



CHEMISTRY

BOOKS - R SHARMA CHEMISTRY (HINGLISH)

COORDINATION COMPOUNDS

Follow Up Test

1. Discovery of complexes was made by

A. B. M. Tassaert

B. C.K. Jorgenson

C. Alfred Werner

D. Kasimiv Fajan

Answer: A



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2. Which of the following is a coordination compounds ?

A. Carnallite

B. Microcosmic salt

C. Fischer salt

D. Chrome alum

Answer: C



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3. When potash alum is dissolved in water, the total number of ions furnish in aqueous solution is

A. thirty two

B. ten

C. four

D. eight

Answer: D



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4. Which of the following is incorrect ?

A. A complex ion is a metal ion with Lewis bases attached to it through coordinate covalent bonds.

B. A complex (or coordination compound) is a compound consisting either of complex ions and other ions of opposite charge or of a neutral complex species.

C. The ions or molecules bound to the central atom/ion in the coordination entity are called ligands.

D. The interactions between a central metal atom/ion and the ligands can be thought of as Bronsted acid-base reactions.

Answer: D



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5. The coordination number of cobalt in tris(ethylenediamine) cobalt(III) ion, $[Co(en)_3]^{3+}$, is

A. 3

B. 6

C. 9

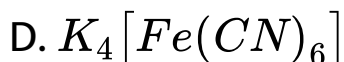
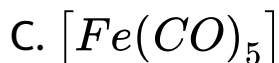
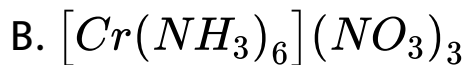
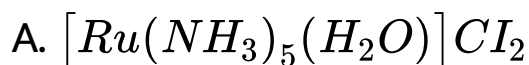
D. 5

Answer: B



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6. Which of following coordination compounds contains the central metal with the highest oxidation number ?



Answer: B



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7. The oxidation number of iron in sodium nitroprusside is

A. +3

B. +4

C. +2

D. +1

Answer: C



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8. Which of the following is not a chelating ligand ?

A. Monodentate

B. Bidentate

C. Tridentate

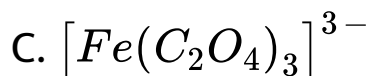
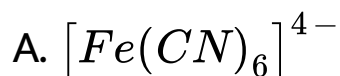
D. Quadridentate

Answer: A



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9. Which of the following complex ions is octahedral ?



D. All of these

Answer: D



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10. The IUPAC name for $[A](OH_2)_5(OH)]^{+2}$ is

- A. aquametaalumination ion
- B. pentahydroaluminium hydroxide
- C. pentaquahydroxidoaluminium (III) ion
- D. pentaquaaluminate (III) hydroxide

Answer: C



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11. The IUPAC name of $[Ru(NH_3)_5N_2]Cl_2$ is

A. pentaammine (azido) ruthenium (II)

dichloride

B. rutheniumpentammine (II)

dichlorodinitrogen

C. pentamine (nitrogen) ruthenium (II) chloride

D. pentaammine (dinitrogen) ruthenium (II)

chloride

Answer: D



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12. The IUPAC name of $K[SbCl_5C_6H_5]$ is

A. potassium pentachlorido (phenyl)

antimonate (V)

B. lutero antimonate (V)

C. potassium benzalantimony (III) choride

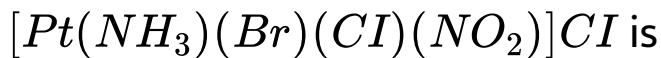
D. potassium phenylchorontimonate (V)

Answer: A



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13. The IUPAC name of



A. triamminechlorobromonitroplatinum (IV)

chloride

B. triamminebromidochloridonitroplatinum

(IV) chloride

C. bromidochloridonitrotriammineplatinum

(IV) chloride

D. triamminetrochloridobromidoplatinum (IV)

chloride

Answer: B



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14. The IUPAC name of $Ba[BrF_4]_2$ is

- A. brium bis [tetrafluorobrominate (III)]
- B. brium bromofluoride (III)
- C. barium bis [tetrafluorobromate (IV)]
- D. barium tetrafluoridobromate (III)

Answer: D



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15. The IUPAC name of the complex $Ni[C_4H_7O_2N_2]$ formed by the reaction between Ni^{2+} and dimethylglyoxime is

- A. bis (dimethylglyoxime) nikel
- B. bis (methylglyoxime) nickel (II)
- C. bis (2,3- butanedionedioximato) nickel (II)
- D. bis (2,3- butanedioldioximato) nivkel (II)

Answer: D



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16. The IUPAC name for $[Co(NH_3)_5(ONO)]SO_4$ is

- A. pentaamine (nitrito-O) cobalt (III) sulphate
- B. pentaamine (nitro-N) cobalt (III) sulphate
- C. pentaamine (nitro-O) cobalt (III) sulphate
- D. pentaamine (nitrito-N) cobalt (III) sulphate

Answer: A



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17. The IUPAC name for $[Co(NH_3)_6][Cr(CN)_6]$ is

A. hexacyanochromate (III) hexaamminecobalt

(III)

B. hexaaamminecobalt

(III)hexacyanidochromate (III)

C. hexaamminechrominum cobalt hexaammine

(VI)

D. hexamminecobalt (III) hexacyanochromium

(III)

Answer: B

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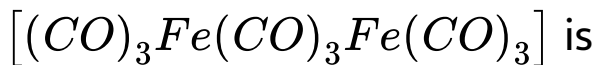
18. The IUPAC name for $[(CO)_5 Mn-Mn (CO)_5]$ is

- A. bis[pentacarbonylmanganate (VIII)]
- B. decarbonyldimanganate (VIII)
- C. bis(pentacarbonylmanganese (0))
- D. bis(pentacarbonyldimanganese)

Answer: C

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19. The IUPAC name for



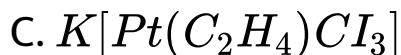
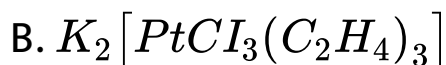
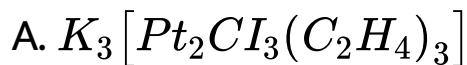
- A. tri- μ - nanocarbonyl ion (III)
- B. tri- μ - carbonyl-bis [tricarbonyldi(iron (0))]
- C. tri- μ - hexacarbonyliron (II)
- D. tri- μ - carbonyl-bis[tricarbonyliron (0)]

Answer: D



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20. The formula of the complex ethylenetrichloridoplatinum (II) is

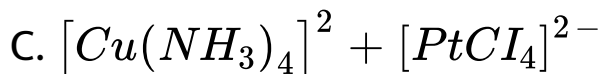
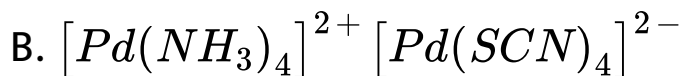
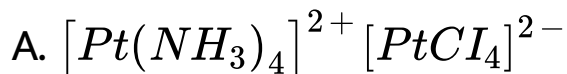


Answer: C



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21. Magnus's green salt has the formula



Answer: A



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22. How many structural isomers are possible for a complex consisting of Co^{3+} as the central metal ion, two en molecules, two Cl^- ions and one NO_2^- ion ?

- A. Four
- B. Three
- C. Five
- D. Two

Answer: B



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23. The Compounds $[Cr(H_2O)_6]Cl_3$,
 $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$ and $[Cr(H_2O)_4Cl_2] \cdot$
 $2H_2O$ exhibit

- A. hydrate isomerism
- B. ionization isomerism
- C. linkage isomerism
- D. coordination isomerism

Answer: A



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24. $[Co(HN_3)_6]$ $[Cr(CN)_6]$ and
 $[Cr(NH_3)_6]$ $[Co(CN)_6]$ are .

