CBSE

CHEMICAL BONDING AND MOLECULAR STRUCTURE WS 1

Class 11 - Chemistry

1. The structure of IF_7 is **[1]**

   a) Octahedral
   b) Square pyramid
   c) Trigonal bipyramid
   d) Pentagonal bipyramid

2. Which of the following species has tetrahedral geometry? **[1]**

   a) H_3O^+
   b) CO_3^{2-}
   c) BH_4^-
   d) NH_2^-

3. The decreasing order of the repulsive interaction of electron pairs is (Here, Ip = lone pair, bp = bond pair) **[1]**

   a) Ip-lp > Ip-bp > bp-bp
   b) bp-bp > Ip-lp > Ip-bp
   c) Ip-lp > bp-bp > Ip-bp
   d) p-bp > Ip-lp > bp-bp

4. Rank the following bonds in order of increasing polarity: H-N, H-O, H-C. **[1]**

   a) H-C < H-N < H-O.
   b) H - C < H-O < H-N.
   c) H-O < H-N < H-C
   d) H-N < H-O < H-C

5. When O_2 is converted into O_2^+ **[1]**

   a) paramagnetic character increases
   b) both paramagnetic character and bond order increase
   c) paramagnetic character decreases and the bond order increases
   d) bond order decreases

6. The electronegativity difference (ΔEN) is large in one of the following: **[1]**

   a) Metal and a Nonmetal
   b) Two nonmetals
   c) Hydrogen and Helium
   d) Two metals

7. A molecule or ion is stable if: **[1]**

   a) $N_b = N_a$
   b) $N_a \times N_b = 1$
   c) $N_a < N_b$
   d) $N_b < N_a$

8. Based on VSEPR theory, the number of 90^0 F — Br — F angles in BrF_5 is: **[1]**

   a) 8
   b) 2
   c) 4
   d) 0

9. Which of the following has maximum number of lone pairs associated with Xe? **[1]**

   a) XeF_2
   b) XeF_6

c) XeF_4 d) XeO_3

10. Dipole moment is usually designated by a Greek letter μ **[1]**

$\mu = Q \times r$

Here, Q and r represent

a) Q = charge, r = radius of anions b) Q = heat, r = radius

c) Q = charge, r = distance of separation d) Q = charge, r = radius of cations

11. N_2, CO, and NO^+ are isoelectronic molecules. Their respective bond order is: **[1]**

a) 2,3,3 b) 2,3,4

c) 1,1,3 d) 3,3,3

12. The structure which represents the molecular structure more accurately is called **[1]**

a) canonical structure b) resonating structure

c) resonance structure d) resonance hybrid

13. Which one of the following is paramagnetic? **[1]**

a) CO b) O_3

c) NO d) N_2

14. Bond order of O_2^+ and O_2^- are: **[1]**

a) 1.1 and 2.5 b) 2.4 and 1.3

c) 3.2 and 2.5 d) 2.5 and 1. 5

15. The product of the magnitude of the charge and the distance between the centres of positive and negative charge is called _____. **[1]**

a) Dipole moment b) ionic character

c) covalent character d) electronegativity

16. The shape of a molecule depends on **[1]**

a) All the electrons b) number of bonded valence electron pairs. and number of non-bonded valence electron pairs.

c) number of non-bonded valence electron pairs. d) number of bonded valence electron pairs.

17. In which of the following molecule/ion all the bonds are **not** equal? **[1]**

a) XeF_4 b) BF_4^-

c) C_2H_4 d) SiF_4

18. Using MO theory predicts which of the following species has the shortest bond length? **[1]**

a) O_2^- b) O_2^{2+}

c) O_2^{2-} d) O_2^+

19. Which molecule/ion out of the following does not contain unpaired electrons? **[1]**

a) B_2 b) O_2

c) N_2^+ d) O_2^{2-}

20. N_2, CO and NO^+ are isoelectronic molecules. Their respective bond order is : **[1]**

a) 3,3,3 b) 2,3,4

c) 1,1,3 d) 2,3,3

21. Which one is diamagnetic among NO^+, NO and NO^- ? **[1]**

a) NO^+ NO^+ b) NO^-

c) NO d) NO^+

22. Polarity in a molecule and hence the dipole moment depends primarily on electronegativity of the constituent atoms and shape of a molecule. Which of the following has the highest dipole moment? **[1]**

