CHEMISTRY

BOOKS - TARGET CHEMISTRY (HINGLISH)

COORDINATION COMPOUNDS

Classical Thinking

1. Coordination compounds contain ligands attached to central metal atom/ion through _____ bond.

A. covalent

B. ionic

C. coordinate

D. metallic

Answer: C

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2. Which of the following is NOT a coordination compound ?

A. Urea

B. Haemoglobin

C. Chlorophyll

D. Cobalt(III) ammines

Answer: A

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3. According to Werner's theory transition metals possesses

A. two

B. three

C. five

D. infinite

Answer: A

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4. Which of the following is INCORRECT about primary valence ?

A. It is excercised by metals towards negative groups.

B. It is non-rigid and non-directional

C. It is a denoted by solid lines.

D. It is also known as non-ionizable valence.

Answer: D

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5. Which of the following is TRUE about secondary valence ?

A. It is denoted by solid lines.

B. It corresponds to the oxidation state of the central metal.

C. It is non-directional and non-rigid

D. It can be satisfied by negative ions or neutral molecules or both.

Answer: D

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6. According to Werner, there are two spheres (ozone) of attraction around the central metal ion. The inner sphere is the _____ and the outer sphere is the _____.

A. coordination sphere, ionization sphere

B. ionization sphere, coordination sphere

C. bonding sphere , antibonding sphere

D. second sphere, first sphere

Answer: A

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7. In the compound $\left[Co(NH_3)_6\right]Cl_3$, there are _____.

A. 3 chlorine ions in coordination sphere, 6 ammonia molecules in ionization sphere.

B. 6 ammonia molecules in coordination sphere, 3 chloride ions in ionization sphere.

C. 3 ammonia and 3 chloride in coordination sphere, 3 ammonia in ionizaiton sphere

D. 6 ammonia molecules and 3 chloride ions in the coordination.

Answer: B

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8. The number of ions given by $\left[Co(NH_3)_6\right]Cl_3$ in aqueous solution is _____.

A. 2

B. 3

C. 1

D. 4

Answer: D

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9. Among the given ligands, which is a negative ligand ?

A. Ammonia

B. Methylamine

C. Hydrazinium

D. Nitrate

Answer: D

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10. Ammonia molecule and oxalate ion have _____ coordination sites respectively.

A. one , two

B. two,one

C. three, two

D. one , three

Answer: A

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11. An ambidentate ligand is one which

A. is linked to the metal atom at two points

B. has two donor atoms but only one of them has the capacity toform a coordinate bond

C. has two donor atoms but either of the two can form a coordinate bond

D. forms chelate rings

Answer: C

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12. EDTA is a/an

A. hexadentate

B. tetradentate

C. unidentate

D. ambidentate

Answer: A

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13. Complex compounds with polydentate ligands involving ring structures are known as _____.

A. metal chelates

B. aromatic ligands

C. alicyclic chelates

D. cyclic metals

Answer: A

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14. The coordination number of cobalt in tris(ethylendiamine) cobalt(III) ion, $\left[Co(en)_3\right]^{3+}$, is

A. 3

B. 6

C. 4

D. 0

Answer: B

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15. Factor(s) influencing the coordination number of metal ion is /are _____.

A. charge of metal ion and ligand

B. size of metal ion and ligands

C. inter-ligand repulsions

D. all of these

Answer: D

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16. Which of the following statements is incorrect about coordination compounds?

A. Coordination number of the metal ion is influenced by the forces of repulsion between the ligands

B. A particular metal can exhibit more than one coordination number.

C. Different metal ions can show same coordination number

D. Geometry or shape of the complex is independent of coordination number.

Answer: D

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17. Central metal atom or ion bonded to fixed number of ions or molecules is known as _____.

A. coordination entitiy

B. coordination number

C. ligand

D. counter ion

Answer: A

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18. Complexes with central letal bonded to one kind of donor atoms are known as _____.

A. heteroleptic complexes

B. honoleptic complexes

C. neutral complexes

D. metal chelates

Answer: B

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19. $\left[Fe(H_2O)_6\right]^{3+}$ is an example of _____.

A. heteroleptic

B. anionic

C. cationic

D. neutral

Answer: C

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20. Oxidation number of nickel in $Ni(CO)_4$ is

A. 0

B. 1

C. 2

D. 4

Answer: A

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21. In the complex $K_3[Fe(CN)_6]$,_____.

A. coordination sphere is K^+

B. counter ion is $\left[Fe(CN)_6\right]^{3-}$

C. coordination number of Fe is 6

D. oxidation number of Fe is $+2$

Answer: C

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22. Transition metals form most stable complex ions as _____.

A. they exhibit multiple oxidation states

B. they have large charge to radius ratio

C. vacant orbitals to accommodate electrons are present

D. all of these

Answer: D

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23. Potassium ferrocyanide on reacting with copper sulphate yeilds a brown precipitate. The precipitate is _____.

A. $FeSO_4$

B. $Fe(CN)_2$

C. $Cu_2[Fe(CN)_6]$

D. $K_4[Cu(CN)_6]$

Answer: C

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24. The CORRECT Sidgwick structure for ferrocyanide complex is _____.

A. 

B. 

C. 

D. 

Answer: B

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25. Effective atomic number (EAN) is _____.

A. the number of electrons donated by the ligands

B. number of electrons on the metal ion

C. number of valence electrons of the central ion

D. sum of electrons on the metal ion and the number of electrons donated by the ligands

Answer: D

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26. EAN (Effective atomic number) of platinum in $\left[Pt(NH_3)_6\right]Cl_4$ is 86. The atomic number of Pt is _____.

A. 78

B. 76

C. 54

D. 86

Answer: A

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27. $K_4\left[Fe(CN)_6\right]$ is _____.

(i) potassium hexacyanoferrous (II)

(ii)potassium hexacyanoferate (II)

(iii) potassium ferrocyanide

(iv)hexacyanoferrate (III) potassium CORRECT answer is _____.

A. Only (i) and (ii)

B. Only (ii) and (iii)

C. Only (i) and (iii)

D. Only (ii) and (iv)

Answer: B

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28. The IUPAC name of $Fe(CO)_5$ is _____.

A. pentacarbonylferrate (0)

B. pentacarbonyferrate(III)

C. pentacarbonyliron (0)

D. pentacarbonyliron (II)

Answer: C

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29. IUPAC name of $K_2[PtCl_6]$ is

A. potassium platinumhexachloride

B. potassium hexachloridoplatinum (IV)

C. potassium hexachloridoplatinate (IV)

D. potassium hexachloridoplatinum (II)

Answer: C

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30. NH_3 group in a coordination compound is named as _____.

A. ammonium

B. ammine

C. amino

D. ammonia

Answer: B

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31. Cis-trans isomerism is found in square planar complexes of molecular formula: (a and b are monodentate ligands)

A. Ma_4

B. Ma_3b

C. Ma_2b_2

D. Mab_3

Answer: C

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32. Geometrical isomerism in coordination compounds is exhibited by

A. square planar and tetrahedral

B. square planar and octahedral

C. tetrahedral and octahedral

D. square planar, tetrahedral and octahedral

Answer: B

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33. $\left[Co(NH_3)_5SO_4\right]Br$ and $\left[Co(NH_3)_5Br\right]SO_4$ shown _____isomerism .

