

UNIT-III - COORDINATION COMPOUNDS AND d-BLOCK ELEMENTS

BCHSI

Dr.S.K

I Choose the correct answer from the following:

- The number of unpaired electrons present in Co^{3+} in the complex $[\text{CoF}_6]^{3-}$ is

a) one b) two c) three d) four
- $[\text{MnCl}_4]^{2-}$ is paramagnetic. The number of unpaired electrons present in Mn^{2+} of this complex is

a) two b) three c) four d) five.
- EDTA is an example of the following type of ligand.

a) Hexadentate b) Monodentate c) Tridentate d) Bidentate
- $[\text{Ni}(\text{CO})_4]$ is

a) Tetrahedral and dia b) Tetrahedral and para
c) Square planar and dia d) Square planar and para
- How many unpaired electrons will be there in a complex whose magnetic moment is 3.9 B.M.

a) 2 b) 3 c) 4 d) 1
- The IUPAC name of $\text{K}_4[\text{Fe}(\text{CN})_6]$ is

a) Potassium ferricyanide b) potassium ferrocyanide
c) potassium hexacyanoferrate(II) d) potassium hexacyanoferrate(III)
- The type of hybridisation in $[\text{FeF}_6]^{3-}$ is

a) dsp^2 b) sp^3d^2 c) dsp^3 d) d^2sp^3
- The number of stereo isomers possible for a square planar complex Ma_2bc is

a) one b) two c) three d) four.
- Which of the following complexes is paramagnetic?

a) $\text{K}_3[\text{Fe}(\text{CN})_6]$ b) $\text{K}_2[\text{Ni}(\text{CN})_4]$ c) $\text{K}_4[\text{Fe}(\text{CN})_6]$ d) $[\text{Ni}(\text{CO})_4]$
- The oxidation number of iron in $[\text{Fe}(\text{CO})_5]$ is

a) zero b) two c) five d) ten
- The complex $[\text{PtCl}_2(\text{NH}_3)_2]$ exhibits

a) Linkage isomerism b) Ionisation isomerism c) Geometrical isomerism
d) Optical isomerism.
- The hybridisation of the central metal ion orbitals in a complex $[\text{PtCl}_4]^{2-}$ is

a) sp^2 b) sp^3 c) dsp^2 d) sp^3d^2
- The number of isomers possible for the complex $[\text{PtCl}_2(\text{NH}_3)_4]^{2+}$ is

a) 2 b) 3 c) 4 d) 6
- The Effective Atomic Number of iron in $[\text{Fe}(\text{CO})_5]$ is

- a) 34 b) 35 c) 36 d) 37

Dr. S. K.

2

15. Co-ordination number of the central metal ion is
- its oxidation number
 - the number of e⁻s lost by the central metal ion
 - the number of ligands attached to it.
 - the number of pairs of electrons donated by the ligands.
- b) According to Sidgwick theory, the type of bonding between the central metal ion and the ligand is
- ionic
 - covalent
 - coordinate
 - Co-ordinate covalent
- 17) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ is an example of
- Inner orbital complex
 - Outer orbital complex
 - Tetrahedral complex
 - Low spin complex
- 18) Oxalate ligand satisfy
- two primary valency and one secondary valency
 - one primary valency and two secondary valency
 - one primary valency only
 - two primary valency and two secondary valency.
- 19) The secondary valency of Al in $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$ is
- 1
 - 2
 - 3
 - 6
- 20) $[\text{Fe}(\text{CN})_6]^{4-}$ has no unpaired electrons. The number of unpaired e⁻s in $[\text{FeF}_6]^{4-}$ is
- zero
 - two
 - one
 - four
- 21) The number of possible isomers of $[\text{PdClBr}(\text{NH}_3)_2]$ is
- 2
 - 1
 - 3
 - 4
- 22) Which cannot exhibit stereoisomerism?
- $[\text{Co}(\text{en})_3]^{3+}$
 - $[\text{CoCl}_2(\text{en})_2]^+$
 - $[\text{CoCl}_4(\text{en})]^-$
 - None of these.
- 23) The number of unpaired electrons in an octahedral complex with d^8 configuration is
- 0 or 2
 - 2 or 4
 - 1
 - 2
- 24) Which among the following is paramagnetic?
- $\text{Cr}(\text{CO})_6$
 - $\text{Fe}(\text{CO})_5$
 - $\text{Fe}_2(\text{CO})_9$
 - $\text{V}(\text{CO})_6$
- 25) If 'aa' is a symmetrical bidentate ligand, complex $[\text{M}(\text{aa})_3]$ exhibits the following isomerism
- Geometrical
 - Coordinate
 - optical
 - ionisation
- 26) Which can exhibit optical isomerism?
- trans $[\text{CoCl}_2(\text{en})_2]\text{NO}_3$
 - $[\text{Co}(\text{en})(\text{trien})]\text{Cl}_3$
 - $[\text{Cu}(\text{en})_2]\text{SO}_4$
 - none of these

