9.COORDINATION COMPOUNDS

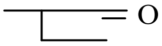
Single Correct Answer Type

1. The IUPAC name of $Na_3[Co(ONO)_6]$ is:
a) Sodium cobaltinitrite
b) Sodium hexanitritocobaltate(III)
c) Sodium hexanitrocobalt(III)
d) Sodium hexanitritocobaltate(II)

2. $CuSO_4$ decolourises on addition of KCN, the product is:
a) $Cu(CN)_4^{2-}$ b) $[Cu(CN)_4]^{3-}$ c) $Cu(CN)_2$ d) CuCN

3. Exchange of coordination group by a water molecule in complex molecule results in:
a) Ionization isomerism
b) Ligand isomerism
c) Hydration isomerism
d) Geometrical isomerism

4. The type of isomerism found in urea molecule is
a) Chain
b) Position
c) Tautomerism
d) None of these

5. The IUPAC name of the compound  is
a) Butane-2-aldehyde b) 2-methyl butanal c) 2-ethyl propanal d) None of the above

6. Anisol is a product obtained from phenol by the reaction known as:
a) Coupling b) Etherification c) Oxidation d) Esterification

7. Which of the following is diamagnetic in nature?
a) $[Fe(CN)_6]^{3-}$ b) $[NiCl_4]^{2-}$ c) $[Ni(CO)_4]$ d) $[MnCl_4]^{2-}$

8. Which is the strongest field ligand?
a) CN^- b) NO_2^- c) NH_3 d) en

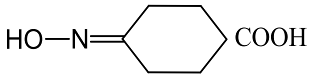
9. Nitrobenzene on reduction with Zn and *aq*. NH_4Cl gives:
a) Aniline
b) Nitrosobenzene
c) *N*-phenyl hydroxylamine
d) Hydrazobenzene

10. The IUPAC name of $[Co(NH_3)_5\ ONO]^{2+}$ ion is
a) Pentaammine nitrito cobalt (IV) ion b) Pentaammine nitro cobalt (III) ion
c) Pentaammine nitrito cobalt (III) ion d) Pentaammine nitro cobalt (IV) ion

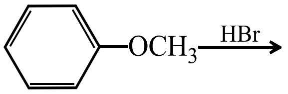
11. The compound which does not show paramagnetism is
a) NO_2 b) NO c) $[Ag(NH_3)_2]Cl$ d) $[Cu(NH_3)_4Cl_2]$

12. Which of the following is expected to undergo nitration more easily and readily to furnish the corresponding nitro derivatives employing the usual nitrating mixture?
a) C_6H_6 b) $C_6H_5NO_2$ c) $C_6H_5CH_3$ d) $C_6H_5 \cdot CCl_3$

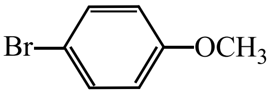
13. The number of unpaired electrons calculated in $[Co(NH_3)_6]^{3+}$and $[Co(F_6)]^{3-}$ are
a) 4 and 4 b) 0 and 2 c) 2 and 4 d) 0 and 4

14. The IUPAC name of

is
a) 4-hydroxy amino benzene carboxylic acid b) 4-(N-hydroxy) imino benzene carboxylic acid
c) 4-hydroxy imino cyclohexanoic acid d) 4-(N-hydroxy) imino cyclohexane-1 -carboxylic acid

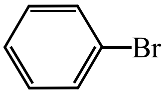
15. The IUPAC name of the coordination compound $K_2[Zn(OH)_4]$ is
    a) Potassium tetrahydroxozine (II)
    b) Dipotassium tetrahydroxo(II)
    c) Potassium tetrahydroxozincate (II)
    d) Potassium tetrahydroxozincate (III)
16. Arrange in order of decreasing trend towards S_E reactions,
    Chlorobenzene, Benzene, Anilium chloride, Toluene:
    I. (II) (III) (IV)
    a) II $> I > III > IV$
    b) III $> I > II > IV$
    c) IV $> II < I > III$
    d) I $> II > III > IV$
17. Toluene is nitrated and the resulting product is reduced with tin and hydrochloric acid. The product so obtained is diazotised and then heated with cuprous bromide. The reaction mixture so formed contains:
    a) Mixture of o- and m-bromotoluenes
    b) Mixture of o- and p-bromotoluenes
    c) Mixture of o- and p-dibromobenzenes
    d) Mixture of o- and p-bromoanilines
18. A positive carbylamine test is given by:
    a) N,N-dimethylaniline
    b) 2,4-dimethylaniline
    c) N-methyl-o-methylaniline
    d) p-methyl benzylamine
19. CN^- is strong field ligand. This is due to the fact that
    a) It carries negative charge
    b) It is a pseudohalide
    c) It can accept electrons from metal species
    d) It forms high spin complexes with metal species.
20. Which of the following is not true for ligand metal complex?
    a) Highly charged ligand forms strong bond
    b) Greater the ionization potential of central metal, the stronger is the bond
    c) Larger the permanent dipole moment of ligand, the more stable is the bond
    d) Larger the ligand, the more stable is the metal-ligand bond
21. The nitration of nitrobenzene with fuming HNO_3 will give:
    a) TNB
    b) 1,3-dinitrobenzene
    c) Picric acid
    d) 1,4-dinitrobenzene
22. A ligand can also be regarded as
    a) Lewis acid
    b) Bronsted base
    c) Lewis base
    d) Bronsted acid
23. The correct statement with respect to the complexes $Ni(CO)_4$ and $[Ni\ (CN)_4]^{2-}$ is
    a) Nickel is in the same oxidation state in both
    b) Both have terahedral geometry
    c) Both have square planar geometry
    d) Have tetrahedral and square planar geometry respectively
24. Which one of the following has lowest value of paramagnetic behaviour?
    a) $[Cr(CN_6)_4]^{3-}$
    b) $[Mn(CN)_6]^{3-}$
    c) $[Fe(CN)_6]^{3-}$
    d) $[Co(CN)_6]^{3-}$
25. In the reaction;



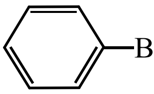
    the products are:

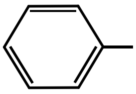
    a) 

    and H_2

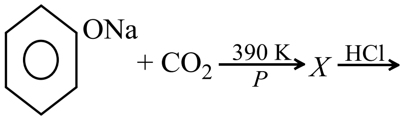
    b) 

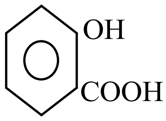
    and CH_3Br

c)  —Br and CH_3OH

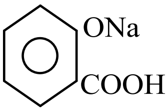
d)  —OH and CH_3Br

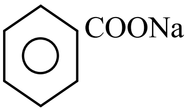
26. An octahedral complex is formed when central metal atom undergoes hybridization amongst the....orbitals.
    a) sp^3 b) dsp^2 c) sp^3d d) sp^3d^2

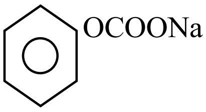
27. 

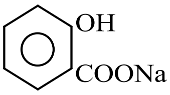


;the product X in the reaction is:

a) 

b) 

c) 

d) 

28. Biological oxidation of C_6H_6 taking place in body of dog, gives:
    a) Benzoic acid b) Toluic acid c) Maleic acid d) Muconic acid
29. Ammonia forms the complex ion $[Cu(NH_3)_4]^{2+}$ with copper ions in the alkaline solutions but not in acidic solutions .What is the reason for it?
    a) In acidic solutions hydration protects copper ions
    b) In acidic solutions protons coordinate with ammonia molecules forming NH_4^+ ions and NH_3 molecules are not available
    c) In alkaline solutions insoluble $Cu(OH)_2$is precipitated which is soluble in excess of any alkali
    d) Copper hydroxide is an amphoteric substance
30. Which of the following has the highest molar conductivity in solution?
    a) $[Pt(NH_3)_6]Cl_4$ b) $[Pt(NH_3)_5Cl]Cl_3$ c) $[Pt(NH_3)_4Cl_2]Cl_2$ d) $[Pt(NH_3)_3Cl_3]Cl$
31. Which of the following is not *meta* directing group?
    a) $—SO_3H$ b) $—NO_2$ c) —CN d) $—NH_2$
32. Which of the following is an organometallic compound?
    a) Lithium methoxide b) Lithium acetate
    c) Lithium dimethylamine d) Methyl lithium
33. Which among the following is very strong *o*-, *p*-directing group?
    a) —Cl b) $—OR$ c) $—NH_2$ d) $—NHR$
34. The type of hybridisation in tetrahedral complexes of metal atom is
    a) dsp^2 b) d^2sp c) sp^3 d) sp^2
35. Chlorobenzene on heating with NaOH at 300°C under pressure gives:
    a) Phenol b) Benzaldehyde c) Chlorophenol d) None of these
36. The coordination number of Fe in $[Fe(CN)_6]^{4-}$ $[Fe(CN)_6]^{3-}$ and $[FeCl_4]^-$ are respectively.
    a) 2, 3, 3 b) 6, 6, 4 c) 6, 3, 3 d) 6, 4, 6

37. Consider the following statements

I. Chain and position isomerism are not possible together between two isomers

II. Tautomerism is a chemical phenomenon which is catalysed by acid as well as base

III. Tautomers are always metamers

IV. Tautomers are always functional isomers

Select the correct answer by using the codes given below

a) Only III is correct
b) III and IV are correct
c) I, II and III are correct
d) I, II and IV are correct

38. What is the EAN of nickel in $[Ni(CN)_4]^{2-}$?

a) 32
b) 35
c) 34
d) 36

39. Which of the following alcohols is dehydrated most readily with conc. H_2SO_4?

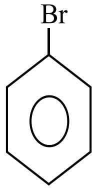
a) p-$O_2NC_6H_4CH(OH)CH_3$
b) p-$ClC_6H_4CH(OH)CH_3$
c) p-$CH_3OC_6H_4CH(OH)CH_3$
d) $C_6H_5CH(OH)CH_3$

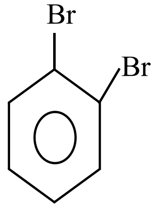
40. The compound having tetrahedral geometry is

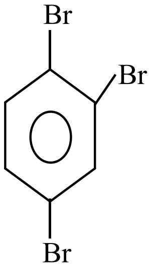
a) $[Ni(CN)_4]^{2-}$
b) $[Pd(CN_4)]^{2-}$
c) $[PdCl_4]^{2-}$
d) $[NiCl_4]^{2-}$

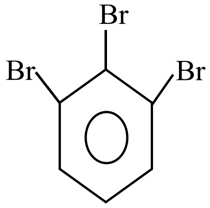
41. Identify 'Z' in the change;

$$C_6H_5NH_2 \xrightarrow[280\text{ K}]{NaNO_2/HCl} X \xrightarrow{CuBr/HBr} Z:$$

a) 

b) 

c) 

d) 

42. Which of the following is most acidic?

a) p-cresol
b) p-chlorophenol
c) p-nitrophenol
d) p-aminophenol

43. Benzoylacetonato beryllium exhibit isomerism of the type

a) Structural
b) Geometrical
c) Optical
d) Conformational

44. Which one of the following has a square planar geometry?

(At. No. Fe=26, Co=27, Ni=28, Pt=78)

a) $[CoCl_4]^{2-}$
b) $[FeCl_4]^{2-}$
c) $[NiCl_4]^{2-}$
d) $[PtCl_4]^{2-}$

45. The number of ions formed on dissolving one molecule of $FeSO_4(NH_4)_2SO_4 \cdot 6H_2O$ in water is:

a) 4
b) 5
c) 3
d) 6

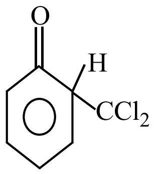
46. A solution of potassium ferrocyanide would contains-ions

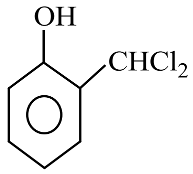
a) 2
b) 3
c) 4
d) 5

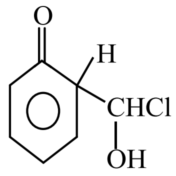
47. Which of the following is not considerd as an organometallic compound?

a) Grignard reagent
b) *cis*-platin
c) Zeise's salt
d) Ferrocene

48. When phenol is reacted with $CHCl_3$ and NaOH followed by acidification, salicylaldehyde is obtained. Which of the following species are involved in the above mentioned reaction as intermediates?

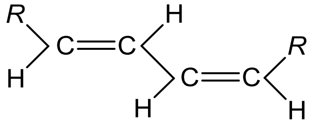
a) 

b) 

c) 

d) Both (a) and (b)

49. Number of geometrical isomers for the molecule



are

a) 2　b) 3　c) 6　d) 5

50. Which statement about coordination number of a cation is true?
a) Most metal ions exhibit only a single characteristic coordination number
b) The coordination number is equal to the number of ligands bonded to the metal atom
c) The coordination number is determined solely by the tendency to surround the metal atom with the same number of electrons as one of the rare gases
d) For most cations, the coordination number depends on the size, structure and charge of the ligands

51. Among the following, the strongest base is:
a) $C_6H_5NH_2$　b) p-$NO_2—C_6H_4NH_2$　c) m-$NO_2—C_6H_4NH_2$　d) $C_6H_5CH_2NH_2$

52. General formula for arenes is:
a) C_nH_{2n+6}　b) C_nH_{2n+6y}　c) C_nH_{2n}　d) C_nH_{2n-6y}

53. Which of the following doesn't have a metal-carbon bond?
a) $Al(OC_2H_5)_3$　b) C_2H_5MgBr　c) $K[Pt(C_2H_4)Cl_3]$　d) $Ni(CO)_4$

54. How many isomers are possible in $[Co(en)_2Cl_2]$?
a) 2　b) 4　c) 6　d) 1

55. How many carbon atoms in the molecule $HOOC-(CHOH)_2-COOH$ are asymmetric?
a) 1　b) 2　c) 3　d) None of these

56. In benzene, there is a delocalisation of π-electrons. Hence, each π-electron is attached by….carbon nuclei.
a) 2　b) 3　c) 6　d) 4

57. Which can be used to distinguish $C_6H_5NH_2$ and $C_6H_5CH_2NH_2$?
a) Diazotisation followed with coupling with phenol
b) Carbylamine reaction
c) Reimer-Tiemann reaction
d) None of the above

58. When RCOCl and $AlCl_3$ are used in Friedel-Craft's reaction, the electrophile is:
a) Cl^+　b) RCOCl　c) $R\overset{+}{C}O$　d) R^+

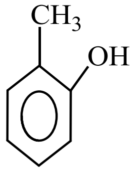
59. Thiophene is separated from benzene by:
a) Chlorination of thiophene
b) Sulphonation of thiophene
c) Nitration of thiophene
d) Oxidation of thiophene

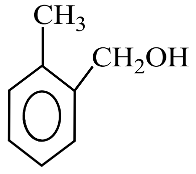
60. A complex compound of CO^{3+} with molecular formula $COCl_x.yNH_3$ gives a total of 3 ions when dissolved in water. How many Cl^- ions satisfy both primary and secondary valencies in this complex?
a) 3　b) 1　c) 4　d) Zero

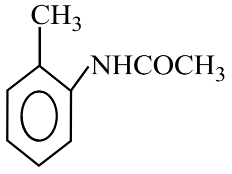
61. The correct IUPAC name of alcohol $[(CH_3)_2CH]_3COH$ is
a) Tri isopropyl carbinol　b) 2, 4-dimethyl-3-isopropyl pentan-3-ol
c) 2,4-dimethyl-3-(1-methyl) ethyl pentan-3-ol　d) None of the above

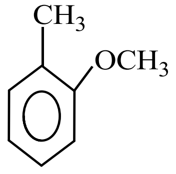
62. Colour of transition metal complexes can be explained by:
a) Completely filled d-orbitals
b) Vacant d-orbitals
c) $d-d$ transition
d) None of the above

63. Which is most reactive towards electrophilic reagents:

a) 

b) 

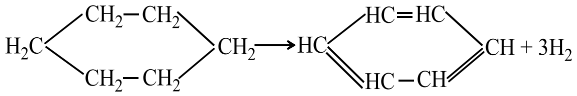
c) 

d) 

64. Pick a poor electrolytic conductor complex in solution:
a) $K_2[PtCl_6]$　b) $[Co(NH_3)_3](NO_2)_3$　c) $K_4[Fe(CN)_6]$　d) $[Co(NH_3)_4]SO_4$

65. Benzene reacts with sulphuric acid only when the acid is:
a) Dilute and cold b) Dilute and hot c) Hot and concentrated d) Mixed with HNO_3

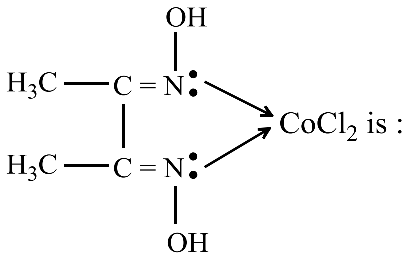
66. In the following reaction the catalyst used is:



a) Cr_2O_3 b) Al_2O_3 c) Zn dust d) Cr_2O_3 and Al_2O_3

67. The alkane which has only primary hydrogen atom is
a) Pentane
b) *iso*pentane
c) *neo*pentane
d) 2, 2-dimethyl butane

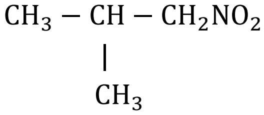
68. The correct IUPAC name of the complex;

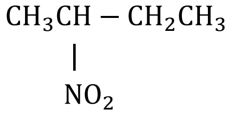


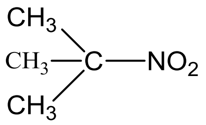
a) Dichlorodimethylglyoximato cobalt(II)
b) *Bis*(dimethylglyoxime) dichloro cobalt(II)
c) Dimethylglyoxime cobalt(II) chloride
d) Dichlorodimethylglyoxime-N,N-cobalt(II)

69. Which of the following nitroalkane will not show tautomerism?

a) $CH_3CH_2CH_2CH_2NO_2$

b) 
$CH_3-\underset{\substack{|\\CH_3}}{CH}-CH_2NO_2$

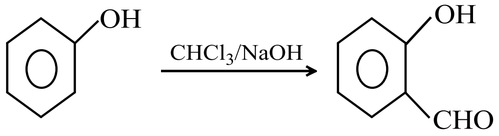
c) 
$CH_3\underset{\substack{|\\NO_2}}{CH}-CH_2CH_3$

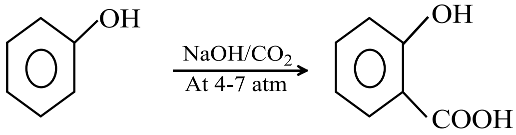
d) 

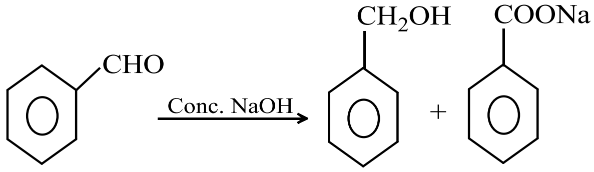
70. Which is low spin complex?
a) $[Fe(CN)_6]^{3-}$ b) $[Co(NO_2)_6]^{3-}$ c) $[Mn(CN)_6]^{3-}$ d) All of these

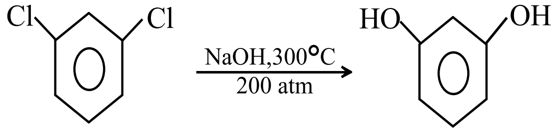
71. The probable formula for Prussian blue is:
a) $Fe_3[Fe(CN)_6]_2$ b) $Fe_2[Fe(CN)_6]_3$ c) $Fe_4[Fe(CN)_6]_3$ d) $Fe_3[Fe(CN)_6]_4$

72. Which represents Reimer-Tiemann reaction?

a) 

b) 

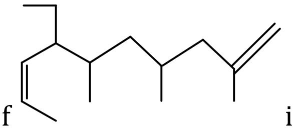
c) 

d) 

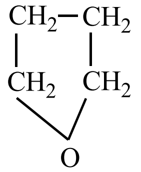
73. The complex ion which has no '*d*'-electron in the central metal atom is :
a) $[MnO_4]^-$ b) $[Co(NH_3)_6]^{3+}$ c) $[Fe(CN)_6]^{3-}$ d) $[Cr(H_2O)_6]^{3+}$

74. The shape of cobalt hexaammine cation, which has its central cobalt atom surrounded by six ammonia molecules is:
a) Tetrahedral b) Octahedral c) Square planar d) Trigonal

75. Which ligand is capable of forming low spin as well as high spin complexes?
a) CO b) NO_2^- c) CN^- d) NH_3

76. The IUPAC name of  is
a) 7-ethyl-2, 4, 5, 6-tetramethyl-deca-1, 9-diene b) 7-ethyl-2, 4, 5, 6-tetramethyl-deca-1, 8-diene
c) 4-ethyl-4, 5, 6, 7-tetramethyl-deca-1, 9-diene d) 7-(1-propenyl)-2, 3, 4, 5-tetramethyl-non-1-ene

77. IUPAC name of $[Pt(NH_3)_3Br(NO_2)Cl]Cl$ is
a) Triamminechlorobromonitro platinum (IV) chloride
b) Triamminebromonitrochloro platinum (IV) chloride
c) Triamminebromochloronitro platinum (IV) chloride
d) Triamminenitrochlorobromo platinum (IV) chloride

78. An aromatic ether is not cleaved by HI even at 525 K. The compound is:
a) $C_6H_5OCH_3$ b) $C_6H_5OC_6H_5$ c) $C_6H_5OC_3H_7$ d) 

79. Phenol does not react with:
a) Na_2CO_3 b) NaOH c) $NaHCO_3$ d) KOH

80. $[EDTA]^{4-}$is a
a) Monodentate ligand b) Bidentate ligand
c) Quadridentate ligand d) Hexadentate ligand

81. $[Pt(NH_3)_4Cl_2]Br_2$ and $[Pt(NH_3)_4Br_2]Cl_2$ are related to
a) Optical isomer b) Linkage isomers c) Coordinate isomers d) Ionization isomers

82. Ferrocene is an example of
a) Sand-wiched complex
b) Pi-bonded complex
c) A complex in which all the five carbon atoms of cyclopentadiene anion are bonded to the metal
d) All of the above

83. Which compound is zero valent metal complex?
a) $[Cu(NH_3)_4]SO_4$ b) $[Pt(NH_3)_2Cl_2]$ c) $[Ni(CO)_4]$ d) $K_3[Fe(CN)_6]$

84. Which of the following compounds is 2, 2, 3-trimethyl hexane?
a) $(CH_3)_3CCH(CH_3)CH_2CH_3$ b) $(CH_3)_3CCH_2(CH_3)_2$
c) $(CH_3)_2CHCH_2CH_2C(CH_3)_3$ d) $(CH_3)_3CCH(CH_3)CH_2CH_2CH_3$

85. The formula of phenoxy benzene is:
a) $C_6H_5C_6H_5$ b) $C_6H_5—O—C_6H_5$ c) $C_6H_5—O—C_6H_6$ d) None of these

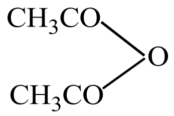
86. Ziegler-Natta catalyst is an organometallic compound containing
a) Iron b) Titanium c) Rhodium d) Zirconium

87. Ziegler-Natta catalyst is
a) $(Ph_3P)_3RhCl$ b) $K[PtCl_3(C_2H_4)]$ c) $[Al_2(C_2H_6)_6 + TiCl_4]$ d) $[Fe(C_2H_5)_2]$

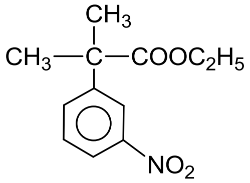
88. The tendency to show complex formation is maximum in ….elements.
a) s-block b) p-block c) d-block d) f-block

89. EDTA has coordination number
a) 3 b) 4 c) 5 d) 6

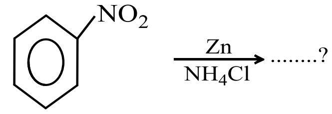
90. Which of the following is used in Friedel-Craft’s acylation reaction?