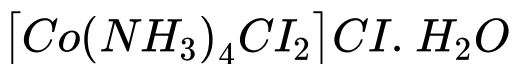
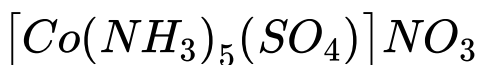
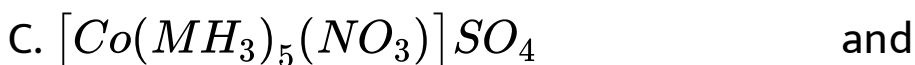
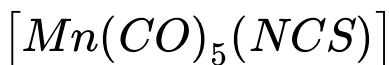
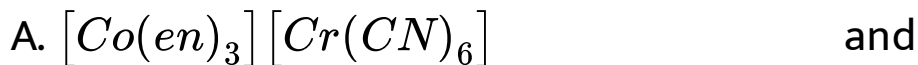
- A. Coordination position isomerism
- B. Polymerization isomerism
- C. Coordination isomerism
- D. Ionization isomerism

Answer: C



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25. Which of the following pairs corresponds to linkage isomerism ?

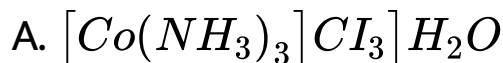


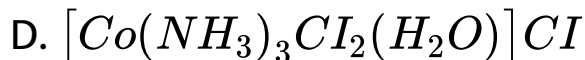
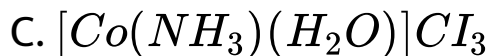
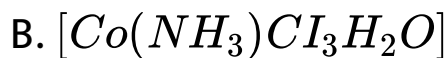
Answer: B



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26. A complex has the composition $Co(NH_3)_4(H_2O)Cl_3$. Conductance measurements show that there are three ions per formula unit and precipitation of AgCl with silver nitrate shows that there are Cl^- ions not coordinated to cobalt. The structural formula of the compound is





Answer: D



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27. Which of the following complexes can't exhibit geometric isomerism ?

A. Tetrahedral complexes

B. Square planar complexes

C. Both (1) and (2)

D. Octahedral complexes

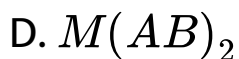
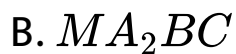
Answer: A



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28. Which of the following types of square planer complexes has maximum number of geometric isomer ?

where Mn is central metal, A, B, C and D are different monodentate ligands, and AB is an unsymmetrical bidentate ligand.



Answer: C



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29. Which of the following types of square planar complexes can't show geometric isomerism ?



B. MA_3B

C. MAB_3

D. All of these

Answer: D



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30. Total number of geometric isomers possible for an octahedral molecules, two CI^- ions and one NO_2^- ion is

A. 3

B. 6

C. 9

D. 4

Answer: B



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31. Which of the following types of octahedral complexes can show mer-fac isomerism ?

where M is central metal, A , B and c are different monodentate ligands while AA is a symmetrical bidentate ligand.

A. MA_4B_2 or MA_2B_4

B. $M(AA)_2B_2$ or $M(AA)_2BC$

C. MA_3B_3

D. MA_5B

Answer: C



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32. Which of the following complexes can't exhibit optical isomerism ?

A. Octahedral complexes

B. Square planar complexes

C. Tetrahedral complexes

D. Both 2 and 3

Answer: B



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33. Which of the following is incorrect regarding the octahedral complex of the type MA_4B_2 ?

A. It has two distereoisomers

B. cis- MA_4B_2 is optically active

C. trans- MA_4B_2 is optically inactive

D. Both cis-and trans MA_4B_2 are optically inactive

Answer: B



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34. How many isomers are possible for an octahedral complex of the type $MA_2B_2C_2$?

A. 3

B. 4

C. 5

D. 6

Answer: D



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35. Total number of isomers of $[Co(en)_2Cl_2]^+$ is

A. 3

B. 4

C. 2

D. 5

Answer: A



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36. Total number of all possible optical isomers of an octahedral complex, composed of Co^{3+} ion (central metal), two en molecules, two Cl^- ions and NO_2 ion, is

A. 3

B. 4

C. 6

D. 5

Answer: C



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37. Which one of the following postulates of Werner's theory is incorrect ?

A. Primary valence are nondirectional while secondary valences are directional

B. Primary valences can be satisfied by neutral as well as negative ions only

C. Primary valence is linked to what we now call the oxidation number of the central metal

D. Secondary valence corresponds to what we now call the coordination number of the central metal

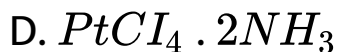
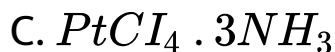
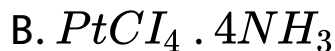
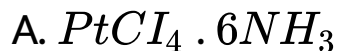
Answer: B



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38. Some platinum (IV) complexes were studied by Werner. Which of the following yields maximum

number of ions in aqueous solution ?



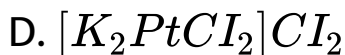
Answer: A



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39. Another complex studied by Werner has a composition corresponding to the formula $PtCl_4$

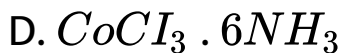
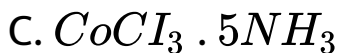
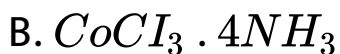
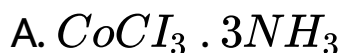
. 2KCl. From electrical conductance measurements, he determine that each formula unit contained three ions. He also found tat silver nitrae did not give a precipitate of AgCl with this complex. Which of the following formula fot this complex agrees with this information ?



Answer: B

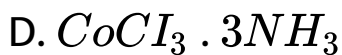
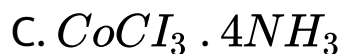
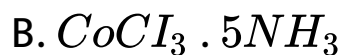
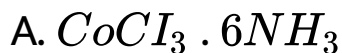


40. Which of the following complexes will have the highest molar conductivity ?



Answer: D

41. Which of the following complexes will lead to lowest cryoscopic measurement ?



Answer: A



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42. The geometries of $[Ni(CO)_4]$ and $[NiCl_2(PPh_3)_2]$ are

- A. tetrahedral
- B. square planar
- C. tetrahedral and square planar respectively
- D. square planar and tetrahedral respectively

Answer: A



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43. The hybridization states of the central metal ion in the complexes $[Co(NO_2)_6]^{3-}$ and $[Fe(CN)_6]^{4-}$ are

A. all sp^3d^2

B. all d^2sp^3

C. sp^3d^2 , d^2sp^3 and $d^{20}sp^3$

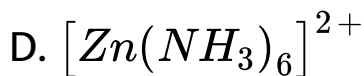
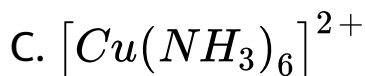
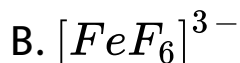
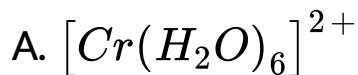
D. d^2sp^3 , sp^3d^2 and sp^3d^2

Answer: B



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44. Which of the following complex ions is dimagnetic ?



Answer: D



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45. Hybridization of iron in $Fe(CO)_5$ is

A. dsP^3

B. sP^3d

C. d^2sP^3

D. sP^3d^2

Answer: A



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46. Which of the following statements is not correct ?