- 27) Which does not have an unpaired electron?
 a) $K_3[Fe(CN)_6]$ b) $K_3[FeF_6]$ c) $K_4[Fe(CN)_6]$ d) all of these
- 28) All octahedral complexes of Ni(II) are
 a) Diamagnetic b) Paramagnetic c) Ferromagnetic d) Antiferromagnetic
- 29) The molar conductance of the complex $[CrCl(CH_2O)_5]Cl_2$ is very close to that of an aqueous electrolyte solution
 a) $LiCl$ b) $CaCl_2$ c) $KaCl_3$ d) $MgSO_4$
- 30) The complexes $[Co(NH_3)_5SO_4]Cl$ and $[Co(NH_3)_5Cl]SO_4$ are known as
 a) linkage isomers b) ionisation isomers
 c) Coordination isomers d) optical isomers.
- 31) The geometry of $[Ni(NH_3)_4]^{2+}$ is
 a) Square planar b) tetrahedral c) tetragonal d) distorted octahedron
- 32) The hybridisation of the central metal ion orbitals in $[PtCl_4]^{2-}$ complex is
 a) sp^3 b) sp^2 c) dsp^2 d) sp^3d^2
- 33) The magnetic moment of $[Cr(CO)_6]$ expressed in BM is
 a) 1.73 b) 0 c) 4.90 d) 2.83
- 34) The isomerism exhibited by the complexes $[CoCl(NH_3)_4(CH_2O)]Cl_2$ & $[CoCl_2(NH_3)_4]Cl \cdot H_2O$ is
 a) Ionisation isomerism b) Hydrate isomerism
 c) linkage isomerism d) coordinate isomerism
- 35) $[Co^{III}(EDTA)]^-$ complex shows _____ isomerism.
 a) Geometrical isomerism b) structural isomerism
 c) Optical isomerism d) ligand isomerism
- 36) The total number of stereo isomers of the complex $[CoCl_2(en)_2]Br$ is
 a) 2 b) 3 c) 4 d) 6
- 37) The primary and secondary valencies of the complex $[CoCl_3(NH_3)_3]$ respectively are
 a) 3, 3 b) 3, 6 c) 6, 3 d) 6, 6
- 38) Which one of the following is expected to be a paramagnetic complex?
 a) $[Ni(CH_2O)_6]^{2+}$ b) $[Ni(CO)_4]$ c) $[Zn(NH_3)_4]^{2+}$ d) $[Co(NH_3)_6]^{3+}$
- 39) The valence-shell configuration of Ti group elements can be represented by
 a) $(n-1)d^2 ns^2$ b) $(n-1)d^3 ns^2$ c) $(n-1)d^5 ns^1$ d) $(n-1)d^6 ns^0$
- 40) Which is the most stable oxidation state of manganese?
 a) +7 b) +2 c) +6 d) +4