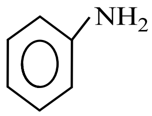
a)  b) CH_3CH_2Cl c) CH_3COOCH_3 d) CH_3Cl

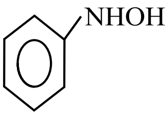
91. The correct IUPAC name of $Mn_3(CO)_{12}$ is
    a) Dodacacarbonyl maganate (0)
    b) Dodacacarbonyl maganate (II)
    c) Didacacarbonyl trimaganese (0)
    d) Manganic dodecacarbanyl (0)
92. The π −bonded organometallic compound which has ethene as one of its component is
    a) Zeise's salt b) Ferrocene c) Dibenzene chromium d) Tetraethyl tin
93. IUPAC name of the compound

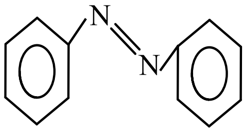


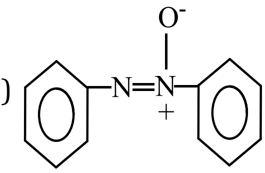
is
    a) Ethyl-2-methyl-2-(*m*-nitro) phenyl propanoate
    b) Ethyl-2-methyl-2-(*o*-nitro) phenyl propanoate
    c) Ethyl-2-methyl-2-(3-nitro) phenyl propanoate
    d) Ethyl-2-methyl-2-(3-nitro) phenyl propanoic acid
94. What is the product obtained in the following reaction:



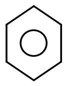
a) 

b) 

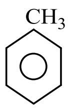
c) 

d) 

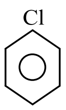
95. $[Co(NH_3)_6]Cl_3$ is called:
    a) Hexaammine cobalt (III) chloride
    b) Amino cobalt chloride (III)
    c) Cobalt chloride hexaammine
    d) Hexaammine tricobalt chloride
96. The complexes $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)_4]Cl_2$ are example for isomerism
    a) Geometrical b) Optical c) Ionization d) Linkage
97. Geometrical shapes of the complexes formed by the reaction of Ni^{2+} with Cl^-, CN^- and H_2O , respectively, are
    a) Octahedral, tetrahedral and square planar
    b) Tetrahedral ,square planar and octahedral
    c) Square planar ,tetrahedral and octahedral
    d) Octahedral , square planar and octahedral
98. Identify the correct order of reactivity in electrophilic substitution reactions of the following compounds:



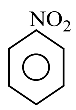
(1) ,



(2) ,



(3) ,



(4)

    a) 1 > 2 > 3 > 4 b) 4 > 3 > 2 > 1 c) 2 > 1 > 3 > 4 d) 2 > 3 > 1 > 4
99. The centric formula for benzene was proposed by:
    a) Dewar
    b) Armstrong and Baeyer
    c) Ladenberg
    d) Kekule
100. Which is the correct statement?
    a) Benzyl alcohol is more acidic than phenol
    b) Ethanol is a powerful oxidizing agent
    c) Phenol is more acidic than propanol
    d) Ethane has high boiling point than ethanol

101. Phenol on sulphonation gives:
a) o-phenol sulphonic acid
b) p-phenol sulphonic acid
c) m-phenol sulphonic acid
d) Mixture of o-and p-phenol sulphonic acids

102. Which of the following organometallic compound is σ and π bonded?
a) $\mathrm{Fe(CH_3)_3}$ b) $\mathrm{[Co(CO)_5NH_3]^{2+}}$ c) $\mathrm{[Fe(\eta^5 - C_5H_5)_2]}$ d) $\mathrm{K[PtCl_3(\eta^2 - C_2H_4)]}$

103. The number of double bonds in BHC (gammexane) is:
a) 1 b) 2 c) 3 d) Zero

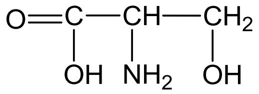
104. Given the molecular formula of the hexa coordinated complexes (A) $\mathrm{CoCl_3 \cdot 6NH_3}$ $(B)\mathrm{CoCl_3 \cdot 5NH_3}$ (C) $\mathrm{CoCl_3 \cdot 4NH_3}$. If the number of coordinated $\mathrm{NH_3}$ molecules in A, B and C respectively are 6, 5 and 4, primary valency in (A), (B) and (C) are
a) 0, 1, 2 b) 3, 2, 1 c) 6, 5, 4 d) 3, 3, 3

105. Type of isomerism shown by $\mathrm{[Cr(NH_3)_5\ NO_2]Cl_2}$ is
a) Optical b) Ionisation c) Geometrical d) Linkage

106. $\mathrm{[Sc(H_2O)_6]^{3+}}$ ion is
a) Colourless and diamagnetic b) Coloured and octahedral
c) Colourless and paramagnetic d) Coloured and paramagnetic

107. Which one of the following octahedral complexes will not show geometrical isomerism? (A and B are monodentate ligands)
a) $[MA_4B_2]$ b) $[MA_5B]$ c) $[MA_2B_4]$ d) $[MA_3B_3]$

108. The IUPAC name of the following compound is



$$\mathrm{O{=}\underset{OH}{\underset{|}{C}}-\underset{NH_2}{\underset{|}{CH}}-\underset{OH}{\underset{|}{CH_2}}}$$

a) 3-amino-2-hydroxy propanoic acid b) 2-aminopropan-3-ol-1-oic acid
c) 2-amion-3-hydroxy propanoic acid d) Aminohydroxy propanoic acid

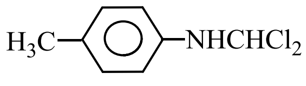
109. Which of the following complex ion is not expected to absorb visible light?
a) $\mathrm{[Ni(CN)_4]^{2-}}$
b) $\mathrm{[Cr(NH_3)_6]^{3+}}$
c) $\mathrm{[Fe(H_2O)_6]^{2+}}$
d) $\mathrm{[Ni(H_2O)_6]^{2+}}$

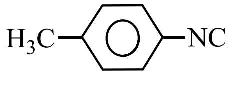
110. The correct sequence of activating power of a group in benzene is:
a) $-\mathrm{NH_2} > -NHCOC\mathrm{H_3} > -C\mathrm{H_3}$
b) $-\mathrm{NH_2} < -NHCOC\mathrm{H_3} < -C\mathrm{H_3}$
c) $-\mathrm{NH_2} > -NHCOC\mathrm{H_3} < -C\mathrm{H_3}$
d) $-\mathrm{NH_2} < -NHCOC\mathrm{H_3} > -C\mathrm{H_3}$

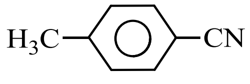
111. The pair of compounds having metals in their highest oxidation state is
a) $\mathrm{MnO_2, FeCl_3}$ b) $\mathrm{[MnO_4]^-, CrO_2Cl_2}$
c) $\mathrm{[Fe(CN)_6]^{3-}}$, $\mathrm{[Co(CN)_3]}$ d) $\mathrm{[NiCl_4]^{2-}}$, $\mathrm{[CoCl_4]^-}$

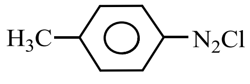
112. Total number of geometrical isomers for the complex $\mathrm{[RhCl(CO)(PPh_3)(NH_2)]}$ is
a) 1 b) 2 c) 3 d) 4

113. The reaction of chloroform with alc. KOH and p-toluidine forms:

a) 

b) 

c) 

d) 

114. Which order is correct in spectrochemical series of ligands?

a) $Cl^- < F^- < [C_2O_4]^{2-} < NO_2^- < CN^-$
b) $CN^- < [C_2O_4]^{2-} < Cl^- > NO_2^- < F^-$
c) $[C_2O_4]^{2-} < F^- < Cl^- > NO_2^- < CN^-$
d) $F^- < Cl^- < NO_2^- < CN^- < [C_2O_4]^{2-}$

115. The IUPAC name of compound $K_3[Fe(CN)_5NO]$ is

a) Pentacyano nitrosyl potassium ferrate(II)
b) Potassium cyano pentanitrosyl ferrate(II)
c) Potassium pentacyanonitrosyl ferrate (III)
d) Potassium pentacyanonitrosyl ferrate (II)

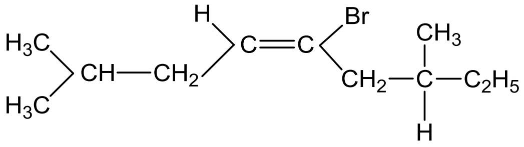
116. The colour of $[Ti(H_2O)_6]^{3+}$ is due to:

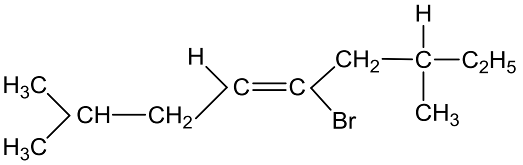
a) Transfer of an electron from one Ti to another
b) Presence of water molecule
c) Excitation of electrons from $d-d$
d) Intramolecular vibration

117. The oxidation number of Fe in $K_4[Fe(CN)_6]$is

a) +3
b) +4
c) +2
d) −2

118. Correct structures of [E][S]-5-bromo-2,7-dimetyl, non-4-ene is

a)


b)


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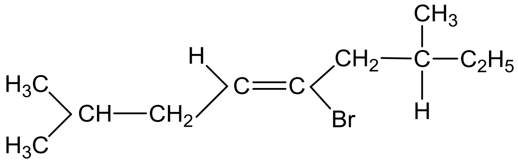

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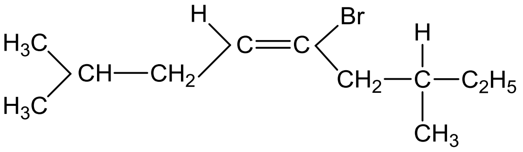


119. Name the metal M which is extracted on the basis of following reactions,

$4M + 8CN^- + 2H_2O + O_2 \longrightarrow 4[M(CN)_2]^- + 4OH^-$
$2[M(CN)_2]^- + Zn \longrightarrow [Zn(CN)_4]^{2-} + 2M$:

a) Nickel
b) Silver
c) Copper
d) Mercury

120. EAN of Cr in $[Cr(NH_3)_6]Cl_3$ is:

a) 32
b) 33
c) 34
d) 35

121. The complex $[Pt(NH_3)_6]Cl_4$ furnishes:

a) 5 ions
b) 6 ions
c) 4 ions
d) 2 ions

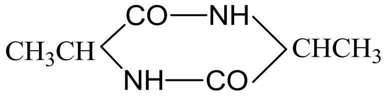
122. Ammoniacal solution of $Ni(CN)_2$ reacts with C_6H_6 to produce a light violet coloured crystalline compound of the formula:

a) $Ni(CN)_2 \cdot C_6H_5$
b) $C_6H_5CH_3$
c) $Ni(CN)_2C_6H_6$
d) $Ni(CN)_2NH_3 \cdot C_6H_6$

123. Ammonia forms the complex ion $[Cu(NH_3)_4]^{2+}$with copper ions in alkaline solution but not in acidic solution. What is the reason for it?

a) In acidic solutions, hydration protects copper ions
b) In alkaline solution, insoluble $Ci(OH)_2$ is precipited which in excess of any alkali
c) Copper hydroxide is an amphoteric substance
d) In acidic solutions, protons coordinate with ammonia molecules forming NH_4^+ ions and NH_3 molecules are not available

124. Which of the following shows geometrical isomerism?

a) 1, 2-dicholoroethane
b) 1, 2-dimethylcyclopropane
c)


d) All of the above

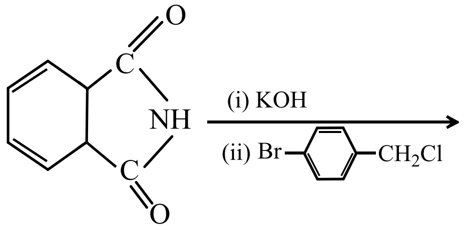
125. The shape of the complex $[Ag(NH_3)_2]^+$ is:

a) Octahedral
b) Square planar
c) Tetrahedral
d) Linear

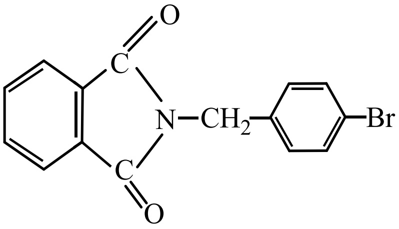
126. The π-bounded organometallic compound which has ethane as one of its component is

a) Dibenzene chromium b) Zeise salt c) Ferrocene d) Tetraethyl tin

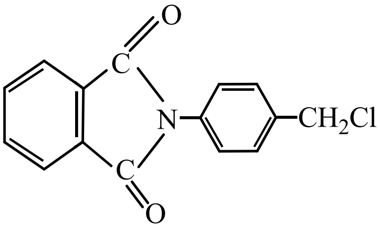
127. The major product of the following reaction is:



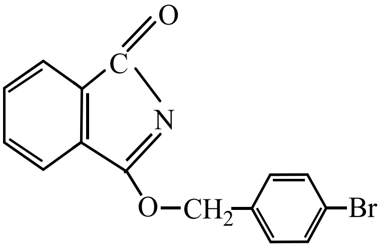
a)



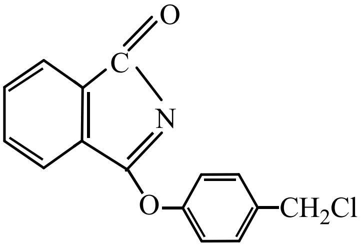
b)



c)



d)



128. Which is true in the case of $Ni(CO)_4$ complex?

a) Hybridization of Ni is sp^3

b) Tetrahedral shape of the molecule

c) Diamagnetic

d) All are correct

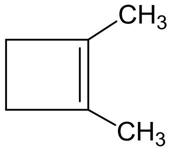
129. The reaction, $C_6H_5N_2Cl \xrightarrow{Cu_2Cl_2/HCl} C_6H_5Cl + N_2$ is called:

a) Etard's reaction b) Sandmeyer's reaction c) Wurtz-Fittig reaction d) Perkin's reaction

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

a) $[Co(en)_3]^{3+}$ b) $[Co(en)_2Cl_2]^{+}$ c) $[Co(NH_3)_3Cl_3]^0$ d) $[Co(en)Cl_2(NH_3)_2]^{+}$

131.



Having the IUPAC name as

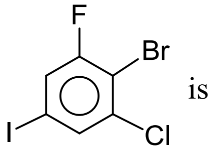
a) 1, 2-dimethyl cyclobutane b) 2, 3-dimethyl cyclobutene

c) 2, 3-dimethyl butane d) 1, 2-dimethyl cyclobut-1-ene

132. Which of the following ions is produced when we prepare nitrating mixture by mixing together concentrated HNO_3 and concentrated H_2SO_4?

a) NO_2^- b) NO_2^+ c) NO_3^- d) SO_3^+H

133. The correct IUPAC name of



is

a) 1-brmo-2-chloro-6-fluoro-4-iodobenzene b) 1-bromo-6-chloro-2-fluoro-4-iodobenzene

c) 2-bromo-1-chloro-3-floro-5-iodobenzene d) 2-bromo-3-chloro-1-floro-5-odobenzene

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

a) Ionization isomerism, geometrical isomerism and optical isomerism

b) Linkage isomerism, geometrical isomerism and optical isomerism

c) Linkage isomerism, ionization isomerism and optical isomerism

d) Linkage isomerism, ionization isomerism and geometrical isomerism

135. Which of the following complexes are not correctly matched with hybridisation of their central metal ion?

1. $[Ni(CO)_4]$ sp^3
2. $[Ni(CO)_4]^{2-}$ sp^3
3. $[CoF_6]^{3-}$ d^2sp^3
4. $[Fe(CN)_6]^{3-}$ sp^3d^2

Select the correct answer using the codes given below

a) 1 and 2 b) 1 and 3 c) 2 and 4 d) 2, 3 and 4

136. Which of the following is an explosive?

a) PCl_5 b) HNO_3 c) C_6H_5OH d) 2,4,6-trinitrophenol

137. The coordination number of Cr in $[Cr(NH_3)_3(H_2O)_3]Cl_3$ is:

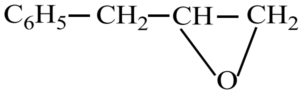
a) 3 b) 4 c) 6 d) 2

138. The major product obtained when 3-phenyl-1, 2-propane-diol is heated with H_2SO_4 is:

a) $C_6H_5—CH_2—CO—CH_3$

b) $C_6H_5—CH_2—CH_2—CHO$

c) $C_6H_5—CH_2—CH = CH_2$

d) 
$C_6H_5—CH_2—\underset{\diagdown O \diagup}{CH—CH_2}$

139. Rate of substitution in phenol is:

a) Slower than as in benzene

b) Faster than as in benzene

c) Equal to that as in benzene

d) None of the above

140. Magnetic moment of $[Ag(CN)_2]^-$ is zero. How many unpaired electrons are there?

a) Zero b) 4 c) 3 d) 1

141. Chlorophyll is a coordination compound having central atom of:

a) Ca b) Mg c) Na d) K

142. Which of the following statements is incorrect?

a) In $K_3[Fe(CN)_6]$, the ligand has satisfied only the secondary valency of ferric ion.

b) In $K_3[Fe(CN)_6]$, the ligand has satisfied both primary and secondary valencies of ferric ion.

c) In $K_4[Fe(CN)_6]$, the ligand has satisfied both primary and secondary valencies of ferrous ion.

d) In$[Cu(NH_3)_4]SO_4$, the ligand has satisfied only the secondary valenecy of copper.

143. Maximum number of open chain isomers that an alkene can have with the molecular formula C_4H_8 is

a) 5 b) 4 c) 3 d) 2

144. Which one is the wrong statement?

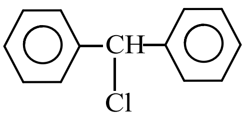
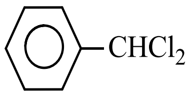
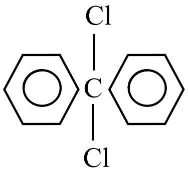
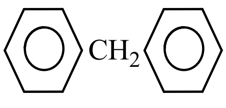
a) Open chain compounds are called aliphatic

b) Unsaturated compounds contain multiple bonds in them
c) Saturated hydrocarbons are called alkene
d) Aromatic compounds possess a characteristic aroma

145. According to postulates of Werner's theory for coordination compounds, which of the following is true?
a) Primary valencies are ionizable b) Secondary valencies are ionizable
c) Only primary valencies are non-ionizable d) Primary and secondary valencies are non-ionizable

146. Atomic numbers of Cr and Fe are respectively 24 and 26. Which of the following is paramagnetic with the spin of the electron?
a) $[Cr(CO)_6]$ b) $[Fe(CO)_5]$ c) $[Fe(CN)_6]^{4-}$ d) $[Cr(NH_3)_6]^{3+}$

147. Which of the following structures correspond to the product expected, when excess of C_6H_6 reacts with CH_2Cl_2 in presence of anhy. $AlCl_3$?

a) 
b) 
c) 
d) 

148. Which of the following will give a pair of enantiomorphs?
a) $[Co(en)_2Cl_2]Cl$ b) $[Cr(NH_3)_6][Co(CN)_6]$
c) $[Pt(NH_3)_4][PtCl_6]$ d) $[Co(NH_3)_4Cl_2]NO_2$

149. The crystal field splitting energy for octahedral(Δ_0) and tetrahedral (Δ_t) complexes is related to
a) $\Delta_t = \frac{4}{9}\Delta_0$ b) $\Delta_t = \frac{1}{2}\Delta_0$ c) $\Delta_0 = 2\Delta_t$ d) $\Delta_0 = \frac{4}{9}\Delta_t$

150. The correct name of the compound $[Cu(NH_3)_4](NO_3)_2$, according to IUPAC system is:
a) Cuprammonium nitrate
b) Tetraamminecopper(II) dinitrate
c) Tetraamminecopper(II) nitrate
d) Tetraamminecopper(I) dinitrate

151. Which among the following will not show chain isomerism?
a) C_3H_8 b) C_4H_{10} c) $C_5H_{12}O$ d) $C_5H_{10}O$

152. Phenol (1 mole) reacts with bromine to give s-tribromophenol. How much bromine is needed?
a) 1.5 mole b) 3.0 mole c) 4.5 mole d) 6.0 mole

153. Dimethyl glyoxime forms a coloured complex with
a) Ag b) Ni c) Cr d) Zn

154. Which has regular tetrahedral geometry?
a) $[Ni(CN)_4]^{2+}$ b) SF_4 c) $[BF_4]^-$ d) XeF_4

155. In haemoglobin the iron shows oxidation state:
a) +2 b) +3 c) +1 d) +4

156. For the given complex $[CoCl_2(en)(NH_3)_2]^+$, the number of geometrical isomers, the number of optical isomers and total number of isomers of all type possible respectively are
a) 2, 2 and 4 b) 2, 2 and 3 c) 2, 0 and 2 d) 0, 2 and 2

157. Which can show aromatic character?
a) Furan b) Pyrrol c) Benzene d) All of these

158. Of the following complexes, the one with the largest value of the crystal field splitting is:
a) $[Fe(H_2O)_6]^{3+}$ b) $[Ru(CN)_6]^{3-}$ c) $[Fe(H_2O)_6]^{2+}$ d) $[Fe(NH_3)_6]^{3+}$

159. The specific rotation of a pure enantiomer is + 16°. Its observed rotation if it is isolated from a reaction with 25% recemisation and 75% retention is
a) −12° b) +12° c) +16° d) −16°

160. Lithium tetrahydridoaluminate is correctly represented as:
a) $Al[LiH_4]$ b) $Al_2[LiH_4]_3$ c) $Li[AlH_4]$ d) $Li[AlH_4]_2$

