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CHEMISTRY

BOOKS - A N EXCEL PUBLICATION

CHEMICAL BONDING AND MOLECULAR STRUCTURE

Question Bank

1. Write the Lewis dot structure of CO molecule.

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2. Write the Lewis structure of the nitrite ion, NO_2^- .

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3. Explain the struture of CO_3^{-2} ion in terms of resonance.

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4. Explain the structure of CO_2 molecule.

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5. Draw the Lewis structures for the following molecules and ions:

H_2S,$SiCl_4$,BeF_2,CO_3^2, HCOOH

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6. Disuss the shapes of the following molecules using VSEPR theory:

$BeCl_2$,BCl_3,$SiCl_4$, H_2S, PH_3

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

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8. How is bond strength related to bond order?

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9. Write the resonance structures of SO_3, NO_2 and NO_3^-

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10. Although both CO_2 and H_2O are triatomic molecules.,the shape of H_2O molecular is bent while that of CO_2 is linear. Explain these on the basis of dipole moment.

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11. Arrange the bonds in the order of increasing ionic character in the following molecules:LiF,K_2O, N_2, SO_2 and ClF_3

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12. Explain why BeH_2 molecule has zero diple moment even though the $Be - H$ bond are polar.

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

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14. Disuss the change in hybridisation of Al atom in the following reaction

`AlCl_3+Cl^1 rarr AlCl_4^-

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15. Is there any change in the hybridisation 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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16. Considering x- axis as the internuclear axis,which out of the following will not form a sigma bond and why?

A. $1s \& 1s$

B. $1s \& 2P_x$

C. $2P_y \& 2P_y$

D. $1s \& 2s$

Answer: C

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17. Which hybird orbitals are used by carbon atoms in the following molecules?

$CH_3 - CH_3$

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18. Which hybird orbitals are used by carbon atoms in the following molecules?

$CH_3 - CH = CH_2$

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19. Which hybird orbitals are used by carbon atoms in the following molecules?

$CH_3 - CH_2 - OH$

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20. Which hybird orbitals are used by carbon atoms in the following molecules?

$CH_3 - CHO$

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21. Which hybird orbitals are used by carbon atoms in the following molecules?

$CH_3 - COOH$

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22. What do you understand by bond pairs and lone pairs of electrons? Illustrate with example.

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23. What is the hybridisation of p in PCl_5. Why are axial $P-Cl$ bonds longer than the equatorial bonds?

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24. Define bond order according to the M.O.theory.

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25. The stability and magnetic properties of a molecule can be well explained using the molecular orbital theory developed by F Hung and R.S.Mulliken.Draw the energy level diagram for the formation of the O_2 molecule.

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26. Calculate the bond order of O_2 molecule.

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27. VSEPR theory is used to predict the shape of covalent molecules.State the main postulates of VSEPR theory.

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28. VSEPR theory is used to predict the shape of covalent molecules.Based on VSEPR theory predict the shape of H_2O and NH_3

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29. The attractive force which holds atoms together in a molecule is called a chemical bond.Explain the formation of a H_2 molecule on the basis of the valence bond theory (VBT)

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30. The attractive force which holds atoms together in a molecule is called a chemical bond.Using the molecular orbital theory (MOT), explain why a Ne_2 molecule does not exist.

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31. Calculate the bond order of dinitrongen (N_2).

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32. Hydrogen bonding plays an important role in determining the physical properties of substances.Illustrate hydrogen bonding using an example.

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33. Hydrogen bonding plays an important role in determining the physical properties of substances.Compare the boiling points of o-nitrophenol and p-nitrophenol based on hydrogen bonding.

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34. Describe the hybridisation and structure of PCl_5 molecule.

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35. Valence Bond Theory (VBT) and Molecular Orbit Theory (MOT) are two important theories of chemical bonding.Out of the following,which is the hybridisation of phosphorus in PCl_5?$\left(sp^2, sp^3, dsp^2, sp^3d\right)$

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36. Valence Bond Theory (VBT) and Molecular Orbit Theory (MOT) are two important theories of chemical bonding.Explain the geometry of PCl_5 molecule and account for its high reactivity.

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37. write the molecular orbital electronic configuration of C_2 molecule and calculate its bond order.

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38. The ionic bond has partial covalent character and the covalent bonds also show some ionic character. Explain the covalent character of LiCl using Fajan's rule

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39. NF_3 and NH_3 show dipole moment.But the dipole moment of NF_3 is less than that of NH_3.Why?

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40. The covalent bond can be explained by molecular orbital theory.Using M.O. diagram,Explain the paramagnetic nature of oxygen molecule.

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41. The Valence Shell Electron pair Repulsion (VSEPR) theory helps in predicting the shapes

of covalent molecules. Arrange the bond pair electron and ione pair electron in the decreasing order of the replusive interactions among them.

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42. The Valence Shell Electron pair Repulsion (VSEPR) theory helps in predicting the shapes of covalent molecules. A molecule of the type, AB_3E_2 has three bond pairs and two lone

pairs of electrons. Predict the most stable arrangement of electron pairs in the molecule.

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43. How is bond order related to bond length?

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44. Write the electronic configuration of an oxygen molecule and justify its magnetic nature.

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45. Only valence electrons of atoms take part in chemical combination. Draw the Lewis representation of NF_3

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46. Define dipole moment.

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47. Based on M.O elecrtonic configuration, compare the magnetic property of O_2 and O_2^{2-}

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48. He_2 cannot exist as stable molecule. Justify this statement on the basis of bond order.

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49. State Fajan's rule regarding the partial covalent character of an ionic bond.

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50. Which has higher boiling point: o-nitrophenol or p-nitophenol? Give reason.

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51. Molecular orbitals are formed by the linear combination of atomic orbitals (LCAO). Give the salient features of the molecular orbital theory.

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52. Explain sp^3d hybridization with a suitable example.

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53. The shapes of the molecules is based on the VSEPR theory. Give the salient features of this theory.

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54. Draw the potential energy curve for the formation of a hydrogen molecule on the basis of the internuclear distance of the hydrogen atomes.

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55. One-half of the difference between the number of electrons in the bonding and antibonding molecular orbitals is called

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56. Calculate the bond order of dinitrogen(N2)

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57. Predict stability and magnetic property of N_2 with reasons

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58. In order to explain the geometrical shapes of molecules, the concept of hybridisation was introduced. The geometry of SF_6 molecule is

A. tetrahedral

B. Planar

C. octahedral

D. triagnonal bipyramidal

Answer:

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59. In order to explain the geometrical shapes of molecules, the concept of hybridisation was introduced. Define the term, hybridisation

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60. Explain sp^3 hybridisation taking methane (CH_4) as an example

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61. Write the molecular orbital configuration of F_2 molecule

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62. What is bond order?

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63. Give any two factors influencing the formation of an ionic bond

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64. Give the shape of NH_4^+

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65. Give the shape of $HgCl_2$

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