SRM IST RAMAPURAM -DEPARTMENT OF CHEMISTRY
CHEMISTRY (21CYB101J) -QUESTION BANK
PART- A MCQ WITH ANSWER

UNIT -1

1. A coordination complex's core atom/ion is also known as _____

a) Bronsted-Lowry acid

b) Lewis base

c) Lewis acid

d) Bronsted-Lowry base

2. Two or more compounds that have the same chemical formula, but different arrangement of atoms are called _____

a) isotopes

b) isotones

c) isomers

d) allotropes

3. Which type of isomerism exhibits compounds with same chemical formula and bonds but different spatial arrangement?

a) Optical isomerism

b) Linkage isomerism

c) Structural isomerism

d) Solvate isomerism

4. Which of the following compounds does not have a coordination isomer?

a) $[Ag(NH_3)_2][Ag(CN)_2]$

b) $[Cr(NH_3)_6][Co(CN)_6]$

c) $[Zn(NH_3)_4][PtCl_4]$

d) $[Cu(NH_3)_4][FeCl_4]$

Answer: $[Ag(NH_3)_2][Ag(CN)_2]$

5. Identify the coordination isomer of $[Fe(CO)_4][Zn(CN)_4]$.

a) Tetracyanidozinc(II) tetracarbonylferrate(II)

b) Tetracarbonylzinc(II) tetracyanidoferrate(II)

c) Tetracyanidoiron(II) tetracarbonylzincate(II)

d) Tetracarbonyliron(II) tetracyanidozincate(II)

6. A coordination complex $[MX_2L_2]$, has a CN=4 and two unidentate ligands X and L. When the two L ligands are arranged opposite to each other in its geometry, it is called _____ isomer.

a) cis

b) trans

c) fac

d) mer

7. Which of the following do not show geometrical isomerism? (Assume all ligands are unidentate)

a) Square planar $[MXL_3]$

b) Square planar $[MX_2L_2]$

c) Octahedral $[MX_2L_4]$

d) Octahedral $[MX_3L_3]$

8. The type of isomerism shown by the complex $[CoCl_2(en)_2]$ is

a. Geometrical isomerism
b. Coordination isomerism
c. Linkage isomerism
d. Ionization isomerism

9.The name of OH- ligand is
A. Hydroxy
B. hydroxide
C. hydroxo
D. hydroxyl

10. A chelating agent has two or more than two donor atoms to bind to a single metal ion. Which of the following is not a chelating agent?

a. Thiosulphato
b. Oxalato
c. Glycinato
d. Ethane-1,2-diamine

11.Iso cyano is the name of ……. Ligand
A. CN^-
B. NC^-
C. NCS^-
D. SCN^-

12.The shape of s-orbital?
A. Sphere
B. Dumbbell
C. Pear-shaped lobe
D. Conical

13.The s-orbital does not show preference to any direction because _____
A. It is the smallest orbital
B. It is present in every atom
C. It is spherically symmetric
D. It is the first orbital

14.The shape of a p orbital is?
A. Sphere
B. Dumbbell
C. Pear-shaped lobe
D. Cuboid

15.In $K_4[Fe(CN)_6]$ the number of unpaired electrons in iron are?
(a) 0
(b) 2
(c) 3
(d) 5

16.The tetrahedral complexes have coordination number
(a) 3
(b) 6
(c) 4
(d) 8

17.The spin only magnetic moment value (in Bohr magneton units) of $Cr(CO)_6$ is
(a) 0
(b) 2.84
(c) 4.90
(d) 5.92

18. Potassium ferrocyanide is an example of
(a) Tetrahedral
(b) Octahedral
(c) Square Planar
(d) Linear

19. In the complex compound K4[Ni(CN)4] oxidation state of nickel is?
(a) -1
(b) 0
(c) +1
(d) +2

20. The number of unpaired electrons in d6 low spin octahedral complex is
a) 0
b) 1
c) 2
d) 3

21. The crystal field splitting energy for octahedral and tetrahedral complexes is related as
a) $\Delta t \approx 4/9\ \Delta o$
b) $\Delta t \approx 1/2\ \Delta o$
c) $\Delta o \approx 2\ \Delta t$
d) $\Delta o \approx 4/9\ \Delta t$