161. Which of the following compounds is generally used for hydrogenation of alkenes?

a) $Ni(CO)_4$ b) $[(C_6H_5)_3P]_3RhCl$ c) $(CH_3)_3Al$ d) $(C_5H_5)_2Fe$

162. The end product of the reaction,

$C_6H_6 + Cl_2 \xrightarrow{\text{Sunlight}}$ is:

a) C_6H_5Cl b) o-$C_6H_4Cl_2$ c) $C_6H_6Cl_6$ d) p-$C_6H_4Cl_2$

163. $[Pt(NH_3)_6]Cl_4$ complex gives

a) 4 ions b) 3 ions c) 2 ions d) 5 ions

164. Which does not obey EAN rule?

a) $[Cu(NH_3)_4]^{2+}$ b) $[Zn(OH)_4]^{2-}$ c) $[HgI_4]^{2-}$ d) $Fe(CO)_5$

165. Oxidation number of Fe in $K_3[Fe(CN)_6]$ is:

a) +3 b) +2 c) +10 d) 1

166. Which of the following is not an organometallic compound?

a) $NaOC_2H_5$ b) $(CH_3)_3Al$ c) $(C_2H_5)_4Pb$ d) $RMgX$

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

a) Three b) Five c) Two d) Four

168. The value of 'spin only' magnetic moment for one of the following configuration is 2.84 BM the correct one

a) d^4 (in weak ligand field) b) d^4(in strong ligand field)

c) d^3 (in weak as well as in strong field) d) d^5 (in weak ligand field)

169. Fluorobenzene (C_6H_5F) can be synthesized in the laboratory:

a) By heating phenol with HF and KF

b) From aniline by diazotisation followed by heating the diazonium salt with HBF_4

c) By direct fluorination of benzene with F_2 gas

d) By reacting bromobenzene with NaF solution

170. Which compound burns with a sooty flame?

a) $C_6H_5CH_2OH$

b) C_6H_5COOH

c) CH_3OH

d) $CH_3COC_2H_5$

171. How many EDTA (ethylenediaminetetraacetic acid) molecules are required to make an octahedral complex with a Ca^{2+} ion?

a) Six b) Three c) One d) Two

172. Intramolecular rearrangement of phenyl esters to give o-and p-derivatives in presence of $AlCl_3$ is known as:

a) Friedel-Craft's reaction

b) Fries rearrangement

c) Esterification

d) Coupling

173. Which reaction can produce R—CO—Ar species?

a) $ArCOCl + H—Ar \xrightarrow{AlCl_3}$ b) $COCl + RMgX \longrightarrow$ c) $RCOCl + H—Ar \xrightarrow{AlCl_3}$ d) $R + CrO_3 \longrightarrow$

174. Acidic character of phenol is due to:

a) Resonance of phenoxide ion

b) Tautomerism occurring in phenol

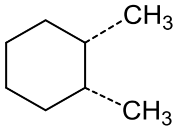
c) The fact that the electronegativity of oxygen is more than that of hydrogen

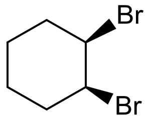
d) None of the above

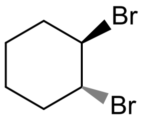
175. In triethylenediamine cobalt(III) chloride the coordination number of cobalt is:

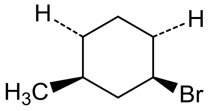
a) 3 b) 4 c) 6 d) 7

176. Mark the unidentical compound

a) 

b) 

c) 

d) 

177. A complex compound in which the oxidation number of a metal is zero, is
a) $K_4[Fe(CN)_6]$ b) $K_3[Fe(CN)_6]$ c) $[Ni(CO)_4]$ d) $[Pt(NH_3)_4]Cl_2$

178. In the halogenation of aromatic nucleus, the halogen carrier, used to generate the species is:
a) Cl b) Cl^+ c) Cl^- d) Cl

179. Among $[Ni(CN)_4]^{2-}$, $[NiCl_4]^{2-}$ and $[Ni(CO)_4]$:
a) $[Ni(CN)_4]^{2-}$ is square planar and , $[NiCl_4]^{2-}$, $Ni(CO)_4$ are tetrahedral
b) $[NiCl_4]^{2-}$ is square planar and $[NiCN_4]^{2-}$, $Ni(CO)_4$ are tetrahedral
c) $Ni(CO)_4$ is square planar and $[Ni(CN)_4]^{2-}$, $[NiCl_4]^{2-}$ are tetrahedral
d) None of the above

180. Benzene is obtained by:
a) Condensation of three C_2H_2 molecules
b) Polymerization of three C_2H_2 molecules
c) Addition of three C_2H_2 molecules
d) Substitution of three acetylene molecules

181. IUPAC name of t-butyl chloride is
a) 2-chloro butane b) 1-chloro-2-methylpropane
c) 2-chloro-2-methylpropane d) None of the above

182. The d-electronic configuration of $Cr^{2+}, Mn^{2+}, Fe^{2+}, Ni^{2+}$ are $3d^4, 3d^5, 3d^6$ and $3d^8$ respectively. Which of the following complex will show minimum paramagnetic behaviour?
a) $[Fe(H_2O)_6]^{2+}$ b) $[Ni(H_2O)_6]^{2+}$ c) $[Cr(H_2O)_6]^{2+}$ d) $[Mn(H_2O)_6]^{2+}$

183. Phenol is more acidic than cyclohexanol because:
a) Benzene ring exists in resonance
b) Cyclohexane ring shows resonance
c) Phenol is poor in hydrogen
d) Cyclohexanol is rich in hydrogen

184. Total possible structural isomers (not stereo) of C_4H_6 are
a) 4 b) 6 c) 9 d) 12

185. In the reaction of p-chlorotoluene with KNH_2 in liq. NH_3 the major product is:
a) o-toluidine b) m-toluidine c) p-toluidine d) p-chloroaniline

186. The type of isomerism in the molecule of compounds $CH_3CH_2COCH_2CH_3$ and $CH_3CHC(OH)CH_2CH_3$ is referred as:
a) Metamerism
b) Chain isomerism
c) Functional isomerism
d) Tautomerism

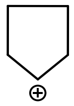
187. Phenol is less soluble in water. It is due to:
a) Non-polar nature of phenol
b) Acidic nature of—OH group
c) Non-polar hydrocarbons part in it
d) None of the above

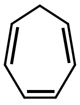
188. When phenol is treated with excess bromine water, it gives:
a) m-bromophenol
b) o-and p-bromophenol
c) 2,4-dibromophenol
d) 2,4,6-tribromophenol

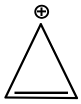
189. Which have octahedral shape (d^2sp^3) hybridization of central atom?

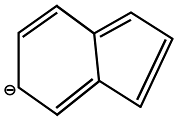
a) $[Cr(NH_3)_6]^{2+}$ b) $[Fe(CN)_6]^{3-}$ c) $[Cu(NH_3)_6]^{+}$ d) All are correct

190. Which of the following molecules/species are aromatic in character?


(1)

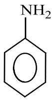

(2)


(3)

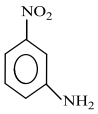

(4)

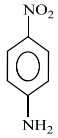
a) 2 b) 3 c) 4 d) 1

191. Among the following compounds ;

I. 

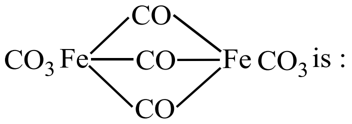
II. Et_3N

III. 

IV. 

the order of basicity is :

a) IV > III > II > I b) II > I > III > IV c) III > IV > II > I d) I > III > IV > II

192. The correct name of  is :

a) Tri-μ-carbonyl *bis*-(tricarbonyl)iron (0)

b) Hexacarbonyl iron (III) μ-tricarbonyl ferrate(0)

c) Tricarbonyl iron(0) μ-tricarbonyl iron(0) tricarbonyl

d) Nonacarbonyl iron

193. Which is high spin complex?

a) $[CoCl_6]^{3-}$ b) $[FeF_6]^{3-}$ c) $[Co(NH_3)_6]^{2+}$ d) All are correct

194. The correct IUPAC name of tartaric acid is

a) 1, 4-dicarboxy-2, 3-dihydroxy ethane b) α, α′-dihydroxy butane-1,4-dioic acid

c) 1, 4-dihydroxybutane-2, 3-dioic acid d) 2, 3-dihydroxybutane-1, 4-dioic acid

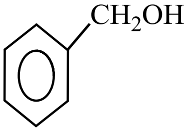
195. What is the overall formation equilibrium constant for the ion$[ML_4]^{2-}$ ion, given that β_4 for this complex is 2.5×10^{13}?

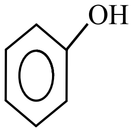
a) 2.5×10^{13} b) 5×10^{-13} c) 2.5×10^{-14} d) 4.0×10^{-13}

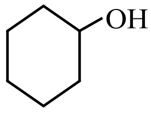
196. The oxidation state of Cr in $[Cr(NH_3)_4 Cl_2]^{+}$ is

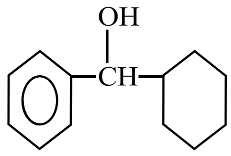
a) 0 b) +1 c) +2 d) +3

197. Which of the following compounds has the most acidic nature?

a) 

b) 

c) 

d) 

198. The oxidation state of Mo in its oxo-complex species $[Mo_2O_4(C_2H_4)_2(H_2O)_2]^{2-}$ is:

a) +2 b) +3 c) +4 d) +5

199. CH_3MgI is an organometallic compound due to

a) Mg —I bond b) C —I bond c) C—Mg bond d) C —H bond

200. The effective atomic number of Cr (At. No.=24)in $[Cr(NH_3)_6]Cl_3$ is

a) 35 b) 27 c) 33 d) 36

201. When aniline is heated with benzaldehyde, the product is:

a) Benzoin b) Schiff 's base c) Unsaturated acid d) Azoxy benzene

202. Slow heating of salicylic acid gives:

a) Benzoic acid b) Phenol c) Benzaldehyde d) None of these

203. According to Hückel, monocyclic compounds will show aromaticity when:

a) It has 4π-electrons

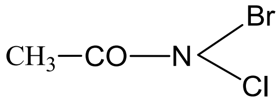
b) It has no π-electron

c) It has 4π+2 electrons

d) It has $(4n+2)\pi$-electrons

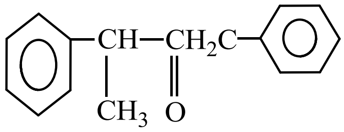
204. When phenol is distilled with zinc dust, it gives:
a) Benzene b) Toluene c) C_6H_5CHO d) None of these

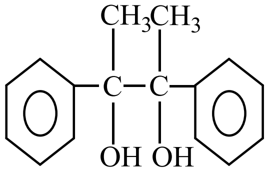
205. The IUPAC name of the given structure

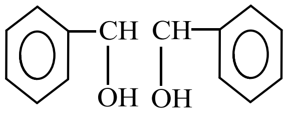

is

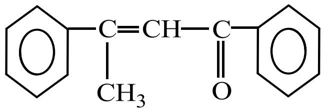
a) N-chloro-N-bromoethanamide
b) N-bromo-N-chloroethanamide
c) N-bromo-N-chloroacetamide
d) N-chloro-N-bromoacetamide

206. Acetophenone when reacted with a base C_2H_5ONa, yields a stable compound which has the structure:

a)


b)


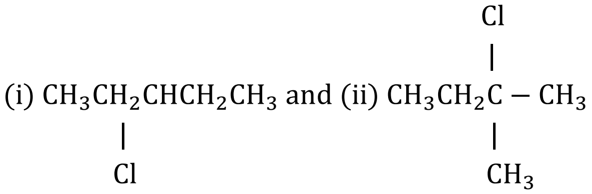
c)


d)


207. Which of the following has maximum resonance energy?
a) Diphenyl b) Benzene c) Naphthalene d) Phenanthrene

208. Benzene sulphonic acid on treating with P_2O_5 gives:
a) Salicylic acid b) Benzoic acid c) Acid anhydride d) Sodium benzoate

209. Compounds with following formula will show


(i) $CH_3CH_2\underset{\underset{Cl}{|}}{CH}CH_2CH_3$ and (ii) $CH_3CH_2\overset{\overset{Cl}{|}}{\underset{\underset{CH_3}{|}}{C}}-CH_3$

a) Position and functional isomerism
b) Chain and positional isomerism
c) Chain and functional isomerism
d) None of the above combinations

210. Which of the following statements is correct?
a) In $K_3[Fe(CN)_6$, the ligand has satisfied both primary and secondary valencies of ferric ion
b) In $(Cu(NH_3)_4SO_4$, the ligand has satisfied only the secondary valency of copper
c) In $K_3[Fe(CN)_6$, the ligand has satisfied only the secondary valency of ferric ion
d) Both (b) and (c)

211. Which statement is not correct?
a) $Fe(CO)_5$ reacts with Br_2Cl_4
b) Carbonyl complexes are usually formed with transition metals
c) All transition metals form monometallic carbonyls
d) The decomposition of $Ni(CO)_4$ to give Ni is used in the extraction of Ni by Mond's process

212. The complex showing a spin-only magnetic moment of 2.82 BM is
a) $Ni(CO)_4$ b) $[NiCl_4]^{2-}$ c) $Ni(PPh_3)_4$ d) $[Ni(CN)_4]^{2-}$

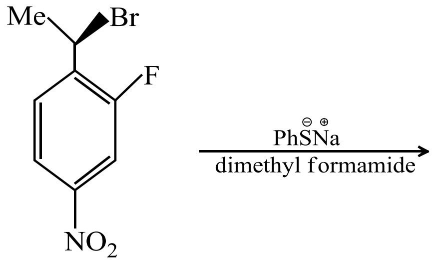
213. The IUPAC name of $[CoCl(NO_2)(en)_2]Cl$ is:

a) Chloronitro-*bis*(ethylenediamine) cobaltic(III) chloride
b) Chloronitro-*bis*(ethylenediamine)cobalt(II) chloride
c) Chloro-*bis*(ethylenediamine)nitrocobalt(III) chloride
d) *Bis*-(ethylenediamine)chloronitrocobalt(III) chloride

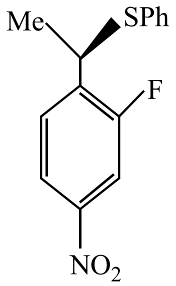
214. The product of acid catalysed hydration of 2-phenyl propene is:
a) 3-phenyl-2-propanol
b) 1-phenyl-2-propanol
c) 2-phenyl-2-propanol
d) 2-phenyl-1-propanol

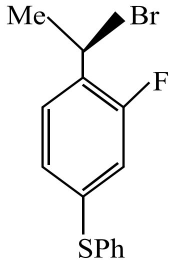
215. Carbolic acid is the name used for:
a) Opium b) Phenol c) Chloroform d) H_2CO_3

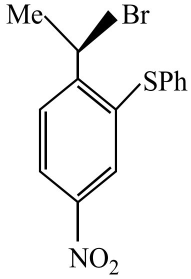
216. The major product of the following reaction

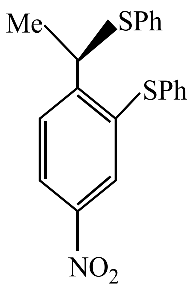


is :

a) 

b) 

c) 

d) 

217. The oxidation number of cobalt in $K[Co(CO)_4]$ is
a) -1 b) $+3$ c) $+1$ d) -3

218. Formaldehyde-phenol resin is:
a) Orlon b) Nylon c) Teflon d) Bakelite

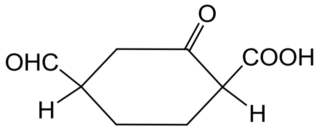
219. Among the ligands NH_3 ,en, CN^- and CO , the correct order of their increasing field strength, is
a) $CO < NH_3 < en < CN^-$
b) $NH_3 < en < CN^- < CO$
c) $CN^- < NH_3 < CO < en$
d) $en < CN^- < NH_3 < CO$

220. Cyclopentadienyl anion is aromatic due to the presence of:
a) 6π-electrons b) 10 π-electrons c) 4 π-electrons d) 12 π-electrons

221. The IUPAC name of $K_4[Fe(CN)_6]$ is
a) Potassium ferrocyanide
b) Potassium hexa cyanoferrate (I)
c) Tetra potassium hexa cyanoferrate (II)
d) Potassium hexa cyanoferrate (II)

222. Which xylene is most easily sulphonated?
a) *Ortho* b) *Para* c) *Meta* d) All at the same rate

223. The IUPAC name of following polyfunctional compound is

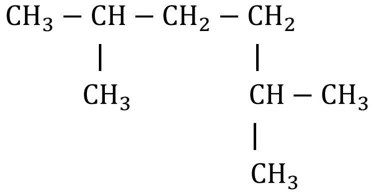


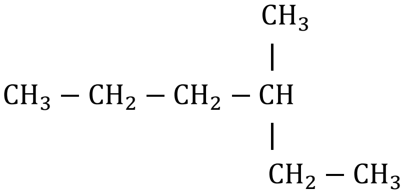
a) 2,4-dioxo cyclohexanoic acid
b) 2,4-dioxo cycloheptanoic acid
c) 4-formyl-2-oxo cyclohexane-1-carboxylic acid
d) 2,4-dioxo cyclohexane-1-carboxylic acid

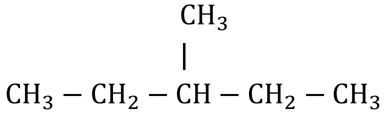
224. Alkyl groups are *o*- and *p*-directing because of:
a) Resonance effect
b) Inductive effect
c) Resonance effect through hyperconjugation
d) All of the above

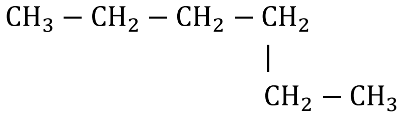
225. Racemic modification can be resolved by
a) The use of enzymes
b) Fractional crystallisation
c) Fractional distillation
d) None of the above

226. Which of the following structure contain 1 primary and 7 secondary hydrogen atoms?

a)

$\mathrm{CH_3-CH(CH_3)-CH_2-CH_2-CH(CH_3)-CH_3}$

b)

$\mathrm{CH_3-CH_2-CH_2-CH(CH_3)-CH_2-CH_3}$

c)

$\mathrm{CH_3-CH_2-CH(CH_3)-CH_2-CH_3}$

d)

$\mathrm{CH_3-CH_2-CH_2-CH_2-CH_2-CH_3}$

227. Which of the following compounds does not dissolve in conc. H_2SO_4 even on warning?
a) Ethylene b) Benzene c) Hexane d) Aniline

228. In the complex $Fe(CO)_x$, the value of x is and it is:
a) 3, octahedral b) 4, tetrahedral c) 5, trigonal pyramidal d) 6, square pyramidal

229. The empirical formula of naphthalene is:
a) CH_2 b) C_5H_4 c) C_2H d) C_nH_{2n}

230. The chemical formula of diammine silver (I) chloride is

a) $[Ag(NH_3)Cl]$ b) $[Ag(NH_3)_3]Cl$ c) $[Ag(NH_4)_2]Cl$ d) $[Ag(NH_3)_2]Cl$

231. For the square planar complex $[M(a)(b)(c)(d)]$ (where , M=central metal and $a, b, c,$ and d are monodentate ligands), the number of possible geometrical isomers are

a) 1 b) 2 c) 3 d) 4

232. Which group is *meta* directing?

a) $-CCl_3$ b) $-OH$ c) $-NH_2$ d) $-CH_3$

233. The IUPAC name of the compound $[Cu(NH_3)_4(NO_3)_2]$ is:

a) Cuprammonium nitrate
b) Dinitratotetraamminecopper(II)
c) Tetraamminecopper(II) dinitrite
d) Tetraamminecopper(III) dinitrite

234. Coordination number of Fe in the complexes $[Fe(CN)_6]^{4-}$, $[Fe(CN)_6]^{3-}$ and $[FeCl_4]^-$ would be respectively

a) 6, 4, 6 b) 6, 6, 4 c) 6, 3, 3 d) 2, 3, 3

235. Which statement is true for cyclohexane?

a) It has two possible isomers
b) It has three conformations
c) Boat conformation is most stable
d) Chair and boat conformations differ in energy by 44 kJ/mol

236. Ligands in a complex salt are:

a) Anions linked by coordinate bonds to a central metal atom or ion
b) Cations linked by coordinate bonds to a central metal atom or ion
c) Molecules linked by coordinate bonds to a central metal atom or ion
d) Ions or molecules linked by coordinate bonds to a central metal atom or ion

237. The IUPAC name of $CH_3COCH_2COOC_2H_5$ is

a) Ethyl butanoate b) Ethyl-(3-oxo)butanoate
c) Ethyl butan-1-oate-2-one d) Ethyl butan-4-oate-2-one

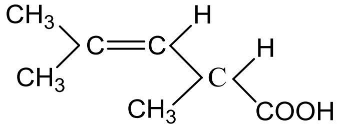
238. When benzene is treated with CO and HCl in presence of anhydrous aluminium chloride, benzaldehyde is formed. This reaction is known as:

a) Friedel-Craft's reaction
b) Rosenmund's reaction
c) Stephen's reaction
d) Gattermann-Koch's reaction

239. $[Cr(NH_3)_6]^{3+}$ ion is:

a) Paramagnetic b) Diamagnetic c) Square planar d) None of these

240. The following compound can exhibits



a) Tautomerism b) Optical isomerism
c) Geometrical isomerism d) Geometrical and optical isomerism

241. Which complex is diamagnetic?

a) $[Fe(CN)_6]^{4-}$ b) $[Cu(NH_3)_4]^{3+}$ c) $[Ti(H_2O)_6]^{3+}$ d) None of these

242. *Meso*-tartaric acid is optically inactive due to the presence of

a) Molecular symmetry b) Molecular asymmetry
c) External compensation d) Two asymmetric C-atoms

243. Complex forming tendency increases with:

a) Increase in size of cation
b) Decrease in size of cation
c) Increase in size of anion
d) None of the above

244. Ziegler-Natta catalyst is

a) $(Ph_3P)_3RhCl$ b) $Al_2(C_2H_6)_6 + TiCl_4$
c) $Fe(C_2H_5)_2$ d) $K[PtCl_3(C_2H_4)]$

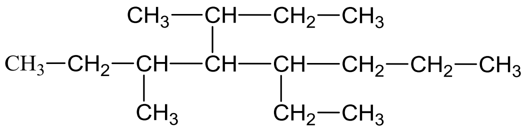
245. Among the following compounds the one that is most reactive towards electrophilic nitration is:

a) Toluene b) Benzene c) Benzoic acid d) Nitrobenzene

246. Phenol on oxidation gives chloranil. The oxidant used is:

a) $K_2S_2O_8$ b) $KMnO_4$ c) $KClO_3 + HCl$ d) None of these

247. The IUPAC name of the compound



$$CH_3-CH_2-\underset{CH_3}{CH}-\overset{CH_3-CH-CH_2-CH_3}{CH}-\underset{CH_2-CH_3}{CH}-CH_2-CH_2-CH_3$$

is

a) 3-sec-butyl-5-ethyl-3-methyloctane b) 4-sec-butyl-5-ethyl-3-methyloctane
c) 5-sec-butyl-4-ethyl-3-methyloctane d) 4-sec-butyl-3-ethyl-5-methyloctane

248. All the common m-directing groups……the benzene ring towards electrophilic substitution reactions.

a) Deactivate b) Activate c) Both (a) and (b) d) None of these

249. Among the following, the coloured compound is :

a) $CuCl$ b) $K_3C_4(CN)_4$ c) CuF_2 d) $[Cu(CH_3CN)_4]BF_3$

250. The existence of two different coloured complexes with the composition of $[Co(NH_3)_4Cl_2]^+$ is due to:

a) Linkage isomerism
b) Geometrical isomerism
c) Coordination isomerism
d) Ionisation isomersim

251. $[Co(NH_3)_4Cl_2]$ possesses:

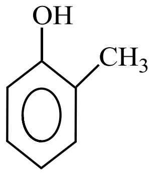
a) Square planar geometry
b) Tetrahedral geometry
c) Tetrahedral nature
d) Octahedral geometry

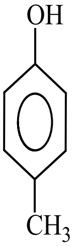
252. Which one does not belong to ligand?

