

CHEMISTRY

BOOKS - OMEGA PUBLICATION

CO-ORDINATION COMPOUNDS

Questions

1. Discuss the main postulates of Werner's coordination theory.



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2. What is the difference between a complex salt and a double salt?



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3. Define the following term- Crop



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4. Define the following term : Co - ordination number



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5. If the velocity of electron in bohr's is $3.5(10^6)\text{ms}^{-1}$, calculate the de broglie wavelength associated with it.



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6. The co-ordination number of Cr in $[Cr(NH_3)_3(H_2O)_3]Cl_3$ is



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7. Explain with two examples each of the following: coordination entity, ligand, coordination number, coordination polyhedron, homoleptic and heteroleptic.



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8. What is meant by unidentate, didentate and ambidentate ligands ? Give two examples for each.



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9. Define chelate and chelating ligand. Give one example of chelate complex.



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10. What is meant by chelate effect ?



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11. Write the IUPAC name of $K_2 [Ni(CN)_4]$.



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12. Write the IUPAC name of



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13. Write IUPAC name of $K_3 [Fe(CN)_6]$.



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14. Write the IUPAC name of $K_2 [Ni(CN)_4]$.



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15. Write the IUPAC name of





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16. Write the IUPAC name of $K_3[Cr(C_2O_4)_3]$.



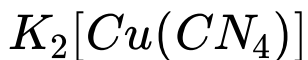
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17. Write the IUPAC name of
 $K_3[Fe(CN)_5NO]$.



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18. Write IUPAC name of the following



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19. Write the IUPAC name of the $K[Ag(CN)_2]$



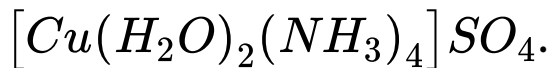
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20. Write IUPAC name of $Na_3[Co(NO_2)_6]$.



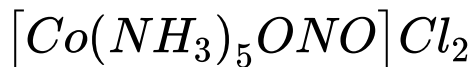
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21. Write IUPAC name of :



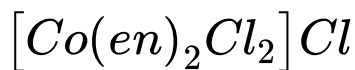
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22. Write the IUPAC name of the



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23. Write the IUPAC name of the



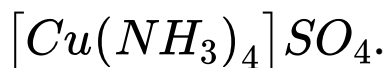
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24. Write the IUPAC name of $K_3[Cr(C_2O_4)_3]$.



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25. Write the IUPAC name of the





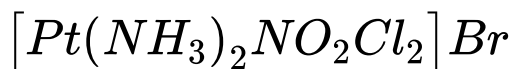
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26. $K_4[Fe(CN)_6]$ is a



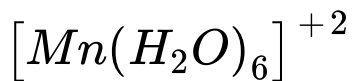
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27. Write the IUPAC name of the



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28. Write the IUPAC name of the



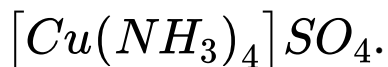
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29. Write the IUPAC name of $K_2[Ni(CN)_4]$.



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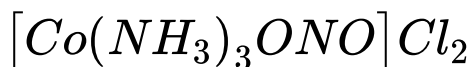
30. Write the IUPAC name of the





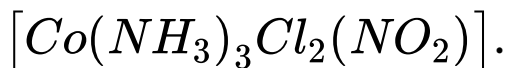
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31. Write the IUPAC name of the



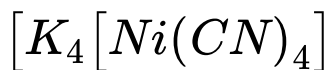
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32. Write the I.U.P.A.C. name of the



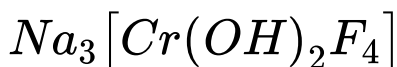
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33. Write the IUPAC name of the



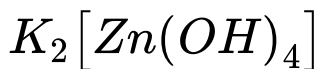
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34. Write IUPAC name of the following:



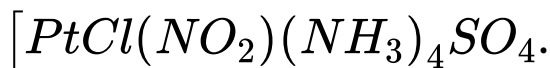
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35. Write IUPAC name of the following



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36. Write IUPAC name of :



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37. Write IUPAC name of $[Co(NH_3)_6]Cl_3.$



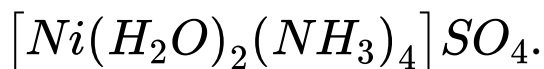
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38. Write the IUPAC name of $K[PtCl_3(NH_3)]$



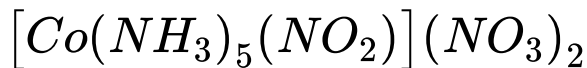
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39. Write IUPAC name of



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40. Write down the IUPAC name of the following complex.