A. linkage

B. geometrical

C. ionization

D. optical

Answer: C

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34. $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5ONO]Cl_2$ are related to each other as :

A. ionization

B. linkage

C. coordination

D. hydrate

Answer: B

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35. Which would exhibit coordination isomerism

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

(b) $\left[Cr(en)_2CI_2\right]^{\oplus}$

(c) $\left[Cr(NH_3)_6\right]CI_3$

(d) $[Cr(edta)]^-$.

A. $\left[Cr(NH_3)_6\right]\left[Co(CN)_6\right]$

B. $Co(en)_2Cl_2]^+$

C. $\left[Cr(NH_3)_6\right]Cl_3$

D. $\left[Cr(en)_2Cl_2\right]^+$

Answer: A

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36. In coordination compounds , the hydrate isomers differ in _____.

A. the number of water molecules of hydration only

B. the number of water molecules only present as ligands

C. their coordination number of the metal atom

D. both (A) and (B)

Answer: D

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37. Which of the following is INCORRECT according to valence bond theory (VBT) ?

A. The bond formed between metal atom/ion is purely ionic.

B. The number of vacant orbitals provided same as its coordination number.

C. Each ligand has at least one orbital containing a lone pair of electrons.

D. The geometry of the complex depends on the hybridisation of the central metal atom/ion.

Answer: A

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38. Inner complexes are formed when _____ orbitals are used for hybridisation.

A. nd

B. (n-1)d

C. (n+1)d

D. (n-2)d

Answer: B

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39. The complex ion $\left[Cu(NH_3)_4\right]^{2+}$ has

A. tetrahedral configuration with one unpaired electron

B. square planar configuration with one unpaired electron

C. tetrahedral configuration with all electrons paired

D. square planar configuration with all paired electrons

Answer: B

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40. The complex ions $\left[Fe(CN)_6\right]^{3-}$ and $\left[Fe(CN)_6\right]^{4-}$ _____.

A. are both octahedral and paramagnetic

B. are both octahedral and diamagnetic

C. have same structures but some magnetic character

D. have different structures but same magnetic character.

Answer: C

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41. Which is NOT true about valence bond theory (VBT) ?

A. It cannot explain the spherical properties of complex compounds.

B. It cannot explain correlation of magnetic behaviour based on geometry of the complex.

C. It can distinguish between weak field and strong field ligands.

D. It accounts for coordinate bond formation due to overlap of vacant hybrid orbitals.

Answer: C

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42. Crystal field theory assumes that interaction between the metal ion and ligand is _____.

A. purely covalent

B. purely coordinate covalent

C. polar covalent

D. electrostatic

Answer: D

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43. The destruction of degeneracy and spliting of d-orbitals , due to repulsive forces is known as _____.

A. crystal field splitting

B. crystal field stabilization

C. spain pairing

D. kinetic stability

Answer: A

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44. The energy differnce between $t_2 \_ (g)$ and e_g level in an octahedral crystal field is _____.

A. 4Dq

B. 6Dq

C. 8Dq

D. 10Dq

Answer: D

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45. Considering H_2O as a weak field ligand, the number of unpaired electrons in $\left[Mn(H_2O)_6\right]^{2+}$ will be (At. no. of $Mn = 25$)

A. two

B. four

C. three

D. five

Answer: D

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46. Which of the following system has maximum number of unpaired electrons?

A. d^5(octahedral)

B. d^9 (octahedral)

C. d^7 (octahedral)

D. d^6 (octahedral)

Answer: A

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47. The colour of the transition metal ions is/are due to:

A. s-p

B. p-p

C. d-d

D. p-d

Answer: C

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48. Ti^{2+} is purple while Ti^{4+} is colourless because

A. there is no crystal field effect in Ti^{4+}

B. the energy difference between e_g and t_{2g} is quite high and hence does not fall within the visible region

C. Ti^{4+} had $3d^{\circ}$ configuration

D. Ti^{4+} is very small cation when compared to Ti^{3+} and hence , does not absorb any radiation.

Answer: C

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49. Two $Mn(CO)_5$ units are joined by _____ bond to form decarbonyl dimanganese (0).

A. Mn-CO

B. CO-CO

C. hydrogen

D. Mn-Mn

Answer: D

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50. In metal carbonyl , there is _____.

A. no π bond between CO and metal atom

B. only σ bond between metal atom and CO molecules

C. one σ and one π bond (block-donation) between metal atom and CO molecules

D. the metal-carbon bonds does not exist at all

Answer: C

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51. The stability constants of the complexes formed by a metal ion $\left(M^{2+}\right)$ with NH_3, CN^-, H_2O and en are of the order $10^{11}, 10^{27}, 10^{15}$ and 10^8 respectively . Then _____.

A. en is the strongest ligand.

B. CN^- is the strongest ligand.

C. these values connot predict the strength of the ligand.

D. all ligands are equally strong.

Answer: B

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52. The stability of complex formed by metal ions of same charge with same ligand, _____.

A. increases with increase inatomic radii of metal ion

B. increases with decrease in atomic radii of metal ion

C. independent of atomic radii of metal ion

D. depends on the atomic mass of metal ion

Answer: B

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53. Stability of the complex may depend on

A. nature of ligand

B. charge of the central metal ion

C. radius of the central metal ion

D. all of these

Answer: D

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54. Silver present in the silver ore forms _____ complex when treated with dilute NaCN solution.

A. a cyano

B. a thiocyanide

C. an isocyanide

D. a carbonyl

Answer: A

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55. Which is a component of chlorophyll ?

A. Mg

B. Mn

C. Co

D. Fe

Answer: A

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56. Vitamin B_{12} contains

A. Mg

B. Co

C. Fe

D. Mn

Answer: B

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57. The IUPAC name of the complex $\left[Ni(C_4H_7O_2N_2)_2\right]$ formed from the reaction of Ni^{2+} with dimethylglyoxime is _____.

A. Bis(methylgyloxal) nickel (II)

B. Bis(dimethylglyoximate) nickelate(IV)

C. Bis(2, 3-butanedioldiooximato) nickel (II)

D. Bis(dimethylglyoximato) nickel (II)

Answer: D

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58. In which of the following compounds transition metal is in oxidation state zero

A. $\left[Co(NH_3)_6\right]Cl_3$

B. $\left[Fe(H_2O)_6\right]SO_4$

C. $\left[Ni(CO)_4\right]$

D. $\left[Fe(H_2O)_3\right](OH)_5$

Answer: C

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59. Which of the following statements is NOT TRUE about crystal field theory (CFT) ?

A. Does not explain π-bonding in complexes.

B. Explains Kinetic and thermodynamic properties of some complexes.

C. Explains colours exhibited by complexes due to d-d transitions.

D. Explains only about the central metal ion with s ad p- orbitals

Answer: D

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60. Which one of the following statements is INCORRECT ?

A. Greater the stability constant of a complex ion, greater is the stability of the complex.

B. Greater the charge on the central metal ion, greater is the stability of the complex.

C. Greater the basic character of the ligand, the greater is the stability of the complex.

D. Chelate complexes have low stability constants.

Answer: D

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Critical Thinking

1. Which of the following statements is INCORRECT about Werner's theory ?

A. Primary valence is the same thing as oxidation state.

B. Secondary valence is the same thing as coordination number.

C. Primary valence are satisfied by neutral molecules.

D. Secondary valences are directional whereas primary valences are non-directional.

Answer: C

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2. The complex $\left[Cr(H_2O)_4Br_2\right]Cl$ in its aqueous solution gives test for _____.

