

Arts, Commerce and Science College, Bodwad.

Multiple Choice Question Bank

T.Y. B.Sc. Sem-V

Subject: - Inorganic chemistry CH 502 (Chemistry)

1) In d⁷ weak field octahedral complex ----- unpaired electrons present.

- Ans a) 1
b) 2
c) **3**
d) 4

2) In spectrochemical series out of the following which ligand has higher position?

- Ans a) **NH₃**
b) H₂O
c) CN⁻
d) Cl

3) Give the symmetry symbol for dx²-y² and dz² orbitals.

- Ans a) t_{2g}
b) e_g
c) **a_{1g}**
d) t_{1u}

4) How many unpaired electrons are present in d⁵ strong field octahedral complex?

- Ans a) **1**
b) 2
c) 3
d) 4

5) In crystal field splitting diagram for tetrahedral complex -----orbital has lower energy

Ans a) t_{2g}

b) e_g

c) none of the above

6) In crystal field splitting diagram for octahedral complex -----orbital has higher energy

Ans a) t_{2g}

b) e_g

c) none of the above

d) both a and b

7) How many unpaired electrons are present in d^6 strong field octahedral complex?

Ans **a) 0**

b) 2

c) 3

d) 1

8) As size of d orbital decreases $10 Dq$ value of such complex -----

Ans a) decreases

b) increases

c) remains same

d) none of the above

9) What is CFSE for d^4 ion in weak field octahedral complex.

Ans a) $-6Dq + 0P$

b) $-12Dq + 1P$

c) $-16Dq + 1P$

d) other than above

10) Give the symmetry symbol for d_{xy} , d_{yz} and d_{xz} orbitals.

Ans **a) t_{2g}**

- b) eg
- c) a1g
- d) t1u

11) How many unpaired electrons are present in weak field octahedral d6 system?

- Ans
- a) 0
 - b) 2
 - c) 3
 - d) 4**

12) Give the symmetry symbols of d-orbital.

- Ans
- a) t2g
 - b) eg
 - c) both t2g & eg**
 - d) t1u

13) What is CFSE for d8 ion in octahedral complex?

- Ans
- a) $-8Dq + 2P$
 - b) $-12Dq + 3P$**
 - c) $-8Dq + 3P$
 - d) other than above

14) What is the symmetry symbol for s orbital?

- Ans
- a) t2g
 - b) eg
 - c) a1g**
 - d) t1u

15) What is CFSE for d6 ion in strong octahedral field?

- Ans a) $-4Dq + 1P$ b) $-12Dq + 3P$ **c) $-24Dq + 3P$** d) other than above

16) Out of the following ligand which has higher position in 'Nephelauxetic effect'?

- Ans
- a) I-
 - b) Br-
 - c) **CN-**
 - d) en

17) What is CFSE of $[\text{Ti}(\text{H}_2\text{O})_6]\text{SO}_4$

- Ans
- a) **$-8Dq + 0P$**
 - b) $-12Dq + 0P$
 - c) $-6Dq + 1P$
 - d) other than above

18) What is C.F.S.E. of d^4 ion in strong octahedral ligand field

- Ans
- a) $-6Dq + 0P$
 - b) $-12Dq + 1P$
 - c) **$-16Dq + 1P$**
 - d) other than above

19) What is CFSE for d^5 ion in strong field octahedral complex.

- Ans
- a) $-20Dq + 0P$
 - b) **0**
 - c) $-20Dq + 2P$
 - d) other than above

20) What is the CFSE of d^9 ion in strong and weak octahedral ligand field

- Ans
- a) **$-6Dq + 4P$**
 - b) $-12Dq + 4P$
 - c) $-6Dq + 3P$
 - d) other than above

21) Among which of the following have zero crystal field stabilization energy.