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41. Write the formulas for the following coordination compounds: Potassium tetracyanonickelate(II)



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42. Define ionisation isomerism. Give example.

How can you distinguish between the two isomers ?



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43. Write short notes on : Hydrate isomerism.



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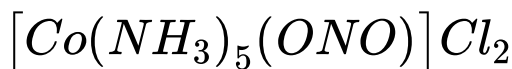
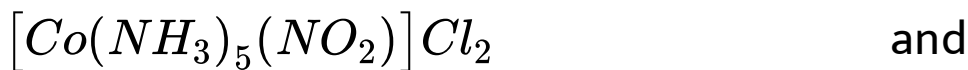
44. Write a note on Co-ordinate isomerism.





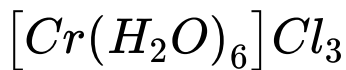
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45. Name the type of isomerism exhibited by the following pair of isomers.

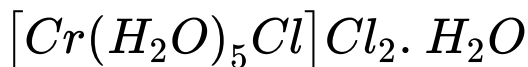


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46. Name the type of isomerism exhibited by the following pair of isomers.



and



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47. Name the type of isomerism exhibited by the following pair of isomers.



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48. Define ionisation isomerism and write one ionisation isomer of : $[CoSO_4(NH_3)_5]Br$.



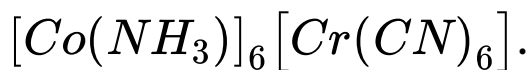
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49. Define linkage isomerism and write one linkage isomer of $[Co(ONO)(NH_3)_5]Cl_2$.



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50. Define co-ordination isomerism and write one co-ordination isomer of :



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51. Why is geometrical isomerism not possible in tetrahedral compounds having two different types of unidentate ligands with the central metal ion ?



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52. How many isomers are possible for the neutral complex $[Co(NH_3)_3Cl_3]$? Draw their structures.



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53. Illustrate optical isomerism in coordination compounds with an example.



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54. Draw the geometrical isomers of $[Co(en)_2Cl_2]^+$ ion. Which of these is optically active ?



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55. Write the structure and hybridisation of the central atom in $[CoCl_2(NH_3)_4]$



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56. Write a note on Co-ordinate isomerism.



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57. Discuss the main postulates of valence bond theory.



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58. On the basis of valence bond theory explain the structure and magnetic nature of $[Ni(CN)_4]^{2-}$ complex ion.



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59. How would you account for the fact that $[Ni(CO)_4]$ has tetrahedral geometry?



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60. Discuss structure of $[Co(NH_3)_6]^{3+}$ complex ion.



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61. Explain $[Co(NH_3)_6]^{3+}$ is an inner orbital complex whereas $[Ni(NH_3)_6]^{2+}$ is an outer orbital complex.



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62. On the basis of valence bond theory explain the structure and magnetic nature of $[Ni(CN)_4]^{2-}$ complex ion.



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63. Account for the different magnetic behaviour of $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$.



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64. Account for the different magnetic behaviour of $[Co(CN_6)]^{3-}$ and $[CoF_6]^{3-}$.



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65. On the basis of valence bond theory explain the structure and magnetic nature of $[Fe(H_2O)_6]^{3+}$ complex ion.



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66. Explain magnetic Behaviour of $[Fe(CN)_6]^{4-}$ and $[Fe(CN)_6]^{3-}$ anions.



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67. Explain, Why $[Ni(CO)_4]$ is diamagnetic whereas $[NiCl_4]^{2-}$ is paramagnetic ?



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68. By using valence bond theory discuss the geometry and magnetic nature of $[Cr(NH_3)_6]^{3+}$ ion.



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69. On the basis of valence bond theory explain the structure and magnetic nature of $[Ni(CN)_4]^{2-}$ complex ion.



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70. With the help of valence bond theory explain that tetracyanonickelate (II) ion is square planar or tetrahedral in nature.