a) H_2O b) SO_2

c) CO_2 d) HI

23. The electronic configurations of three elements, A, B and C are given below. **[1]**

A $1s^2\ 2s^2\ 2p^6$

B $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$

C $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

Stable form of **A** may be represented by the formula:

a) A_2 b) A_3

c) A d) A_4

24. The shape of SF_4 molecule is **[1]**

a) square planar b) see-saw

c) trigonal bi-pyramidal d) bent

25. The electronic configurations of three elements, A, B and C are given below. **[1]**

A $1s^2\ 2s^2\ 2p^6$

B $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$

C $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

The molecular formula of the compound formed from B and C will be

a) BC_3 b) BC

c) B_2C d) BC_2

26. In NO_3^- ion, the number of bond pairs and lone pairs of electrons on nitrogen atom are **[1]**

a) 1, 3 b) 3, 1

c) 2, 2 d) 4, 0

27. Lewis postulated that atom s achieve the stable octet when they are linked by **[1]**

a) covalent bonds b) chemical bonds

c) coordinate bonds

d) ionic bonds

28. The types of hybrid orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ respectively are expected to be **[1]**

a) sp, sp^2 and sp^3

b) sp^2, sp^3 and sp.

c) sp^2, sp and sp^3

d) sp, sp^3 and sp^2

29. The electronic configurations of three elements, A, B and C are given below. **[1]**

A $1s^2\ 2s^2\ 2p^6$

B $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$

C $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

The bond between B and C will be

a) Hydrogen

b) Coordinate

c) Ionic

d) Covalent

30. In NO^-_3 ion, the number of bond pairs and lone pairs of electrons on nitrogen atom are **[1]**

a) 1, 3

b) 3, 1

c) 2, 2

d) 4,0

31. Hydrogen bonds are formed in many compounds e.g., H_2O, HF, NH_3. The boiling point of such compounds depends to a large extent on the strength of the hydrogen bond and the number of hydrogen bonds. The correct decreasing order of the boiling points of the above compounds is: **[1]**

a) $H_2O > HF > NH_3$

b) $HF > H_2O > NH_3$

c) $NH_3 > HF > H_2O$

d) $NH_3 > H_2O > HF$

32. If the bond distance in chlorine molecule (Cl_2) is 198 pm, then the radius of chlorine is **[1]**

a) 99 pm

b) 24.75 pm

c) 198 pm

d) 49.5 pm

33. Elements in which apart from 3s and 3p orbitals, 3d orbitals also available for bonding In a number of compounds of these elements there are more than eight valence electrons around the central atom. One such example is: **[1]**

a) H_2O

b) HNO_3

c) H_2SO_4

d) HCl

34. Bond angle helps us in: **[1]**

a) determining molecular shape

b) determining the stability of the element

c) determining molecular size

d) determining the reactivity of the element

35. CO is isoelectronic with: **[1]**

a) NO_2^- and $SnCl_2$

b) $SnCl_2$ and NO^+

c) NO^+ and N_2

d) N_2 and $SnCl_2$

36. In PO_4^{3-} ion the formal charge on the oxygen atom of P–O bond is **[1]**

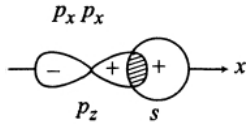
a) -1

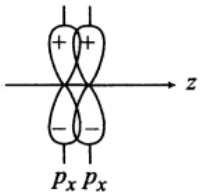
b) – 0.75

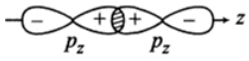
c) + 1

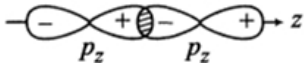
d) + 0.75

37. Which of the following does not represent positive overlap? **[1]**

a) 

b) 

c) 

d) 