Ans : a) $[\text{Co}(\text{H}_2\text{O})_6]^{+2}$

b) $[\text{Co}(\text{H}_2\text{O})_6]^{+3}$

c) $[\text{Mn}(\text{H}_2\text{O})_6]^{+3}$

d) $[\text{Fe}(\text{H}_2\text{O})_6]^{+3}$

22) Which orbital is important in crystal field theory

a) S orbital

b) P orbital

c) d orbital

d) f orbital

23) Which one of the following is wrongly matched.

a) $[\text{Ni}(\text{CO})_4]$ = Neutral complex

b) $[\text{Ni}(\text{NH}_3)_4]^{+2}$ = Square planer

c) $[\text{Co}(\text{en})_2]^{+3}$ = follow EAN rule

d) $[\text{Fe}(\text{CN})_6]$ = $\text{SP}^3 \text{d}^2$

24) Which of the following has SP^3d^2 hybridization

a) $[\text{Co}(\text{F})_6]^{-3}$

b) $[\text{Co}(\text{NH}_3)_6]^{+3}$

c) $[\text{Fe}(\text{CN})_6]^{-3}$

d) $[\text{Cr}(\text{NH}_3)_6]^{+3}$

25) which is diamagnetic

a) $[\text{CoF}_6]^{-3}$

b) $[\text{Ni}(\text{CN})_4]^{-2}$

c) $[\text{Ni}(\text{Cl})_4]^{-2}$

d) $[\text{Fe}(\text{CN})_6]^{-3}$

26) A magnetic moment 1.73 is shown by the following

a) $[\text{Ni}(\text{CN})_4]^{-2}$

b) TiCl_4

c) $[\text{CoCl}_6]$

d) $[\text{Cu}(\text{NH}_3)_4]$

27) which one of the following complex does not involve inner orbital hybridisation.

- a) $[\text{CoF}_6]^{-3}$
- b) $[\text{Cr}(\text{NH}_3)_6]^{+3}$
- c) $[\text{Fe}(\text{CN})_6]^{-3}$
- d) $[\text{Co}(\text{NH}_3)_6]^{+3}$

28) which of the following has zero magnetic moment.

- a) $[\text{Ni}(\text{NH}_3)_6]\text{Cl}_2$
- b) Na_3FeF_6
- c) $[\text{Cr}(\text{H}_2\text{O})_6]\text{SO}_4$
- d) $\text{K}_4\text{Fe}(\text{CN})_6$

29) The number of unpaired electron calculated in $[\text{Co}(\text{NH}_3)_6]^{+3}$ $[\text{CoF}_6]^{-3}$

- a) 4 and 4
- b) 0 and 2
- c) 4 and 0
- d) **0 and 4**

30) tetra chloro complex of Ni(II) and Pd (II)

- a) Dimagnetic and Dimagnetic
- b) Dimagnetic and Paramagnetic
- c) **Paramagnetic and Dimagnetic**
- d) Paramagnetic and paramagnetic

31) which one of the following is an inner orbital complex as well as diamagnetic in behavior.

- a) $[\text{Zn}(\text{NH}_3)_6]^{+2}$
- b) **$[\text{Cr}(\text{NH}_3)_6]^{+3}$**
- c) $[\text{Co}(\text{NH}_3)_6]^{+3}$
- d) $[\text{Ni}(\text{NH}_3)_6]^{+2}$

32) The H-N-H bond angle in NH_3 is

- a) 104
- b) **107**
- c) 109
- d) 120

33) the H-O-H bond angle in H_2O is

- a) 107
- b) 103
- c) **104**

d) 109

34) Cl-P-Cl bond angle in PCl_5 is

a) 107

b) 180

c) **120**

d) 109

35) the observed shape of BrF_5 molecule is

a) Trigonal bipyramidal

b) Bent T

c) Planertrigular

d) Tetrahedral

36) the order of repulsion in the molecule among the lone pair bond pair is.....