A. $[CuCl_4]^{2-}$ has a tetrahedral geometry and is paramagnetic

B. $[MnCl_4]^{2-}$ has a tetrahedral geometry and is paramagnetic

C. $[NiCl_4]^{2-}$ has a tetrahedral geometry and is paramagnetic

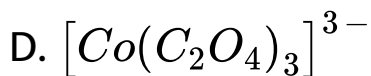
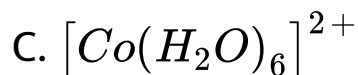
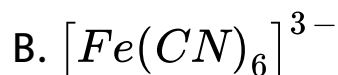
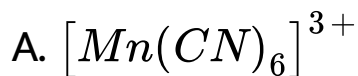
D. $[Cu(NH_3)_4]^{2+}$ has a square planar geometry and is paramagnetic

Answer: D



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47. Which of the following is not an inner orbital complex ?

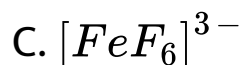
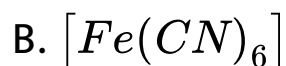
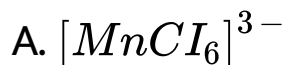


Answer: C



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48. Which of the following is not an outer orbital complex ?

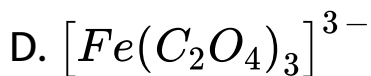
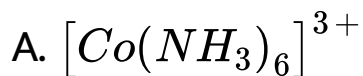


Answer: B



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49. Which of the following is a low spin (spin-paired) complex ?

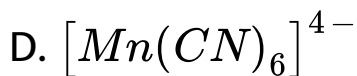
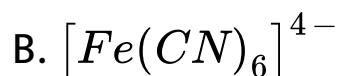
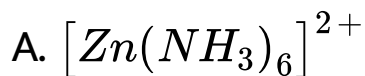


Answer: A



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50. Which of the following is a high spin (spin-free) complex ?



Answer: C



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51. Which of the following statements is correct ?

A. $[Mn(CN)_6]^{3-}$ has magnetic moment of two unpaired electrons while $[Mn(CI)_6]^{3-}$ has a paramagnetic moment of four unpaired electrons.

B. $[Fe(CN)_6]^{3-}$ has magnetic moment of a single unpaired electron while $[FeF_6]^{3-}$ has a paramagnetic moment of five unpaired electrons

C. $[CoF_6]^{3-}$ is paramagnetic with four unpaired d electrons while $[Co(C_2O_4)_3]^{3-}$ is diamagnetic

D. All of these

Answer: D



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52. Which of the following is not correct for crystal field theory ?

- A. The crystal field theory (CFT) was originally proposed for explaining the optical properties of crystalline solids.
- B. CFT assumes the ligands to be point charges.
- C. The interaction between the ligands and the electrons of the central metal is assumed to be covalent in nature.
- D. The interaction between the ligand and the central metal atom/ion results in splitting of the d orbital energies.

Answer: C



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53. In the octahedral crystal field, there is splitting of d orbitals. Which of the following d orbitals constitute the higher energy e_g set of orbitals.

A. d_{xy}, d_{xy}

B. d_{z^2}, d_{yz}

C. $d_{xy}, d_{x^2-y^2}$

D. $d_{x^2-y^2}, d_{z^2}$

Answer: D



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54. In an octahedral crystal field, the t_2g orbitals are

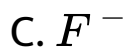
- A. lower in energy by $0.4\Delta_o$.
- B. raised in energy by $0.4\Delta_o$.
- C. lowered in energy by $0.6\Delta_o$.
- D. raised in energy by $0.6\Delta_o$.

Answer: A



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55. Which of the following ligands leads to minimum value of Δ_o ?



Answer: C



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56. Which of the following electronic configurations can lead to the formation of high spin and low spin octahedral complexes ?

A. d^1

B. d^2

C. d^3

D. d^4

Answer: D



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57. The crystal field theory attributes the colour of coordination compounds to

- A. d-d transition
- B. charge transfer spectrum
- C. polarisation
- D. All of these

Answer: A



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58. Which of the following colour change occurs when tridentate ligand, ethane-1, 2-diamine (en) is progressively added to an aqueous solution of nickel (II) chloride ?

- A. Green to pale blue
- B. Green to purple blue
- C. Green to violet
- D. All of these

Answer: D



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59. Gem stones such as ruby and emerald own emerald owe their color to

A. Co^{2+} ions

B. Ni^{2+} ions

C. Cr^{3+} ions

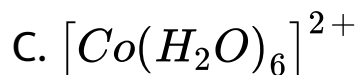
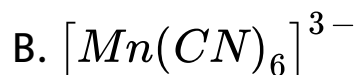
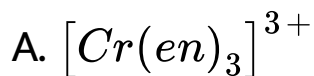
D. Mn^{2+} ions

Answer: C



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60. Which of the following complex ions has three unpaired electrons ?



D. Both (1) and (3)

Answer: D



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61. CuF_2 contains Cu^{2+} ions surrounded by six F^- ions, four F^- being at a distance of 0.193 nm other two at a distance of 0.227 nm. Thus, it should have the configuration.

A. $(d_{z^2})^1 (d_{x^2-y^2})^2$

B. $(d_{z^2})^2 (d_{x^2-y^2})^1$

C. $(d_{xy})^1 (d_{yz})^1 (d_{xz})^1$

D. $(d_{xy})^2 (d_{yz})^2 (d_{xz})^0$

Answer: B



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62. Which of the following d-electron distribution of the diamagnetic complex $[Ni(CN)]^{2-}$ is possible according to the crystal field theory ?

A. $(d_{yz})^2 (d_{xy})^2 (d_{z^2})^2 (d_{xy})^2$

B. $(d_{xy})^2 (d_{xz})^2 (d_{yz})^2 (d_{x^2-y^2})^1 (d_{z^2})^1$

C. $(d_{xy})^2 (d_{xy})^2 (d_{yz})^2 (d_{x^2-y^2})^2$

D. $(d_{xy})^2 (d_{xz})^2 (d_{yz})^2 (d_{z^2})^2$

Answer: A



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63. In tetrahedral crystal field, there is splitting of d orbitals. Which of the following d orbitals constitute the higher energy set of orbitals.

A. d_{xy} , $d_{x^2 - y^2}$

B. d_{z^2} , $d_{x^2 - y^2}$

C. d_{xy} , d_{yz} , d_{xz}

D. d_{z^2} , d_{xz} , d_{yz}

Answer: C



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64. Which of the following relations is correct

A. $\Delta_t = (9/4)\Delta_o$

B. $\Delta_t = (2/3)\Delta_o$

C. $\Delta_t = (3/2)\Delta_o$

D. $\Delta_t = (4/9)\Delta_o$

Answer: D



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65. Nearly all tetrahedral complexes are

A. high spin

B. low spin

C. intermediate spin

D. complex spin

Answer: A



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66. Which of the following d orbitals has highest energy in square planer complexes ?

A. d_{xy}

B. d_{xy}

C. $d_{x^2 - y^2}$

D. d_{yz}

Answer: C



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67. Which of the following is not an organometallic compounds ?

A. Sodium ethoxide

B. Trimethoxytitanium chloride

C. trimethylorthoborate

D. All of these

Answer: D



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68. Oxidation state of Fe in ferrocene is

A. 0

B. +3

C. +2

D. +1

Answer: C



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69. Which of the following ligands donates three electrons during the formation of complexes ?

A. NO

B. CO

C. CN^-

D. PR_3

Answer: A



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70. Which of the following solvents are used for organometallic chemistry ?

(i) THF (tetrahydrofuran)

(ii) Ether

(iii) Acetone

(iv) DCM (Dichloromethane)

A. (i), (ii)

B. (i), (ii), (iv)

C. (ii), (iii)

D. (i), (iii)

Answer: B



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71. The value of x in the complex $H_xCo(CO)_4$ is
($Co, Z = 27$)

A. 2

B. 3

C. 1

D. 0

Answer: C



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72. Which of the following metals from polynuclear complex ?