38. The state of hybridization of the central atom and the number of lone pairs over the central atom in $POCl_3$ are: **[1]**

a) sp, 0

b) dsp^2, 1

c) sp^2, 0

d) sp^3, 0

39. Which of the following molecules has a triple bond? **[1]**

a) C_2H_2

b) O_3

c) C_2H_4

d) CH_4

40. Bond lengths are lower in elements having: **[1]**

a) double bond

b) triple bond

c) crystal structure

d) single bond

41. In acetylene molecule, between the carbon atoms there are **[1]**

a) one sigma and two pi bonds

b) three sigma bonds

c) two sigma and one pi bonds

d) three pi bonds

42. The valence bond theory explains the shape, the formation and directional properties of bonds in polyatomic molecules like CH_4, NH_3 and H_2O etc, in terms of **[1]**

a) Both overlapping of atomic orbitals and hybridisation of atomic orbitals

b) overlapping of atomic orbitals

c) synchronisation of atomic orbitals

d) hybridisation of atomic orbitals

43. Kossel and Lewis approach was based on the **[1]**

a) inertness of non-metals

b) inertness of noble gases

c) reactivity of elements

d) reactivity of metals

44. According to Lewis and Kossel approach, which of the following molecule has complete octet of the central atom? **[1]**

a) LiCl

b) BeH_2

c) CO_2

d) BCl_3

45. The condition to form a molecular orbital from atomic orbitals is **[1]**

a) Only atomic orbitals must be in proper

b) atomic orbitals must have comparable

Asymmetry

energies and of proper symmetry

c) Only atomic orbitals must be of comparable energies

d) Only atomic orbitals must be in proper symmetry

46. The sp^3d^2 hybridization of central atom of a molecule would lead to **[1]**

a) Trigonal bipyramidal geometry

b) Octahedral geometry

c) square planar geometry

d) Tetrahedral geometry

47. A co-ordinate bond is formed by: **[1]**

a) Complete transfer of protons

b) Complete transfer of electrons

c) Sharing of electrons contributed by both the atoms

d) Sharing of electrons contributed by one atom only

48. VSEPR theory helps in predicting the shape of **[1]**

a) ionic molecules

b) covalent molecules

c) noble gases

d) All of these

49. The molecular orbitals like atomic orbitals are filled in accordance with the **[1]**

a) Hund's rule

b) All of these

c) Aufbau principle

d) Pauli's exclusion principle

50. Which of the following angle corresponds to sp^2 hybridisation? **[1]**

a) 109°

b) 180°

c) 90°

d) 120°

51. The electron probability distribution around a group of nuclei in a molecule is given by **[1]**

a) antibonding molecular orbital

b) molecular orbital

c) atomic orbital

d) bonding molecular orbital

52. Ionic crystalline compounds formed by ion-formation by electron transfer proves: **[1]**

a) Valence Shell Electron Pair Repulsion VSEPR Theory

b) Electronic theory of chemical bonding

c) Valence Bond (VB) Theory

d) Molecular Orbital (MO) Theory

53. In SO_2 molecule, S atom is **[1]**

a) dsp^2 hybridized

b) sp^3 hybridized

c) sP^2 hybridized

d) sp hybridized

54. The species CO, CN^- and N_2 are **[1]**

a) Isoelectronic

b) Having coordinated bond

c) Having low bond energies

d) Having polar bond

55. According to Pauling, the atomic orbitals combine to form new set of equivalent atomic orbitals known as **[1]**

a) pure orbitals

b) Atomic orbitals

c) molecular orbitals
d) hybrid orbitals

56. Why do the deviations occur from idealised shape of H_2O and NH_3 molecules? **[1]**

a) Repulsive hybridisation
b) Repulsive effect
c) Same hybridisation
d) Different hybridisation

57. H.O.H bond angle in water is: **[1]**

a) 110°
b) 240°
c) 104.5^0
d) 416°

58. During the formation of a chemical bond: **[1]**

a) energy of the system does not change
b) electron-electron repulsion becomes more than the nucleus-electron attraction
c) energy decreases
d) energy increases