A. Cl^- ion

B. Br^- ion

C. Both Cl^- and Br^- ion

D. Neither Cl^- and Br^- ion

Answer: A

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3. When $AgNO_3$ is added to a solution of $CoCl_{3.5}NH_3$, the precipitate of AgCl shows two ionizable chloride ions.

This means that _____.0

A. two chlorine atoms satisfy primary valence and one chlorine atom satisfies secondary valence.

B. two chlorine atoms satisfy primary as well as secondry valences

C. Three chlorine atoms satisfy primary valence

D. three chlorine atoms satisfy secondary valence.

Answer: A

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4. Pick out from the following complex compounds, a poor electrolytic conductor in solution?

A. $K_2[PtCl_6]$

B. $[Co(NH_3)_3(NO_2)_3]$

C. $K_4[Fe(CN)_6]$

D. $[Cu(NH_3)_4]SO_4$

Answer: B

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5. Bidenate ligand is _____.

A. triethylenetetramine

B. ethylenediamine

C. EDTA

D. SCN^-

Answer: B

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6. The neutral ligand is _____.

A. chloride

B. hydroxide

C. ammonia

D. oxalato

Answer: C

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7. Which of the following ligands is NOT a chelating agent

/

A. EDTA

B. en

C. Oxalate

D. Pyridine

Answer: D

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8. The donor sites of $(EDTA)^{4-}$ are ?

A. O atoms only

B. N atoms only

C. two N atoms and four O atoms

D. three n atoms and three O atoms

Answer: C

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9. NO_2^- has two donor atoms (N and O). Which donor atom/s get/s linked with a metal, while forming a complex ?

A. N only

B. O only

C. Either N or O

D. Both N and O

Answer: C

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10. In metal chelates, the coordination number is the_____.

A. number of ligands

B. oxidation number of metal ion

C. number of electron pairs involved in bonding

D. charge on the ligand

Answer: C

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11. In which of the following , the central atom does NOT exhibit an oxidation state of $+2$?

A. $K_2\left[Ni(CN)_4\right]$

B. $K_4\left[Fe(CN)_6\right]$

C. $\left[Fe(C_2O_4)_3\right]^{3-}$

D. $\left[Cu(NH_3)_4\right]^{2+}$

Answer: C

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12. The coordination number and oxidation number of M in the complex, $\left[M(NH_3)_5SO_4Cl\right.$ are _____.

A. 10, $+3$

B. 6 , $+4$

C. $2, +6$

D. $6, +3$

Answer: D

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13. $\left[Fe(H_2O)_6\right]Cl_3$ and $\left[Pt(NH_3)_2Cl_2\right]$ are

A. anionic and neutral

B. neutral and cationic

C. cationic and neutral

D. cationic and anionic

Answer: C

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14. An example for a double salt is

A. potassium ferricyanide

B. hexaamminecobalt(III) chloride

C. copper sulphate

D. Mohr's salt

Answer: D

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15. The effective atomic number for the complex ion $\left[Pd(NH_3)_6\right]^{4+}$ is _____.

[Given : Pd(Z = 46)]

A. 54

B. 86

C. 36

D. 50

Answer: A

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16. As per IUPAC name , the name of the complex $\left[Co(en)_2(ONO)Cl\right]Cl$ is

A. Cobalt diethylene diamminechloronitrate

B. Chlorodiethyldiamminenitritocoblat (III)

C. Chloronitritodiethyldiamminecobaltate (III)

D. Chlorobis(ethylenediammine)nitrito-O cobalt (III)

Answer: D

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17. The IUPAC name of compound $Na_3\left[Co(ONO)_6\right]$ will be

A. Hexanitrito-O cobalt (III) sodium

B. Sodium cobalt nitrite

C. Sodium hexanitrocobaltate (III)

D. Sodium hexanitrocobaltate(III)

Answer: D

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18. IUPAC name of $\left[Pt(NH_3)_3(Br)(NO_2)CI\right]CI$ is

A. Triamminechlorobromonitroplatinum (IV) chloride

B. Triamminebromonitrochloroplatinum(IV)chloride

C. Triamminebromochloronitrito-N platinum (IV) chloride

D. Triamminenitrochlorobromoplatinum (IV) chloride

Answer: C

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19. The complex compound $\left[Co(NH_3)_3NO_2ClCN\right]$ is named as _____.

A. Triamminechlorocyanonitrito-N cobalt (III)

B. Nitrochlorocyanotriammine coblat(III)

C. Cyanonitrochlorotriammine cobalt (III)

D. Triamminenitrochlorocyano cobalt (III)

Answer: A

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20. IUPAC name of $\left[Co(ONO)(NH_3)_5Cl_2\right]$ is

A. Pentaamminethiocyanato-N cobalt (III) chloride

B. Pentaamminethiocyanato-S cobalt (III) chloride

C. Pentaammineisothiocyanato-N, S cobalt (III) chloride

D. Pentaamminmercapto -N cobalt (III) chloride

Answer: A

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21. Which of the following is CORRECT ?

A. The IUPAC name of $Mn_3\left[(CO)_{12}\right]$ is Dodecacarbonyltrimanganese (0).

B. The IUPAC name of $K[BF_4]$ is Tetrafluoridoboronpotassium (I).

C. The IUPAC name of $K_3\left[Al(C_2O_4)_3\right]$ is Potassiumtrioxalatealuminium (III).

D. The IUPAC name of $K_4\left[Fe(CN)_6\right]$ is Potassium ferrocyanide.

Answer: A

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22. Out of the following , which will NOT show geometrical isothermism ?

A. $\left[Pt(NH_3)_2(H_2O)_2\right]^{2+}$

B. $\left[Cr(NH_3)_5Cl\right]Cl_2$

C. $\left[Co(en)_2Cl_2\right]Cl$

D. $\left[Co(NH_3)_4Cl_2\right]Cl$

Answer: B

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23. The number of geometrical isomers of $\left[Co(NH_3)_3(NO_3)_3\right]$ is

A. 2

B. 3

C. 4

D. 6

Answer: A

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24. Which of the following pairs of structures represents facial and meridional isomers (geometrical iosmers) respectively ?

A. 

B. 

C. 

D. 

Answer: A

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25. Which of the following is optically inactive ?

[Where a, b =monodentate ligands, AA = symmetrical bidentate ligand]

A. Cis-$\left[M(\mathrm{AA})_2ab\right]^{npn}$

B. $\left[M(\mathrm{AA})_3\right]^{npn}$

C. Trans-$\left[M(\mathrm{AA})_2a_2\right]^{npn}$

D. Cis-$\left[M(\mathrm{AA})_2a_2\right]^{npn}$

Answer: C

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26. Which one of the following pairs of isomers and types of isomerism are CORRECTLY matched ?

A.

$\left[Co(NH_3)_5(NO_2)\right]Cl_2$ and $\left[Co(NH_3)_5(ONO)\right]Cl_2$

.... Linkage

B. $\left[Cu(NH_3)_4\right]\left[(PtCl_4)\right]$ and $\left[Pt(NH_3)_4[CuCl_4]\right]$....

Coordination

C.

$\left[Pt(NH_3)_4Cl_2\right)]Br_2$ and $\left[Pt(NH_3)_4Br_2\right)Cl_2$.....