A. Ti

B. V

C. Cr

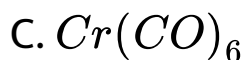
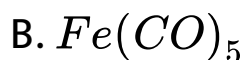
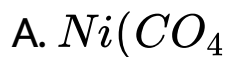
D. Mn

Answer: D



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73. Which of the following organometallics is used in the purification of the metal centre ?



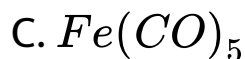
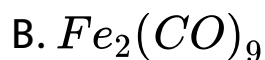
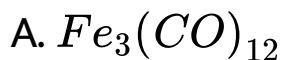
D. All of these

Answer: A



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74. Which of the following metal carbonyls is synthesized by the direct interaction of finely divided metal with CO ?



D. All of these

Answer: C



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75. Which of following is an example is an example of a sandwich compound ?

- A. Ferrocene
- B. Chromocene
- C. Manganocene
- D. All of these

Answer: D



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76. Hardness of water is estimated by simple titration with

A. EDTA

B. H_4 EDTA

C. Na_2H_2 EDTA

D. Na_3H EDTA

Answer: C



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77. The extraction of ---- by the formation of cyanide complex is a typical example of the use of coordination compounds in metallurgical processes.

A. Ag

B. Au

C. Cu

D. Both 1 and 2

Answer: D



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78. Which of the following metals is purified by converting the metal to the coordination compounds ?

A. Pt

B. Ni

C. Pd

D. All of these

Answer: B



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79. The chelate effect is important in biological complexes. There is a ---- ligand of particular importance to biological system, the porphyrin ring.

- A. tetradentate
- B. pentadentate
- C. hexadentate
- D. bidentate

Answer: A



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80. Rhodium complex, $[RhCl(PPh_3)_3]$, a Wilkinson catalyst is used for hydrogenation of

- A. arenes
- B. alkanes
- C. alkenes
- D. alkynes

Answer: C



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81. Ziegler-Natta catalyst, catalyses the polymerisation of ----- at atmospheric pressure and ambient temperature.

A. alkynes

B. alkenes

C. arenes

D. All of these

Answer: B



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82. The structure and hybridisation of organometallic $Si(CH_3)_4$ is

- A. trigonal, sp^2
- B. bent, sp
- C. tetrahedral, sp^3
- D. octahedral, sp^3d

Answer: C



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1. The number of geometrical isomers for $[Pt(NH_3)_2Cl_2]$ is

A. 3

B. 4

C. 1

D. 2

Answer: D



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2. The coordination number and oxidation state of Cr in $K_3[Cr(C_2O_4)_3]$ are respectively

A. 3 and +3

B. 6 and +3

C. 3 and 0

D. 4 and +2

Answer: B



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3. In metal carbonyl having and general formula $M(CO)_x$, where, M = metal, $x = 4$ and the metal is bonded to

A. carbon and oxygen

B. oxygen

C. carbon

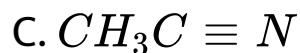
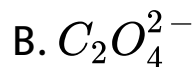
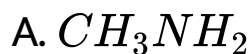
D. $C \equiv O$

Answer: C



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4. Which of the following ligands is expected to bidentates?



Answer: B



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5. The number of ions formed from a formula unit of potassium ferricyanide in solution is

A. 4

B. 5

C. 2

D. 3

Answer: A



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6. Which of the following is a hexadentate ligand ?

A. Ethylenediaminetetraacetato

B. Dimethylglyoxime anion

C. 8- Hydroxyquinolinol ion

D. 2,2' - Dipyridyl

Answer: A



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7. The IUPAC name of $[Co(NH_3)_5(NCS)]Cl_2$ is

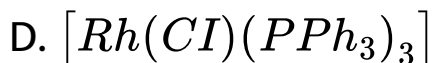
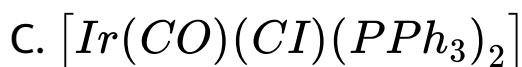
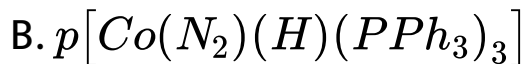
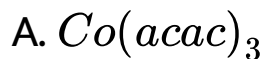
- A. pentaammine (thiocyanato-S)cobalt (III)
chloride
- B. pentaammine (thiocyanato-N)cobalt (III)
chloride
- C. pentaammine (mercapto-N)cobalt (III)
chloride
- D. pentaammine (isothiocyanato-N)cobalt (III)
chloride

Answer: B



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8. Wilkinson's catalyst has the formula



Answer: D



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9. Tetrahedral complexes of the types of $[MA_4]$ and $[MA_3B]$ (where M = central metal, A,B = achiral ligands) are not able to show optical isomerism because

A. these molecules/ion have nonsuperposable mirror images

B. these molecules possess a centre of symmetry

C. these molecules possess a plane of symmetry and hence are achiral.

D. these molecules/ion possess C_n axis of symmetry.

Answer: C



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10. The number of unpaired spins in the $[Cr(en)_3]^{2+}$ ion is

A. two

B. four

C. three

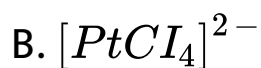
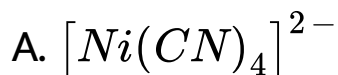
D. zero

Answer: A



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11. Which of the following is paramagnetic and square planar ?



Answer: B



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12. The magnitude of crystal field stabilization energy (CFSE) in tetrahedral complexes is considerably less than in the octahedral field because

A. There are only four ligands instead of six so the ligand field is only $\frac{2}{3}$ the size hence the Δ_t is only $\frac{2}{3}$ the size

B. The direction of the orbitals does not coincide with the direction of the ligands.

This reduces the crystal field stabilization energy Δ_t by further $2/3$.

C. Both points (1) and (2) are correct

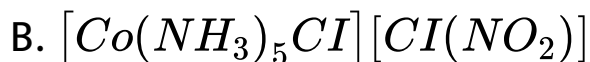
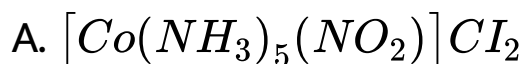
D. Both points (1) and (2) are wrong

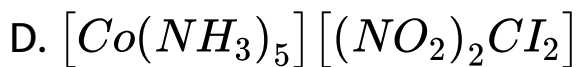
Answer: C



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13. A coordination compound of cobalt has the molecular formula containing five ammonia molecules, one nitro group and two chlorine atoms for one cobalt atom. One mole of this compound gives three ions in an aqueous solution. On reacting this solution with excess of $AgNO_3$ solution, we get two moles of $AgCl$ precipitate. The ionic formula for this complex would be





Answer: A



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14. IUPAC name of $[Pt(NH_3)_3(Br)(NO_2)Cl]Cl$

is

A. trimminenitrochlorobromoplatinum (IV)

chloride

B. triamminebromochloronitroplatinum (IV)

chloride

C. triamminebromonitrochloroplatinum (IV)

chloride

D. triamminechlorobromonitroplatinum (IV)

chloride

Answer: B



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15. The number of geometrical isomers of the complex $[Co(NO_2)_3(NH_3)_3]$ is

A. 0

B. 3

C. 4

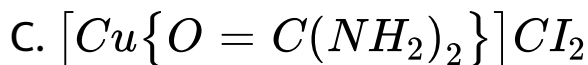
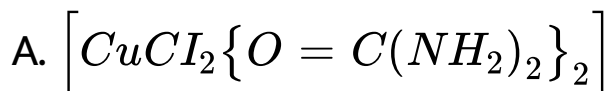
D. 2

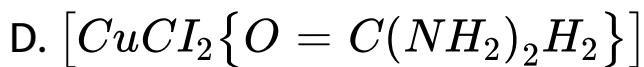
Answer: D



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16. The formula of dichlorobis (urea) copper (II) is





Answer: A



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17. The complex ion $[Co(NH_3)_6]^{3+}$ is formed by sp^3d^2 hybridization. Hence, the ion should possess

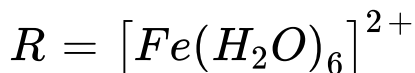
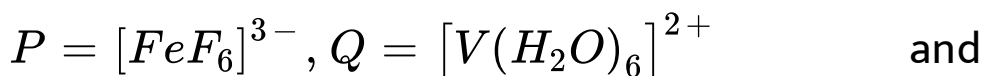
- A. octahedral geometry
- B. tetrahedral geometry
- C. square planar geometry
- D. tetragonal geometry

Answer: A



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18. Consider the following complexes ion P , Q and R



The correct order of the complex ions, according to their spin only magnetic moment values (in BM) is .