a) B.P.-B.P.> BP-LP>LP-LP

b) BP-BP>LP-LP> BP-LP

c) LP-BP>BP-BP> LP-LP

d) **LP-LP-> LP-BP> BP-BP**

35) The B-A-B bond angle in tetrahedral molecule AB_4 with SP^3 hybridization is

a) 120

b) $104^{\circ}5'$

c) **$109^{\circ}28'$**

d) 107

36) The B-A-B bond angle in trigonal molecule AB_3 with SP^2 hybridization is

a) **120**

b) $104^{\circ}5'$

c) $109^{\circ}28'$

d) 107

37) the actual F-C-F bond angle in OCF_2 molecule is

a) 107

b) 103

c) **108**

d) 109

38) The shape of dichloroiodate (I) anion is

- a) Linear
- b) Tetrahedral
- c) Trigonal
- d) Trigonal bipyramidal

39) the hybridisation of atomic orbital in ICl_2^- is

- a) SP
- b) Sp^2
- c) SP^3
- d) **$\text{SP}^3 \text{ d}$**

40) the observed shape of SF_4 molecule is

- a) Octahedral
- b) Trigonal bipyramidal
- c) **See saw**
- d) Planer trigonal

41) Having square planer shape .

- a) CH_4
- b) NH_3
- c) SF_4
- d) **ICl_4^-**

42) the observed geometry for ICl_4^- is

- a) Trigonal bipyramidal
- b) **square planer**
- c) Planer trigonal
- d) Octahedral

43)has square pyramidal geometry.

- a) CH_4
- b) NH_3
- c) SF_4
- d) **TeF_4^-**

44) in coordination compound , every metal has fixed numbers of secondary valency called

- a) Oxidation numbers
- b) **Valency**

- c) EAN
- d) Co ordination number**

45) the number of ionizable Cl^- ions in $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ is

- a) 0
- b) 6
- c) 3**
- d) 9

46) A complex with co ordination number six gives two isomer. Its structure will be .

- a) Trigonal bipyramidal
- b) square planer
- c) Planer trigonal
- d) Octahedral**

47) A complex with co ordination number four gives one isomer. Its structure will be ...

- a) Trigonal bipyramidal
- b) square planer
- c) tetrahedral**
- d) Octahedral

48) the total numbers of electron associated with central metal ion in the co ordination compound is called

- a) Co ordination number and central l ion
- b) EAN of central metal**
- c) Oxidation number of central ,metal
- d) Valency of central metal;

49) A complex is said to be obey EAN rule if EAN of metal is

- a) 36
- b) 54
- c) 86
- d) All of these

50) the EAN for $\text{K}_4[\text{Fe}(\text{CN})_6]$ is

- a) 6
- b) 35
- c) 36**
- d) 3

51) the compound having same molecular formula but different structural formula called as

- a) Isotope
- b) Isomer**
- c) Isotone
- d) Isobar

52) compound having same molecular formula but gives different ions in solution is called

- a) Linkage isomer
- b) Hydrate isomer
- c) Ionization isomer**
- d) Coordination isomer

53) the number of geometrical isomer given by Square planar complex $[\text{Pt}(\text{NH}_3\text{Cl}_2)]$ is

- a) 0
- b) 1
- c) 2**
- d) 3

54) the number of geometrical isomer given by $[\text{Mabcd}]$ is

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

55) the number of geometrical isomer given by Square planar complex $[\text{Ma}_4]$ and $[\text{Ma}_3\text{b}]$ is.....

- a) 0**
- b) 2
- c) 3
- d) 4

56) the number of geometrical isomer given by octahedral complex $[\text{Ma}_4\text{bc}]$ is

- a) 0
- b) 2**
- c) 3
- d) 4

57) the number of geometrical isomer given by octahedral complex $[\text{Mabcdef}]$ is

- a) 2
- b) 5
- c) **15**
- d) 30

58) which one of the following do not show geometrical isomer

- a) Trigonal bipyramidal
- b) square planer
- c) **tetrahedral**
- d) Octahedral

59) complex with coordination number four have

- a) Tetrahedral
- b) Square planer
- c) **Either tetrahedral or octahedral**
- d) Octahedral

60) complex with sp^3 hybridization

- a) **Tetrahedral**
- b) Square planer
- c) Either tetrahedral or octahedral
- d) Octahedral

61) complex with dsp^2 hybridization has

- a) Tetrahedral
- b) **Square planer**
- c) Either tetrahedral or octahedral
- d) Octahedral

62) complex with sp^3d^2 hybridisation

- a) Tetrahedral
- b) Square planer
- c) Either tetrahedral or octahedral
- d) **Octahedral**

63) complex with tetrahedral geometry is

- a) $[Ni(CN)_4]^{-2}$
- b) $[Ni(CO)_4]$
- c) $[Ni(Cl)_4]^{-2}$



64) the hybridization in $[\text{Ni}(\text{CO})_4]$ is.....