Ionization

D. All of these

Answer: D

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27. The complex salt having the molecular composition $\left[Co(NO_2)(SCN)(en)_2\right]Br$ exhibits _____.

A. cis-trans isomerism

B. linkage isomerism

C. ionization isomerism

D. all of above

Answer: D

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28. $\left[Co(NH_3)_4(NO_2)_{92}\right]Cl$ exhibits _____.

A. ionization isomerism, geometrical isomerism and optical isomerism.

B. linkage isomersim , geometrical isomerism and optical iosmerism.

C. linkage isomerism, ionization isomerism and optical isomerism.

D. linkage isomerism, geometrical isomerism and ionization isomerism.

Answer: D

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29. Hexafluorocbaltate(III) ion is found to be high spin complex, the probable hybrid state of cobalt in it is

A. d^2sp^3

B. sp^3

C. sp^3d

D. sp^3d^2

Answer: D

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30. When excess of ammonia is added to $CuSO_4$ solution, the deep blue coloured complex is formed. Complex is

A. tetrahedral, paramagnetic

B. tetrahedral , diamagnetic

C. square planar , diamagnetic

D. square planar, paramagnetic

Answer: D

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31. Which of the following statements is CORRECT ?

A. The $\left[Ni(CN)_4\right]^{2-}$ ion has tetrahedral geometry and is diamagnetic

B. The $\left[Ni(CN)_4\right]^{2-}$ ion has a square-planar geometry and is paramagnetic.

C. The $\left[Ni(CN)_4\right]^{2-}$ ion has a sqaure -planar geometry and is diamagentic.

D. The $\left[Cu(NH_3)_4\right]^{2+}$ ion has a tetrahedral geometry and is diamagnetic.

Answer: C

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32. The number of unpaired electrons in the complex ion $[CoF_6]^{3-}$ is

A. 4

B. 0

C. 2

D. 3

Answer: A

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33. Which of the following complexes are paramagnetic in nature ?

$[Fe(CN)_6]^{3-}$, $[Fe(CN)_6]^{4-}$, $[CoF_6]^{3-}$, $Ni(CO)_4$.

A. I and IV

B. I and II

C. I and III

D. III and IV

Answer: C

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34. The strongest ligand in the following is _____.

A. CN^-

B. Br^-

C. HO^-

D. F^-

Answer: A

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35. What is the shape of $Fe(CO)_5$?

A. Square pyramidal

B. Octahedral

C. Linear

D. Trigonal bipyramidal

Answer: D

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36. Which of the following is NOT true for metal carbonyls ?

A. The oxidation state of the metal in the carbonyls is zero.

B. M-C π bond is formed by donation of electron pair from metal to carbon monoxide.

C. Metal carbonyls are single bonded species .

D. $d\pi - p\pi$ overlap is observed in metal carbonyls.

Answer: C

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37. The character of Fe-C bond in $Fe(CO)_5$ is _____.

A. π only

B. σ only

C. ionic only

D. both π and σ

Answer: D

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38. In the complex $\left[Co(NH_3)_6\right]^{3+}$ the species acting as Lewis acid and Lewis base are respectively-

A. Co^{2+}, NH_3

B. NH_3, CO^{3+}

C. Co^{3+}, NH_3

D. NH_3, Co^{3+}

Answer: C

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39. Which of the following factors does tends to increase the stability of metal ion complexes ?

A. Higher ionic radius of the metal ion.

B. Higher charge/size ratio of the metal ion.

C. Lower ionization potential of the metal ion.

D. Lower basicity of the ligand.

Answer: B

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40. The complexes formed by Cu^{2+} ion are more stable than those formed byCd^{2+} ion because _____.

A. the value of the stability constant for Cd^{2+} complexes is greater than that of

B. the charge density on Cu^{2+} ion is greater than that on Cd^{2+} ion.

C. the ionic radius of Cu^{2+} ion is more than that of Cd^{2+} ion.

D. Cu^{2+} ion forms chelate compounds.

Answer: B

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41. Irving William order of stability of complexes of divalent metal ions with same ligands is _____.

A.

$$Cu^{2+} > Ni^{2+} > Co^{2+} > Fe^{2+} > Mn^{2+} > Cd^{2+}$$

B.

$$Ni^{2+} < Co^{2+} < Fe^{2+} < Mn^{2+} < Cd^{2+} < Cu^{2+}$$

C.

$$Fe^{2+} > Mn^{2+} > Cd^{2+} > Cu^{2+} > Ni^{2+} > Co^{2+}$$

D.

$$Fe^{2+} < Mn^{2+} < Cd^{2+} < Cu^{2+} < Ni^{2+} < Co^{2+}$$

Answer: A

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42. A reagent used for identifying nickel ion is:

A. potassium ferrocyanide

B. phenolphthalein

C. dimethylglyoxine

D. EDTA

Answer: C

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43. Which of the following is widely used as an electrolyte for silver plating ?

A. $k\left[Au(CN)_2\right]$

B. AgCl

C. $\left[Ag(NH_3)_2\right]Cl$

D. $k\left[Ag(CN)_2\right]$

Answer: D

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44. The hardness of water is estimated by _____ method.

A. conductivity

B. EDTA

C. DMG

D. distillation

Answer: B

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45. Triphenyl phosphine is –

A. neutral and monodentate ligand.

B. neutral and tridentate ligand

C. uninegative and unidentate ligand

D. trinegative and tridentate ligand

Answer: A

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46. Which isomer of $CrCl_{3.6}H_2O$ is dark green in colour and forms one mole of AgCl with excess of $AgNO_3$ solution –

A. $[Cr(H_2O)]Cl_3$

B. $\left[Cr(H_2O)_5Cl\right]Cl_2H_2O$

C. $\left[Cr(H_2O)_4Cl_2\right]Cl.2H_2O$

D. $\left[Cr(H_2O)_3Cl_3\right].3H_2O$

Answer: C

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47. Two complexes $PtCl_{4.2}NH_3$ and $PtCl_{4.2}KCl$ do not give precipitate of AgCl with $AgNO_3$ solution. The conductance studies indicate presence of zero and 3 ions per mol in their solutions. The structures of these complexes are _____.

A. $\left[Pt(NH_3)_2Cl_2\right]Cl_2, K_2[PtCl_6]$

B. $\left[Pt(NH_3)_2\right]Cl_4, K_2[PtCl_6]$

C. $\left[Pt(NH_3)_2Cl_4\right], K_2[PtCl_6]$

D. $\left[Pt(NH_3)_2Cl_4\right], K_2[PtCl_5]Cl$

Answer: C

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48. $\left[Fe(H_2O)_6\right]^{2+}$ and $\left[Fe(CN)_6\right]^{4-}$ differ in :

A. geometry , magnetic moment

B. magnetic moment ,colour

C. geometry, hybridization

D. hybridization , number of unpaired electrons.

Answer: B

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49. Match List-I and List -II and select the correct answer using codes given ahead in the lists

A. i-a, ii-c, iii-e, iv-d

B. i-b, ii-c, iii-e, iv-a

C. i-d, ii-c, iii-e, iv-a

D. i-d, ii-c, iii-c , iv-a

Answer: C

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50. When potassium hexachloridoplatinate (IV) is dissolved in water, the solution :

A. contains 6 ions per molecule

B. reacts with $AgNO_3$ to give 6 moles of AgCl

C. does not contain any Cl^- ion

D. contains K^+, Pt^{4+} and Cl^- ions

Answer: C

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51. In SCN ligand if N is attached to central atom, the name of ligand is –

A. thiocyanato-N

B. cyanato-N

C. thiocyanato-S

D. cyanato-S

Answer: A

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Competitive Thinking

1. Cobalt (III) chloride forms several octahedral complexes with amonia. Which of the following will not give test for chloride ions with silver nitrate at $25^{\circ}C$?