B. $Q < P < R$

C. $Q < R < P$

D. $R < P < Q$

Answer: C



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19. The number of geometric isomers that can exist for square planar complex ion $[Pt(Cl)(PY)(NH_3)(NH_2OH)]^+$ is (Py = pyridine) :

A. 3

B. 4

C. 6

D. 2

Answer: A



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20. If the freezing point of a 0.01 molal aqueous solution of a cobalt (III) chloride-ammonia complex (which behaves as a strong electrolyte) is

$-0.0558^{\circ}C$, the number of chloride (s) in the coordination sphere of the complex if $[K_f \text{ of water} = 1.86Kkgmol^{-1}]$

A. Four

B. one

C. three

D. Two

Answer: B



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21. In the complex ion $[Fe(H_2O)_5NO]^{2+}$

- A. Fe is in the $+2$ oxidation state and NO coordinates as NO^+
- B. Fe is in the $+3$ oxidation state and NO coordinates as NO^-
- C. Fe is in the $+2$ oxidation state and NO coordinates as neutral NO (nitrosyl) radical
- D. Fe is in the $+1$ oxidation state and NO coordinates as NO^+ (nitrosonium ion)

Answer: C



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22. Which of the following statements is incorrect regarding the stereoisomerism of the complexes note below (where M stands for a metal, and A, B, C and D are achiral ligands) ?

A. The octahedral complex $[MABCD(EE)]$

where EE is a symmetrical bidentate ligand

have 12 stereoisomers

B. The facial and meridional isomers of an

MA_3B_3 octahedral complex are both

optically active.

C. The facial and meridional isomer of the octahedral complex $M(A_3B_3)$ possess three identical ligands (A or B) at positions 1, 2, 3 and 1, 2, 6 respectively.

D. In the cis and trans isomers of the octahedral complex (MA_4B_2) two ligand occupy the position 1, 2 and 1, 6 respectively.

Answer: B



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23. Which of the following coordination entities are more stable for strong field as compared to weak field cases ?

A. $d^1 - d^3$

B. $d^4 - d^7$

C. $d^8 - d^{10}$

D. $d^5 - d^9$

Answer: B



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24. The total number possible isomers for the complex compound $[Cu^{II}(NH_3)_4][Pt^{II}Cl_4]$ are

A. 5

B. 6

C. 4

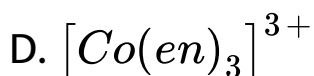
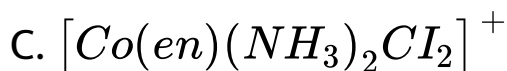
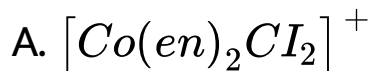
D. 3

Answer: C



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25. Which of the following complexes is not expected to exhibit optical isomerism? .



Answer: B



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26. 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 blue, respectively. The increasing order of ligand strength of the four ligands is

A. $L_3 < L_2 < L_4 < L_1$

B. $L_1 < L_2 < L_4 < L_3$

C. $L_4 < L_3 < L_2 < L_1$

D. $L_1 < L_3 < L_2 < L_4$

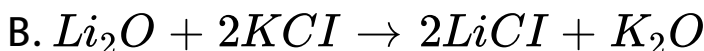
Answer: D



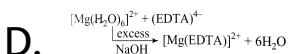
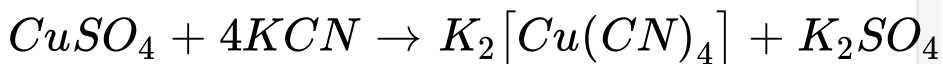
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27. The equation which is balanced and represents the correct product(s) is .

A.



C.



Answer: A



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28. In the complex acetyl bromidodicarbonyl bis (triethylphospine) iron (II), the number of Fe – C bonds (s) is

A. 3

B. 4

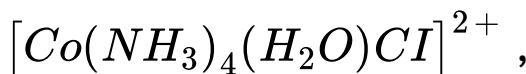
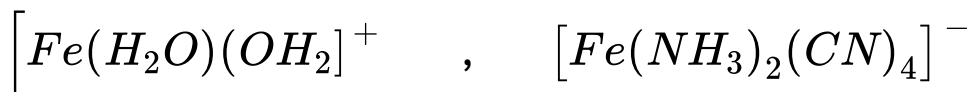
C. 6

D. 5

Answer: A



29. Among the complex ions,



the number of complex ion(s) that show (s) cis-trans isomerism is

A. 5

B. 1

C. 4

D. 6

Answer: D



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30. Which of the following is a bidentate ligand ?

(i) Acetylacetonate (ii) Glycinato

(iii) Oxalato (iv) Carbanato

A. (i), (ii), (iii), (iv)

B. (ii), (iii), (iv)

C. (i), (iii), (iv)

D. (i), (ii), (iii)

Answer: A



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31. The IUPAC name of the complex $[Cu(C_5H_7O_2)_2]$ formed by the reaction between Cu^{2+} and acetylacetonone is

A. bis (2, 4- pentanediol)copper(II)

B. bis (2, 4 -pentanol)copper (II)

C. bis (2, 4- pentanedionato)copper (II)

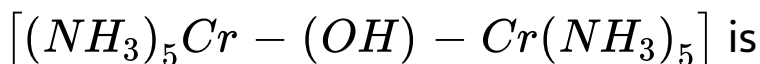
D. bis (2,3- pentanedionato)copper (II)

Answer: C



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32. The IUPAC name for



A. μ - hydroxido- bis[pentaamminechromium(III)]

B. μ - hydroxo-bis(octaamminechromium)

(5 +) ion

C. μ - hydroxo-bis(pentaamminedichromium)

(5 +)

D. m-hydroxyl-bis(decaamminedichromium)

(5 +) ion

Answer: A

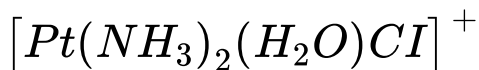


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33. The pair(s) of coordination complexes/ion exhibiting the same kind of isomerism is (are):

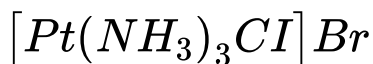
(i) $[Cr(NH_3)_5Cl]Cl_2$ and $[Cr(NH_3)_4Cl_2]Cl$

(ii) $[Co(NH_3)_4Cl_2]^+$ and



(iii) $[CoBr_2Cl_2]^{2-}$ and $[PtBr_2Cl_2]^{2-}$

(iv) $[Pt(NH_3)_3(NO_3)]Cl$ and



A. (i) and (iii)

B. (i), (ii), (iii)

C. (i), (ii), (iii), (iv)

D. (ii) and (iv)

Answer: D



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34. $EDTA^{4-}$ is ethylenediamine tetraacetate ion. The total number of $N - CO - O$ bond angles in $[Co(EDTA)]^{-1}$ complex ion is .

