sodium metal is a stable compound.

Reason (R) : This is because sodium and chloride ions acquire octet in sodium chloride formation.

A. A and R both are correct, and R is the correct explanation of A.

B. A and R both are correct, but R is not the correct explanation of A.

C. A is true but R is false.

D. A and R both are false.

Answer: A

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2. Assertion (A) : Though the central atom of both NH_3 and H_2O molecules are sp^3 hybridised, yet H - N - H bond angle is greater than that of H- 0 - H.

Reason (R) : This is because nitrogen atom has one lone pair and oxygen atom has two lone pans.

A. A and R both are correct, and R is the correct explanation of A.

B. A and R both are correct, but R is not the : correct explanation of A.

C. A is true but R is false.

D. A and R both are false.

Answer: A

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3. Assertion (A) : Among the two O - H bonds in H_2O molecule, the energy required to break the first O - H bond and the other O - H bond is the same.

Reason (R) : This is because the electronic environment around oxygen is the same even after breakage of one O - H bond.

A. A and R both are correct, and R is correct explanation of A.

B. A and R both are correct, but R is not the correct explanation of A.

C. A is true but R is false.

D. A and R both are false.

Answer: D

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Section D Solutions Of Ncert Exemplar Problems Long Answer Type Questions

1. Discuss the significance/ applications of dipole moment.

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2. Represent diagrammatically the bond moments and the resultant dipoJe moment in CO_2, NF_3 and CHCl.

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3. Use the molecular orbital energy level diagram to show that N_2 would be expected to have a triple bond, F_2 a single bond and Ne_2, no bond.

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4. Briefly describe the valence bond theory of covalent bond formation by taking an example of hydrogen. How can you interpret chergy changes taking place in the formation of dihydrogen ?

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5. Describe hybridization in the case of PCl_5, and SF_6 . The axial bonds are longer as compared to equatorial bonds in PCl_5 whereas in SF_6 both axial bonds and equatorial bonds have the same bond length Explain.

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6. (a) Discuss the concept of hybridization. What are its different types in a carbon atom.

(b) What is the type of hybridiz.ation of carbon atoms marked with star.

(a) $\dot{C}H_2 = CH - CH - \cdot \overset{\overset{O}{||}}{C} - O - H$

(b) $CH_3 - \dot{C}H_2 - OH$

(c) $CH_3 - CH_2 - \overset{\overset{O}{||}}{C}\cdot - H$

(d) $\dot{C}H_3 - CH = CH - CH_3$

(e) $\dot{C}H_3 - \dot{C} \equiv CH$

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7. Which of the following statements is correct ?

A. In the formation of dioxygen from oxygen atoms 10 molecular orbitals will be formed.

B. All the molecular orbitals in the dioxygen will be completely filled.

C. Total number of bonding molecular orbitals will not be same as total number of anti bonding orbitals in dioxygen.

D. Number of filled bonding orbitals will be same as number of filled anti bonding orbitals.

Answer: A

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8. Which or the following molecular orbitals has maximum number of nodal planes ?

A. $\sigma^* 1s$

B. $\sigma^* 2p_z$

C. $\pi 2p_x$

D. $\pi^* 2p_y$

Answer: B

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9. Which of the following pair is expected to have the same bond order ?

A. O_2, N_2

B. O_2^+, N_2^-

C. O_2^-, N_2^+

D. O_2^- , N_2^- ,

Answer: B

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10. In which of the following molecules, $\sigma 2p_z$ molecular orbital is filled after $\pi 2p_x$ and $\pi 2p_y$ molecular orbitals ?

A. O_2

B. Ne_2

C. N_2

D. F_9

Answer: C

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