- a) **$d\text{SP}^2$**
- b) $d^2\text{sp}^3$
- c) $\text{SP}^3 d^2$
- d) SP^3

65) which of the following is paramagnetic in nature

- a) $[\text{Ni}(\text{CN})_4]^{-2}$
- b) $[\text{Ni}(\text{CO})_4]$
- c) **$[\text{Ni}(\text{Cl})_4]^{-2}$**
- d) $[\text{Co}(\text{NH}_3)_6]^{+3}$

66) which statement is incorrect

- a) **$[\text{Ni}(\text{CO})_4]$ tetrahedral paramagnetic**
- e) $[\text{Ni}(\text{CN})_4]^{-2}$ Square planer , diamagnetic
- f) $[\text{Ni}(\text{CO})_4]$ tetrahedral diamagnetic
- b) $[\text{Ni}(\text{Cl})_4]^{-2}$ tetrahedral paramagnetic

67) which of the following is outer d orbital octahedral complex

- a) $[\text{Co}(\text{NH}_3)_6]$
- b) $[\text{Mn}(\text{CN})_6]$
- c) $[\text{Cr}(\text{NH}_3)_6]^{-2}$
- d) $[\text{Co}(\text{F})_6]^{-3}$

68) complex with coordination number six has

- a) Tetrahedral
- b) Square planer
- c) Either tetrahedral or octahedral
- d) **Octahedral**

69) according to CFT bond between metal ion and ligand in complex is

- a) **Covalent**
- b) Ionic
- c) Partly ionic and partly covalent
- d) Dative

70) the d orbital which have their lobes along the axis X Y and Z are

- a) dx^2-y^2 and dz^2
- b) d_{xy} d_{yz}
- c) d_{xz} d_{yz}
- d) d_{xy} d_{xz}

71) degenerate orbitals have

- a) Different energy
- b) Matching geometry
- c) **Similar energy**
- d) Matching symmetry

72) in case of octahedral complex, the ligand directions are

- a) Along x and y axis
- b) Along y and z axis
- c) **Along x and z axis**
- d) Between x, y and z axis

73) the splitting of degeneracy of d orbitals under the influence of approaching ligands into two or more sets of different energies is called

- a) CFSE
- b) Crystal field splitting
- c) Nephelauxetic effect
- d) Spectrochemical series

74) the splitting of degeneracy of d orbitals under the influence of approaching ligands into two or more sets of different energies is called

- a) CFSE
- b) **Crystal field splitting**
- c) Nephelauxetic effect
- d) Spectrochemical series

75) the lowering in energy of transition metal ion in a given ligand environment due to crystal field effect is called

- a) $10Dq$
- b) Crystal field splitting
- c) **CFSE**
- d) Nephelauxetic

76) tetrahedral complex ligand directions are

- a) Along x and y axis
- b) Along y and z axis
- c) Along x and z axis
- d) **Between x y and z axis**

77) in tetrahedral ligand field

- a) The eg orbital have higher energy than t_{2g} orbital
- b) **The t_{2g} orbital; have higher energy than eg orbital**
- c) Both eg and t_{2g} orbital have similar energy
- d) None of these

78) tetrahedral complex are always high spin or spin free because

- a) $10Dq$ is > pairing energy
- b) $10Dq$ < pairing energy
- c) $10Dq$ = pairing energy
- d) $10Dq$ is greater than equal to pairing energy

79) in square planar field the four ligands are ...