A. 8

B. 6

C. 5

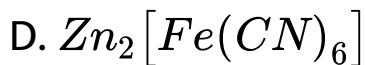
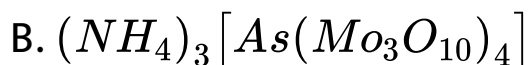
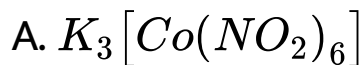
D. 7

Answer: A



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35. Which of the following compounds is not yellow coloured ?



Answer: D



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36. For the octahedral complex of Fe^{+} in SCN^{-} (thiocyanato-S) and in CN^{-} ligand environments, the difference between the spin - only magnetic moments in Bohr magneton (when approximated to the nearest integer) is [At. No. of $Fe = 26$]

A. 3

B. 6

C. 4

D. 5

Answer: C



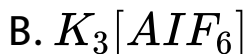
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37. An aqueous solution of metal ion $M1$ reacts separately with reagents Q and R in excess to give tetrahedral and square planar complexes, respectively. An aqueous solution of another metal ion $M2$ always forms tetrahedral complexes with these reagents. Aqueous solution of $M2$ on reaction with reagent S gives white precipitate which dissolves in excess of S . The reactions are summarised in the scheme given below:

SCHEME:

38. AlF_3 is soluble in HF only in presence of KF

. It is due to the formation of



Answer: B



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1. Which of the following pairs of d-orbitals will have electron density along the axes ?

A. d_{z^2} , d_{xz}

B. d_{xz} , d_{yz}

C. d_{z^2} , $d_{x^2 - y^2}$

D. d_{xy} , $d_{x^2 - y^2}$

Answer: C



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2. Jahn - Teller effect is not observed in high spin complexes of

A. d^7

B. d^8

C. d^4

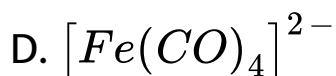
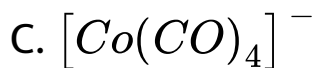
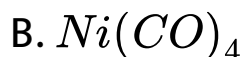
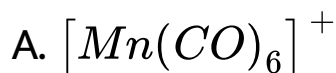
D. d^9

Answer: B



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3. Which of the following has longest $C - O$ bond length? (Free $C - O$ bond length in CO is 1.128\AA).



Answer: D



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4. The name of complex ion, $[Fe(CN_6)]^{3-}$ is

- A. Tricyanoferrate (III) ion
- B. Hexacyanidoferrate (III) ion
- C. Hexacyanoiron (III) ion
- D. Hexacyanitoferrate (III) ion

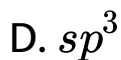
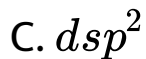
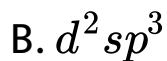
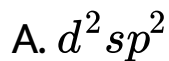
Answer: B



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5. The hybridization involved in complex

$[Ni(CN)_4]^{2-}$ is (*At. No. Ni = 28*)



Answer: C



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6. The sum of coordination number and oxidation number of the metal M in the complex

$[M(en)_2(C_2O_4)]Cl$ (where en is

ethylenediamine) is:

A. 7

B. 8

C. 9

D. 6

Answer: C



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7. Number of possible isomer for the complex

$[Co(en)_2Cl_2]Cl$ will be: (em = ethylenediamine)

A. 3

B. 4

C. 2

D. 1

Answer: A



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8. Which of these statements about

$[Co(CN)_6]^{3-}$ is true?

A. $[Co(CN)_6]^{3-}$ has no unpaired electrons

and will be in a high-spin configuration

B. $[Co(CN)_6]^{3-}$ has no unpaired electrons

and will be in a low-spin configuration

C. $[Co(CN)_6]^{3-}$ has four unpaired electrons

and will be in a lowspin configuration

D. $[Co(CN)_6]^{3-}$ has four unpaired electrons

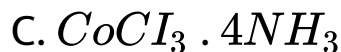
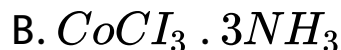
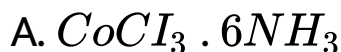
and will be in a high-spin configuration

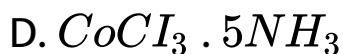
Answer: B



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



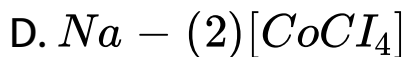
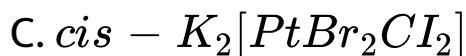
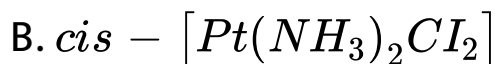
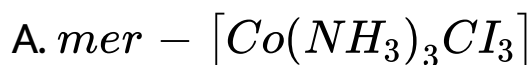


Answer: B



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10. The complex used as an anticancer agent is

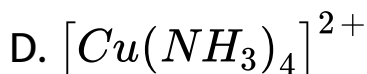
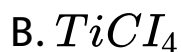
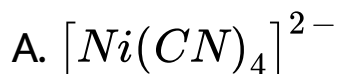


Answer: B



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11. A magnetic moment of 1.73 B.M. will be shown by one among the following:



Answer: D



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12. An excess of $AgNO_3$ is added to 100mL of a 0.01M solution of dichlorotetraaquachromium(III) chloride. The number of moles of $AgCl$ precipitated would be .

A. 0.002

B. 0.003

C. 0.01

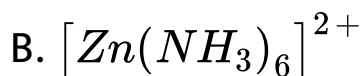
D. 0.001

Answer: D



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13. Which one of the following is an outer orbital complex and exhibits paramagnetic behaviour ?



Answer: A



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14. Red precipitate is obtained when ethanol solution of dimethylglyoxime is added to ammoniacal $Ni(II)$. Which of the following statement is not true?

- A. Dimethylglyoxime functions as bidentate ligand.
- B. Red complex has a square planar geometry
- C. Complex has symmetrical H bonding
- D. Red complex has a tetrahedral geometry

Answer: D



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15. Low spin complex of d^6 -cation in an octahedral field will have the following energy:

A. $-2/5\Delta_0 + P$

B. $-12/5\Delta_0 + P$

C. $-12/5\Delta_0 + 3P$

D. $-2/5\Delta_0 + 2P$

Answer: C



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16. The complex, $[Pt(py)(NH_3)BrCl]$ will have how many geometrical isomers?

A. 2

B. 3

C. 4

D. 0

Answer: B



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17. $[Co(HN_3)_6]$ $[Cr(CN)_6]$ and $[Cr(NH_3)_6]$ $[Co(CN)_6]$ are .

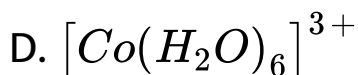
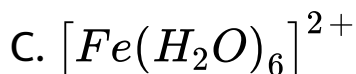
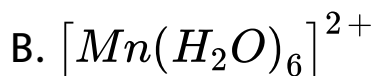
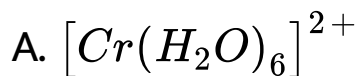
- A. Geometrical isomerism
- B. Linkage isomerism
- C. Ionization isomerism
- D. coordination isomerism

Answer: D



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18. 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 behaviour?

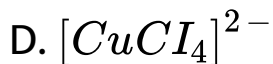
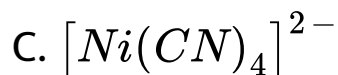
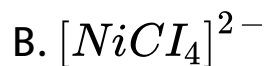


Answer: D



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19. Of the following complex ions, which is diamagnetic in nature?



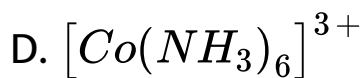
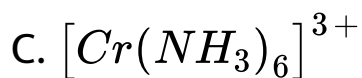
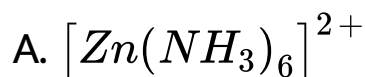
Answer: C



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20. Which of the following complex compounds will exhibit highest magnetic behaviour ?