- 41) Which is not a ore of molybdenum?
 a) Wulfenite b) molybdenite c) molybdite d) none of these
- 42) Wolframite is the ore of
 a) Te b) Cr c) W d) Mo
- 43) Main occurrence of cobalt is
 a) Smalite b) Wolframite c) Carnotite d) Monazite
- 44) What is the composition of cobalt glance or cobaltite?
 a) $CoAsS$ b) CoS c) Co_3As d) Co_2S
- 45) An ore of tungsten is
 a) Wolgenite b) Wolframite c) Haematite d) Rutile
- 46) ~~St~~ Pick out the metal ion having high abundance in earth crust?
 a) V b) Cr c) Mn d) Fe
- 47) Which of the following metal ion is not coloured?
 a) $Ti(III)$ b) $V(III)$ c) $Ti(IV)$ d) $Cu(II)$
- 48) The most stable oxidation state of Vanadium is
 a) +5 b) +2 c) +3 d) +4
- 49) The most stable oxidation state of Cr is
 a) +6 b) +4 c) +3 d) +2
- 50) The most important and stable oxidation state of Zirconium is
 a) +4 b) +3 c) +2 d) +1
- 51) Smalite is the ore of
 a) Zr b) V c) Co d) W
- 52) The maximum possible stable valency state of Mn group is
 a) +5 b) +6 c) +7 d) +8
- 53) In Cr group the stability of the higher oxidation state with increase in atomic number
 a) Increase b) Decrease c) Remains unchanged d) All are right.
- 54) Ni compounds are coloured due to the presence of unpaired
 a) s e ns b) p e ns c) f e ns d) d e ns.
- 55) In the periodic table, to which one of the following group does Ti belong?
 a) IVB b) IIIB c) IA d) VIII
- 56) Which element can have hexavalency?
 a) Fe b) Cr c) Ti d) V

57. The metal used for purifying hydrogen is

(3) ✓

- a) Ir b) Pt c) Pd d) Rh

5

Dr. S.K.

58. Identify the element that does not occur in nature.

- a) Re b) Ir c) Rh d) Technetium (Tc)

59. V^{3+} has the configuration

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

60. The complex which does not obey sidwick rule is

- a) $Ni(CO)_4$ b) $Fe(CO)_5$ c) $K_3[Fe(CO)_6]$ d) $K_4[Fe(CN)_6]$

61. The number of ions produced by the complex

$[Cr(H_2O)_4Cl_2]Cl$ in solution is

- a) 4 b) 2 c) 3 d) 7

62. The molecular formula of hematite is

- a) Fe_3O_4 b) Fe_2O_3 c) Fe_2S_2 d) $FeCO_3$

63. How many ions will be observed if $CoCl_3 \cdot 5NH_3$ is dissolved in water?

- a) 1 b) 2 c) 4 d) 9

64. The number of unpaired ions in $[Mn(H_2O)_6]^{2+}$ complex is

- a) 2 b) 3 c) 5 d) 0

65. Which among the following can exhibit optical isomerism?

- a) Trans - $[Co(en)_2Cl_2]NO_3$ b) Cis - $[Co(en)_2Cl_2]NO_3$
c) Trans $[Co(NH_3)_4Cl_2]NO_3$ d) Cis $[Co(NH_3)_4Cl_2]NO_3$

66. Which is a powerful oxidising agent?

- a) Co^{3+} b) Co^{2+} c) Fe^{3+} d) Cr^{3+}

67. The nature of compounds $Cr(OH)_2$, Cr_2O_3 and CrO_3 is

- respectively (a) Amphoteric, basic, acidic (b) Basic, amphoteric, acidic
c) Acidic, amphoteric, basic d) Basic, acidic, amphoteric

68.