- a) Along z axis
- b) Along x axis
- c) **Along x y in xy plane**
- d) Between x y and z axis

80) the magnitude of crystal field splitting decreases with the ..

- a) Decrease in oxidation state of metal ion
- b) **Increase oxidation state of metal ion**
- c) Decrease in size of d orbital
- d) Decrease in charge on metal ion

81) the magnitude of crystal field splitting

- a) Increase with decrease in oxidation number
- b) **Increase with increase in size of d orbital**
- c) Increase with decrease in size of d orbital
- d) None of the above

82) the magnitude of crystal field splitting decreases with ...

- a) **Increase in number of d electron**
- b) Decreasing no of d electron of central metal ion
- c) Both a and b

d) None of the above

83) the distribution of electron in splitting d orbital obey hunds rule when

- a) $10dq > \text{pairin energy}$
- b) $10dq < \text{pairing energy}$**
- c) $10dq = \text{pairing energy}$
- d) $10dq$ is greater than equal to pairing energy

84) the distribution of electron in splitting d orbitals do not obey hund rule when

- a) $10dq$ is $>$ pairin energy**
- b) $10dq < \text{pairing energy}$
- c) $10dq = \text{pairing energy}$
- d) $10dq$ is greater than equal to pairing energy

85) in weakoctahedral ligand field CFSE is zero for configuration

- a) $d^1 d^2$ and d^3
- b) $d^4 d^6$
- c) $d^7 d^8$
- d) $d^0 d^5 d^{10}$**

86) the symmetry symbol used for d_{xy} d_{yz} d_{xz} metal orbital in octahedral complex is

- a) t_{1u}
- b) a_{1g}
- c) e_g
- d) t_{2g}**

87) the symmetry symbol for $d_{x^2-y^2}$ and d_{z^2} metaloprbitl in octahedral copmlex

- a) t_{1u}
- b) a_{1g}
- c) e_g**
- d) t_{2g}

88) in tetrahedral field the metal ion with d^6 electrons has electronic configuration

- a) $e_g^3 t_2^3$
- b) $e_g^4 t_{2g}^2$
- c) $e_g^2 t_{2g}^4$
- d) $e_g^6 t_{2g}^0$

89) in crystal field splitting d orbital at hypothetical level the d orbital have

- a) Different energy
- b) Zero energy
- c) **Same energy**
- d) Low energy

90) in normal spinner structure A^{+2} ion occupyholes

- a) **Tetrahedral**
- b) octahedral
- c) both a nad b
- d) none of these

91) the normal spinner structure in which B^{+3} ion occupyholes

- a) Tetrahedral
- b) **octahedral**
- c) both a nad b
- d) none of these

92) the metal ion which has larger negative CFSE occupiessite

- a) Tetrahedral
- b) **octahedral**
- c) both a nad b
- d) none of these

93) MOT consider the bonding between metal ion and ligand is

- a) Purely ionic
- b) Purely covalent
- c) Intermediate bonding
- d) All of these

94) the symmetry symbol used for d_{xy} d_{yz} d_{xz} metal orbital in octahedral complex is

- a) **t_{1u}**
- b) t_{2g}
- c) **a_{1g}**
- d) e_g

95) use of metal s p d f orbital for bonding with ligand involved in

- a) CFT and MOT
- b) **VBT and MOT**
- c) CFT and VBT

d) None of these

96) among following theoriesinvolves hybridization of metal orbitals

- a) MOT
- b) CFT
- c) **VBT**
- d) Wernwes theory

97) use of metal s,p,d orbitals for bonding with ligands is involved in

- a) VBT and CFT
- b) CFTand MOT
- c) Werners theory
- d) **VBT and MOT**

98) ligands are termed as point charges by

- a) VBT
- b) CFT
- c) MOT
- d) VBT and MOT

99) spectral properties of complex are explained by

- a) CFT and MOT
- b) VBT and CFT
- c) CFT and VBT
- d) Werners theory

100) pi bonding by acceptor ligand

- a) **Increase delta 0**
- b) Decreases delta 0
- c) Do not affect delta 0
- d) Marks 0