(*At. N* ⊙ *Ti* = 22, *Cr* = 24, *Co* = 27, *Zn* = 30)

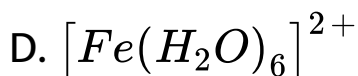
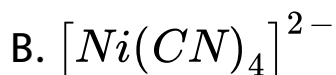
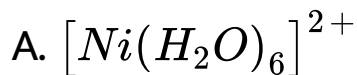


Answer: C



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21. Which of the following complex ions is not expected to absorb visible light ?



Answer: B



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22. The existence of two different colored complexes with the composition of $[Co(NH_3)_4Cl_2]$ is due to

- A. ionization isomerism
- B. Linkage isomerism
- C. geometrical isomerism
- D. coordination isomerism

Answer: C



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23. Crystal field stabilization energy for high spin d^4 octahedral complex is

A. $-0.6\Delta_0$

B. $-1.8\Delta_0$

C. $-1.8\Delta_0 + P$

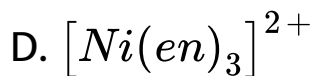
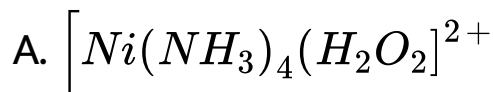
D. $-1.2\Delta_0$

Answer: A



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24. Which one of the following complex is not expected to exhibit isomerism?

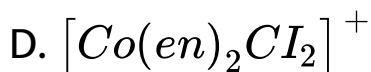
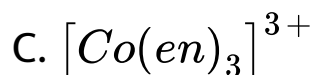
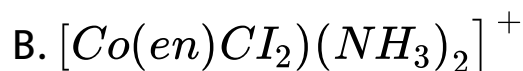


Answer: A



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25. Which of the following does not show optical isomerism ?



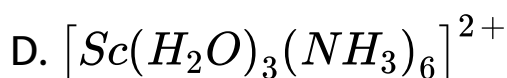
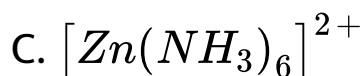
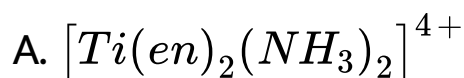
Answer: A



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26. Which of the following complex compounds will exhibit highest magnetic behaviour ?

(*At. N* \odot *Ti* = 22, *Cr* = 24, *Co* = 27, *Zn* = 30)



Answer: B



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27. A $0.002M$ aqueous solution of an ionic compound $[Co(NH_3)_5(NO_2)]Cl$ freezes at $-0.00732^\circ C$. Find the number of moles of ions which 1 mole of ionic compound produces of being dissolved in water. ($K_f = -1.86^\circ C/m$).

A. 3

B. 4

C. 1

D. 2

Answer: D

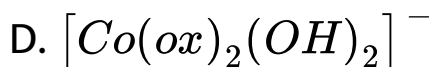
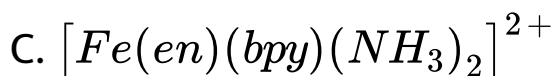


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28. Which of the following complexes exhibits the highest paramagnetic behaviour?

where gly=glycine, en=ethylenediamine and bipy =bipyridyl

(At. no. $Ti = 22$, $V = 23$, $Fe = 26$, $Co = 27$)



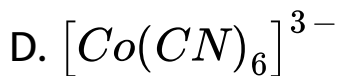
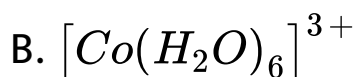
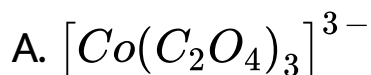
Answer:



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29. In which of the following coordination entites the magnitude of Δ_0 (CFSE in octehedral field) will be maximum.

(*At. No. Co = 27*)



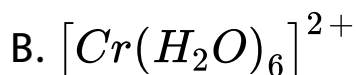
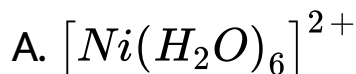
Answer: D

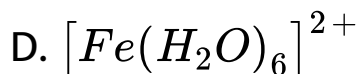
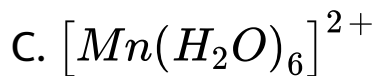


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30. The d electron configuration of Cr^{2+} , Mn^{2+} , Fe^{2+} and Ni^{2+} are $3d^4$, $3d^5$, $3d^6$ and $3d^8$ respectively. Which one of the following aqua complexes will exhibit the minimum paramagnetic behaviour ?

(*At. No. Cr = 24, Mn = 25, Fe = 26, Ni = 28*)



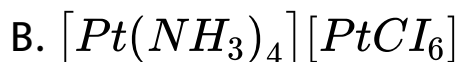
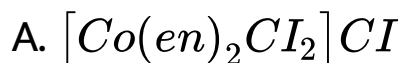


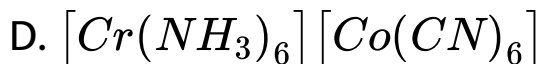
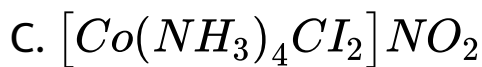
Answer: A



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31. Which of the following will give a pair of enantiomers ?



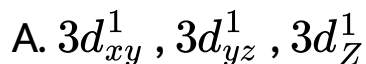


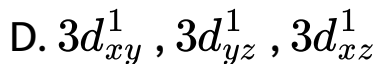
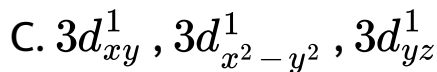
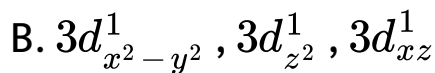
Answer: A



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32. $[Cr(H_2O)_6]Cl_3$ (at no. of Cr = 24) has a magnetic moment of $3.83B.M.$ The correct distribution of $3d$ electrons the chromium of the complex.





Answer: D



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33. $[Co(NH_3)_4(NO_2)_2]Cl$ exhibits

A. linkage isomerism, geometrical isomerism,
and optical isomerism

B. linkage isomerism, ionization isomerism and optical isomerism

C. linkage isomerism, ionization isomerism and geometrical isomerism

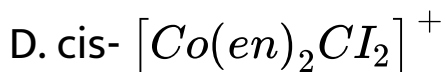
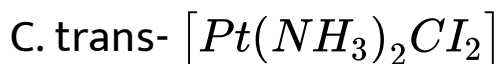
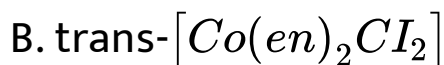
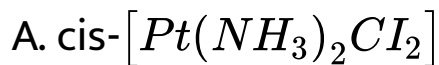
D. ionization isomerism, geometrical isomerism and optical isomerism.

Answer: C



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34. Which one of the following is expected to exhibit optical isomerism (en=ethylenediamine)?

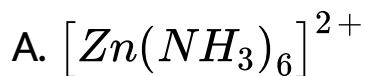


Answer: D



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35. Which one of the following is an inner orbital complex as well as diamagnetic in nature?



Answer: C



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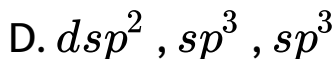
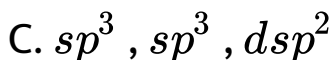
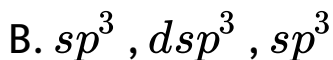
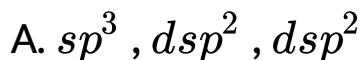
36.