UNIT-III - Inorganic chemistry - UNIVERSITY QUESTIONS

(Coordination Compounds and d-block elements)

(4)
6
Dr.S.K

II Fill in the blanks suitably:

- 1) A square planar complex is carried by _____ hybridisation.
- 2) The concept that the ligands donate the electron pair and form the coordinate bond to the metal $M \leftarrow L$ was first proposed by _____.
- 3) An example of inner-orbital octahedral paramagnetic complexes _____.
- 4) Geometrical isomerism cannot arise in _____.
- 5) The complex $[Pt(NH_3)_4]^{2+}$ has _____ structure.
- 6) d^2sp^3 hybridisation of central metal atom gives the _____ orbital complexes.
- 7) A tetrahedral complex is formed by _____ hybridisation.
- 8) The oxidation number of Ni in $[Ni(CO)_4]$ is _____.
- 9) The secondary valency of Cu in $[Cu(NH_3)_4]^{2+}$ is _____.
- 10) The IUPAC name of $[PtCl_2(NH_3)_2]$ is _____.
- 11) The formula of pentacarbonylmanganese(I) ion is _____.
- 12) The name of the complex $[Co(NH_3)_2(en)_2]Cl_3$ is _____.
- 13) The geometry of $Cr(CO)_6$ as predicted by VBT is _____.
- 14) High spin octahedral complexes are formed by using _____ d orbitals.
- 15) According to VBT, the type of bonding between the central metal ion and the ligand is _____.
- 16) The paramagnetic complexes have _____ electrons.
- 17) The trans octahedral complexes are optically _____.
- 18) EDTA is a _____ ligand.
- 19) $[Co(NH_3)_4Cl_2]NO_2$ and $[Co(NH_3)_4ClNO_2]Cl$ are _____ isomers.
- 20) $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$ show _____ isomerism.
- 21) The secondary valency of Fe in $K_4[Fe(CN)_6]$ is _____.
- 22) Formula of tetraammineplatinum(II) is _____.
- 23) The formula of the complex, potassium pentacyanonitrosylferrate(III) is _____.
- 24) The name of the complex, $[Pt(CH_3NH_2)_2(NH_3)_2]Cl_2$ is _____.
- 25) Cu^{2+} forms a stabler complex with ethylene diamine than with NH_3 , because of _____.
- 26) The EAN of Copper in $[Cu(NH_3)_4]^{2+}$ is _____.
- 27) The isomerism exhibited by the complexes $[Co(NO_2)_2(en)_2]^+$ and $[Co(NO_2)_2(en)_2]^+$ is _____.

28. The IUPAC name of $\text{Na}[\text{Co}(\text{CO})_4]$ is _____

In

29. $[\text{Co}(\text{CN})_4\text{Cl}_2]^-$, the co. number of cobalt is _____

7

Dr. S. K.

30. Electronic configuration of Zr is _____

31. The composition of Vanadinite _____

32. The formula of molybdenite _____

33. The important ore of W is _____

34. Ti group elements show the variable valency from _____ to _____

35. Ionisation potential of Cr group elements _____ with increase in at. no.

36. The finely divided form of nickel often used as a catalyst is called _____

37. The uptake of hydrogen by palladium is known as _____

38. The first man-made element is _____ (also radioactive)

39. Zirconium and _____ closely resemble each other due to lanthanide contraction.

40. Some Manganese compounds resembles _____ group compounds.

41. Niobium and Tantalum are having same properties due to _____

42. The aqueous solution of VCl_3 is _____ coloured.

43. Electronic configuration of manganese is _____

44. V^{3+} is _____ magnetic in nature.

45. Co^{2+} ion exhibits _____ colour.

46. Thiocyanate ligand is an example for _____ isomerism.

47. The number of unpaired electrons in $\text{Ni}(\text{CO})_4$ complex is _____

48. In $[\text{Ni}(\text{CN})_4]^{2-}$, the hybridisation is _____

49. $[\text{Pt}(\text{CN})_2\text{Cl}_2]$ exhibits _____ isomerism.