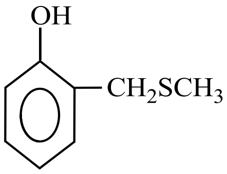
a) PH_3 b) NO^+ c) BF_3 d) Cl^-

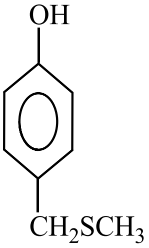
253. Product formed in the reaction;

$$\text{Phenol} \xrightarrow[\text{Pyridine} - SO_3/(CH_3CO)_2O]{(CH_3)SO} \text{Product; is:}$$

a) 

b) 

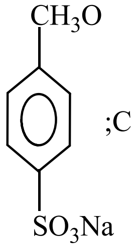
c) 

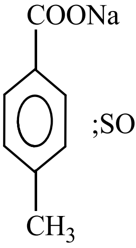
d) 

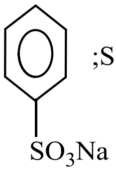
254. Which one of the following has square planar structure?

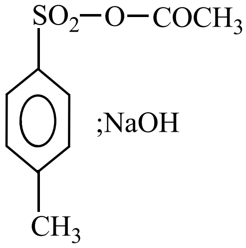
a) $[Ni(CN)_4]^{2-}$ b) $[Ni(CO)_4]$ c) $[NiCl_4]^{2-}$ d) All of these

255. 4-methyl benzene sulphonic acid reacts with sodium acetate to give:

a)  $;CH_3COOH$

b)  $;SO_3$

c)  $;SO_3$

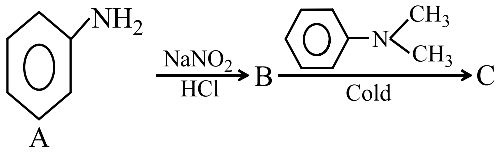
d)  $;NaOH$

256. Phthalein test is characteristics of ….and is given by it.

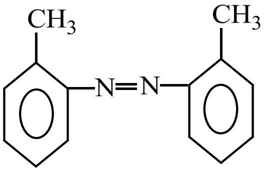
a) Alcohols b) Phenols c) Aldehydes d) Ketones

257. Which of the following compounds would exhibit coordination isomerism?
a) $[Cr(H_2O)_6]Cl_2$ b) $[Cr(NH_3)_6][Co(CN)_6]$ c) $[Cr(en)_2]NO_2$ d) $[Ni(NH_3)_6][BF_4]_2$

258. In a reaction of aniline a coloured product C was obtained.



The structure of *C* would be:

a)


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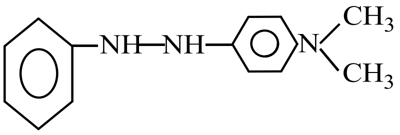
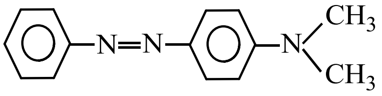
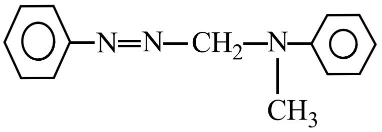


c)


d)


259. The carboxyl functional group ($-COOH$) is present in:
a) Picric acid
b) Barbituric acid
c) Ascorbic acid
d) Aspirin

260. Which of the following is an example of electrophilic substitution reaction?
a) Acylation b) Alkylation c) Benzoylation d) All of these

261. The number of ions given by $[Co(NH_3)_4]Cl_3$ in aqueous solution is:
a) 2 b) 3 c) 1 d) 4

262. Which of the following is an organometallic compound?
a) $Ti(OC_6H_5)_4$ b) $Ti(OCOCH_3)_4$ c) $Ti(OC_2H_5)_4$ d) $Ti(C_2H_5)_4$

263. A solution of CuCl in NH_4OH is used to measure the amount of which gas is a sample by simply measuring change in volume?
a) CO_2 b) H_2 c) CO d) All of these

264. On passing benzene vapour through a tube at 700-800°C or through molten lead we get:
a) Diphenyl b) Phenol c) Toluene d) Benzaldehyde

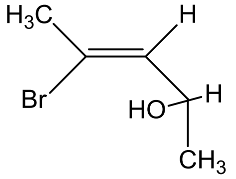
265. Picric acid is a yellow coloured compound. Its chemical name is:
a) m-nitrobenzoic acid b) 2,4,6-trinitrophenol c) Trinitrotoluene d) Trinitroaniline

266. The ideal starting material for the synthesis of m-chloronitro benzene is:
a) Benzene b) Chlorobenzene c) Toluene d) Nitrobenzene

267. In a reaction involving ring substitution of C_6H_5Y, the major product is *meta*-isomer. The group Y can be:
a) $-NH_2$ b) $-COOH$ c) $-CH_3$ d) $-Cl$

268. When ammonia is added to green aqueous solution of nickel(II) sulphate, the colour of the solution changes to blue violet. This is caused by:
a) Nickel undergoing a change in oxidation state
b) Ammonia molecules replacing water molecules surrounding nickel
c) Change in coordination number of nickel
d) Change in pH value of the solution

269. The compound, whose stereo chemical formula is written below, exhibits x-geometrical isomers and y-optical isomers. The value of x and y are



a) 4 and 4 b) 2 and 2 c) 2 and 4 d) 4 and 2

270. Among the following-phenol, benzoic acid, nitrobenzene and toluene, the compound that undergoes nitration readily is:

a) Benzoic acid b) Toluene c) Phenol d) Nitrobenzene

271. Which one is organometalllic compound?

a) Lithium acetate
b) Lithium methoxide
c) Lithium dimethyl amide
d) Methyl lithium

272. What are the products formed when an equimolar mixture of benzaldehyde and formaldehyde is heated with concentrated NaOH?

a) C_6H_5—CH_2—OH and H—COONa
b) C_6H_5—COONa and CH_3—OH
c) C_6H_5—CH_2—COONa
d) C_6H_5—COOH and CH_3—ONa

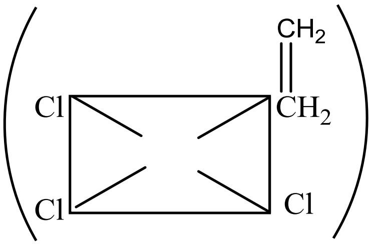
273. Gammexane (a γ-isomer of) is:

a) BHC
b) Benzene hexachloride
c) Lindane
d) All of these

274. Number of electrons gained by Pd in $[PdCl_4]^{2-}$:

a) 4 b) 8 c) 10 d) 0

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

a)


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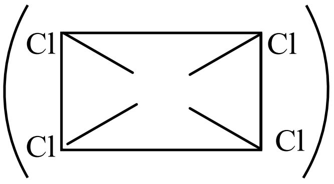
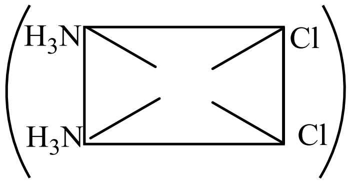
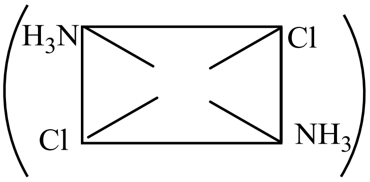


c)


d)


276. For benzaldehyde which of the following is incorrect?

a) It is an aromatic aldehyde
b) It is used in perfumery
c) On oxidation it yields benzoic acid
d) On reduction it yields phenol

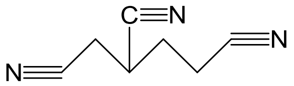
277. The main source of aromatic compounds is:

a) Wood b) Petroleum c) Coal d) Both (b) and (c)

278. Phenol on hydrogenation in presence of a nickel catalyst at 160°C gives:

a) Benzene b) Cyclohexane c) Cyclohexanol d) n-hexanol

279. The IUPAC name of compound

 is

a) Hexane-1, 2, 5-tricarbonitrile b) Hexane-1, 3, 6-tricarbonitrile
c) Butane-1, 2, 4-tricarbonitrile d) Butane-1, 3, 4-tircarbonitrile

280. *Fac-mer* isomerism is associated with which one of the following complexes? (M=central metal)
a) $[M(AA)_2]$ b) $[MA_3B_3]$ c) $[M(AA)_3]$ d) $[MABCD]$

281. Which of the following is the correct order of stability of the following four distinct conformation of n butane?
a) Staggered > Gauche > Partially eclipsed > Fully eclipsed
b) Gauche > Staggered > partially eclipsed > Fully eclipsed
c) Staggered > Partially eclipsed > Gauche > Fully eclipsed
d) Fully eclipsed > Staggered > Partially eclipsed > Gauche

282. o-nitrophenol can form hydrogen bonds within the molecule. It thus, has:
a) Very high m.p. b) Very high viscosity c) Low m.p. d) none of these

283. The element which does not form mononuclear carbonyl is:
a) Fe b) Mn c) Ni d) W

284. Which of the following is hexadentate ligand?
a) Ethylene diamine b) Ethylene diamine tetra acetic acid
c) 1,10-phenanthroline d) Acetyl acetonato

285. The molecular formula of a saturated compound is $C_2H_4Cl_2$. The formula permits the existence of two
a) Functional isomers b) Position isomers c) Optical isomers d) $cis-trans$ isomers

286. An octahedral complex is formed when hybrid orbitals of the following type are involved
a) sp^3 b) dsp^2 c) d^2sp^3 d) sp^2d^2

287. The IUPAC name of the given compound $CH_3-CH=CH-COOC_2H_5$ is
a) Ethyl propenoate b) Ethyl-2-butenoate
c) Ethyl-1-butenoate d) Propene ethyl methanoate

288. Which product is not obtained by heating wood or coal in the absence of air?
a) Coal-tar b) Naphthalene c) Benzene d) Wax

289. Dry distillation of calcium benzoate with calcium formate gives:
a) Acetaldehyde b) Benzoic acid c) Benzaldehyde d) Benzoic anhydride

290. Which will give Fe^{3+} ions in solution?
a) $[Fe(CN)_6]^{3-}$
b) $Fe_2(SO_4)_3$
c) $[Fe(CN)_6]^{4-}$
d) $NH_4(SO_4)_2 \cdot FeSO_4 \cdot 6H_2O$

291. Each metal possesses:
a) Primary valencies satisfied by anions only
b) Secondary valencies satisfied by donor molecules
c) Coordination number
d) All of the above

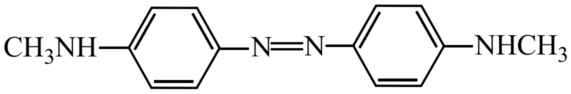
292. Aspirin is:
a) Antibiotic b) Antipyretic c) Sedative d) Psychedelic

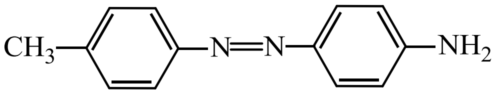
293. Hybridisation, shape and magnetic moment of $K_3[Co(CO_3)_3]$ is
a) $d^2\,sp^3$, octahedral, 4.9 BM b) sp^3d^2, octahedral, 4.9 BM
c) dsp^2, square planer, 4.9 BM d) sp^3, tetrahedral, 4.9BM

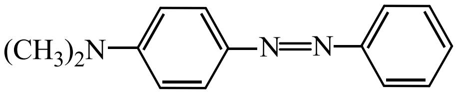
294. Among the following complexes (K-P),
$K_3[Fe(CN)_6](K)$, $[Co(NH_3)_6]Cl_3(L)$,
$Na_3[Co(ox)_3](M)$
$[Ni(H_2O)_6]Cl_2$ (N) , and
$[Zn(H_2O)_6](NO_3)_2(P)$ the diamagnetic complexes

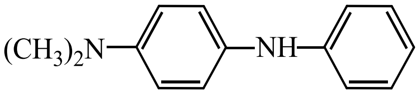
a) *K, L, M, N* b) *K, M, O, P* c) *L, M, O, P* d) *L, M, N, O*

295. Aniline when diazotised in cold and then treated with dimethyl aniline gives a coloured product. It structure would be:

a) 

b) 

c) 

d) 

296. Pyridine possesses:
a) Aromatic nature
b) Unsaturated aliphatic nature
c) Alicyclic nature
d) Aliphatic nature

297. A reagent used for identifying nickel ion is:
a) Potassium ferrocyanide
b) Phenolphthalein
c) Dimethyl glyoxime
d) EDTA

298. Aniline was diazotised and subsequently reduced with stannous chloride and hydrochloric acid to yield:
a) Phenyl aniline b) Phenyl hydrazine c) p-amino azobenzene d) Diazoamino benzene

299. The reaction of toluene with Cl_2 in presence of $FeCl_3$ gives predominantly:
a) m-chlorobenzene
b) Benzoylchloride
c) Benzyl chloride
d) o- and p-chlorobenzene

300. Which statement is not correct in the case of $[Co(NH_3)_6]^{3+}$ complex?
a) It is octahedral in shape
b) It involves d^2sp^2-hybridization
c) It has diamagnetic nature
d) None of the above

301. Pick out the complex compound in which the central metal atom obeys EAN rule strictly
a) $K_4[Fe(CN)_6]$ b) $K_3[Fe(CN)_6]$ c) $[Cr(H_2O)_6]Cl_3$ d) $[Cu(NH_3)_4]SO_4$

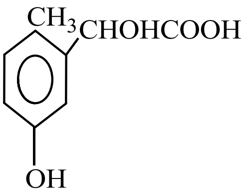
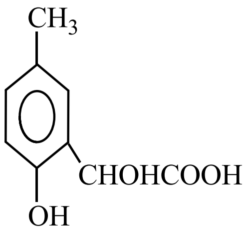
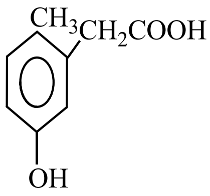
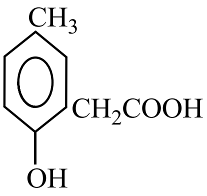
302. Amongst the following, the compound that can be most readily sulphonated is:
a) Benzene b) Methoxy benzene c) Toluene d) Chlorobenzene

303. p-chloroaniline and anilium hydrochloride can be distinguished by:
a) P_2O_5 b) $AgNO_3$ c) Carbylamine test d) Sandmeyer's reaction

304. Pyrogallol is….. trihydroxy benzene.
a) 1, 2, 4 b) 1, 2, 3 c) 1, 3, 5 d) None of these

305. Phenol is weakly acidic but does not react with$NaHCO_3$ like carboxylic acids hence:
a) Phenol is weaker than carbonic acid
b) Phenol is stronger than acid
c) Phenol is stronger than carboxylic acid
d) None of the above

306. p-cresol reacts with chloroform in alkaline medium to give compound (A) which adds hydrogen cyanide to form compound (B). The latter on acidic hydrolysis gives chiral carboxylic acid. The acid is:

a) 
b) 
c) 
d) 

307. The number of isomeric xylenes is:

a) 2 b) 3 c) 4 d) 1

308. The IUPAC name of $[Cr(H_2O)_4Cl_2]Cl$ is:

a) Tetrahydrodichlorochromium(III) chloride

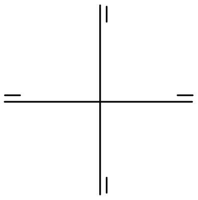
b) Tetraaquodichlorochromium(III) chloride

c) Tetraaquodichlorochromium(I) chloride

d) None of the above

309. Among the following metal carbonyls, C— O bond order is lowest in

a) $[Mn(CO)_6]^+$ b) $[Fe(CO)_5]$ c) $[Cr(CO)_6]$ d) $[V(CO)_6]^-$

310.  is

a) 3-propyl-1,3-pentadiene

b) 3,3-dipropyl-1,3-pentadiene

c) 3,3-diethenyl penta-1,4-diene

d) 4,4-diethenyl penta,1,2-diene

311. Which of the following shell, form an outer octahedral complex?

a) d^4 b) d^8 c) d^6 d) None of these

312. Friedel-Craft's reaction of bromobenzene with methyl iodide gives:

a) o-bromotoluene

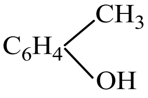
b) p-bromotoluene

c) o-and p-bromotoluene

d) m-bromotoluene

313. An organic compound C_7H_8O is neither soluble in NaOH nor gives blue colour with $FeCl_3$, is:

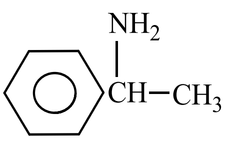
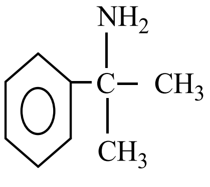
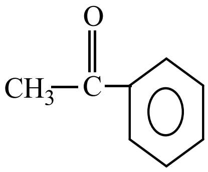
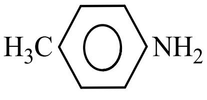
a) $C_6H_5 \cdot CH_2OH$

b) 
$C_6H_4\begin{matrix} CH_3 \\ OH \end{matrix}$

c) $C_6H_5 \cdot OCH_3$

d) None of these

314. Which exist as a pair of mirror image isomers?

a) 
b) 
c) 
d) 

315. Benzene double bonds are not so reactive as those of hexatriene because:

a) The three double bonds are caged in a ring

b) Benzene is aromatic and has six π-resonating electrons

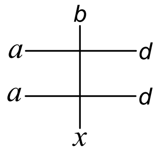
c) Benzene has no double bond

d) Benzene is non-polar

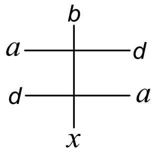
316. The most stable ion is

a) $[Fe(OH)_5]^{3-}$ b) $[FeCl_6]^{3-}$ c) $[Fe(CN)_6]^{3-}$ d) $[Fe(H_2O)_6]^{3+}$

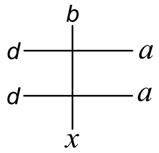
317. Which of the following is/are threo isomers?



(i)



(ii)

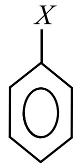


(iii)

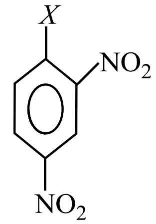
a) Only (i)
b) Only (ii)
c) Only (iii)
d) All (i), (ii) and (iii)

318. In the coal-tar distillation of middle oil, the aromatic compounds present are:
a) Benzene, naphthalene, anthracene
b) Naphthalene, pyridine, phenol
c) Naphthalene, pyridine
d) None of the above

319. The correct order of increasing reactivity of C—X bond towards nucleophilic in the following compound is:



I



II

, $(CH_3)_3C—X$, $(CH_3)_2CH—X$
III IV

a) I<II<IV<III
b) II<III<I<IV
c) IV<III<I<II
d) III<II<I<IV

320. Which of the following system is most stable for a chelate?
a) Two fused cyclic system
b) Three fused cyclic system
c) Four fused cyclic system
d) Five fused cyclic system

321. Which of the following reaction take place when a mixture of concentrated HNO_3 and H_2SO_4 reacts on benzene at 300 K?
a) Sulphonation
b) Nitration
c) Hydrogenation
d) Dehydration

322. Consider the following reaction:

$$\text{Phenol} \xrightarrow{\text{Zn dust}} X \xrightarrow[\text{Anhydrous AlCl}_3]{\text{CH}_3\text{Cl}} Y \xrightarrow{\text{Alkaline KMnO}_4} Z, \text{the product Z is:}$$

a) Benzene
b) Toluene
c) Benzaldehyde
d) Benzoic acid

323. The shortest C—O bond order exists in:
a) $[Mn(CO)_6]^+$
b) $[Fe(CO)_5]$
c) $[Cr(CO)_6]$
d) $[V(CO)_6]^-$

324. Between p-nitrophenol and salicyladehyde, solubility in base is:
a) Almost nil in both cases
b) Higher in p-nitrophenol
c) Higher for salicyladehyde
d) Equal in nature

325. (+) and (-) forms of optically active compounds are different in
a) Boiling points
b) Melting points
c) Specific gravity
d) Specific rotation

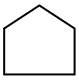
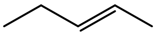
326. Benzene on treatment with dry HCN and HCl in presence of anhy. $AlCl_3$ followed by hydrolysis forms:
a) Chlorobenzene
b) Benzoic acid
c) Benzaldehyde
d) Cyanobenzene

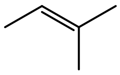
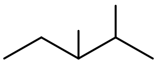
327. In which of the following compounds does the central atom obey EAN rule?
a) $K_3Fe(CN)_6$
b) $K_4Fe(CN)_6$
c) $Cu(NH_3)_4SO_4$
d) All of these

328. Pick the correct name of $[Co(NH_3)_5Cl]Cl_2$
a) Chloropentammine cobalt (III) chloride
b) Chloropentammine cobalt (III)
c) Chloropentammine cobalt (II) chloride
d) Pentammine chloro cobalt(III) chloride

329. The geometry of $Ni(CO)_4$ and $Ni(PPh_3)_2Cl_2$ are
a) Square planar and terrahedral respectively
b) Both tetrahedral
c) Tetrahedral and square planer respectively
d) Both square planar

330. Select pair of chain isomers from the following

(I)  (II) 

(III)  (IV) 

a) I and II b) II and III c) I and IV d) II and III

331. Which ligand produces a high crystal field splitting (a strong ligand field)?
 a) CO b) NO_2^- c) CN^- d) All are correct

332. Benzene reacts with *n*-propyl chloride in the presence of anhydrous $AlCl_3$ to give predominantly:
 a) Isopropyl benzene
 b) No reaction
 c) *n*-propylbenzene
 d) 3-propyl-1-chlorobenzene