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71. Why is geometrical isomerism not possible in tetrahedral compounds having two different types of unidentate ligands with the central metal ion ?



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72. $[Fe(CN)_6]^{4-}$ and $[Fe(H_2O)_6]^{2+}$ are of different colours in solutions. Why?



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73. On the basis of valence bond theory explain the structure and magnetic nature of $[\text{Fe}(\text{CN})_6]^{3-}$ complex ion.



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74. Explain magnetic Behaviour of $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{Fe}(\text{CN})_6]^{3-}$ anions.



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75. With the help of crystal field theory, predict the number of unpaired electrons in $[Fe(CN)_6]^{4-}$ and $[Fe(H_2O)_6]^{2+}$.



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76. Explain: $[Ni(CN)_4]^{2-}$ is diamagnetic while $[Ni(Cl)_4]^{2-}$ is paramagnetic.



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77. Explain $[Fe(H_2O)_6]^{3+}$ is paramagnetic.



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78. On the basis of valence bond theory explain the structure and magnetic nature of $[Fe(H_2O)_6]^{3+}$ complex ion.



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79. For the complex $[NiCl_4]^{2-}$, write the shape of the complex.



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80. For the complex $[NiCl_4]^{2-}$, write the hybridization type.



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81. For the complex $[NiCl_4]^{2-}$, write the shape of the complex.



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82. What is spectrochemical series?



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83. What is crystal field splitting? How will you account for the colour of compounds having

completely filled and empty d orbitals and partially filled d orbitals ?



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84. Define crystal field splitting energy. Write the electronic configuration of d^4 in terms of t_{2g} and e_g in octahedral field when i) $\Delta_0 > P$
ii) $\Delta_0 < P$



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85. Explain the difference between a weak field ligand and a strong field ligand.



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86. A solution of $[Ni(H_2O)_6]^{2+}$ is green but a solution of $[Ni(CN)_4]^{2-}$ is colourless. Explain.



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87. $[Ti(H_2O)_6]^{3+}$ is coloured while $[Sc(H_2O)_6]^{3+}$ is colourless. Explain.



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88. $[Sc(H_2O)_6]^{3+}$ and $[Ti(H_2O)_6]^{3+}$ ions are coloured why ?



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89. With the help of crystal field theory, predict the number of unpaired electrons in $[Fe(CN)_6]^{4-}$ and $[Fe(H_2O)_6]^{2+}$.



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90. What is the difference between inner orbital and outer orbital octahedral complexes? Explain with the help of an example.



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91. predict the number of unpaired electrons in $[CoF_6]^{3-}$ and $[Co(NH_3)_6]^{3+}$



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92. With the help of the crystal field theory predict the number of unpaired electrons in $[Fe(CN)_6]^{3-}$ and $[FeF_6]^{3-}$.



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93. What is meant by stability of a coordination compound in solution? State the factors which govern



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94. What are homoleptic carbonyls ? Give different examples.



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95. Discuss the nature of bonding in metal carbonyls.



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96. Draw the structure of Zeise's salt.



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97. Write the state of hybridization, the shape and the magnetic behaviour of the following

complex entities : $[Cr(NH_3)_4Cl_2]Cl$



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98. Write the state of hybridization, the shape and the magnetic behaviour of the following

complex entities : $[Co(en)_3]Cl_3$



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99. Write the state of hybridization, the shape and the magnetic behaviour of the following

complex entities : $K_2 [Ni(CN)_4]$



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100. Write the IUPAC name and describe the magnetic behaviour (diamagnetic or paramagnetic) of the following coordination entities : $[Cr(H_2O)_2(C_2O_4)_2]^-$



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101. Write the IUPAC name and describe the magnetic behaviour (diamagnetic or paramagnetic) of the following coordination entities : $[Co(NH_3)_5Cl]^{2+}$

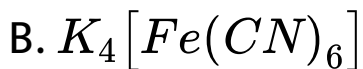


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Multiple Choice Questions

1. An example of double salt is

A. bleaching powder



C. hypo

D. potash alum

Answer: D



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2. Write IUPAC name of $[Co(NH_3)_6]Cl_3$.