50. The type of magnetism exhibited by $\text{Mn}(\text{H}_2\text{O})_6^{2+}$ ion is _____

51. Zinc group elements can also be called as _____

52. Type of hybridisation in $[\text{Ni}(\text{CN})_4]^{2-}$ is _____

53. The chelating ligand used in the detection of Ni^{2+} is _____

54. The maximum possible oxidation state for the manganese group elements is _____

55. Outer orbital hybridisation for octahedral cpx is _____

56. Platinum, in the form of _____ is used as a catalyst

UNIT-III - Inorganic Chemistry - University Questions.

Coordination Compounds and d-block elements

III State whether the following statements are true or false. If false, correct the statement.

Dr. S. K

- 1) $[\text{CoF}_6]^{3-}$ is diamagnetic.
- 2) $\text{K}_3[\text{Fe}(\text{CN})_6]$ is diamagnetic.
- 3) IUPAC name of $\text{K}_3[\text{Fe}(\text{CN})_6]$ is potassium ferricyanide.
- 4) Nickel carbonyl is paramagnetic.
- 5) $[\text{Cr}(\text{CN})_6]^{3-}$ obeys Effective Atomic Number rule.
- 6) $\text{K}_4[\text{Fe}(\text{CN})_6]$ has octahedral structure.
- 7) $[\text{Ni}(\text{CN})_4]^{2-}$ is a tetrahedral complex ion.
- 8) The six coordinated complex can be either ~~outer orbital~~ outer orbital or inner orbital complex.
- 9) $[\text{Ni}(\text{CO})_4]$ has a square planar structure.
- 10) The magnetic moment of $[\text{FeF}_6]^{3-}$ is less than that of $[\text{Fe}(\text{CN})_6]^{3-}$.
- 11) In $[\text{Fe}(\text{CN})_6]^{3-}$, the primary valency of Fe is +3.
- 12) Tetrahedral complexes show geometrical isomerism.
- 13) The four Co-ordinated complexes always have square planar geometry.
- 14) The oxidation number of Ni in $[\text{Ni}(\text{CO})_4]$ is +4.
- 15) The complex $[\text{Cu}(\text{NH}_3)_4]^{2+}$ has square planar structure.
- 16) Cis and trans isomers cannot exist for Ma_2b complexes.
- 17) IUPAC name of LiAlH_4 is lithium tetrahydridoaluminate(III).
- 18) The non-ionisable valency of Al in $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$ is +3.
- 19) According to Werner theory, the geometry of the complex is determined by secondary valency of the central metal ion.
- 20) The secondary valency of a metal in a complex is non-directional.
- 21) All Ni(II) octahedral complexes are paramagnetic.
- 22) The hybridisation of Fe in potassium ferrocyanide is dsp^3 .
- 23) CuCl_2 is diamagnetic.
- 24) Platinum black is a weaker ~~absorber~~ absorber of hydrogen than spongy platinum.
- 25) Carnotite is an ore of molybdenum.
- 26) In the periodic table, Tungsten is present in the ~~VIB~~ VI B group.
- 27) Patronite is the ore of Mo.
- 28) Sperrylite is Pt arsenic ore.
- 29) Molybdenum and Tungsten form Polyacids.
- 30) Cobalt, Nickel and iron are diamagnetic.

31. Te(III) Salts are colourless ✓
32. Electronic Configuration of Zn^{2+} is $[\text{Ar}]3d^{10}$
33. Among all metals, Tungsten has the highest m.pt. (3410°C)
34. Technetium is obtained from its oxide ore.
35. Hydrogen is adsorbed more by Pd.
36. Stellite is an alloy of W, Co and Cr and it is used to make surgical instruments.
37. ReF_7 is the only heptafluoride other than IF_7 , known throughout the periodic table.
38. The common oxidation state of Fe are +2 and +3.
39. The transition element Fe belongs to 4d series.
40. $[\text{Fe}(\text{CN})_6]^{4-}$ contains one unpaired electron in metal d-orbital
41. The coordination number of Cr in $[\text{Cr}(\text{en})_2(\text{H}_2\text{O})_2]^{2+}$ is 4
42. $\text{V}(\text{CO})_6$ obeys the 18-Electron rule.
43. Ethylene diphosphine is a _____
a) ligand b) ion c) complex d) none.