Among

$[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$, $[NiCl_4]^{2-}$ species,

the hybridization states at the Ni atom are,

respectively (At. no. of $Ni = 28$)



Answer: B



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

A. 3

B. 5

C. 2

D. 4

Answer: B



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38. CN^- is a strong field ligand. This is due to the fact that

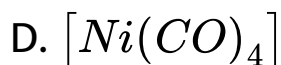
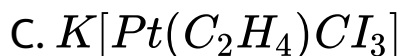
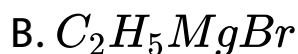
- A. it carries a negative charge
- B. it is a pseudohalide
- C. it can accept electrons from metal species
- D. it forms high spin complexes with metal species

Answer: C



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39. Which of the following does not have a metal carbon bond?

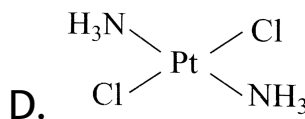
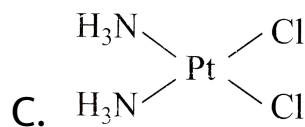
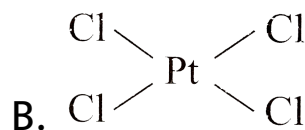
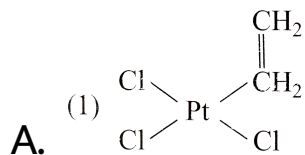


Answer: A



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40. Which of the following is considered to be an anticancer species ?



Answer: C



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41. Which of the following coordination compounds would exhibit optical isomerism?

A. pentaamminenitrocobalt (III) iodide

B. Diamminedichloroplatinum (II)

C. trans-Dicyanobis (ethylenediamine)

chromium (III) Chloride

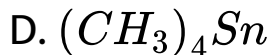
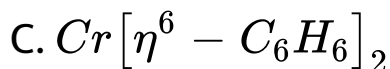
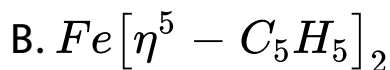
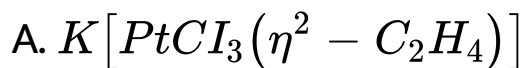
D. Tris-(ethylenediamine) cobalt (III) bromide

Answer: D



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42. Among the following, which is not the π - bonded organometallic compound ?



Answer: D



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43. The number of unpaired electrons in the complex ion $[CoF_6]^{3-}$ is (Atomic no. of $Co = 27$)

A. 3

B. 2

C. 4

D. 0

Answer: C



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44. According to IUPAC nomenclature sodium nitroprusside is named as

A. sodium pentacyanonitrosyl ferrate (II)

B. sodium pentacyanonitrosyl ferrate (III)

C. sodium nitroferricyanide

D. sodium nitroferrocyanide

Answer: B



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

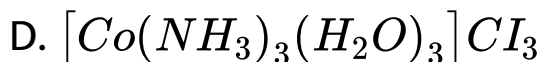
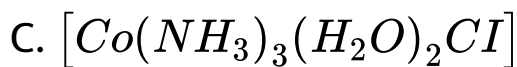
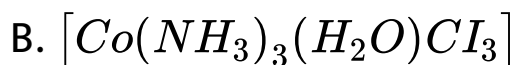
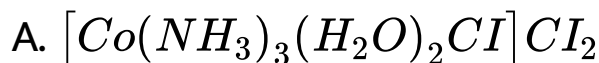


Answer: B



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46. The hypothetical complex triamminediaquachloridocobalt(*III*) chloride can be represented as :

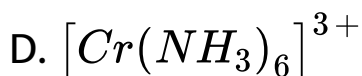
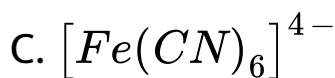
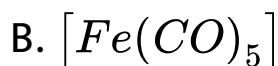
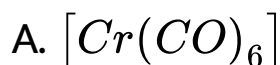


Answer: A



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47. Atomic numbers of Cr and Fe are respectively 24 and 26. Which of the following is paramagnetic with the spin of the electron?



Answer: D



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48. In the silver plating of copper, $K[Ag(CN)_2]$ is used instead of $AgNO_3$. The reason is

A. a thin voltage of Ag is formed on Cu

B. more voltage is required

C. Ag^+ ions are completely removed from solution

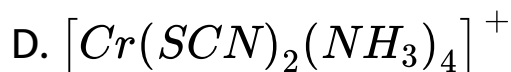
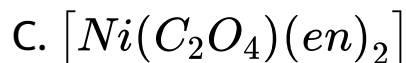
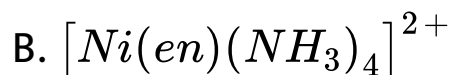
D. less availability of Ag^+ ions as Cu cannot displace Ag from $[Ag(CN)_2]^-$ ion

Answer: D



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49. Which of the following will give maximum number of isomer ?

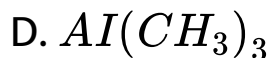
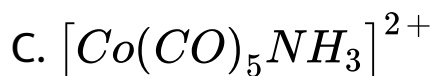
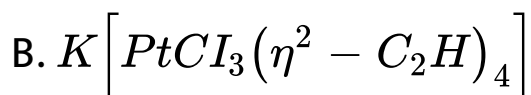
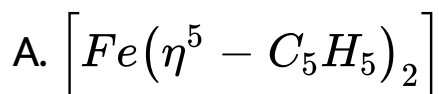


Answer: D



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50. Which of the following organometallic compound is σ and π -bonded?



Answer: C



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51. Coordination number of Ni in $[Ni(C_2O_4)_3]^{4-}$

is:

A. 3

B. 6

C. 4

D. 2

Answer: B



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52. Which statement is incorrect?

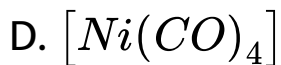
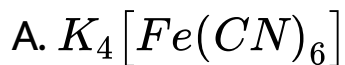
- A. $[Ni(CO)_4]$ - tetrahedral, paramagnetic
- B. $[Ni(CN)_4]^{2-}$ - square planar, diamagnetic
- C. $[Ni(CO)_4]$ - tetrahedral, diamagnetic
- D. $[Ni(CI)_4]^{2-}$ - tetrahedral, paramagnetic

Answer: A



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

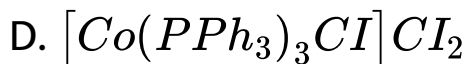
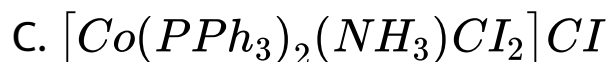
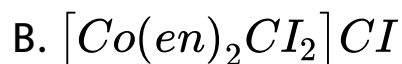
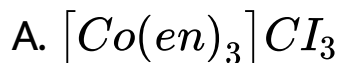


Answer: A



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54. Which of the following complexes will have four isomers ?



Answer: B



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55. In the separation of Cu^{2+} and Cd^{2+} of IInd group in qualitative analysis of cations, tetraamminecopper (II) sulphate and tetraamminecadmium (II) sulphate react with KCN to form the corresponding cyano complex. Which one of the following pairs of the complexes and their relative stability enables the separation of Cu^{2+} and Cd^{2+} ?

A. $K_3[Cu(CN)_4]$: less stable and

$K_2[Cd(CN)_4]$: more stable

B. $K_3 [Cu(CN)_4]$: more stable and

$K_2 [Cd(CN)_4]$: less stable

C. $K_2 [Cu(CN)_4]$: less stable and

$K_2 [Cd(CN)_4]$: more stable

D. $K_2 [Cu(CN)_4]$: more stable and

$K_2 [Cd(CN)_4]$: less stable.

Answer: B



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

Given that its dipole moment = 0.

- A. octahedral
- B. square planar
- C. trigonal bipyramidal
- D. square bipyramidal

Answer: C



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