333. Which of the following coordination compounds would exhibit optical isomerism?
 a) Pentaamminenitrocobalt (III) iodide b) Diamminedinitroplatinum (II)
 c) *trans*-dicyanobis (ethylenediamine) d) Tris-(ethylenediamine) cobalt(III) bromide

334. What is the magnetic moment of $K_3[FeF_6]$?
 a) 3.87 BM b) 4.89 BM c) 5.91 BM d) 6.92 BM

335. The EAN of Cr in $[Cr(SCN)_6]^{3-}$ is:
 a) 35 b) 33 c) 34 d) 37

336. Which has maximum paramagnetic character?
 a) $[Fe(CN)_6]^{4-}$ b) $[Cu(H_2O)_4]^{2+}$ c) $[Cu(NH_3)_4]^{2+}$ d) $[Mn(H_2O)_6]^{2+}$

337. Phenol, when it first reacts with concentrated sulphuric acid and then with concentrated nitric acid, gives:
 a) Nitrobenzene
 b) 2, 4, 6-trinitrobenzene
 c) *o*-nitrophenol
 d) *p*-nitrophenol

338. Activation of benzene ring by $—NH_2$ in aniline can be reduced by treating with:
 a) Dil. HCl b) Ethyl alcohol c) Acetic acid d) Acetyl chloride

339. Sulphonation of benzoic acid produces mainly:
 a) *o*-sulphobenzoic acid
 b) *m*-sulphobenzoic acid
 c) *p*-sulphobenzoic acid
 d) *o*-*p*-disulphobenzoic acid

340. The IUPAC name for the complex $[Co(NO_2)(NH_3)_5]Cl_2$ is
 a) Nitrito -N- pentamminecobalt (III) chloride b) Nitrito -N- pentamminecobalt (II) chloride
 c) Pentammine nitrito-N- cobalt (II) chloride d) Pentaammine nitrito-N- cobalt (III) chloride

341. The ionisation isomer of $[Cr(H_2O)_4Cl(NO_2)C]$ is
 a) $[Cr(H_2O)_4(O_2N)]Cl_2$ b) $[Cr(H_2O)_4Cl_2](NO_2)$
 c) $[Cr(H_2O)_4Cl\ (ONO)]\ Cl$ d) $[Cr(H_2O)_4Cl_2(NO_2)].H_2O$

342. Salicylic acid, aspirin, nylon, plastics and picric acid have a common raw material, namely:
 a) Methane b) Formic acid c) Phenol d) Alcohol

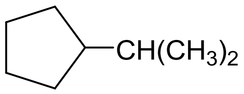
343. Ulmann’s reaction is used for the preparation of:
 a) Diphenyl b) Iodobenzene c) Toluene d) Naphthalene

344. Which of the following statements is/are incorrect for $D-(+)-$glyceradehyde?
 a) The symbol *D* not indicates the dextrorotatory nature of the compound
 b) The sign (+) indicates the dextrorotatory nature of the compound
 c) The symbol *D* indicates that hydrogen atom lies left to the chiral centre in the Fischer projection diagram
 d) The symbol *D* indicates that hydrogen atom lies right to the chiral centre in the Fischer projection

diagram

345. Complexes with CN^- ligands are usually:
a) High spin complexes b) Low spin complexes c) Both (a) and (b) d) None of these

346. The IUPAC of

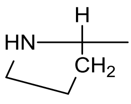


is

a) 2-cyclopentyl propane b) 1, 1-dimethyl-1-cyclopentyl methane
c) 1-(1-methyl) ethyl cyclopentane d) None of the above

347. Which ion is paramagnetic?
a) $[Ni(H_2O)_6]^{2+}$ b) $[Fe(CN)_6]^{4-}$ c) $[Ni(CO)_4]$ d) $[Ni(CN)_4]^{2-}$

348.
Configuration of



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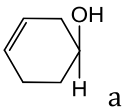


are

a) R, R b) R, S c) S, S d) S, R

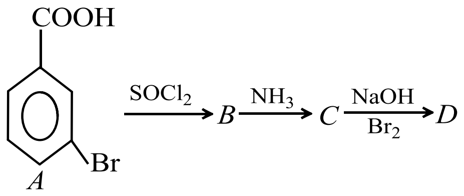
349. Dow process is used for the conversion of chlorobenzene to:
a) Benzene b) Nitrobenzene c) Phenol d) Gammexane

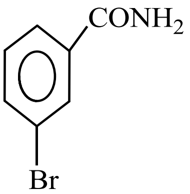
350. Phenolphthalein is produced on heating phthalic anhydride and conc. sulphuric acid with:
a) Salicylic acid b) Phenol c) Phenacetin d) Phenanthrene

351. Benzene is converted to toluene by:
a) Friedel-Crafts reaction
b) Grignard reaction
c) Wurtz reaction
d) Perkin's reaction

352. The number of ions formed when hexamine copper (II) sulphate is dissolved in water is?
a) 1 b) 2 c) 4 d) 6

353. In a set of reactions m-bromobenzoic acid gave a product D, Identify the product D:



a)


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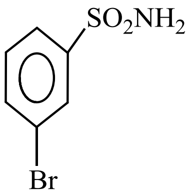

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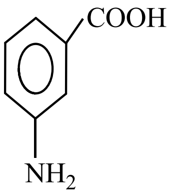
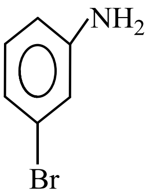
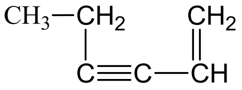


d)


354. In $[Cr(C_2O_4)_3]^{3-}$, the isomerism shown is:
a) Ligand b) Optical c) Geometrical d) Ionization

355. The hybridization of Fe in $K_4[Fe(CN)_6]$ complex is:
a) d^2sp^2 b) d^2sp^3 c) dsp^2 d) sp^3

356.
The correct name of



is

a) Hex-3-yn-5-ene b) Hex-5-en-3-yne c) Hex-3-yn-1-ene d) Hex-1-en-3-yne

357. Nickel metal is in highest oxidation state in:
a) $Ni(CO)_4$ b) K_2NiF_6 c) $[Ni(NH_3)_6](BF_4)_2$ d) $K_4[Ni(CN)_6]$

358. Which of the following complexes show six coordination number?
a) $[Zn(CN)_4]^{2-}$ b) $[Ni(NH_3)_4]^{2+}$ c) $[Cu(CN)_4]^{2-}$ d) $[Cr(H_2O)_6]^{3+}$

359. Which of the following statements is wrong?

a) The IUPAC name of alkenes ends with suffix-ene
b) The IUPAC name of alkynes ends with suffix-yne
c) The IUPAC name of acid amide is alkanamide
d) The substituents get lower number in comparison to principal functional group

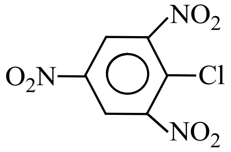
360. The possible number of isomers for the complex $[MCl_2Br_2]SO_4$ is:
a) 1 b) 2 c) 4 d) 5

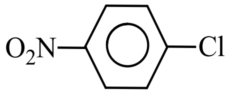
361. $K_3[(Al)(C_2O_4)_3]$ is called
a) Potassium aliminium (III) oxalate
b) Potassium alumino oxalate
c) Potassium trioxalato aluminate (VI)
d) Potassium trioxalato aluminate (III)

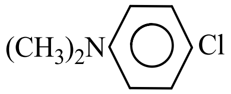
362. In $Fe(CO)_5$, the Fe — C bond possesses
a) π −Character only
b) Both σ and π −characters
c) Ionic characters
d) σ −Character only

363. The reaction, $[Fe(CNS)_6]^{3-} \longrightarrow [FeF_6]^{3-}$ taken place with
a) Decrease in magnetic moment
b) Increase in magnetic moment
c) Decrease in coordination number
d) Increase in coordination number

364. Which chloro derivative of benzene among the following would undergo hydrolysis most readily with aqueous NaOH to furnish the corresponding hydroxyl derivative?

a) 

b) 

c) 

d) C_6H_5Cl

365. Some salts although containing two different metallic elements give test for only one of them in solution. Such salts are:
a) Complex salts b) Double salts c) Normal salts d) None of these

366. Mixture $X = 0.02$ mole of $[Co(NH_3)_5SO_4]Br$ and 0.02 mole of $[Co(NH_3)_5Br]SO_4$ was prepared in 2 litre of solution.
1 litre of mixture X+excess $AgNO_3 \longrightarrow Y$.
1 litre of mixture X+ excess $BaCl_2 \longrightarrow Z$.
No. of moles of Y and Z are.
a) 0.01, 0.01 b) 0.02, 0.01 c) 0.01, 0.02 d) 0.02, 0.02

367. The hybridization of central metal ion and shape of Wilkinson's catalyst is
a) sp^3d, trigonal bipyramidal
b) sp^3,tetrahedral
c) dsp^2,squre planar
d) d^2sp^2, octahedral

368. 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?
a) $[Cr(H_2O)_6]^{2+}$
b) $[Mn(H_2O)_6]^{2+}$
c) $[Fe(H_2O)_6]^{2+}$
d) $[Co(H_2O)_6]^{2+}$
(At. Nos. $Cr = 24, Mn = 25, Fe = 26, Co = 27$)

369. An enantiomerically pure acid is treated with racemic mixture of an alcohol having one chiral carbon. The ester formed will be
a) Optically active mixture
b) Pure enantiomer
c) *meso* compound
d) Racemic mixture

370. Which of the following ring is most strained?

a) Cyclohexane b) Cyclopentane c) Cyclobutane d) Cyclopropane

371. Formylchloride has not been prepared so far. Which can function as formylchloride in formylation?

a) $HCHO + HCl$ b) $HCOOCH_3 + HCl$ c) $CO + HCl$ d) $HCONH_2 + HCl$

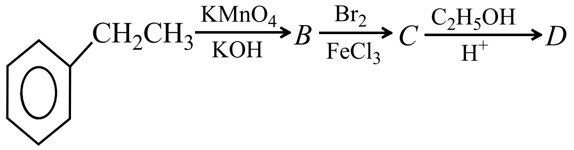
372. In hexacyanomanganate (II) ion the Mn-atom assumes d^2sp^3-hybrid state. The number of unpaired electrons in the complex is:

a) 1 b) 2 c) 3 d) 0

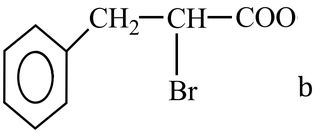
373. Which one of the following does not give a white precipitate with silver nitrate solution?

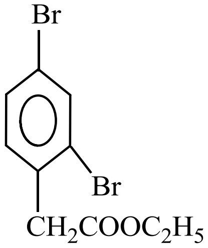
a) $[Co(NH_3)_6]Cl_3$ b) $[Co(NH_3)_5Cl]Cl_2$ c) $[Co(NH_3)_4Cl_2]Cl$ d) $[Co(NH_3)_3Cl_3]$

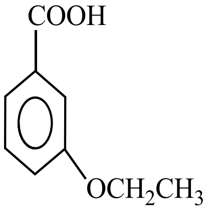
374. In a set of reactions, ethyl benzene yielded a product *D*.

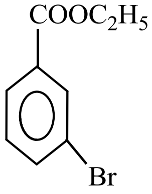


D would be:

a) 

b) 

c) 

d) 

375. The oxidation number of Pt in $[Pt(C_2H_4)Cl_3]$ is

a) +1 b) +2 c) +3 d) +4

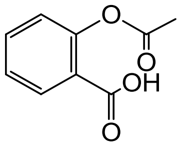
376. Among $[Fe(H_2O)_6]^{3+}$, $[Fe(CN)_6]^{3-}$, $[Fe(Cl)_6]^{3-}$species, the hybridization state of the Fe atom are, respectively

a) $d^2sp^3, d^2sp^3, sp^3d^2$ b) $sp^3d^2, d^2sp^3, d^2sp^3$ c) $sp^3d^2, d^2sp^3, sp^3d^2$ d) None of these

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

a) $[CoF_6]^{3-}$ b) $[NiCl_4]^{2-}$ c) $[Ni(CN)_4]^{2-}$ d) $[CuCl_4]^{2-}$

378. The IUPAC name of compound



is

a) 2-methoxycarbonylbenzoic acid b) Methyl-2-carboxy benzoate

c) 2-carboxy phenyl ethanoate d) *o*-carboxyphenyl acetate

379. Which of the following are produced from coal-tar?

a) Synthetic dyes b) Drugs c) Perfumes d) All of these

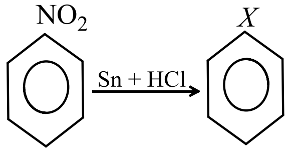
380. Chlorine is least reactive in:

a) CH_3Cl b) $CH_2{=}CHCl$ c) C_6H_5Cl d) C_2H_5Cl

381. Correct IUPAC name of compound $(CH_3)_2C(CH_2CH_3)CH_2CH(Cl)CH_3$ is

a) 5-chloro-3,3-dimethylhexane b) 3-chloro-2-ethyl-2-methylpentane

c) 2-chloro-4-ethyl-4-methylpentane d) None of the above

382. 

In the above reaction '*X*' stands for:

a) NH_2 b) Cl c) $SnCl_2$ d) $\overset{+}{N}H_3Cl^-$

383. Which follows EAN rule?
a) $Fe(CO)_5$　b) $Ni(CO)_4$　c) $K_4[Fe(CN)_6]$　d) All are correct

384. Which one is bidentate ligand?
a) $C_2O_4^{2-}$　b) $NH_2 \cdot CH_2 \cdot CH_2 \cdot NH_2$　c) Both (a) and (b)　d) None of these

385. The reagent used for conversion of benzene diazonium chloride to benzene is:
a) $H_3PO_2 + H_2O$　b) $Na_2SnO_2 + NaOH$　c) C_2H_5OH　d) All of these

386. Which will not give the usual test for iron?
a) $K_2Fe_2(SO_4)_4 \cdot 24H_2O$
b) $(NH_4)_2Fe(SO_4)_2 \cdot 6H_2O$
c) $K_3[Fe(CN)_6]$
d) $Fe_2(SO_4)_3$

387. $[Co(NH_3)_5SO_4]Br$ and $[Co(NH_3)_5\,Br]SO_4$ are a pair of …… isomers.
a) Ionisation　b) Ligand　c) Coordination　d) Hydrate

388. The first organic compound prepared in the laboratory was
a) Acetic acid　b) Acetylene　c) Urea　d) Methane

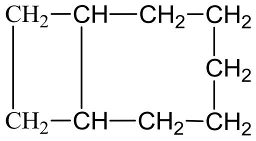
389. Aniline on heating with conc. H_2SO_4 at 460 K gives:
a) Aniline sulphate
b) Benzene sulphonic acid
c) Sulphanilic acid
d) None of the above

390. Which of the following statements regarding phenols is not correct?
a) Phenols are stronger acid than water and alcohols
b) Phenols are weaker acids than carboxylic acids
c) Phenols are soluble in both aqueous NaOH and aqueous $NaHCO_3$
d) Phenoxide ions are more stable than the corresponding phenols

391. Which would decolourise cold, *aq*. potassium permanganate solution?
a) Benzoic acid　b) Cinnamic acid　c) *p*-toluic acid　d) *m*-toluic acid

392. The magnetic moment of $K_3[Fe(CN)_6]$ is found to be 1.7 BM. How many unpaired electron (s) is/are present per molecule?
a) 1　b) 2　c) 3　d) 4

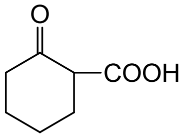
393. The IUPAC name of the compound



is

a) Bicyclo [2,5,0] nonane　b) Bicyclo [5,0,2] nonane
c) Bicyclo [5,2,0] nonane　d) Bicyclo [0,2,5] nonane

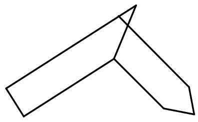
394. The IUPAC name of the compound



is

a) 2-oxocyclohexane-1-carboxylic acid　b) Cyclohexane-2-oxo-1-carboxylic acid
c) 6-oxocyclohexane-1-carboxylic acid　d) None of the above

395. The IUPAC name of



is

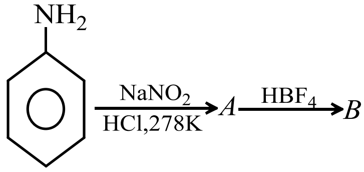
a) Spiro [3.2.1] octane　b) Bicyclo [3.2.2] octane　c) Bicyclo [3.2.1] octane　d) None of these

396. Which of the following deactivates benzene substitution?
a) $-NHR$　b) $-OH$　c) $-OR$　d) $-COOR$

397. Aniline, chloroform and alc. KOH on heating give:

a) Phenyl isocyanide b) Phenyl cyanide c) Chlorobenzene d) Phenol

398. In the chemical reactions,



the compounds $''A''$ and $''B''$ respectively are :

a) Nitrobenzene and chlorobenzene

b) Nitrobenzene and fluorobenzene

c) Phenol and benzene

d) Benzenediazonium chloride and fluorobenzene

399. The incorrect statement for IUPAC system of nomenclature is

a) In an organic compound, the longest carbon chain is always selected for assigning the root word

b) There is no compound with the name 3-ethyl pentane

c) Out of – NH_2 and – OH groups present in an organic compound, $-NH_2$ is treated as substituent

d) Different alkyl groups are written alphabetically while, writing the IUPAC name

400. When sodium benzene sulphonate is fused with sodium hydroxide (solid), followed by hydrolysis the product formed is:

a) Benzene b) Sod. phenoxide c) Benzene thiophenol d) Phenol

401. The correct order of stability of conformations of cyclohexane is

a) Chair > twist boat > boat b) Twist boat > chair > boat

c) Boat > chair > twist boat d) Boat > twist boat > chair

402. Phenol with dilute HNO_3 gives:

a) *meta* and *para* nitrophenol

b) *ortho* and *para* nitrophenol

c) Trinitrophenol

d) *ortho* and *meta* nitrophenol

403. The increasing order of boiling points of compounds given below is:

(I) 1,2-dihydroxy benzene

(II) 1,3-dihydroxy benzene

(III) 1,4-dihydroxy benzene

(IV) Hydroxyl benzene

a) $I < II < III < IV$ b) $I < II < IV < III$ c) $IV < I < II < III$ d) $IV < II < I < III$

404. The pair of the compounds in which both the metals are in the higher possible oxidation state is

a) CrO_2Cl_2, MnO_4^- b) $[Co(CN)_6]^{3-}, MnO_3$

c) TiO_3, MnO_2 d) $[Fe(CN)_6]^{3-}, [Co(CN)_6]^{3-}$

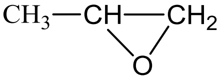
405. The number of ions given by $K_2[PtCl_6]$ in aqueous solution is:

a) 2 b) 3 c) 4 d) Zero

406. Which of the following are functional isomers?

a) CH_3CH_2Cl and CH_3CH_2Br b) CH_3CHBr_2 and $CH_2Br_2 \cdot CH_2Br$

c) $C_2H_5OC_2H_5$ and $CH_3OC_3H_7$ d) CH_3CH_2CHO and



407. Phenol is:

a) Strongly acidic b) Weakly acidic c) Strongly basic d) Weakly basic

408. The correct IUPAC name of $KAl(SO_4)_2 \cdot 12H_2O$ is:

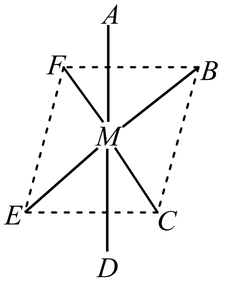
a) Aluminium potassium sulphate-12-water

b) Potassium aluminium(III) sulphate-12-water

c) Potassium aluminate(III) sulphatehydrate

d) Aluminium(III) potassium sulphate hydrate-12

409. A complex shown below can exhibit:

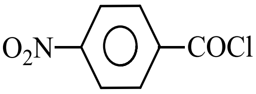


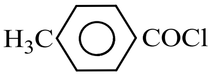
a) Optical isomerism only
b) Geometrical isomerism only
c) Both optical and geometrical isomerism
d) None of the above

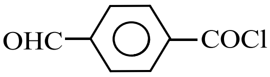
410. The IUPAC name of the complex $[Co(NH_3)_4Cl_2]Cl$ is
a) Dichloro tetraammine cobalt (III) chloride
b) Tetraammine dichloro cobalt(III) chloride
c) Tetraammine dichloro cobalt (II) chloride
d) Tetraammine dichloro cobalt (IV) chloride

411. The correct decreasing order of their reactivity towards hydrolysis is:

(i) C_6H_5COCl

(ii) 

(iii) 

(iv) 

a) (i)>(ii)>(iii)>(iv)
b) (iv)>(ii)>(i)>(iii)
c) (ii)>(iv)>(i)>(iii)
d) (ii)>(iv)>(iii)>(i)

412. Nitrobenzene is generally used for:
a) Preparing shoe polish
b) Preparing floor polish
c) Preparing aniline
d) All of these

413. In the coordination compound, $K_4[Ni(CN)_4]$, the oxidation state of nickel is
a) -1
b) 0
c) +1
d) +2

414. Salicylic acid as compared to benzoic acid:
a) Is more acidic
b) Has same acidity
c) Has less acidity
d) None of these

415. Which ligand is expected to be bidentate?
a) $C_2O_4^{2-}$
b) $CH_3C \equiv N$
c) Br^-
d) CH_3NH_2

416. Which one of the following is most reactive towards aqueous NaOH?
a) C_6H_5Cl
b) $C_6H_5CH_2Cl$
c) C_6H_5Br
d) BrC_6H_4Br

417. Which is not an aromatic compound?
a) Pyridine
b) Naphthalene
c) Xylene
d) Cyclohexane

418. Which one of the following is wrongly matched?
a) $[Cu(NH_3)_4]^{2+}$ – Square planar
b) $[Ni(CO)_4]$ – Neutral ligand
c) $[Fe(CN_6)]^{3-}$ – $sp^3\,d^2$
d) $[Co(en)_3]^{3+}$ – Follows EAN rule

419. Stereoisomers have different
a) Molecular formula
b) Structural formula
c) Configuration
d) Molecular mass

420. Which of the following will show optical isomerism?
a) $[Cu(NH_3)_4]^{2+}$
b) $[ZnCl_4]^{2-}$
c) $[Cr(C_2O_4)_3]^{3-}$
d) $[Co(CN)_6]^{3-}$

421. A complex of cobalt has five ammonia molecules, one nitro group and two chlorine atoms for each cobalt atom. One mole of this compound produces three mole ions in aqueous solution which on treating with

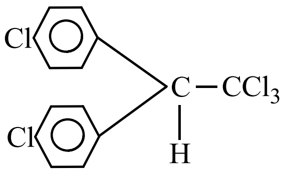
excess of $AgNO_3$ give two mole of AgCl. The formula of the compound is:
a) $[Co(NH_3)_4NO_2Cl][(NH_3$ b) $[Co(NH_3)_5Cl][ClNO_2]$ c) $[Co(NH_3)_5NO_2]Cl_2$ d) $[Co(NH_3)_5][(NO_2)_2Cl_2]$

422. Which one group is trivalent in nature?
a) Benzo b) Benzal c) Benzyl d) All of these

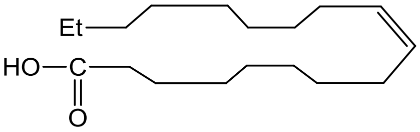
423. Benzene contains double bonds but does not give addition reactions because:
a) Double bonds in benzene are strong
b) Double bonds change their position rapidly
c) Resonance lowers the energy of benzene molecule and leads to greater stabilization
d) None of the above

424. Low spin complex of d^6-cation in an octahedral field will have the following energy:
a) $\frac{-12}{5}\Delta_0 + P$
b) $\frac{-12}{5}\Delta_0 + 3P$
c) $\frac{-2}{5}\Delta_0 + 2P$
d) $\frac{-2}{5}\Delta_0 + P$
(Δ_0= Crystal field splitting energy in an octahedral field, P=Electron pairing energy)

425. C_7H_8O show how many isomers?
a) 2 b) 3 c) 4 d) 5

426.