9

Dr. S.K.

(P1, 3)

Paper-III - Inorganic Chemistry - UNIVERSITY QUESTIONS.UNIT-IV Crystal Field Theory, metallic Carbonyls, Bio-Inorganic Chemistry.

I Choose the correct answer from the following:

BCHSI

(10)

Dr. S. K.

- 1) Which does not have a bridging carbonyl group?
 a) $\text{Co}_2(\text{CO})_8$ b) $\text{Mn}_2(\text{CO})_{10}$ c) $\text{Fe}_2(\text{CO})_9$ d) $\text{Co}_4(\text{CO})_{12}$
2. In a strong field octahedral complex, the crystal field stabilization energy of d^6 configuration is
 a) $\frac{18}{5} \Delta_0$ b) $\frac{12}{5} \Delta_0$ c) $-\frac{12}{5} \Delta_0$ d) $-\frac{18}{5} \Delta_0$
3. The energy gap between t_{2g} and e_g sets is denoted by
 a) $10 Dq$ b) Dq c) $2 \Delta_0$ d) $4 Dq$
4. According to Crystal Field Theory, the neutral ligands like H_2O , NH_3 are regarded as
 a) point charges b) dipoles c) neutral molecules d) none of these.
5. The ligand with lowest ligand field strength is
 a) Pyridine b) cyanide ion c) fluoride ion d) ammonia.
6. In a square planar complex, the energy of d-orbitals are in the order.
 a) $d_{z^2} > d_{xy} > d_{yz} > d_{xz} > d_{x^2-y^2}$ (b) $d_{x^2-y^2} > d_{z^2} > d_{yz} > d_{xz} > d_{xy}$
 c) $d_{z^2} < d_{yz} \equiv d_{xz} < d_{xy} \equiv d_{x^2-y^2}$ (d) $d_{z^2} \equiv d_{yz} < d_{z^2} < d_{xy} < d_{x^2-y^2}$
7. The CFSE value for an octahedral complex with 3 e⁻s (in units of Δ_0) is
 a) 0 b) -0.4 c) +0.4 d) -1.2
8. In a square planar complex, the orbital with lowest energy is
 a) d_{xy} b) d_{z^2} c) $d_{x^2-y^2}$ d) d_{yz}
9. Which orbital has the highest energy in a square planar complex?
 a) $d_{x^2-y^2}$ b) d_{z^2} c) d_{xy} d) d_{yz}
- 10) The CFSE for octahedral complex with d^3 configuration is
 a) $-\frac{9}{5} \Delta_0$ b) $-\frac{6}{5} \Delta_0$ c) $-\frac{4}{5} \Delta_0$ d) $-\frac{6}{5} \Delta_0 + P$
- 11) The CFSE for a d^6 ion low spin octahedral complex is
 a) $-18 Dq$ b) $+24 Dq$ c) $-24 Dq$ d) $-24 Dq + 3P$
- 12) The order of Crystal Field Splitting energy is
 a) $\Delta_0 > \Delta_t > \Delta_{sp}$ b) $\Delta_t > \Delta_0 > \Delta_{sp}$
 c) $\Delta_{sp} > \Delta_0 > \Delta_t$ d) $\Delta_{sp} < \Delta_t < \Delta_0$