A. $CoCl_3.3NH_3$

B. $CoCl_3.4NH_3$

C. $CoCl_3.5NH_3$

D. $CoCl_3.6NH_3$

Answer: A

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2. The correct order of the stoichiometries of $AgCl$ formed when $AgNO_3$ in excess is treated with the complexes: $CoCl_3.6NH_3, CoCl_3.5NH_3, CoCl_3.4NH_3$ respectively is:

A. 3 AgCl , 1 AgCl , 2 AgCl

B. 3 AgCl , 2 AgCl , 1 AgCl

C. 2 AgCl , 3 AgCl , 1 AgCl

D. 1 AgCl , 3 AgCl , 2 AgCl

Answer: B

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3. One mole of the complex compound $Co(NH_3)_5Cl_3$, gives 3 moles of ions on dissolution in water. One mole of the same complex reacts with two moles of $AgNO_3$ solution to yield two moles of $AgCl_{(s)}$. The structure of the complex is _____.

A. $\left[Co(NH_3)_3Cl_3\right]2NH_3$

B. $\left[Co(NH_3)_4Cl_2\right]Cl.\ NH_3$

C. $\left[Co(NH_3)_4Cl\right]Cl_2.\ NH_3$

D. $\left[Co(NH_3)_5Cl\right]Cl_2$

Answer: D

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4. Which of the following will exhibit maximum ionic conductivity?

A. $K_4[Fe(CN)_6]$

B. $[Co(NH_3)_6]Cl_3$

C. $[Cu(NH_3)_4]Cl_2$

D. $[Ni(CO)_4]$

Answer: A

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5. Which of the following represents chelating ligand ?

A. H_2O

B. OH^-

C. DMG

D. Cl^-

Answer: C

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6. What is the number of donar atoms in dimethylglyoxinato ligand ?

A. 1

B. 2

C. 3

D. 4

Answer: B

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7. The CORRECT structure of ethyldiaminetetraacetic acid (EDTA) is _____.

A. 

B. 

C. 

D. 

Answer: C

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8. Which one is ambidentate ligand

A. SO_3^{2-}

B. CN^-

C. NH_3

D. H_2O

Answer: B

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9. The coordination number of a central metal atom in a complex is determined by the number of _____.

A. ligands around a metal ions is bonded by both sigma and pi-bonds

B. ligands around a metal ion bonded by pi-bonds.

C. ligands around a metal ion bonded by coordinate bond.

D. only anionic ligands bonded to the metal ion.

Answer: C

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10. What is the oxidation number of gold in the complex $[AuCl_4]^{1-}$?

A. $+4$

B. $+3$

C. $+2$

D. $+1$

Answer: B

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11. The oxidation number of Ni in $\left[Ni(C_2O_4)_3\right]^{4-}$ is _____.

A. $+3$

B. $+4$

C. $+2$

D. $+6$

Answer: C

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12. The CORRECT charge on and coordination number of 'Fe' in $K_3\left[Fe(CN)_6\right]$ are _____.

A. $+2, 4$

B. $+3, 6$

C. $+2, 6$

D. $+3,3$

Answer: B

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13. The coordination number and the oxidation state of the element 'E' in the complex $\left[E(en)_2(C_2O_4)\right]NO_2$ (where (en) is ethylenediamine) are, respectively

A. 4 and 2

B. 4 and 3

C. 6 and 3

D. 6 and 2

Answer: C

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14. The sum of coordination number and oxidation number of the metal M in the complex $\left[M(en)_2(C_2O_4)\right]Cl$ (where en is ethylenediamine) is:

A. 7

B. 8

C. 9

D. 6

Answer: C

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15. Which of the following is a neutral complex ?

A. $\left[Pt(NH_3)_2Cl_2\right]$

B. $\left[Co(NH_3)_6\right]Cl_3$

C. $\left[Ni(NH_3)_6\right]Cl_2$

D. $K_4\left[Fe(CN)_6\right]$

Answer: A

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16. Potassium ferrocyanide is a

A. normal salt

B. mixed salt

C. double salt

D. complex salt

Answer: D

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17. How many ions per molecules are produced in the solution when Mohr's salt is dissolved in excess of water ?

A. 4

B. 5

C. 6

D. 10

Answer: B

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18. What is the EAN of nickel in $Ni(CO)_4$?

A. 34

B. 35

C. 32

D. 36

Answer: D

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19. If the Effective Atomic Number (EAN) of $\left[A(NH_3)_6\right]Cl_3$ is 33, the atomic number of the element (A) will be _____.

A. 23

B. 27

C. 24

D. 29

Answer: C

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20. Which of the following co-ordinate complexes is an exception to EAN rule ?

(Given atomic number $Pt = 078, Fe = 26, Zn = 30, Cu = 29$)

A. $\left[Pt(NH_3)_6\right]^{4+}$

B. $\left[Fe(CN)_6\right]^{4-}$

C. $\left[Zn(NH_3)_4\right]^{2+}$

D. $\left[Cu(NH_3)_4\right]^{2+}$

Answer: D

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21. IUPAC name of $\left[Co(ONO)(NH_3)_5Cl_2\right]$ is

A. Pentaamminenitrocobalt (III) chloride

B. Pentaamminenitrito-O cobalt (III) chloride

C. Pentaamminenitrosocobalt (III) chloride

D. Pentaammineoxo-nitrocobalt (III) chloride

Answer: B

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22. The name of the complex ion, $\left[Fe(CN)_6\right]^{3-}$ is _____.

A. tricyanoferrate (III) ion

B. hexacyanoferrate (III) ion

C. hexacyanoiron (III) ion

D. hexacyanitoferrate (III) ion

Answer: B

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23. The IUPA name of $\left[Co(NH_3)_3(NO_2)_3\right]$ is

A. triamminetrinitrito-N cobalt (III)

B. triamminetrinitrito-N cobalt (II)

C. Hexacyanoiron (III) ion

D. triamminetrinititto-N cobaltate (III)

Answer: A

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24. What is the structural formula of lithium tetrahydrido aluminate

A. $Al[LiH_4]$

B. $Al_2[LiH_4]_3$

C. $Li[AlH_4]$

D. $Li[AlH_4]_2$

Answer: C

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25. Formula of hexa-aquamangnnese (II) phosphate is

A. $[Mn(H_2O)_6](PO_4)$

B. $[Mn(H_2O)_6]_3(PO_4)$

C. $[Mn(H_2O)_6]_3(PO_4)_2$

D. $[Mn(H_2O)_6](PO_4)_3$

Answer: C

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26. As per IUPAC nomeclature , the name of the complex $\left[Co(H_2O)_4(NH_3)_2\right]Cl_3$ is _____.

A. Tetraaquadiaminecobalt (III) chloride

B. Tetraaquadiaminecobalt (II) chloride

C. Diamminetetraaquacobalt (II) chloride

D. Diamminetetraaquacobalt (III) chloride

Answer: D

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27. Which among the following will be named as dibromidobis-(ethylenediamine) chromium (III) bromide?