A. hexaamminecobalt (III) chloride

B. cobalt (III) hexamine tri-chloride

C. cobalt hexamine chloride

D. hexamine cobalt chloride

Answer: A



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3. Name of complex $[pt(NH_3)_6]Cl_4$ is

A. hexaammineplatinum (IV) chloride

B. hexaammineplatinum (II) chloride

C. tetrachloro hexaammineplatinum (IV)

D. tetrachloro hexaammineplatinum (II)

Answer: A



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4.



are examples of which type of isomers ?

A. Linkage

B. Geometrical

C. Ionisation

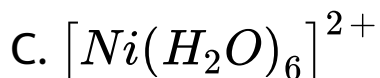
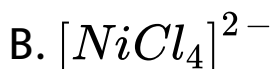
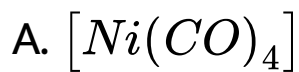
D. Optical

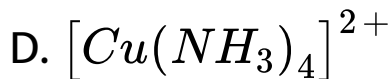
Answer: C



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5. Which complex has square planar structure?



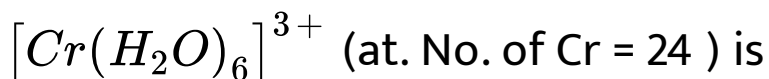


Answer: D



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6. The number of d-electrons in



A. 2

B. 3

C. 4

D. 5

Answer: B



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7. The oxidation number of iron in

$K_4[Fe(CN)_6]$ is :

A. 3

B. 2

C. 0

D. 1

Answer: B



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8. The IUPAC name of $[Co(Cl)(NO_2)(en)_2]Cl$

is

A. chloronitrobis (ethylene diamine)

cobaltic (III) chloride

B. chloronitrobis (ethylenediamine) cobalt

(II) chloride

C. chlorobis (ethylenediamine) nitro

cobalt(III) chloride

D. bis (ethylenediamine) chloronitrocobalt

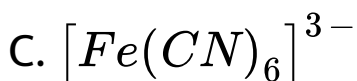
(III) chloride

Answer: C



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9. Which of the following complex species involves d^2sp^3 hybridisation ?



Answer: D



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10. Which of the following acts as a positive ligand?

A. acetate

B. carbonyl

C. nitrosonium

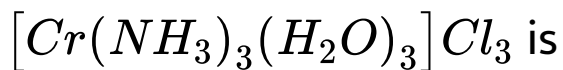
D. aquo

Answer: C



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11. The co-ordination number of Cr in



A. 3

B. 4

C. 6

D. 2

Answer: C



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12. The magnetic moment of $[Ni(CO_4)]$ is

A. 0

B. 2

C. 1

D. 3

Answer: A



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13. The effective atomic number of Cr (Atomic no. = 24) in $[Cr(NH_3)_6]Cl_3$ is

A. 35

B. 27

C. 33

D. 36

Answer: C



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14. The effective atomic number of Fe in $Fe(CO)_5$ is

A. 26

B. 34

C. 36

D. 54

Answer: C



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15. The coordination number of copper in cuprammonium sulphate is

A. 2

B. 4

C. 3

D. 6

Answer: B



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16. *en* is an example of a

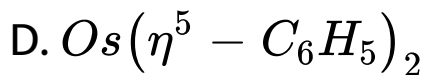
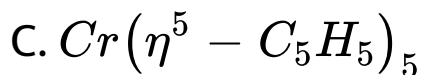
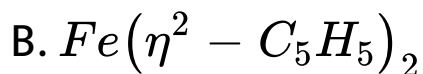
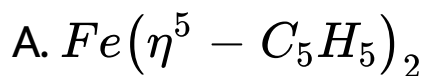
- A. monodentate
- B. bidentate ligand
- C. tridentate ligand
- D. hexadentate ligand

Answer: B



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17. Ferrocene is

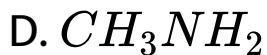
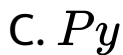
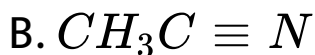
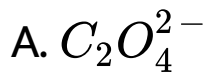


Answer: A



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18. Which of the following ligands is expected to be bidentate?