22. Among the ligands NH3, en, CN-and CO the correct order of their increasing field strength, is
(a) CO< NH3 <en< CN–
(b) NH3<en< CN–< CO
(c) CN–< NH3< CO<en
(d) en< CN–<NH3< CO

23. Which of the following octahedral complexes of Co (at. no.27) will be magnitude of Δoct be the highest?
(a) $[Co(CN)_6]^{3-}$
(b) $[Co(C_2O_4)_3]^{3-}$
(c) $[Co(H_2O)_6]^{3+}$
(d) $[Co(NH_3)_6]^{3+}$

24. The magnetic moment of $[Co(NH_3)_6]CI_3$ is
(a) 1.73
(b) 2.83
(c) 6.6
(d) Zero

25. The magnetic moment of [NiCI4]2-is
(a) 1.82 BM
(b) 5.46 BM
(c) 2.82 BM
(d) 1.41 BM

26.The CFSE for a high spin d^4 octahedral complex is
a)-0.6Δ_{oct}
b) -1.8Δ_{oct}
c) -1.6 Δ_{oct}+P
d) -1.2Δ_{oct}

27. What is the coordination number and oxidation state for the cobalt atom in the compound $[Co(NH_3)_5Cl]Cl2$?
a) 4; +2
b) 5 ; +2
c) 6 ; +2
d) 6 ;+3

28. Which of the following species will be diamagnetic?

a) $[Fe(CN)_6]^{4-}$
b) $[FeF_6]^{3+}$
c) $[Co(C_2O_4)_3]^{3-}$
d) $[CoF_6]^{3-}$

29. How many unpaired electrons are there in a strong field complex $[Co(NH_3)_6]^{3+}$?
a) Zero
b) One
c) Two
d) three

30. $Co[(NH_3)_6]^{3+}$ ion is:
(a) Paramagnetic
(b) Diamagnetic
(c) Ferromagnetic
(d) Ferri magnetic

31. The CFSE for a high spin d^4 octahedral complex is:

A. –0.6 Δoct
B. –0.8 Δoct
C. –0.4 Δoct
D. –0.2 Δoct

32. $[Cr(CN)_6]^{3-}$ will be …… in nature:

A. paramagnetic
B. diamagnetic
C. nonmagnetic
D. uniform

33. The magnetic moment for $[Cr(CN)_6]^{3-}$ is approximately:

A. 3.87 μB
B. 4.87 μB
C. 2.87 μB
D. 1.87 μB

34. Which is correct according to ligands in spectrochemical series:

A. I– < Cl– < H2O <en
B. I– < Cl– < H2O = en
C. I– = Cl– < H2O <en
D. I– < Cl– = H2O <en

35. The electron acceptor in coordination complex is

A. Metal ion
B. ligand
C. p-orbital
D. s-orbital

36. Which metal ion have d3 electronic configuration in the following complexes?

A. [Cr(NH3)6]3+
B. [Co(OH2)6]2+
C. [Fe(CN)6]3-
D. [Ni(OH2)6]2+

37. Which complex ion will be having tetrahedral geometry?

A. $[PdCl_4]^{2-}$
B. $[PtCl_4]^{2-}$
C. $[NiCl_4]^{2-}$
D. $[AuCl_4]^{2-}$

38. What is the coordination number of the metal in $[Co(en)_2Cl_2]^+$
A. 4
B. 5
C. 6
D. 3

39. Which of the following has square planar structure
A. $[NiCl_4]^{2-}$
B. $[Ni(CO)_4]$
C. $[Ni(CN)_4]^{2-}$
D. $MnCl_2$

40. Which of the following is not an ambidentate ligand?
A. CN-
B. SCN-
C. NH_3
D. NO_2

41. The second ionisation energy is always higher than the first ionization energy because the---------
a. electron is attracted more by the core electrons
b. electron is more tightly bound to the nucleus in an ion
c. becomes more stable attaining the octet or duplet configuration
d. atomic radii is large