A. $\left[Cr(en)_3\right]Br_3$

B. $\left[Cr(en)_2Br_2\right]Br$

C. $[Cr(en)Br_4]^-$

D. $[Cr(en)Br_2]Br$

Answer: B

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28. The number of geometric isomers that can exist for square planar $\left[Pt(C1)(py)(NH_3)(NH_2OH)^+\right]$ is (py =

pyridine).

A. 2

B. 3

C. 4

D. 6

Answer: B

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29. Which of the following will be able to show geometrical isomerism ?

A. MA_3B- Square planar

B. MA_2B_2- Tetrahedral

C. MABCD- Sqaure planar

D. MABCD - tetrahedral

Answer: C

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30. Which of the following octahedral complex does not show geometrical isomerism (A and B are monodentate ligands) ?

A. $[MA_5B]$

B. $[MA_2B_4]$

C. $[MA_3B_3]$

D. $[MA_4B_2]$

Answer: A

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31. The existence of two different coloured comlexes with the composition $\left|Co(NH_3)_2Cl_2\right|^+$ is due to

A. ionization

B. linkage

C. geometrical

D. coordination

Answer: C

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32. Which of the following has an optical isomer ?

A. $\left[Zn(en)_2\right]^{2+}$

B. $\left[Zn(en)(NH_3)_2\right]^{2+}$

C. $\left[Co(en)_3\right]^{3+}$

D. $\left[Co(H_2O)_4(en)\right]^{3+}$

Answer: C

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33. Which of the following has an optical isomer?

A. $\left[Co(NH_3)_3Cl\right]^+$

B. $\left[Co(en)(NH_3)_2\right]^{2+}$

C. $\left[Co(H_2O)_4(en)\right]^{3+}$

D. $\left[Co(en)_2(NH_3)_2\right]^{3+}$

Answer: D

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34. Which one of the following complexes shows optical isomerism ?

A. $\left[Co(NH_3)_3Cl_3\right]$

B. cis $\left[Co(en)_2Cl_2\right]Cl$

C. trans $\left[Co(en)_2Cl_2\right]Cl$

D. $\left[Co(NH_3)_4Cl_2\right]Cl$

(en = ethylenediamine)

Answer: B

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35. Number of possible isomers for the complex $\left[Co(en)_2CI_2\right]$ will be (en = ethylenediamine)

A. 3

B. 4

C. 2

D. 1

Answer: A

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36. The ionisation isomer of $\left[Cr(H_2O)_4Cl(NO_2)\right]Cl$

A. $\left[Cr(H_2O)_4(O_2N)\right]Cl_2$

B. $\left[Cr(H_2O)_4Cl_2\right](NO_2)$

C. $\left[Cr(H_2O)_4Cl(ONO)\right]Cl$

D. $\left[Cr(H_2O)_4Cl_2(NO_2)\right]H_2O$

Answer: B

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37. Which of the following pairs represents linkage isomers?

A. $\left[Cu(NH_3)_4\right][PtCl_4]$ and $\left[Pt(NH_3)_4\right][CuCl_4]$

B. $\left[Pd(\mathrm{PP}h_3)_2(NCS)_2\right]$ and $\left[Pd(\mathrm{PP}h_3)_2(SCN)_2\right]$

C. $\left[Co(NH_3)_5NO_3SO_4\right.$ and $\left.\left[Co(NH_3)_5SO_4\right]NO_3\right.$

D. $\left[Pt\left(Cl_2(NH_3)_4\right]Br_2\right.$ and $\left.\left[PtBr_2(NH_3)_4\right]Cl_2\right.$

Answer: B

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38. The complexes $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$ are the examples of which type of isomerism ?

A. Geometrical isomerism

B. linkage isomerism

C. ionization isomerism

D. Coordination isomerism

Answer: D

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39. $[Cr(NH_3)_6]Cr(SCN)_6$ and $[Cr(NH_3)_2(SCN)_4][Cr(NH_3)_4(SCN)_2]$ are the examples of what type of isomerism ?

A. Ionization isomerism

B. Linkage isomerism

C. Coordination isomerism

D. Solvate isomerism

Answer: C

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40. Which of the following complexes is an outer orbital complex ?

(Atomic number : Mn =25 , Fe=26, Co=27, Ni=28)

A. $\left[Co(NH_3)_6\right]^{3+}$

B. $\left[Mn(CN)_6\right]^{4-}$

C. $\left[Fe(CN)_6\right]^{4-}$

D. $\left[Ni(NH_3)_6\right]^{2+}$

Answer: D

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41. The hybridization involved in complex $\left[Ni(CN)_4\right]^{2-}$ is $(At.\ No.\ Ni = 28)$

A. d^2sp^2

B. d^2sp^3

C. dsp^2

D. sp^3

Answer: C

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42. The complex ion which has no.'d' electrons in the central metal atom is :

A. $[MnO_4]^-$

B. $[Co(NH_3)_6]^{3+}$

C. $[Fe(CN)_6]^{3-}$

D. $[Cr(H_2O)_6]^{3+}$

Answer: A

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43. Nickel $(Z = 28)$ combines with a uninegative monodentate ligand X^- to form a paramagnetic complex $[NiX_4]^{2-}$. The number of unpaired electron(s) in the nickel and geometry of this complex ion are, respectively:

A. one , square planar

B. Two , square planar

C. one , tetrahedral

D. two, tetrahedral

Answer: D

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44. The magnetic moment (spin only) of $[NiCl_4]^{2-}$ is

A. 1.82 B.M.

B. 5.46 B.M.

C. 2.82 B.M.

D. 1.41 B.M.

Answer: C

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45. The d-electron configurations of Cr^{2+}, Mn^{2+}, Fe^{2+} and Co^{2+} are d^4, d^5, d^6 and d^7 respectively. Which one of the following will exhibit minimum paramagnetic behavious?

A. $\left[Cr(H_2O)_6\right]^{2+}$

B. $\left[Mn(H_2O)_6\right]^{2+}$

C. $\left[Fe(H_2O)_6\right]^{2+}$

D. $\left[Co(H_2O)_6\right]^{2+}$

Answer: D

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46. Both $\left[Ni(CO)_4\right]$ and $\left[Ni(CN)_4\right]^{2-}$ are diamagnetic The hybridisations of nickel in these complexes , respectively are :

A. sp^3, sp^3

B. sp^3, dsp^2

C. dsp^2, sp^3

D. dsp^2, dsp^2

Answer: B

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47. Which of the following spectrochemical series is TRUE ?

A. $SCN^- < NH_3 < F^- < en < CO$

B. $SCN^- < F^- < NH_3 < en < CO$

C. $SCN^- < F^- < en < NH_3 < CO$

D. $SCN^- < F^- < en < CO < NH_3$

Answer: B

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48. In which of the following coordination entities the magnitude fo $\Delta_{\circ}$ (CFSE in octahedral field) will be maximum ?

A. $\left[Co(CN)_6\right]^{3-}$

B. $\left[Co(C_2O_4)_3\right]^{3-}$

C. $\left[Co(H_2O)_6\right]^{3+}$

D. $\left[Co(NH_3)_6\right]^{3+}$

Answer: A

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49. What type of hybridisation is involved in $\left[Fe(CN)_6\right]^{3-}$?

A. d^2sp^3

B. dsp^2

C. sp^3d^2

D. dsp^3

Answer: A

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50. Which of these statements about $\left[Co(CN)_6\right]^{3-}$ is true?