13. According to CFT, the bonding between the central metal ion and the ligand is
 a) ionic b) covalent c) Coordinate d) Coordinate Covalent
14. The green colour of $[Ni(CH_3O)_6]^{2+}$ is attributable to a
 a) charge-transfer process b) $d \rightarrow d$ electronic transition
 c) $f \rightarrow f$ electronic transition d) absorption in the UV region.
15. The CFSE, for d^4 ion in high spin octahedral complex is
 a) $18 Dq$ b) $+6 Dq$ c) $-6 Dq$ d) $-4 Dq + P$
16. The structure of $Fe_2(CO)_9$ involves
 a) three ketonic carbonyl groups b) only one ketonic carbonyl group
 c) two ketonic carbonyl gps d) all terminal carbonyl gps.
17. Identify the complex which will absorb light of shorter wave length?
 a) $[Fe(CN)_6]^{4-}$ b) $[FeF_6]^{4-}$ c) $[Fe(CH_3O)_6]^{2+}$ d) $[Fe(CNCS)_6]^{4-}$
18. Lowest value of Δ_0 is for
 a) F^- b) Cl^- c) Br^- d) I^-
19. Which among the following is paramagnetic?
 a) $[Cr(CO)_6]$ b) $[Fe(CO)_5]$ c) $[Fe_2(CO)_9]$ d) $[V(CO)_6]$
20. The CFSE value of high spin Mn^{2+} ion in tetrahedral field is
 a) 0 b) $-0.4 \Delta_t$ c) $+0.4 \Delta_t$ d) $-1.8 \Delta_t + 4P$
21. The π -acid ligand is
 a) $\begin{matrix} COO^- \\ | \\ COO^- \end{matrix}$ b) gly $^-$ c) NO_2^- d) CO
22. Which of the following is expected to have the lowest Δ_0 value?
 a) $[Co(NH_3)_6]^{3+}$ b) $[Rh(NH_3)_6]^{3+}$ c) $[Ir(NH_3)_6]^{3+}$ d) $[CoF_6]^{3-}$
23. Colourless transition metal ion is
 a) Zn^{2+} b) Ti^{3+} c) Cr^{3+} d) V^{2+}
24. Chlorophyll contains the metal
 a) Fe b) Mg c) Mn d) Co
25. The Vitamin B_{12} contains the metal
 a) Fe b) Mg c) Mn d) Co
26. Haemoglobin is the chelate complex of the metal
 a) Fe b) Mg c) Mn d) Zn
27. The enzyme Carboxypeptidase contains the metal
 a) Co b) Mo c) Zn d) Na

28) According to CFT, the number of unpaired electrons in the complex $[Fe(CN)_6]^{4-}$ is

- a) 6 b) 5 c) 0 d) 3

29) which one of the following ligand is stronger?

- a) Cl^- b) H_2O c) NO_2^- d) CO

30) _____ ion in water is colourless

- a) Cr^{3+} b) Cu^{2+} c) Ti^{4+} d) Co^{2+}

31) Most common geometry associated with Copper(II) complexes is

- a) Square planar b) octahedral c) linear d) Square pyramidal

32) which does not give a mononuclear carbonyl?

- a) Fe b) V c) Ni d) Co

33) The value of field strength (f) for the ligands: (i) Nitrate ion, (ii) Fluoride ion (iii) water and (iv) Ethylenediamine tetraacetic acid

are respectively

- a) 1.28, 0.90, 1.00, 0.83 b) 0.90, 0.83, 1.28, 1.00 c) 0.83, 1.28, 1.00, 0.90
- d) 0.83, 0.90, 1.00, 1.28

34) Carbonic anhydrase contains _____

- a) Zn b) Mo c) Co d) Mg

35) ~~the~~ For which electronic configuration, both low spin and high spin complexes are possible?

- a) d^2 b) d^4 c) d^8 d) d^{10}

36) The metal that does not form binuclear carbonyl is

- a) Ni b) Fe c) Co d) Mn

37) Zinc-metallo enzymes catalyse _____ hydrolysis.

- a) acid b) base c) peptide d) ester.