The above structural formula refers to:
a) BHC b) DNA c) DDT d) RNA

427. The compound


Have its IUPAC name as
a) Octa dec-9-enoic acid b) Oleic acid
c) Ethyl hexadic-9-enoic acid d) All of these

428. The type of isomerism present in nitropentaammine-chromium (III) chloride is :
a) Optical b) Linkage c) Ionization d) polymerization

429. Which complex compound possesses sp^3d^2 hybridisation?
a) $[Fe(NH_3)_6]^{3+}$ b) $[Fe(CN)_6]^{4-}$ c) $[Fe(CN)_6]^{3-}$ d) $[Fe(Cl)_6]^{3-}$

430. Amongst the following carboxylic acids the strongest acid is:
a) Benzoic acid
b) o-methoxybenzoic acid
c) m-nitrobenzoic acid
d) p-nitrobenzoic acid

431. When EDTA solution is added to Mg^{2+} ion solution, then which of the following statements is not true?
a) Four coordinate sites of Mg^{2+} are occupied by EDTA and remaining two sites are occupied by water molecules.
b) All six coordinate sites of Mg^{2+} are occupied.
c) P^H of the solution is decreased.
d) Colourless $[Mg - EDTA]^{2-}$chelate is formed.

432. The energy difference between chair and the boat conformation of cyclohexane is

a) 29.7 kJ b) 44 kJ c) 151 kJ d) 36 kJ

433. Compounds having the same molecular formula but different properties are called

a) Isotopes b) Isobars c) Isomers d) Isomorphs

434. $CH_3OCH_2CH_2CH_2OCH_2CH_3$ is

a) Ethylmethylpropyl diether
b) Ethylmethoxypropyl ether
c) 3-ethoxy-1-methoxy propane
d) 1-ethoxy-3-methoxy propane

435. The benzene molecule contains:

a) Six sp^2-hybridized carbons
b) Three sp^2-hybridized carbons
c) Six sp^3-hybridized carbons
d) Three sp^3-hybridized carbons

436. The correct order of stability of conformations of $NH_2 - CH_2 - CH_2 - OH$ is

a) Gauche > eclipsed > anti
b) Gauche > anti > eclipsed
c) Eclipsed > gauche > anti
d) Anti > eclipsed > gauche

437. The solubility of AgCN increases by the addition of KCN because of:

a) Complex formation b) Redox change c) Salt formation d) None of these

438. Alicyclic compounds are

a) Aromatic cyclic compounds
b) Aliphatic cyclic compounds
c) Both (a) and (b)
d) None of the above

439. Which of the following compounds reacts slower than benzene in electrophilic bromination?

a) $C_6H_5—NO_2$ b) $C_6H_5—NH_2$ c) $C_6H_5—OH$ d) $C_6H_6—CH_3$

440. The fraction of chlorine precipitated by $AgNO_3$ solution from $[Cu(NH_3)_5Cl]Cl_2$ is:

a) 1/2 b) 2/3 c) 1/3 d) 1/4

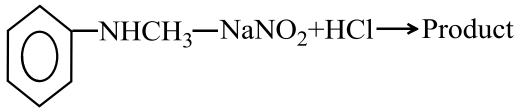
441. Number of possible optical isomers in $[Co(en)_2Cl_2]^+$ is

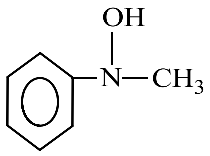
a) 2 b) 3 c) 4 d) 6

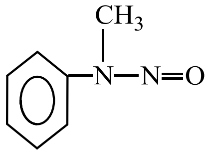
442. Dimethyl glyoxime gives a red precipitate with Ni^{2+} which is used for its detection. To get this precipitate readily, the best pH range is

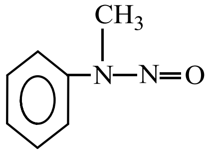
a) < 1 b) 3 – 4 c) 9 – 11 d) 2 – 3

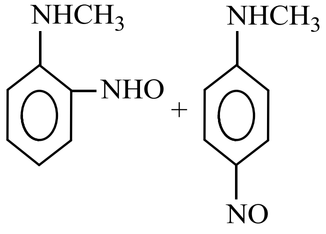
443. Predict the product:



a) 

b) 

c) 

d) 

444. Replacement of Cl of chlorobenzene to give phenol requires drastic conditions but chlorine of 2, 4-dinitrochlorobenzene is readily replaced because:

a) NO_2 makes the electron rich ring at *ortho* and *para* positions
b) NO_2 withdraws electrons at *meta* position
c) NO_2 donate electrons at *meta*-position
d) NO_2 withdraws electrons at *ortho* and *para* positions

445. Salicylic acid on heating with soda lime forms:

a) Phenol b) Benzyl alcohol c) Benzene d) Benzoic acid

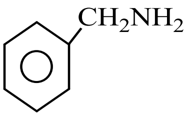
446. Which of the following is an organometallic compound?

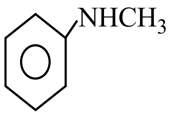
a) $Ti(C_2H_5)_4$ b) $Ti(OC_2H_5)_4$ c) $Ti(OCOCH_3)_4$ d) $Ti(OC_6H_5)_4$

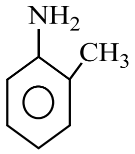
447. Which kind of isomerism is exhibited by octahedral $Co(NH_3)_4Br_2Cl$?

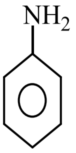
a) Geometrical and ionisation b) Geometrical and optical
c) Optical and ionisation d) Geometrical only

448. Which of the following is the strongest base?

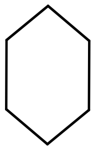
a) 

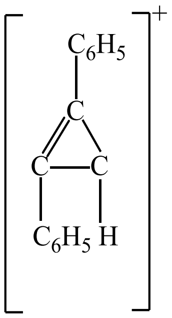
b) 

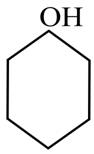
c) 

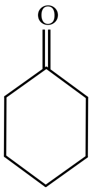
d) 

449. Which of the following will be aromatic?

a) 

b) 

c) 

d) 

450. The correct symbol relating the two Kekule structure of benzene is:

a) ⟶ b) ⇌ c) ↔ d) ⇄

451. Benzaldehyde can be obtained by the hydrolysis of:

a) Benzyl chloride b) Benzal chloride c) Benzonitrile d) Benzoic acid

452. Which of the following has an optical isomer?

a) $[Co(en)(NH_3)_2]^{2+}$ b) $[Co(H_2O)_4(en)]^{3+}$ c) $[Co(en)_2(NH_3)_2]^{3+}$ d) $[Co(NH_3)_3Cl]^+$

453. Chromium carbonyl is:

a) $Cr(CO)_4$ b) $Cr(CO)_5$ c) $Cr(CO)_6$ d) None of these

454. Which of the following reagents may be used to distinguish between phenol and benzoic acid?

a) Aqueous NaOH b) Tollen's reagent c) Molisch reagent d) Neutral $FeCl_3$

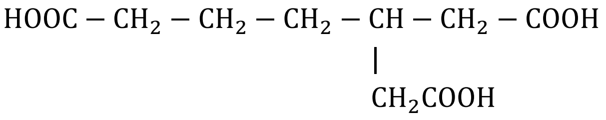
455. Which of the following complex species do not involve d^2sp^3-hybridization?

a) $[CoF_6]^{3-}$ b) $[Co(NH_3)_6]^{3+}$ c) $[Fe(CN)_6]^{3-}$ d) $[Cr(NH_3)_6]^{3+}$

456. Which one of the following shows maximum value of paramagnetic behaviour?

a) $[Sc(CN)_6]^{3-}$ b) $[Co(CN)_6]^{3-}$ c) $[Ni(CN)_4]^{2-}$ d) $[Cr(CN)_6]^{3-}$

457. The IUPAC name of



$$HOOC-CH_2-CH_2-CH_2-\underset{\displaystyle CH_2COOH}{\underset{|}{CH}}-CH_2-COOH$$

is

a) 3-(carboxymethyl) heptane-1,7-dioic acid
b) 5-(carboxymethyl) heptane-1,7-dioic acid
c) 2-(carboxymethyl) pentane dicarboxylic acid
d) 4-(carboxymethyl) pentane dicarboxylic acid

458. Which of the following species will be diamagnetic?

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

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

a) $[Cr(NH_3)_6]^{3+}$ b) $[Co(NH_3)_6]^{3+}$ c) $[Ni(NH_3)_6]^{2+}$ d) $[Zn(NH_3)_6]^{2+}$

460. Moth balls contain:

a) Camphor b) Benzoic acid c) Naphthalene d) Cinnamic acid

461. The number of unidentate ligands in the complex ion is called

a) Oxidation number b) Primary valency
c) Coordination number d) EAN

462. According to Hückel rule, the number of π-electrons in anthracene is:

a) 12 b) 14 c) 10 d) 20

463. In ethane and cyclohexane which one of the following pairs of conformations are more stable?

a) Eclipsed and chair conformations b) Staggered and chair conformations
c) Staggered and boat conformations d) Eclipsed and boat conformations

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

a) $K[PtCl_3(\eta^2 - C_2H_4)]$ b) $Fe(\eta^5 - C_5H_5)_2$ c) $Cr(\eta^6 - C_6H_6)_2$ d) $(CH_3)_4Sn$

465. o, p-directing groups are generally:

a) Activating groups b) Deactivating groups c) Neutral groups d) None of these

466. Aryl halides are less reactive towards nucleophilic substitution reaction as compared to alkyl due halides to:

a) The formation of less stable carbonium ion
b) Resonance stabilization
c) Longer carbon-halogen bond
d) The inductive effect

467. Which would be least reactive towards bromine?

a) Nitrobenze b) Anisole c) Phenol d) Chlorobenzene

468. Which has a smell of oil of winter green?

a) Benzaldehyde b) Benzoic acid c) Ethyl salicylate d) Methyl salicylate

469. The coordination number of Pt in $[Pt(NH_3)_4Cl_2\ ]^{2+}$ ion is

a) 2 b) 4 c) 6 d) 8

470. C_6H_5Cl on treating with NaOH at 300°C gives phenol. However the yield is poor because of side reaction producing:

a) C_6H_5Na b) $C_6H_5OCH_3$ c) $C_6H_5OC_6H_5$ d) None of these

471. In $Cr(NH_3)_4Cl_2]Cl$ the ligands are:

a) NH_3 only b) Cl^- only c) Both NH_3 and Cl^- d) Cr, NH_3, Cl^-

472. Which statement is not correct regarding aniline?

a) It is less basic than ethyl amine
b) It can be steam distilled
c) It reacts with sodium to give hydrogen
d) It is soluble in water

473. Among the following, identify the species with an atom of +6 oxidation state:

a) $[MnO_4]^-$ b) $[Cr(CN)_6]^{3-}$ c) $[NiF_6]^{2-}$ d) CrO_2Cl_2

474. Which of the following alkanes contain primary, secondary, tertiary and quaternary carbon atom together?

a) $(CH_3)_3CH$ b) $(C_2H_5)_3CH$ c) $(CH_3)_3CCH_2CH(CH_3)_2$ d) $(CH_3)_4C$

475. The hardness of water is estimated by:

a) Conductivity method b) EDTA method c) Titrimetric method d) Distillation method

476. I_2 is stirred in between two liquids, C_6H_6 and water. It:

a) Dissolves more in C_6H_6
b) Dissolves more in H_2O
c) Dissolve equally

d) Dissolves in neither C_6H_6 nor water

477. The number of tertiary C-atoms in 2,2,4,4-tetra methyl pentane is

a) 1 b) 2 c) 3 d) 4

478. Hydrogenation of benzoyl chloride in the presence of Pd on $BaSO_4$ gives:

a) Benzyl alcohol b) Benzaldehyde c) Benzoic acid d) Phenol

479. The Clemmensen reduction of benzaldehyde gives:

a) $C_6H_5NH_2$ b) C_6H_5OH c) $C_6H_5CH_3$ d) C_6H_5COOH

480. Which of the following ligand has lowest Δ_o value?

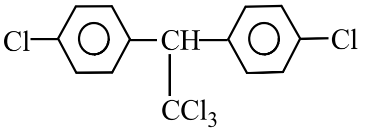
a) CN^- b) CO c) F^- d) NH_3

481. Which one of the following has an optical isomer?
(en=ethylenediamine)

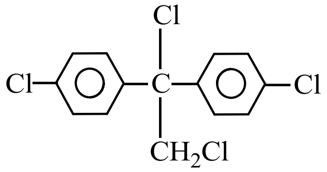
a) $[Zn(en)(NH_3)_2]^{2+}$ b) $[Co(en)_3]^{3+}$ c) $[CO(H_2O)_4(en)]^{3+}$ d) $[Zn(en)_2]^{2+}$

482. Trichloroacetaldehyde, CCl_3CHO reacts with chlorobenzene in presence of sulphuric acid and produces:

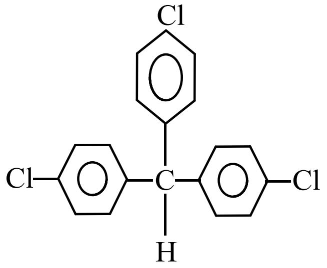
a)



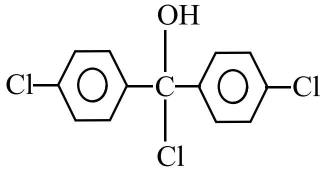
b)



c)



d)



483. Which fraction of coal-tar is rich in arene?

a) Light oil b) Heavy oil c) Green oil d) Middle oil

484. The coordination number and oxidation number of X in the following compound $[X(SO_4)(NH_3)_5]Cl$ will be

a) 10 and 3 b) 2 and 6 c) 6 and 3 d) 6 and 4

485. Benzyl chloride is formed by treating toluene with Cl_2 in:

a) Presence of light
b) Absence of light
c) Treating benzene with anhy. $AlCl_3$
d) Treating benzene with As_2S_3

486. Which complex cannot ionize in solution?

a) $[CoCl_3(NH_3)_3]$ b) $K_4(Fe(CN)_6]$ c) $K_2[Pt(F_6)]$ d) $[Pt(NH_3)_6]Cl_4$

487. $[Ni\ (CN)_4]^{2-}$, $[MnBr_4]^{2-}$ and $[CoF_6]^{3-}$, geometry, hybridisation and magnetic moment of the ions respectively, are

a) Tetrahedral, square planar, octahedral :
sp^3, dsp^2, sp^3d^2: 5.9, 0, 4.9

b) Tetrahedral, square planar, octahedral :
dsp^2, sp^3, sp^3d^2: 0, 5.9, 4.9

c) Square planar, tetrahedral, octahedral :

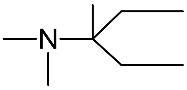
dsp^2, sp^3, d^2sp^3: 5.9,4.9,0

d) Square planar, tetrahedral, octahedral : dsp^2, sp^3, sp^3d^2: 0, 5.9, 4.9

488. Ozonolysis of benzene gives:
a) 1 molecule of glyoxal
b) 2 molecules of glyoxal
c) 3 molecules of glyoxal
d) None of these

489. In benzene, C—C bond length is 1.39 Å; the C—H bond length is:
a) 1.39 b) 1.08 c) 1.54 d) 1.46

490. The IUPAC name of following compound is



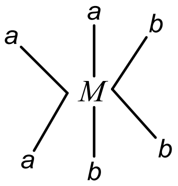
a) N,N-dimethyl, 3-methyl pentan-3-amine
b) 3-N,N-dimethyl, 3-methyl pentanamine
c) 3-methyl-3-N, N-dimethyl pentane
d) 3-methyl-3-N, N-dimethyl butane

491. Which of the following may be used as food preservative?
a) Benzene
b) Ethylene
c) Sodium benzoate
d) Sodium metaaluminate

492. Which compound is formed when sodium phenoxide is heated with ethyl iodide?
a) Phenetole b) Ethyl phenyl alcohol c) Phenol d) None of these

493. In metal carbonyl (organometallic)complexes, the M— C bond is
a) Ionic
b) Covalent with ionic character
c) Covalent
d) Coordinate covalent

494. Octahedral complex



is

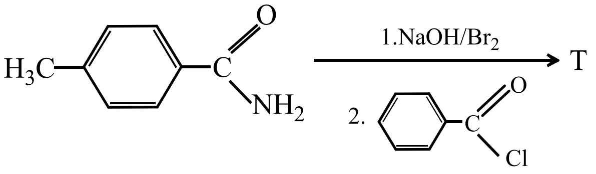
a) *cis* b) *trans* c) *mer* d) *fac*

495. The correct order of magnetic moments (spin only values in BM) among the following is
(Atomic no. Mn=25, Fe=26, Co=27)
a) $[MnCl_4]^{2-} > [CoCl_4]^{2-} > [Fe(CN)_6]^{4-}$
b) $[MnCl_4]^{2-} > [Fe(CN)_6]^{4-} > [CoCl_4]^{2-}$
c) $[Fe(CN)_6]^{4-} > [MnCl_4]^{2-} > [CoCl_4]^{2-}$
d) $[Fe(CN)_6]^{4-} > [CoCl_4]^{2-} > [MnCl_4]^{2-}$

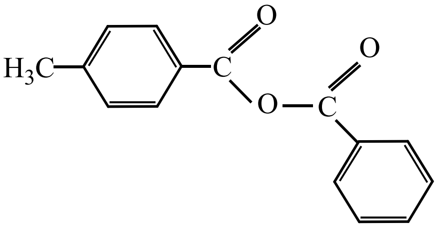
496. Aniline and methyl amine can be differentiated by:
a) Diazotisation followed by coupling with phenol
b) Reaction with chloroform and aqueous solution of KOH
c) Reaction with HNO_2
d) None of the above

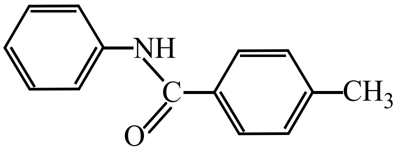
497. The functional group present in cresols is:
a) Alcoholic (— OH) b) Aldehydic (— CHO) c) Phenolic (— OH) d) Carboxylic (— COOH)

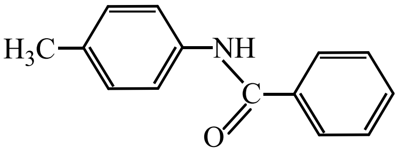
498. In the reaction;

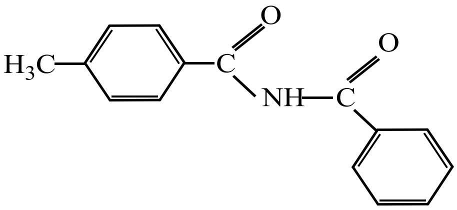


the structure of the product T is:

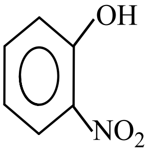
a) 

b) 

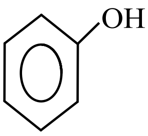
c) 

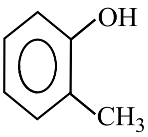
d) 

499. Which one of the following compounds is most acidic?

a) 

b) $Cl-CH_2-CH_2-OH$

c) 

d) 

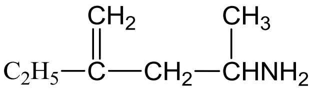
500. The most unstable configuration of cyclohexane is

a) Boat b) Chair c) Twist boat d) Half chair

501. In which compound synergic effect is present?

a) $[Ni(CO)_4]$ b) $[NiCl_4]^{2-}$ c) $[CuCl_4]^{2-}$ d) $[Mn(H_2O)_6]^{2+}$

502. The IUPAC name of the compound



$C_2H_5-\overset{\overset{CH_2}{\|}}{C}-CH_2-\overset{\overset{CH_3}{|}}{C}HNH_2$ is

a) 4-amino-2-ethyl pent-1-ene b) 2-ethyl pentan-4-amine

c) Amino-4-pentene d) 4-ethyl pent-4-en-2-amine

503. Aqua regia reacts with Pt to yield:

a) $Pt(NO_3)_4$ b) $H_2[PtCl_6]$ c) $PtCl_4$ d) $PtCl_2$

504. $K_3[Al(C_2O_4)_3]$ is called:

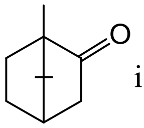
a) Potassium aluminooxalate

b) Potassium alumino(III) oxalate

c) Potassium trioxalatoaluminate

d) Potassium trioxalatoaluminate(III)

505. The IUPAC name of



is

a) 6-oxo-1,2,2-tri methyl bicycle [2.2.1] heptane b) 1,7,7-trimethyl bicyclo [2.2.1] heptan-2-one

c) 1,5,5-trimethyl bicyclo [2.1.1] hexane-2-one d) 1,7,7-trimethyl bicyclo [2.1.2] heptan-2-one

506. Nitration of toluene takes place at:

a) *ortho* position

b) *meta* position

c) *para* position

d) Both *ortho* and *para* position

507. Estimation of calcium and magnesium is done by

a) EDTA b) Oxalate c) Phosphate d) None of these

508. How many enantiomer pairs are obtained by monochlorination of 2, 3-dimethyl butane?

a) Four b) Two c) Three d) One

509. Common reactions of benzene and its derivatives are:

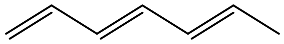
a) Electrophilic addition reactions

b) Electrophilic substitution reactions

c) Nucleophilic substitution reactions

d) Nucleophilic addition reactions

510. The IUPAC name of the compound

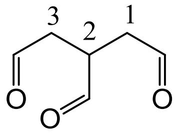


is

a) 1, 3, 5-triheptene b) 2, 4, 6-triheptene

c) 2, 4, 6-heptatriene d) Hepta-1, 3, 5-triene

511. Name of compound



a) 1, 2, 3-triformylpentane b) Propane-1, 2, 3-tricarbaldehyde

c) 3-formylpentane-1, 5-dial d) Propane-1, 2, 3-trial

512. The attacking species in aromatic sulphonation is:

a) SO_3 b) $H_3SO_4^+$ c) HSO_4 d) SO_2^+

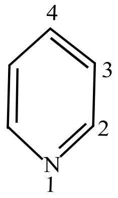
513. Which one of the following compound does not react with bromine?