42.The most electronegative element possesses the electronic configuration?
a. $ns^2 np^2$
b. $ns^2 np^4$
c. $ns^2 np^5$
d. $ns^2 np^3$

43. Which of the following elements has completely filled two shells?
A. Ni
B. Ne
C. Na
D. No

44. Electronic configuration 2,8 is related to
A. Al+
B. Al+2
C. Al+3
D. Al+4

45. Periodic table gives a platform for studying
A. physical properties only
B. chemical properties only
C. not any property
D. physical and chemical properties both

46.The geometry of [PtCl4]2- is
A. tetrahedral
B. octahedral
C. square planar
D. pyramidal

47. Which one has the highest value of first ionisation energy _____.
A. Hydrogen
B. Helium
C. Lithium
D. Sodium

48. The correct statement about the atomic of the alkaline earth metals is _____.
A. it is smaller than corresponding alkali metals in the same periods
B. it is larger than corresponding alkali metals in the same periods
C. It is same as the corresponding alkali metals in the same periods
D. None of the above

49. The general electronic configuration of outermost orbital in the elements of Group 13 is _____.
A. ns2 np2
B. ns2
C. ns2 np1
D. ns2 np3

50. The correct statement about the variation of electronegativity in a group of the periodic table
A. It increases
B. It decreases
C. It remains constant
D. All of the above

51.The correct reason for the increase in the electronegativity across a period in periodic table
A. attraction between the valence electrons and the nucleus increases
B. attraction between the valence electrons and the nucleus decreases
C. increase in the atomic weight
D. decrease in the atomic weight

52. Which of the following outer electronic configurations is characteristic of alkali metals
   A. ns^1
   B. ns^2
   C. ns^2np^6
   D. ns^2np^2

53. Group 2 elements are
   A. oxidizing agents
   B. reducing agents
   C. oxidizing as well reducing agents
   D. microbial agents

54. Paramagnetism is common in
   A. p- block elements
   B. d- block elements
   C. s- block elements
   D. f- block elements

55. d- block elements form coloured ions because
   A. They absorb some energy for d – s transition
   B. They absorb some energy for p – d transition
   C. They absorb some energy for d – d transition
   D. They do not absorb any energy

56. Which of the following elements involves gradual filling of 5f level
   A. Lanthanides
   B. Actinides
   C. Transition metals
   D. Coinage metals

57. Which one is having largest atomic radii?
   A. Oxygen
   B. Nitrogen
   C. Fluorine
   D. Lithium

58.Which of the following would exhibit co-ordination isomerism?
   a)**$[Cr(NH_3)_6][Co(CN)_6]$**
   b) $[Co(en)_2Cl_2]$
   c) $[Cr(NH_3)_6]Cl_3$
   d) $[Cr(en)_2Cl_2]^+$

59. Exchange of co-ordination group by a water molecule in complex molecule results in ----

(a) Ionization isomerism
(b) Ligand isomerism
(c) Hydration isomerism
(d) Geometrical isomerism

60.Which would exhibit co-ordination isomerism?

a) **$[Cr(NH_3)_6][Co(CN)_6]$**
b) $[Co(en)_2Cl_2]$
c) $[Cr(NH_3)_6]Cl_3$
d) $[Cr(en)_2Cl_2]$

61. $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2$ are related to each other as?

a) Geometrical isomers
b) Optical isomers
c) Linkage isomers
d) Coordination isomers

62. $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ is an example for

a) Coordination isomerism
b) Ionisation isomerism
c) hydrate isomerism
d) linkage isomerism

63.The ionisation isomer of $[Cr(H_2O)_4Cl(NO_2)Cl]$ is

a)$[Cr(H_2O)_4(O_2N)]Cl_2$
a) $[Cr(H_2O)_4Cl_2](NO_2)$
b) $[Cr(H_2O)_4Cl(ONO)Cl$
c) $[Cr(H_2O)_4Cl_2(NO_2)]\ H_2O$