59. Sidgwick and Powell proposed the VSEPR theory which was further developed and refined by **[1]**

a) Nyholm and Gillespie
b) Johann Dobereiner
c) Werner Heisenberg
d) Neils Bohr

60. The maximum number of hydrogen bonds that a molecule of water can have is **[1]**

a) 2
b) 1
c) 3
d) 4

61. The inertness of noble gas was observed to be due to their electronic configurations. Choose the most appropriate: **[1]**

a) Outermost orbitals of the noble gases are fully filled**.**
b) Atomic mass is low so they are stable.
c) Total number of electrons in the outermost shell is duplets.
d) Noble gases form ions to complete their outermost orbitals.

62. VBT theory is based on the **[1]**

a) knowledge of atomic orbitals and electronic configuration of elements
b) overlapping criteria and the hybridisation of atomic orbitals
c) All of these
d) the principles of variation and superposition

63. The hybridization of orbitals of N atom in NO_3^-, NO_2^+ and NH_4^+ are respectively: **[1]**

a) sp , sp^3 , sp^2
b) sp , sp^2 , sp^3
c) sp^2 , sp^3 , sp
d) sp^2 , sp , sp^3

64. The axial overlap between the two orbitals leads to the formation of a **[1]**

a) pi bond
b) Ionic bond
c) sigma bond
d) multiple bond

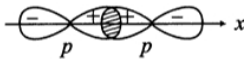
65. 788 kJ of energy is required to separate one mole of solid NaCl into one mole of Na^+ (g) and one mole of Cl^- (g) to an infinite distance. This process explains: **[1]**

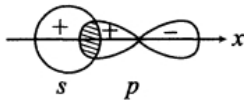
a) ionization enthalpy
b) Electron affinity
c) electron gain enthalpy
d) lattice enthalpy

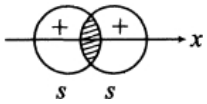
66. Canonical forms **[1]**

a) have no real existence
b) have real existence
c) are present in equilibrium
d) exist in one form for certain fraction of time and to other in remaining time.

67. The molecule of hydrogen atom is formed due to the overlapping of orbitals of two hydrogen atoms. Which of the following types of overlapping takes place in the formation of H_2 molecule? **[1]**

a) 

b) All of these
c) 

d) 

68. If internuclear axis is taken to be in z-direction then, which of the following orbital does form σ - bond? Choose the correct option. **[1]**

a) p_y orbitals
b) p_z orbitals
c) p_x orbitals
d) All of these

69. Rank the bonds in the set C=O, C-O, C $\equiv$ O in order of decreasing bond length. **[1]**

a) C-O > C=O > C $\equiv$ O
b) C=O > C $\equiv$ O > C-O
c) C $\equiv$ O < C-O < C=O
d) C-O > C $\equiv$ O > C=O

70. The number of dots around the Lewis symbols for the elements represent: **[1]**

a) the number of valence electrons of the element
b) electrovalency
c) coordinate valency
d) group valence of the element

71. In the formation of hydrogen molecule, the overlapping of atomic orbitals occur which results in the pairing of electrons. These are: **[1]**

a) valence shell electrons with same spins
b) lone pair of electons
c) valence shell electrons with opposite spins.
d) valence shell electrons irrespective of the spins

72. A qualitative measure of the stability of an ionic compound is provided by: **[1]**

a) lattice enthalpy
b) Electron affinity
c) electron gain enthalpy
d) ionization enthalpy

73. For a stable molecule the value of bond order must be: **[1]**

a) negative
b) there is no relationship between stability and bond order
c) positive
d) zero

74. In case of bonding molecular orbital the electron density is located **[1]**

a) between the nuclei of the bonded atoms

b) in the inner orbital

c) in the outer shell

d) away from the space between nuclei of the bonded atom

75. Rank the bonds in the set C=O, C-O, C≡O in order of decreasing bond strength. **[1]**

a) C-O < C≡O > C=O

b) C≡O > C=O > C-O

c) C=O < C≡O > C-O

d) C≡O > C-O < C=O