A. $\left[Co(CN)_6\right]^{3-}$ has no unpaired electrons and will be in low-spin configuration.

B. $\left[Co(CN)_6\right]^{3-}$ has four unpaired electrons and will be in low-spin configuration.

C. $\left[Co(CN)_6\right]^{3-}$ has four unpaired electrons and will be in high-spin configuration.

D. $\left[Co(CN)_6\right]^{3-}$ has no unpaired electrons and will be in a high-spin configuration.

Answer: A

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51. Which of the following complexes is paramagnetic

A. $[Ni(CO)_4]$

B. $[Co(NH_3)_6]^{3+}$

C. $[Ni(CN)_4]^{2-}$

D. $[NiCl_4]^{2-}$

Answer: D

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52. Which one of the following complexes has highest magnetic moment value ?

A. $\left[Fe(CN)_6\right]^{3-}$

B. $\left[Co(CN)_6\right]^{3-}$

C. $\left[Fe(H_2O)_6\right]^{3+}$

D. $\left[CoF_6\right]^{3-}$

Answer: C

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53. The pair having the same magnetic moment is_____.

[At. No. :Cr = 24, Mn =25 , Fe= 26 , Co =27]

A. $\left[Cr(H_2O)_6\right]^{2+}$ and $\left[CoCl_4\right]^{2-}$

B. $[Cr(H_2O)_6]^{2+}$ and $[Fe(H_2O)_6]^{2+}$

C. $[Mn(H_2O)_6]^{2+}$ and $[Cr(H_2O)_6]^{2+}$

D. $[CoCl_4]^{2-}$ and $[Fe(H_2O)_6]^{2+}$

Answer: B

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54. Which of the following complex ions is expected to absorb visible light?

A. $[Sc(H_2O)_3(NH_3)_3]^{3+}$

B. $[Ti(en)_2(NH_3)_3]^{3+}$

C. $[Cr(NH_3)_6]^{3+}$

D. $\left[Zn(NH_3)_6\right]^{2+}$

Answer: C

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55. Which of the following complex ions is not expected to absorve visible light ?

A. $\left[Ni(H_2O)_6\right]^{2+}$

B. $\left[Ni(CN)_4\right]^{2-}$

C. $\left[Cr(NH_3)_6\right]^{3+}$

D. $\left[Fe(H_2O)_6\right]^{2+}$

Answer: B

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56. How many out of $[TiF_6]^{2-}$, $[CoF_6]^{3-}$, Cu_2Cl_2 and $[NiCl_4]^{2-}$ are colourless ?

(Ti =22, Co = 27 , Cu = 29 , Ni = 28)

A. 0

B. 2

C. 3

D. 1

Answer: B

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57. Correct increasing order for the wavelengths of absorption in the visible region by the complexes of Co^{3+} is:

A. $[Co(H_2O)_6]^{3+}, [Co(en)_3]^{3+}, [Co(NH_3)_6]^{3+}$

B. $[Co(H_2O)_6]^{3+}, [Co(NH_3)_6]^{3+}, [Co(en)_3]^{3+}$

C. $[Co(Nh_3)_6]^{3+}, [Co(en)_3]^{3+}, [Co(H_2O)_6]^{3+}$

D. $Co(en)_3]^{3+}, [Co(NH_3)_6]^{3+}, [Co(H_2O)_6]^{3+}$

Answer: D

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58. Finely divided iron combines with CO to give _____.

A. $Fe(CO)_5$

B. $Fe_2(CO)_9$

C. $Fe_2(CO)_{12}$

D. $Fe(CO)_6$

Answer: A

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59. Which of the following has the highest stability constant at 298 K ?

A. $[CdCl_4]^{2-}$

B. $CdBr_4]^{2-}$

C. $[CdI_4]^{2-}$

D. $\left[Cd(CN)_4\right]^{2-}$

Answer: D

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60. $CuSO_4$, solution with excess of KCN gives _____.

A. $Cu(CN)_2$

B. CuCN

C. $K_2\left[Cu(CN)_4\right]$

D. $K_2[Cu(CN)_4]$

Answer: C

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61. The complex used as an anticancer agent is _____.

A. trans-$[Co(NH_3)_3Cl_3]$

B. cis-$[PtCl_2(NH_3)_2]$

C. cis-$K_2[PtCl_2Br_2]$

D. Na_2CO_3

Answer: B

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62. The chelating ligand, which is used in the treatment of lead poisoning is _____.

A. ethane-1, 2-diamine

B. EDTA

C. dimethylglyoxine

D. None of these

Answer: B

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63. Wilkinson catalyst is

A. $Co(CO)_8$

B. $(Ph_3P)_3RhCl$

C. $\left[Pt(NH_3)_2CL_2\right]$

D. $k\left[Ag(CN)_2\right]$

Answer: B

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64. In the complex with formula $MCl_3.4H_2O$ the co-ordination number of the metal M is six. And there is a no molecule of hydration in it. The volume of 0.1 M $AgNO_3$ solution needed to precitate the free chloride ions in 200 ml of 0.01 M solution of the complex is

A. 40 mL

B. 20 mL

C. 60 mL

D. 80 mL

Answer: B

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65. A solution contains 2.675 g of $CoCl_{3.6}NH_3$ (molar mass =267.5 g mol^-) is passed through a cation exchanger . The chloride ions obtained in solution were treated with excess of $AgNO_3$ to give 4.78 g of AgCl. The formula of the complex is_____.

A. $\left[CoCl(NH_3)_5\right]Cl_2$

B. $\left[Co(NH_3)_6\right]Cl_3$

C. $\left[Co(NH_3)_4Cl_2\right]Cl$

D. $\left[Co(NH_3)_3Cl_3\right]$

Answer: B

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66. On treatment of 100 mL of 0.1 M solution of $CoCl_{3.6}H_2O$ with excess $AgNO_3$, 1.2×10^{22} ions are precipitated. The complex is _____.

A. $\left[Co(H_2O)_4Cl_2\right]Cl.2H_2O$

B. $[Co(H_2O)_3Cl_3].3H_2O$

C. $[Co(H_2O)_6]Cl_3$

D. $[Co(H_2O)_5Cl]Cl_2.\ H_2O$

Answer: D

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67. The most stable complex among the following is

A. $K_2[Al(C_2O_4)_3]$

B. $[Pt(en)_2]Cl_2$

C. $[Ag(NH_3)_2]Cl$

D. $K_2[Ni(EDTA)]$

Answer: D

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68. Which of the following has longest C-O bond length ?

(Free C-O bond length in CO is 1.128 Å)

A. $\left[Fe(CO)_4\right]^{2-}$

B. $\left[Mn(CO)_6\right]^{+}$

C. $Ni(CO)_4$

D. $\left[Co(CO)_4\right]^{-}$

Answer: A

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69. How many EDTA molecules are required to make an octahedral complex with a Ca^{2+} ion?

A. six

B. three

C. one

D. two

Answer: C

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70. Complex salt can be made by the combination of $\left[Co^{III}(NH_3)_5Cl\right]^x$ with

A. PO^{3-}

B. Cl^-

C. $2Cl^-$

D. $2K^+$

Answer: C

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71. Bonds present in $K_4\left[Fe(CN)_6\right]$ are

A. all ionic

B. all covalent

C. ionic and covalent

D. ionic, covalent and coordinate covalent

Answer: D

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72. What is (are) number (s) of unpaired electron(s) in the square planar $\left[Pt(CN)_4\right]^{2-}$ ion ?