a) Ethyl amine b) Propene c) Phenol d) Chloroform

514. The magnetic moment (spin only) of $[Ni\ Cl_4]^{2-}$ is

a) 1.82 BM b) 5.46 BM c) 2.82 BM d) 1.41 BM

515.



undergoes electrophilic substitution reaction preferentially :

a) At position-2 b) At position-3 c) At position-4 d) At positions-2 and 4

516. Ionization of $K[Ag(CN)_2]$ will give:

a) K^+ and $[Ag(CN)_2]^-$ ion

b) KCN and AgCN

c) K^+, Ag^+, CN^-

d) None of the above

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

a) +6 and +3 b) 3 and 0 c) 4 and +2 d) 3 and +3

518. A complex of platinum, ammonia and chlorine produces four ions per molecule in the solution. The structure consistent with the observation is:

a) $[Pt(NH_3)_4]Cl_4$ b) $[Pt(NH_3)_2Cl_4]$ c) $[Pt(NH_3)_5Cl]Cl_3$ d) $[Pt(NH_3)_4Cl_2]Cl_2$

519. The type of magnetism exhibited by $[Mn(H_2O]^{2+}]$ ion is

a) Paramagnetism b) Diamagnetism c) Both (a) and (b) d) None of these

520. According to effective atomic number rule the central metal acquires:

a) Inert gas configuration

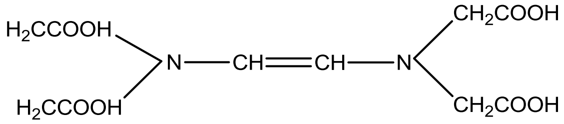
b) Duplet

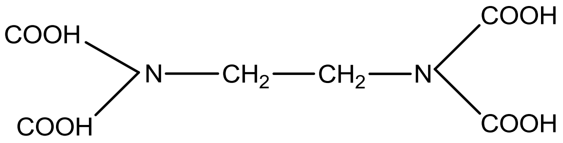
c) Octet

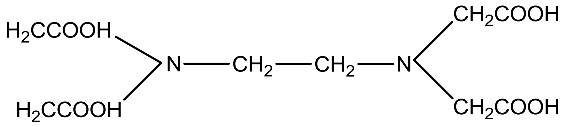
d) Quartet

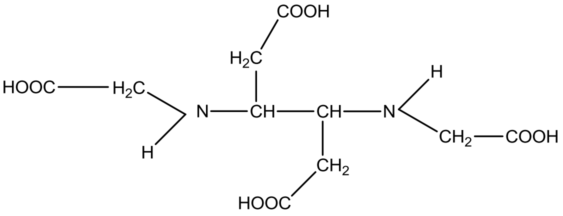
521. K_3CoF_6 is high spin complex. What is the hybrid state of Co-atom in this complex?
a) sp^3d b) sp^3d^2 c) d^2sp^3 d) dsp^2

522. The correct structure of ethylenediaminetetraacetic acid (EDTA) is

a) 

b) 

c) 

d) 

523. $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$ are examples of which type of isomerism?
a) Linkage b) Optical c) Geometrical d) Ionisation

524. The coordination number of a central metal atom in a complex is determined by
a) The number of ligands around a metal ion bonded by σ − bonds
b) The number of ligands around a metal ion bonded by π −bonds
c) The number of ligands around a metal ion bonded by σ –and π − bonds both
d) The number of only anionic ligands bonded to the metal ion

525. Action of benzoic acid with hydrazoic acid in presence of N_3H gives:
a) Aniline b) Benzamide c) Phenyl cyanide d) All of these

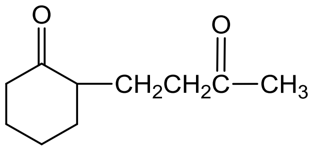
526. Which ion shows usually the coordination number 6?
a) Cr^{3+} b) Fe^{3+} c) Fe^{2+} d) All of these

527. Which of the following represents hexadentate ligand?
a) 2, 2-bipyridyl b) DMG c) Ethylenediamine d) None of these

528. Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4.In the mixture, nitric acid acts as a/an:
a) Catalyst b) Reducing agent c) Acid d) Base

529. The value of the 'spin only' magnetic moment for one of the following configurations is 2.84 BM. The correct one is
a) d^5 (in strong ligand field) b) d^3 (in weak as well as strong ligand fields)
c) d^4(in weak ligand field) d) d^4(in strong ligand field)

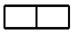
530. The IUPAC name of the compound



is

a) 6-(3-oxobutyl) cyclohexan-1-one b) 6-(2-oxobutyl) cyclohexan-1-one
c) 2-(3-oxobutyl) cyclohexan-1-one d) 2-(2-oxobutyl) cyclohexan-1-one

531. Hybridisation, shape and magnetic moment of $[Ni(CN)_4]^{2-}$ ion
a) dsp^2, square planar, zero b) dsp^2, square planar, 1.73
c) sp^2d^2, octahedral, zero d) d^2sp^3, octahedral, 1.73

532. Choose the IUPAC name of 
a) Dicyclobutane b) Bicyclo [2.2.0] hexane
c) Bicyclo [2.2.1] hexane d) None of these

533. Which of the following is a heterocyclic compound?
a) Phenanthrene b) Thiophene c) Phenol d) Aniline

534. $[Sc(H_2O)_6]^{3+}$ ion is
a) Colourless and diamagnetic b) Coloured and octahedral

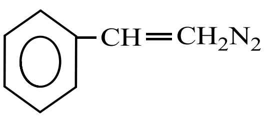
c) Colourless and paramagnetic d) Coloured and paramagnetic

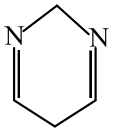
535. Benzene reacts with CH_3Cl in the presence of anhydrous $AlCl_3$ to form:
a) Xylene b) Toluene c) Chlorobenzene d) Benzylchloride

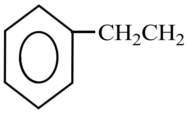
536. The magnetic moment of $[Co(NH_3)_6]Cl_3$ is
a) 1.73 b) 2.83 c) 6.6 d) Zero

537. The correct order of reactivity towards electrophilic substitution is:
a) Phenol >Benzene>Chlorobenzene>Benzoic acid
b) Benzoic acid>Chlorobenzene>Benzene>Phenol
c) Phenol >Chlorobenzene>Benzene>Benzoic acid
d) Benzoic acid>Phenol>Benzene>Chlorobenzene

538. The product formed by the reaction of C_6H_5CN and CH_2N_2 is:

a) 

b) 

c) 

d) None of these

539. Increasing order of expected enol content
a) $CH_3COCH_2CHO > CH_3COCH_3 > CH_3CHO > CH_3COCH_2COCH_3$
b) $CH_3COCH_2COCH_3 > CH_3COCH_2CHO > CH_3COCH_3 > CH_3CHO$
c) $CH_3CHO > CH_3COCH_3 > CH_3COCH_2CHO > CH_3COCH_2COCH_3$
d) $CH_3COCH_3 > CH_3COCH_2COCH_3 > CH_3CHO > CH_3COCH_2CHO$

540. Out of the following the metal which forms polynuclear carbonyl is:
a) Na b) Mg c) Mn d) All of these

541. Picric acid and benzoic acid can be distinguished by:
a) Aqueous $NaHCO_3$ b) Aqueous NaOH c) Aqueous $FeCl_3$ d) Aqueous Na_2CO_3

542. The compound having the lowest oxidation state of iron is
a) $K_4Fe(CN)_6$ b) K_2FeO_4 c) Fe_2O_3 d) $Fe(CO)_5$

543. The name of $[Pt(NH_3)_4Cl_2]^{2+}$, $[PtCl_4]^{2-}$ is
a) Tetramminedichloroplatinum(IV) tetrachloro platinate(II)
b) Dichloroplatinum (IV) tetrachloroplatinate
c) Tetrachloroplatinum (II) tetrammineplatinate
d) Tetrachloroplatinum (II) dichlorotetraammine platinate

544. m-dihydroxybenzene is also called:
a) Catechol b) Resorcinol c) Quinol d) Pyrogallol

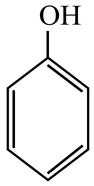
545. The ion which exhibits green colour
a) Cu^{2+} b) Mn^{2+} c) Co^{2+} d) Ni^{2+}

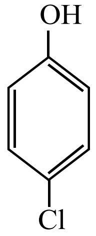
546. $X \xrightarrow{Cl_2}$ Benzotrichloride $\xrightarrow{\text{Hydrolysis}} Y$
X and Y respectively are:
a) Benzene, benzaldehyde
b) Toluene, benzaldehyde
c) Toluene, benzoic acid
d) Benzene, benzoic acid

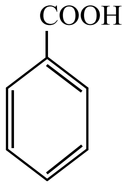
547. Geometrical isomerism is found in coordination compounds having coordination number:
a) 2 b) 3 c) 4 (tetrahedral) d) 6

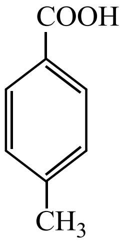
548. Which one of the following complexes is not expected to exhibit isomerism?
a) $[Ni(NH_3)_4(H_2O)_2]^{2+}$ b) $[Pt(NH_3)_2Cl_2]$ c) $[Ni(NH_3)_2Cl_2]$ d) $[Ni(en)_3]^{2+}$

549. The correct acidity order of the following is:


(I)

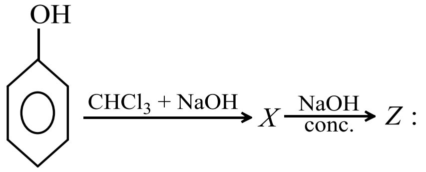

(II)

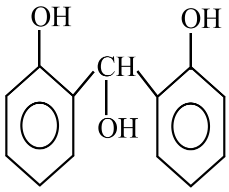

(III)

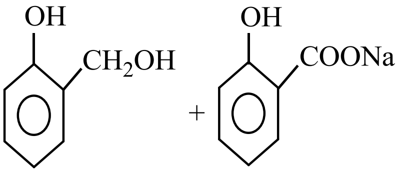

(IV)

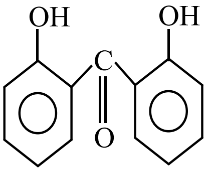
a) (III) $> (IV) > (II) > (I)$
b) (IV) $> (III) > (I) > (II)$
c) (III) $> (II) > (I) > (IV)$
d) (II) $> (III) > (IV) > (I)$

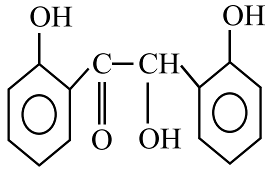
550. Identify 'Z' in the reaction;



a) 

b) 

c) 

d) 

551. Pure aniline is a:
a) Brown coloured liquid
b) Colourless liquid
c) Brown coloured solid
d) Colourless solid

552. Aromatic compounds undergo most easily:
a) Nucleophilic substitution
b) Electrophilic substitution
c) Nucleophilic addition
d) Electrophilic addition

553. The colour of $CoCl_3 \cdot 5NH_3 \cdot H_2O$ is:
a) Orange yellow b) Orange c) Green d) Pink

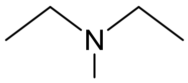
554. The value of x on the $[Ni(CN)_4]^x$ is:
a) $+2$ b) -2 c) Zero d) $+4$

555. Complexes with halide ligands are generally:

a) High spin complexes b) Low spin complexes c) Both (a) and (b) d) None of these

556. The hybridization involved in $[CoF_6]^{3-}$ is:

a) d^2sp^3 b) d^3sp^2 c) dsp^3 d) sp^3d^2

557. 

Will have the name

a) N-ethyl-N-methylethanamine b) N,N-diethylmethanamine

c) N,N-diethylethanamide d) None of the above

558. The oxidation state of Fe in the brown ring complex $[Fe(H_2O)_5NO]SO_4$is

a) +3 b) 0 c) +2 d) +1

559. The metal ion in complex <u>*A*</u> has EAN identical to the atomic number of krypton . <u>*A*</u> is

(At. no. of Cr=24, Fe=26, Pd=46)

a) $[Pd(NH_3)_6]Cl_4$ b) $[Cr(NH_3)_5Cl]SO_4$ c) $Na_4[Fe(CN)_6]$ d) $K_3[Fe(CN)_6]$

560. Which one of the following is expected to exhibit optical isomerism [en =ethylenediamine]?

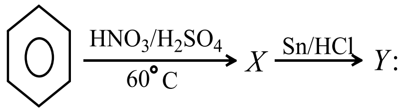
a) $trans - [Co(en)_2Cl_2]$ b) $cis - [pt(NH_3)_2Cl_2]$

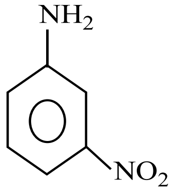
c) $cis - [Co9en)_2Cl_2]$ d) $Trans - [pt(NH_3)_2Cl_2$

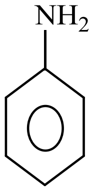
561. What is the magnetic moment of $K_3[FeF_6]$?

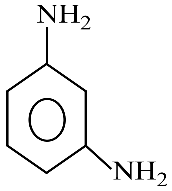
a) 5.91 BM b) 4.89 BM c) 3.87 BM d) 6.92 BM

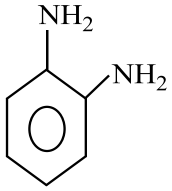
562. Identify '*Y*' in the change;



a) 

b) 

c) 

d) 

563. Among the following statements on the nitration of aromatic compounds, the false one is:

a) The rate of nitration of benzene is almost the same as that of hexadeuterobenzene

b) The rate of nitration of toluene is greater than that of benzene

c) The rate of nitration of benzene is greater than that of hexadeuterobenzene

d) Nitration is an electrophilic substitution reaction

564. The bond length of C—O bond in carbon monoxide is 1.128Å. The C— O bond in $Fe(CO)_5$ is:

a) 1.15 Å b) 1.128 Å c) 1.72 Å d) 1.118 Å

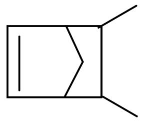
565. Which one is not correct for homologous series?

a) All members are represented by same general formula

b) All members have same chemical properties

c) All members have same physical properties

d) All members have same functional group

566.  is named in IUPAC as

a) 2, 3-dimethyl bicyclo [2.2.1] hept-5-ene b) 1, 2-dimethyl bicyclo [2.2.1] hept-4-ene

c) 5, 6-dimethyl bicyclo [2.2.1] hept-2-ene d) 4, 5-dimethyl bicyclo [2.2.1] hept-1-ene

567. Ferric ion forms a prussian blue coloured solution due to the formation of:

a) $K_4[Fe(CN)_6]$ b) $Fe(CNS)_3$ c) $Fe_4[Fe(CN)_6]_3$ d) $K_3[Fe(CN)_6]$

568. What is the magnetic moment of $[FeF_6]^{3-}$?

a) 5.92 b) 5.49 c) 2.34 d) 4

569. Which of the following can exhibit geometrical isomerism?

a) $[MnBr_4]^{2-}$ b) $[Pt(NH_3)_3Cl]^+$ c) $[PtCl_2.P(C_2H_5)_3]_2$ d) $[Fe(H_2O)_5NO]^{2+}$

570. A compound contains 2 dissimilar asymmetric C-atoms. The number of optical isomers are

a) 2 b) 3 c) 4 d) 5

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

a) 3 b) 6 c) 4 d) 5

572. Which compound exhibits optical isomerism?

a) Pentaamminenitrocobalt (III) iodide

b) Diamminedichloroplatinum (II)

c) *Trans*-dicyano-bis-(ethylenediamine) chromium (III) chloride

d) Tris-(ethylenediamine)cobalt (III) bromide

573. Ruthenium carbonyl is:

a) $Ru(CO)_4$ b) $Ru(CO)_5$ c) $Ru(CO)_8$ d) $Ru(CO)_6$

574. Oxidation state of nitrogen is incorrectly given for

Compound	**Oxidation state**		
a) $[Co(NH_3)_5Cl]Cl_2$	0	b) NH_2OH	-1
c) $(N_2H_5)_2SO_4$	$+2$	d) Mg_3N_2	-3

575. Which of the following can participate in linkage isomerism?

a) NH_3 b) H_2O c) $H_2NCH_2CH_2NH_2$ d) NO_2^-

576. *Ortho*-nitrophenol is less soluble in water than p-and m-nitrophenols because:

a) o-nitrophenol shows intramolecular H-bonding

b) o-nitrophenol shows intermolecular H-bonding

c) Melting point of o-nitrophenol is lower than those of m-and p-isomers

d) o-nitrophenol is more volatile in steam than those of m-and p-isomers

577. Among the following most basic compound is:

a) Benzyl amine b) Aniline c) Acetanilide d) p-nitro aniline

578. The EAN of platinum in potassium hexachloroplatinate (IV) is:

a) 46 b) 86 c) 36 d) 84

579. The number of ions formed when copper ammonium sulphate is dissolved in water is:

a) 1 b) 2 c) 4 d) Zero

580. Which of the following cannot show linkage isomerism?

a) NO_2^- b) NH_3 c) CN^- d) SCN^-

581. Xylenes on oxidation with acidic $KMnO_4$ gives:

a) Phthalic acid b) Isophthalic acid c) Terephthalic acid d) All of these

582. The ratio of σ-and π-bonds in benzene is:

a) 2 b) 4 c) 6 d) 8

583. The order of decreasing reactivity towards S_E reaction for the given compound is:

(i)C_6H_6

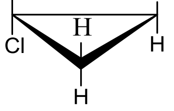
(ii)$C_6H_5CH_3$

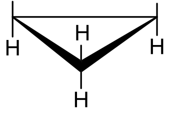
(iii)C_6H_5Cl

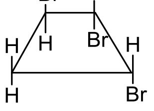
(iv)C_6H_5OH

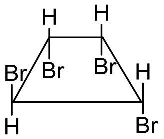
a) (ii)>(iv)>(i)>(iii) b) (iv)>(iii)>(ii)>(i) c) (iv)>(ii)>(i)>(iii) d) (i)>(ii)>(iii)>(iv)

584. Which of the following compounds is not optically active?

a) 

b) 

c) 

d) 

585. The number of geometrical isomers of $[Co(NH_3)_3(NO_2)_3]$ are:

a) Zero b) 2 c) 3 d) 4

586. Phenol is less acidic than:

a) Water b) p-methoxyphenol c) p-nitrophenol d) Ethanol

587. In the reaction,

$C_6H_5CH_3 \xrightarrow{\text{Oxidation}} A \xrightarrow{\text{NaOH}} B \xrightarrow[\Delta]{\text{Soda lime}} C$ s

a) C_6H_5OH b) C_6H_6 c) C_6H_5COONa d) C_6H_5ONa

588. Incorrect statement is
a) Ethane can have an infinite number of conformations
b) Cyclopropane molecule has considerable angle strain
c) Eclipsed form of ethane is less stable then staggered conformation
d) Staggered conformation possess maximum energy

589. The complex $[Co(NH_3)_5Br]SO_4$ will give white ppt. with:
a) $PbCl_2$ b) $AgNO_3$ c) KI d) None of these

590. Which of the following complexes exhibits the highest paramagnetic behaviour?
a) $[Fe(en)(bpy)(NH_3)_2]^{2+}$
b) $[Co(OX)_2(OH)_2]^-$
c) $[Ti(NH_3)_6]^{3+}$
$[V(gly)_2(OH)_2(NH_3)_2]^+$
d) Where, gly = glycine, en = ethylenediamine and bpy = bipyridylmoities
(At. No. Ti=22, V=23, Fe=26, Co=27)

591. The coordination number in a/an ……… complex may increase to 8.
a) Cobalt b) Osmium c) Nickel d) Iron

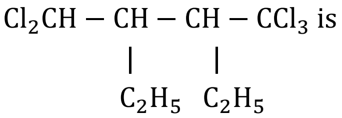
592. Compound used for covering wounds caused by bite of mad dog is:
a) Benzoic acid b) Aniline c) Phenol d) Salicylic acid

593. Cinnamic acid on decarboxylation gives:
a) Benzene b) Toluene c) Styrene d) Benzaldehyde

594. In which of the following pairs both the complex show optical isomerism?
a) *Cis*-$[Cr(C_2O_4)_2Cl_2]^{3-}$; *cis*-$[Co(NH_3)_4Cl_2]$ b) $[PtCl(dien)]Cl$, $[NiCl_2Br_2]^{2-}$
c) $[Co(NO_3)_3(NH_3)_3]$, *cis*-$[Pt(en)_2Cl_2]$ d) $[Co(en)_3]Cl_3$, *cis*-$[Co(en)_2Cl_2]Cl$

595. The name of the ring structure complex compound formed between metal ion and polydentate ligand is
a) Simple complex b) Chelate complex c) Polynuclear complex d) None of the above

596. IUPAC name of



$Cl_2CH-\underset{C_2H_5}{\underset{|}{CH}}-\underset{C_2H_5}{\underset{|}{CH}}-CCl_3$ is

a) 1,1,1,4,4-pentachloro-2,3-diethyl-butane
b) 3-(dichloromethyl)-4-(trichloromethyl)-hexane
c) 3-(trichloromethyl)-4-(dichloromethyl)-hexane
d) 1,1,4,4,4-pentachloro-2,3-diethyl butane

597. Which statement is wrong with regard to acetaldehyde and benzaldehyde?
a) Both react with hydroxylamine to form oximes
b) Both react with HCN to form cyanohydrin
c) Both react with NaOH to form polymers
d) Both react with hydrazine to form hydrazones

598. The coordination number of Cu in complex $[Cu(H_2O)_4]^{2+}$ is
a) 4 b) 3 c) 2 d) 1

599. Which reaction sequence would be best to prepare 3-chloroaniline from benzene?
a) Chlorination, nitration, reduction
b) Nitration, chlorination, reduction
c) Nitration, reduction, chlorination
d) Nitration, reduction, acetylation, chlorination, hydrolysis

600. The complexes $(Co(NH_3)_6)][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$
a) Geometrical isomerism b) Ionization energy
c) Coordination isomerism d) Linkage isomerism

601. The reaction,

$C_6H_5NHCOCH_3 \xrightarrow{B_2/Fe} BrC_6H_4NHCOCH_3$

is an example of:

a) Substitution reaction

b) Addition reaction

c) Condensation reaction

d) Elimination reaction

602. Given the molecular formula of the hexa coordinated complexes is

(A) $CoCl_3 .6NH_3$

(B) $CoCl_3 .5NH_3$

(C) $CoCl_3 .4NH_3$

If the number of coordinated NH_3 molecules in A, B and C respectively are 6, 5 and 4 the primary valency in (A),(B) and (C) are

a) 6, 5, 4 b) 3, 2, 1 c) 0, 1, 2 d) 3, 3, 3

603. C_6H_{14} has two tertiary carbons. The IUPAC name is

a) n-hexane b) 2-methylpentane c) 3-methylpentane d) 2,3-dimethylbutane

604. The compound $[Co(NO_2)(NH_3)_5]Cl_2$ and $[Co(ONO)(NH_3)_5]Cl_2$ are examples of:

a) Geometrical isomers b) Linkage isomers c) Ligand isomers d) Ionization isomers

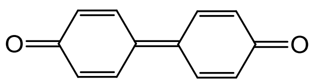
605. Which is not a π-bonded complex?

