SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

RAMAPURAM

DEPARTMENT OF CHEMISTRY

QUESTION BANK

CHEMISTRY-21CYB101J

PART- A MCQ WITH ANSWER

UNIT -1

1. Which of the following will prefer to exist as sulphide?
   a. Mg^{2+}
   b. Al^{3+}
   c. Hg^{2+}
   d. Ca^{2+}

2. Among the following complexes, the one that shows zero crystal field stabilization energy (CFSE) is

a. $[Fe(H_2O)_6]^{3+}$

b. $[Mn(H_2O)_6]^{3+}$

c. $[Co(H_2O)_6]^{3+}$

d. $[Co(H_2O)_6]^{2+}$

3. 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

4. How many unpaired electrons are there in a strong field iron(II) octahedral complex?
   (A) 0
   (B) 5
   (C) 1
   (D) 3

5. 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: $[Ag(NH_3)_2][Ag(CN)_2]$

6. 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)

7. 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

8. 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]

9. 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

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^-

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) $-0.6\Delta_{oct}$
b) $-1.8\Delta_{oct}$
c) $-1.6\ \Delta_{oct}+P$
d) $-1.2\Delta_{oct}$

27. What is the coordination number and oxidation state for the cobalt atom in the compound $[Co(NH_3)_5Cl]Cl_2$?
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. 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

31. $[Cr(CN)_6]^{3-}$ will be..... in nature:
A. **paramagnetic**
B. diamagnetic
C. nonmagnetic
D. uniform

32. 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

33. 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

34. 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. $[Ni(OH2)6]^{2+}$

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

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

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

38. 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

39. Choose the correct statement

(A) As shielding effect increases electronegativity decreases
(B) As shielding effect increases electronegativity increases
(C) As shielding effect increases ionization potential increases
(D) As positive charge on species increases ionic radii increases

40. 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

41. 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

42. 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

43. Paramagnetism is common in

A. p- block elements
B. d- block elements
C. s- block elements
D. f- block elements

44. 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

45. Which one is having largest atomic radii?

A. Oxygen
B. Nitrogen
C. Fluorine
D. Lithium

46. 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) $[Cr(en)_2Cl_2]^+$

47. 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

48. $[Co(NH_3)_5NO_2]Cl_2$ 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

49. $[Co(NH_3)_6][Cr(C_2O_4)_3]$ 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

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

a) $[Cr(H_2O)_4(O_2N)]Cl_2$

b) $[Cr(H_2O)_4Cl_2](NO_2)$

c) $[Cr(H_2O)_4Cl(ONO)Cl$

d) $[Cr(H_2O)_4Cl_2(NO_2)]\ H_2O$