II Fill in the blanks suitably [Crystal Field Theory]

(10)

13

D.S.K

- 1) In an octahedral complex, d_{xy} , d_{xz} , d_{yz} orbitals are called as _____ orbitals.
- 2) _____ does not form polynuclear carbonyls
- 3) In metal carbonyls Co-ordination occurs through _____ atom.
- 4) Low spin complexes are formed by ligands having _____ crystal field splittings.
- 5) The complex $[Pt(NH_3)_4]^{2+}$ has _____ structure.
- 6) The geometry of $Cr(CO)_6$ as predicted by VBT is _____
- 7) The separation of five d-orbitals of the metal ion into two sets having different energies is called _____
- 8) The energy of t_{2g} orbitals is _____ less than that of hypothetical degenerate 'd' orbitals.
- 9) Weak field complexes of d^4 , d^5 , d^6 and d^7 ions are called _____ complexes.
- 10) In an octahedral field, the 'eg' d-orbitals have their lobes _____ the axes.
- 11) In strong ligand field, Co^{3+} complex is _____ stable than Co^{2+} complexes.
- 12) All the metal carbonyls are diamagnetic except _____
- 13) In d^6 configuration, if $\Delta_0 < P$, then the compound is _____ magnetic.
- 14) Chromium exhibits _____ hybridisation in $Cr(CO)_6$.
- 15) Among the following ligands, pyridine, CN^- , F^- & NH_3 , _____ has the lowest ligand field strength.
- 16) The colour of $[Ti(H_2O)_6]^{3+}$ is _____
- 17) $d_{x^2-y^2}$ and d_{z^2} orbitals are called _____ orbitals.
- 18) _____ effect is common in the square planar substitution reactions of Pt(II) complexes.
- 19) _____ is a zinc containing enzyme
- 20) The crystal field stabilization energy for d^3 octahedral complex is _____
- 21) According to _____ theory ligands are considered as point charges or dipoles.
- 22) The metal (ion) present in superoxide dismutase is _____
- 23) ~~Platinum in the form~~

III - State whether the following statements are True or False.
If False, correct the statement. (CFT)

(14)

14

Dr. S. K.

- 1) Cobalt does not form mononuclear carbonyls.
- 2) In $\text{Co}_2(\text{CO})_8$, the presence of Co-Co bond explain the diamagnetic nature.
- 3) Colour of Co-ordination compounds is due to d-d transition.
- 4) In strong field complexes, the crystal field splitting energy (Δ_o) is greater than electron pairing energy (P).
- 5) Manganese can form a mono nuclear carbonyl.
- 6) In tetrahedral field splitting, t_{2g} d-orbitals are having higher energy than 'eg' d-orbitals.
- 7) In octahedral field, the e_g orbitals experience greater force of repulsion than those in 't_{2g}'-orbitals.
- 8) The energy of e_g orbitals is $0.6 \Delta_o$ above that of the hypothetical degenerate d-orbitals.
- 9) The CFSE of d^6 configuration is same in both strong and weak octahedral ligand fields.
- 10) CN^- ligand is having higher crystal field splitting energy (Δ_o) than H_2O ligand.
- 11) In most of the metallic carbonyls, the metals are in the zero oxidation state.
- 12) $[\text{Fe}(\text{CO})_5]$ has a trigonal bipyramidal involving dsp^3 hybridisation.
- 13) When the octahedral crystal field splitting energy (Δ_o) is larger than Pairing energy (P), low-spin complexes are formed.
- 14) The crystal field splitting energy is larger for an octahedral complex than for a tetrahedral complex.
- 15) $\Delta_t = \frac{4}{9} \Delta_o$
- 16) ~~Zn²⁺~~ CO is a π -acid ligand.
- 17) The nature of bonding present in metallic carbonyls is 'back bonding'.
- 18) Zn^{2+} generally forms four coordinated complexes.
- 19) The Δ_{sp} value in square planar complex is less than Δ_o in octahedral complex.
- 20) In metals, all the five 'd' orbitals are equal in energy.
- 21) Pure Platinum does not react with hot concentrated acids.
22. $(10 Dq)_{\text{octahedral}} = f_{\text{ligand}} \times f_{\text{metal}}$