Answer: A



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19. The number of unpaired electrons in the complexes $[NiCl_4]^{-2}$ and $[Ni(CO)_4]$ are

A. 2 and 2

B. 1 and 2

C. 2 and zero

D. 3 and 2

Answer: C



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20. According to effective atomic number, the central metal acquires

A. inert gas configuration

B. duplet

C. octet

D. quartet

Answer: B



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21. A group of atoms can function as a ligand only when

- A. It is a small molecule
- B. It has an unshared electron pair
- C. It is a negatively charged ion
- D. It is a positively charged ion.

Answer: A



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22. How many ions are produced from

$[Co(NH_3)_6]Cl_3$ in solution ?

A. 6

B. 4

C. 3

D. 2

Answer: B



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23. Write the IUPAC name of



A. Potassium pentacyanonitrosyl ferrate (II)

B. Potassium penta cyanonitrile (II)

C. Potassium penta cyanonitrosyl ferrate
(III)

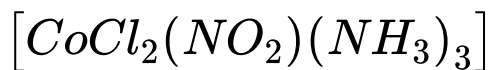
D. None of these

Answer: A



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24. Write the I.U.P.A.C. name of the



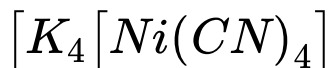
- A. Triammine dichloridonitrito-N-cobalt(III)
- B. Dichlorotriamminenitriro-N cobalt (III)
- C. Dichlorotriamminenitrito-N cobalt (II)
- D. None of these

Answer: A



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25. Write the IUPAC name of the



- A. Potassium tetracyanonickelate (II)
- B. Potassium tetracyanonickelate (III)
- C. Potassium tetracyanonickelate (0)
- D. None of these

Answer: A



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26. An example of double salt is

A. bleaching powder

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

C. hypo solution

D. potash alum

Answer: D



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27. Write IUPAC name of $[Co(NH_3)_6]Cl_3$.

- A. hexaamminecobalt (III) chloride
- B. cobalt (III) hexamine tri-chloride
- C. cobalt hexamine chloride
- D. hexamine cobalt chloride,

Answer: A



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28. The name of complex $[Fe(CN)_6]^{3-}$ is

- A. hexaammineplatinum (IV) chloride
- B. hexaammineplatinum (II) chloride
- C. tetrachloro hexaammineplatinum (IV)
- D. tetrachloro hexaammineplatinum (II).

Answer: A



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29.



are examples of which type of isomers ?

A.

B.

C.

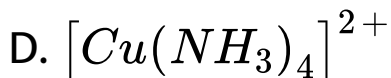
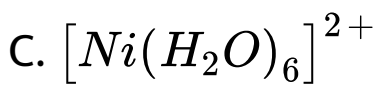
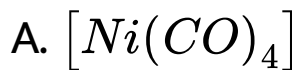
D.

Answer: C



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30. Which complex has square planar structure?



Answer: D



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31. The number of d-electrons in

$[Cr(H_2O)_6]^{3+}$ (at. No. of Cr = 24) is

A. 2

B. 3

C. 4

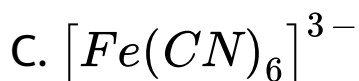
D. 5

Answer: B



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32. Which of the following complex species involves d^2sp^3 hybridisation ?



Answer: D



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33. Which of the following acts as a positive ligand?

A. Acetate

B. Carbonyl

C. Nitrosonium

D. Aquo.

Answer: C



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34. The effective atomic number of Fe in $Fe(CO)_5$ is

A. 26

B. 34

C. 36

D. 54

Answer: C



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35. The coordination number of copper in cuprammonium sulphate is

A. 2

B. 4

C. 3

D. 6

Answer: B



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36. The correct IUPAC name of $[Pt(NH_3)_2Cl_2]$

is:

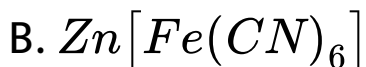
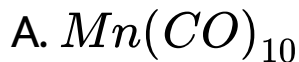
- A. Diammine dichlorido platinum (II)
- B. Diammine dichlorido platinum (IV)
- C. Diammine dichlorido platinum (0)
- D. Chlorido diammine Platinum (IV)

Answer: A



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37. In which of the following complexes, the metal ion is in zero oxidation state ?



Answer: A



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38. The oxidation number of iron in

$K_4[Fe(CN)_6]$ is :

A. +1

B. +2

C. +3

D. Zero

Answer: B



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