A. 0

B. 1

C. 4

D. 6

Answer: A

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

A. $\left[Mn(H_2O)_6\right]^{3+}$

B. $\left[Fe(H_2O)_6\right]^{3+}$

C. $\left[Co(H_2O)_6\right]^{2+}$

D. $\left[Co(H_2O)_6\right]^{3+}$

Answer: B

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74. The octahedral complex of a metal ion M^{3+} with four monodentate ligands L_1, L_2, L_3 and L_4 absorb wavelengths in the region of red,green, yellow and bule, respectively The increasing order of ligand strengh of the four ligands is

A. $L_4 < L_3 < L_2 < L_1$

B. $L_1 < L_3 < L_2 < L_4$

C. $L_3 < L_2 < L_4 < L_1$

D. $L_1 < L_2 < L_4 < L_3$

Answer: B

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75. Which of the following processes does not involve oxidation of iron ?

A. Rusting of iron sheets.

B. Decolourization of blue $CuSO_4$ solution by iron.

C. Formation of $Fe(CO)_5$ from Fe.

D. Liberation of H_2 form steam by iron at high temperature

Answer: C

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76. The IUPAC name of the complex ion formed when gold dissolves in aqua-regia is

A. tetrachloridoaurate (III)

B. tetrachloridoaurate (I)

C. tetrachloridaurate (II)

D. dichloridoaruate (III)

Answer: A

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Evaluation Test

1. The primary valence of the metal ion in the co-ordination compound $Na_2\left[Co(CN)_4\right]$ is _____.

A. four

B. zero

C. two

D. six

Answer: C

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2. Among the following which are ambidenatate ligands ?

$(i) NO_2^-$

$(ii) NO_3^-$

$(iii) EDTA^{4-}$

(iv) $C_2O_4^{2-}$

(v) SCN^-

A. (i) and (ii)

B. (iii) and (iv)

C. (i) and (v)

D. (iii) and (vi)

Answer: C

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3. Which of the following has highest molar conductivity

A. Diamminedichloridoplatinum (II)

B. Tetraamminedichloridocobalt (III) chloride

C. Potassium hexacyanoferrate (II)

D. Hexaaquachromium (III) bromide

Answer: C

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4. Which of the following does not have optical isomer

A. $\left[Co(NH_3)_3Cl_3\right]$

B. $[Co(en)_3]Cl_3$

C. $[Co(en)_2Cl_2]Cl$

D. $[Co(en)(NH_3)_2Cl_2]Cl$

Answer: A

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5. The spin only magnetic moment value of $Cr(CO)_6$ is

A. 0

B. 2.84

C. 4.9

D. 5.92

Answer: A

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6. Both geometrical and optical isomerism are exhibited by

A. Dichlorobis(ethylenediamine)cobalt (III) ion

B. Pentaamminechloridocobalt (III) ion

C. Triamminotrichloridocobalt (III) ion

D. Tetraamminedichloridocobalt (III) ion

Answer: A

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7. The coordination number and oxidation state of Cr in $K_3\left[Cr(C_2O_4)_3\right]$ an respectively

A. 4 and $+2$

B. 6 and $+3$

C. 3 and $+3$

D. 3 and 0

Answer: B

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8. A mixture x containing 0.02 mol of $\left[Co(NH_3)_5SO_4\right]Br$ and 0.02 mol of $\left[Co(NH_3)_5Br\right]SO_4$ was prepared in $2L$ of solution.

$1L$ of mixture $X +$ excess $AgNO_3 \rightarrow Y$

$1L$ of mixture $X +$ excess $BaCl_2 \rightarrow Z$

The number of moles of Y and Z are

A. 0.01 , 0.01

B. 0.02, 0.01

C. 0.01 , 0.02

D. 0.02 , 0.02

Answer: A

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9. $\left[Mn_2(CO)_{10}\right]$ is made up of _____ units joined by a Mn-Mn bond.

A. two square pyramidal $Mn(CO)_5$

B. three square pyramidal $Mn(CO)_5$

C. two pentagonal $Mn(CO)_5$

D. two trigonal bipyramidal $Mn(CO)_5$

Answer: A

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10. Among the following ligands, the positive ion that can act as a ligand is _____.

A. hydroxylamine

B. nitrite

C. nitrosylium

D. methylamine

Answer: C

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11. The charge number , oxidation number and coordination number of the complex $\left[Co(en)_3\right]Cl_3$ are

_____ respectively.

A. $3, -3$ and 6

B. -3, 3 and 6

C. 3 , 0 and 4

D. 3, 0 and 4

Answer: B

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12. A complex is prepared by mixing $CoCl_3$ and Nh_3, 0.1 M solution of the complex was found to freeze at $-0.372^\circ C$. The formula of the complex is _____.

[Molar depression constant of water =$1.86^\circ C/m$]

A. $[Co(NH_3)_6]Cl_3$

B. $[Co(NH_3)_5Cl]Cl_2$

C. $[Co(NH_3)_4Cl_2]Cl$

D. $[Co(NH_3)_3Cl_3]$

Answer: C

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13. The fraction of chlorine precipitated by $AgNO_3$ solution from $[Co(NH_3)_5Cl]Cl_2$ is _____.

A. $\frac{1}{2}$

B. $\frac{2}{3}$

C. $\frac{1}{3}$

D. $\frac{1}{4}$

Answer: B

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14. Which of the following is a π-acid ligand?

A. NH_3

B. CO

C. F^-

D. Ethylenediamine

Answer: B

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15. In which of the following complexes, the EAN is NOT equal to the atomic number of Krypton ?

A. $\left[Co(NH_3)_6\right]^{3+}$

B. $\left[Zn(NH_3)_4\right]^{2+}$

C. $\left[Ni(CO)_4\right]$

D. $\left[Fe(CN)_6\right]^{3-}$

Answer: D

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16. $\left[(C_6H_5)_2Pd(SCN)_2\right]$ and $\left[9C_6H_5)_2Pd(NCS)_2\right]$ are _____ isomers.

A. linkage

B. coordination

C. ionization

D. geometrical

Answer: A

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17. The IUPAC name of the complex $\left[CrCl_2(H_2O)_4\right]NO_3$ is _____.

A. dichloridotetraaquachromate (III) nitrate

B. tetraaquadichloridochromium (III) nitrate

C. chromiumtetraaquadichlorido nitrate

D. dichloridotetraaquachromium nitrate

Answer: B

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18. The electronic transition that is responsible for the purple colour of $\left[Ti(H_2O)_6\right]^{3+}$ is _____.

A. $t_{2g}^0 e_g^1 \rightarrow t_{2g}^1 e_g^0$

B. $t_{2g}^1 e_g^1 \rightarrow t_{2g}^0 e_g^2$

C. $t_{2g}^1 e_g^0 \rightarrow t_{2g}^0 e_g^1$

D. $t_{2g}^1 e_g^0 \rightarrow t_{2g}^1 e_g^1$

Answer: C

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19. In which of the following complex ions, the magnitude of Δ_o (CFSE in octahedral field) will be minimum ?

A. $\left[Co(en)_3\right]^{3+}$

B. $\left[CoF_6\right]^{3-}$

C. $\left[Co(H_2O)_6\right]^{3+}$

D. $\left[Co(NH_3)_6\right]^{3+}$

Answer: B

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