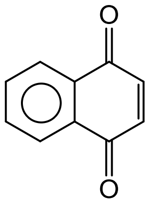
a) Zeise salt b) Ferrocene c) Dibenzene chromium d) Tetraethyl lead

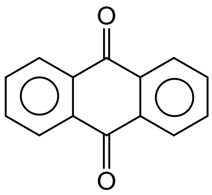
606. When phenol is treated with PCl_5, the yield of chlorobenzene is generally poor because of the formation of:

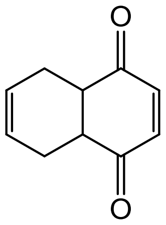
a) Benzoyl chloride b) p-chlorophenol c) o-chlorophenol d) Tertiary phosphate

607. Which will show tautomerism?

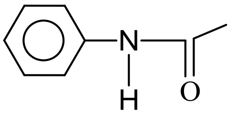
a) 

b) 

c) 

d) 

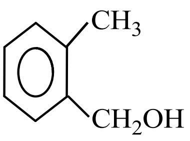
608. The IUPAC name of compound

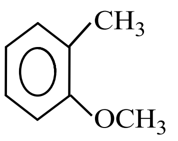
 is

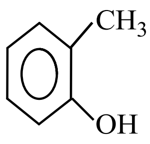
a) N-phenylaminoethanone b) N-phenylethanamide

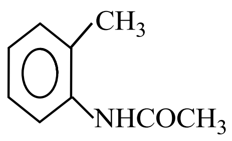
c) N-phenylmethanamide d) N-phenylaminomethane

609. Which one of the following is most reactive towards electrophilic reagent?

a) 

b) 

c) 

d) 

610. Which of the following shows dsp^2 hybridisation?

a) $NiCl_4^{2-}$ b) SCl_4 c) NH_4^+ d) $PtCl_4^{2-}$

611. Which one of the following is not an explosive?

a) Trinitroglycerine b) o-aminotoluene c) Dynamite d) TNT

612. Spin only magnetic moment of the compound $Hg[Co(SCN)_4]$is

a) $\sqrt{3}$ b) $\sqrt{15}$ c) $\sqrt{24}$ d) $\sqrt{8}$

613. When phenol is treated with NH_3 and $ZnCl_2$, it changes to:

a) Aniline b) Salicylic acid c) Cyclohexanol d) None of these

614. In which complex is the transition metal in zero oxidation state?

a) $[Co(NH_3)_6]Cl_2$ b) $[Fe(H_2O)_6SO_4]$ c) $[Ni(CO)_4]$ d) $[Fe(H_2O)_3](OH)_2$

615. The species having tetrahedral shape is

a) $[NiCl_4]^{2-}$ b) $[Ni(CN)_4]^{2-}$ c) $[PdCl_4]^{2-}$ d) $[Pd(CN)_4]^{2-}$

616. An imperfect complex of a complex compound is 100% ionized; the compound is called:

a) Double salt b) Complex salt c) Acid salt d) Normal salt

617. For which transition metal ions are low spin complexes impossible?

a) Zn^{2+} b) Zr^{2+} c) Ag^+ d) All are correct

618. (A) $K_4[Fe(CN)_6]$
(B)$K_3[Cr(CN)_6]$
(C)$K_3[Co(CN)_6]$
(D)$K_2[Ni(CN)_6]$
Select the complexes which are diamagnetic.

a) (A), (B) and (C) b) (B), (C) and (D) c) (A), (C) and (D) d) (A), (B) and (D)

619. Wilkinson's catalyst, $(Ph_3P)_3RhCl$ is used for

a) Hydrogenation of oils b) Hydrogenation of alkynes
c) Hydrogenation of alkenes d) Polymerization of alkenes

620. Among the following compounds, the most acidic is:

a) p-nitrophenol
b) p-hydroxybenzoic acid
c) o-hydroxybenzoic acid
d) p-toluic acid

621. An aromatic primary amine with cold nitrous acid leads to the formation of:

a) Alcohol b) Nitrite c) Diazonium salt d) Benzene

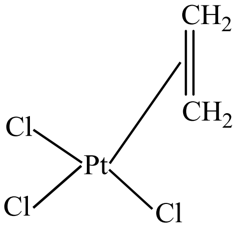
622. Chlorobenzene gives DDT when it reacts with:

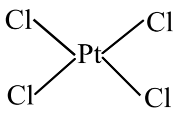
a) Phenol b) Naphthalene c) Chloral d) Acetaldehyde

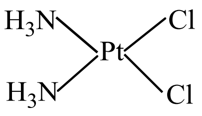
623. Under suitable conditions $C_6H_5CH_2OH(A), C_6H_5OH(B)$ and $C_6H_5COOH(C)$ can act as acids. The increasing order of their acidic strengths is:

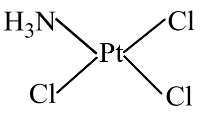
a) $A < B < C$ b) $A < C < B$ c) $B < A < C$ d) $C < B < A$

624. Which is considered to be an anticancer species?

a) 

b) 

c) 

d) 

625. The compound required for the formation of thermosetting polymer with methanal is:

a) Phenol b) Benzene c) Benzaldehyde d) All of these

626. Which one of the following has highest number of isomers?

a) $[Co(NH_3)_5Cl]^{2+}$ b) $[Co(en)_2Cl_2]^+$ c) $[Ru(NH_3)_4Cl^-]$ d) $[In(PP_3)_2H(CO)]^{2+}$

627. Which group is o- and p-directing?

a) $—NO_2$ b) $—SO_3H$ c) —COOH d) $—NHCOCH_3$

628. When benzyl chloride is boiled with aqueous solution of lead nitrate in current of carbon dioxide, the main product is:

a) Benzoic acid b) Benzyl alcohol c) Benzaldehyde d) Nitrobenzene

629. Ligands in complex compounds

a) Donates electron pair b) Accept electron pair
c) Neither accept electron pair nor donate d) All of the above

630. Aniline is separated by:
a) Fractional crystallisation
b) Fractional distillation
c) Steam distillation
d) Vacuum distillation

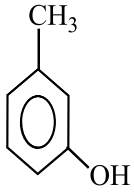
631. In which of the following octahedral complexes of Co (at. No. 27), will be magnitude of Δ_0 be the highest?
a) $[Co(CN)_6]^{3-}$ b) $[Co(C_2O_4)_3]^{3-}$ c) $[Co(H_2O)_6]^{3+}$ d) $[Co(NH_3)_6]^{3+}$

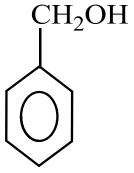
632. The IUPAC name of $K_2[PtCl_6]$ is
a) Hexachloroplatinate potassium b) Potassium hexachloroplatinate (IV)
c) Potassium hexachloroplatinate d) Potassium hexachloroplatinum(IV)

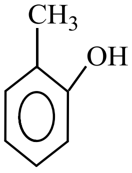
633. Aqueous solution of nickel sulphate on treating with pyridine and then adding a solution of sodium nitrite gives dark blue crystals of:
a) $[Ni(py)_4]SO_4$ b) $[Ni(py)_2(NO_2)_2]$ c) $[Ni(py)_4(NO_2)_2]$ d) $[Ni(py)_3(NO_2)]_2SO_4$

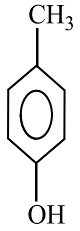
634. Benzyl alcohol is obtained from benzaldehyde by:
a) Fittig's reaction b) Cannizzaro's reaction c) Kolbe's reaction d) Wurtz's reaction

635. The structure of the compound that gives a tribromo derivative on treatment with bromine water is:

a) 

b) 

c) 

d) 

636. The coordination number and the oxidation state of the element 'E' in the complex $[E(en)_2(C_2O_4)]NO_2$ (where (en) is ethylene diamine) are, respectively :
a) 6 and 3 b) 6 and 2 c) 4 and 2 d) 4 and 3

637. Benzaldehyde reacts with PCl_5 to give:
a) Benzyl chloride b) Benzo trichloride c) Benzal chloride d) Chlorobenzene

638. Which one of the following complex ions has geometrical isomers?
a) $[Co(en)_3]^{3+}$ b) $[Ni(NH_3)_5Br]^+$ c) $[Co(NH_3)_2(en)_2]^{3+}$ d) $[Cr(NH_3)_4(en)]^{3+}$

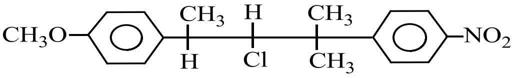
639. The strongest acid among the following aromatic compounds is:
a) *Ortho*-nitrophenol b) *para*-chlorophenol c) *para*-nitrophenol d) *meta*-nitrophenol

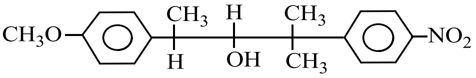
640. The isomers observed in alkanes is
a) Metamerism b) Chain isomerism
c) Position isomerism d) Geometrical isomerism

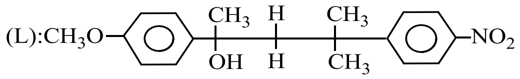
641. The two compounds pentaamminesulphatocobalt (III) bromide and pentaamminesulphatocobalt(III) chloride represent:
a) Linkage isomerism
b) Ionization isomerism
c) Coordination isomerism
d) No isomerism

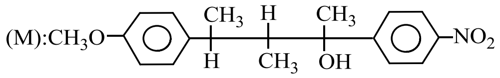
642. Both $[Ni(CO)_4]$ and $[Ni(CN)_4]^{2-}$ are diamagnetic. The hybridisation of nickel in the compounds respectively are :
a) sp^3, sp^3 b) sp^3, dsp^2 c) dsp^2, sp^3 d) dsp^3, dsp^2

643. The following compounds on hydrolysis in aqueous acetone will give:



(K): 

(L):


(M):


a) Mixture of (K) and (L) b) Mixture of (K) and (M) c) Only (M) d) Only (K)

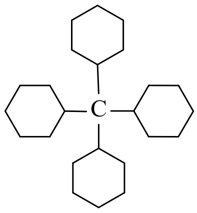
644. The number of π-electrons in cyclo hepta trienyl anion is:
a) 2 b) 3 c) 8 d) 5

645. In the Grignard reaction, which metal forms an organometallic bond?
a) Sodium b) Titanium c) Magnesium d) Palladium

646. Aromatic hydrocarbons are the derivatives of:
a) Benzene
b) Methane
c) Normal series of paraffins
d) None of the above

647. Benzene easily shows:
a) Ring fission reactions since it is unstable
b) Addition reactions since it is unsaturated
c) Electrophilic substitution reactions due to stable ring and high π-electron density
d) Nucleophilic substitution reactions due to stable ring and minimum electron density

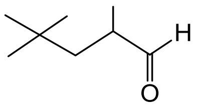
648. The IUPAC name of the compound



is

a) Tetra phenyl methane b) 1,1,1,1-tetraphenyl methane
c) 1,1,1,1-tetracyclohexyl methane d) Methyno-1,1,1-1-tetracyclohexane

649.



having the IUPAC name as

a) 2,4,4-trimethyl pentanal b) 4,4,2-trimethyl pentanal
c) 1,3,3-trimethyl butanal d) 3,3,1-trimethyl butanal

650. When benzoic acid is heated with soda lime, we get:
a) Phenol b) Benzyl alcohol c) Benzene d) Benzaldehyde

651. If a compound absorbs violet colour from the sunlight, then the observed colour is:
a) Yellow b) Orange c) Blue d) Green

652. Sulphonic acid is used in the manufacture of:
a) Antipyretics b) Antitoxine c) Antibiotics d) Dyes

653. In the silver plating of Cu, $K[Ag(CN)_2]$ is used instead of $AgNO_3$. The reason is:
a) A thin layer of Ag is formed on Cu
b) More heat is required
c) Ag^+ ions are completely removed from solution
d) Less availability of Ag^+ ion as Cu cannot displace Ag from $Ag(CN)_2$

654. The strongest *o*-, *p*-directing group among the following is:
a) —OH b) —Cl c) $—C_6H_5$ d) —Br

655. Out of TiF_6^{2-}, CoF_6^{3-}, Cu_2Cl_2 and $NiCl_4^{2-}$ (Z of Ti = 22, Co = 27, Cu = 29, Ni = 28) the colourless species are:
a) CoF_6^{3-} and $NiCl_4^{2-}$ b) TiF_6^{2-} and CoF_6^{3-} c) Cu_2Cl_2 and $NiCl_4^{2-}$ d) TiF_6^{2-} and Cu_2Cl_2

656. Which is true in the case of $[Fe(CN)_6]^{3-}$ complex?

a) d^2sp^3-hybridization of Fe
b) Paramagnetic
c) One unpaired electron
d) All of the above are correct

657. The IUPAC name of $[\mathrm{Ni(PPh_3)_2Cl_2}]^{2+}$ is
a) Bis-dichloro (triphenylphosphine)nickel(II)
b) Dichloro bis (triphenylphosphine)nickel(II)
c) Dichloro triphenylphosphine nickel(II)
d) Triphenyl phosphine nickel (II) dichloride

658. The complex $[\mathrm{Co(NH_3)_3Cl_3}]$is:
a) Neutral
b) Cationic
c) Anionic
d) None of these

659. From the stability constant (hypothetical values) given below, predict which is the strongest ligand?
a) $\mathrm{Cu^{2+} + 4NH_3 \rightleftharpoons [Cu(NH_3)_4]^{2+}}$; $(K = 4.5 \times 10^{11})$
b) $\mathrm{Cu^{2} + 4CN \rightleftharpoons [Cu(CN)_4]^{2-}}$; $(K = 2.0 \times 10^{27})$
c) $\mathrm{Cu^{2+} + 2en \rightleftharpoons [Cu(en)_2]^{2+}}$; $(K = 3.0 \times 10^{15})$
d) $\mathrm{Cu^{2+} + 4H_2O \rightleftharpoons [Cu(H_2O)_4]^{2+}}$; $(K = 9.5 \times 10^{8})$

660. Which has highest m.p.?
a) o-bromophenol
b) m-bromophenol
c) p-bromophenol
d) m-chlorophenol

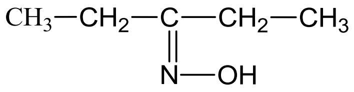
661. Hexafluorocobaltate(III) ion is found to be high spin complex, the probable hybrid state of cobalt in it is:
a) d^2sp^3
b) sp^3
c) sp^3d
d) sp^3d^2

662. Which isomeric dibromotoluene is most difficult to make from toluene?
a) 2,3
b) 2,4
c) 3,5
d) 2,6

663. Which one of the following forms with an excess of $\mathrm{CN^-}$(cyanide) a complex?
a) $\mathrm{Cu^+}$
b) $\mathrm{Ag^+}$
c) $\mathrm{Ni^{2+}}$
d) $\mathrm{Fe^{2+}}$

664. Nitration of salicylic acid gives:
a) 2,4,6-trinitrosalicylic acid
b) 2,4,6-trinitrophenol
c) 2,4,6-trinitrobenzoic acid
d) None of the above

665. The IUPAC name of the compound

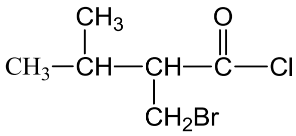


$\mathrm{CH_3{-}CH_2{-}\underset{\underset{\displaystyle N{-}OH}{\|}}{C}{-}CH_2{-}CH_3}$

is
a) N-hydroxy-3-amino pentane
b) N-hydroxyamino pentane
c) N-hydroxy-3-imino pentane
d) None of the above

666. Which is not true of the coordination compound $[\mathrm{Co(en)_2Cl_2}]\mathrm{Cl}$?
a) Exhibits geometrical isomerism
b) Exhibits optical isomerism
c) Exhibits ionisation isomerism
d) Is an octahedral complex

667. The IUPAC name of



$\mathrm{CH_3{-}\overset{\overset{\displaystyle CH_3}{|}}{C}H{-}\underset{\underset{\displaystyle CH_2Br}{|}}{C}H{-}\overset{\overset{\displaystyle O}{\|}}{C}{-}Cl}$

is
a) 3-(bromomethyl)-2-methyl butanoyl chloride
b) 3-(bromomethyl)-2-methyl propanoyl chloride
c) 2-(bromomethyl)-3-methyl butanoyl chloride
d) None of the above

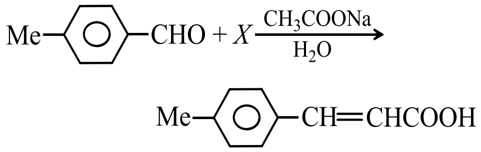
668. Aniline is reacted with bromine water and the resulting product is treated with an aqueous solution of sodium nitrite in the presence of dilute HCl. The compound so formed is treated with fluoroboric acid which is subsequently heated dry. The final product is:
a) p-bromofluorobenzene
b) p-bromoaniline
c) 2,4,6-tribromofluorobenzene
d) 1,3,5-tribromobenzene

669. Which of the following is a common donor atom in ligands?

a) Nitrogen b) Oxygen c) Arsenic d) Both (b) and (c)

670. The reaction of aniline with acetyl chloride in presence of NaOH gives:
a) Acetanilide b) Aniline hydrochloride c) p-chloroaniline d) A red dye

671. In the reaction, the compound $''X''$ is:



a) CH_3COOH
b) $Br \cdot CH_2COOH$
c) $(CH_3CO)_2O$
d) $CHO \cdot COOH$

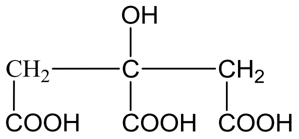
672. Which of the following will exhibit maximum ionic conductivity?
a) $K_4[Fe(CN)_6]$ b) $[Co(NH_3)_6]Cl_3$ c) $[Cu(NH_3)_4]Cl_2$ d) $[Ni(CO)_4]$

673. Dipole moment of p-nitroaniline, when compared to nitrobenzene (X) and aniline (Y) will be:
a) Greater than (X) and (Y)
b) Smaller than (X) and (Y)
c) Greater than (X) but smaller than (Y)
d) Equal to zero

674. The structure of iron pentacarbonyl is:
a) Square planar b) Trigonal bipyramidal c) Triangular d) None of these

675. Turnbull's blue is:
a) Ferricyanide b) Ferrous ferricyanide c) Ferrous cyanide d) Ferri ferrocyanide

676. The correct IUPAC name of



is

a) 2-hydroxypropane-1, 2, 3-tricarboxylic acid b) 3-carboxy-3-hydroxy-pentane-1, 5-dioic acid
c) 2 carboxy-4 hydroxy-pentane-1, 5-dioic acid d) 3-carboxy-3-hydroxy-hexane-1, 6-dioic acid

677. The trivial name among the following is
a) Acetone b) Acetylene c) Uric acid d) None of these

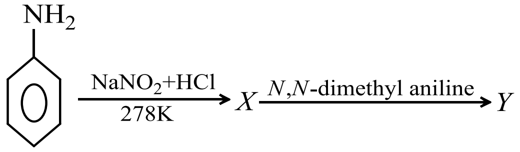
678. The IUPAC name of $[Pt(NH_3)_4(NO_2)Cl]SO_4$ is
a) Chloronitro tetrammine platinum (IV) sulphate
b) Tetrammine chloronitro platinum (II) sulphate
c) Tetrammine chloronitro platinum (IV) sulphate
d) Chlorotetrammine nitroplatinum (IV) sulphate

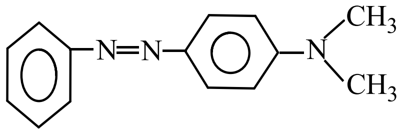
679. The overlapping in benzene is in carbon-carbon orbitals of the type:
a) $p - p$ b) $sp - sp$ c) $sp^2 - sp^2$ d) $sp^3 - sp^3$

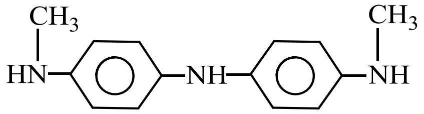
680. Change in composition of coordination sphere yields which type of isomer?
a) Geometrical b) Ionization c) Optical d) None of these

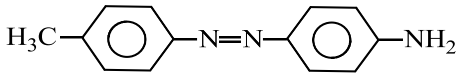
681. The IUPAC name of $K_2[Ni(CN)_4]$ is
a) Potassium tetracyanonickelate (II) b) Potassium tetracyanatonickelate (III)
c) Potassium tetracyanatonickel (II) d) Potassium tetracyanonickel (III)

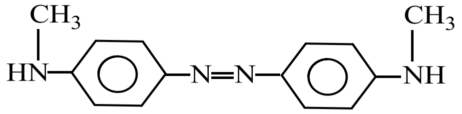
682. Aniline in a set of the following reactions yielded a coloured compound Y:



a) 

b) 

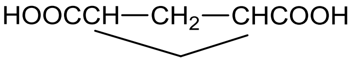
c) 

d) 

683. The effective atomic number rule is less likely to apply if the metal-ligand bond:
   a) Is extremely weak
   b) Has a covalent character
   c) Has a large amount of ionic character
   d) None is correct

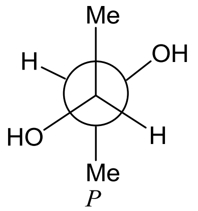
684. Potassium ferrocyanide is an example of
   a) Tetrahedral b) Octahedral c) Square planar d) Linear

685. 1-phenyl, 2-chloropropane on treatment with aqueous KOH gives mainly:
   a) 1-phenylpropane b) 3-phenylpropane c) 1-phenylpropan-2-ol d) 1-phenylpropan-3-ol

686. Which class of compounds can exhibit geometrical isomerism?
   a) $C_6H_5CH = NOH$ b) $CH_3CH = CHCH_3$
   c) 
   d) All of the above

687. The product of oxidation of aniline with $K_2Cr_2O_7$ and conc. H_2SO_4 will be:
   a) p-amino phenol
   b) p-benzoquinone
   c) Aniline black dye
   d) Phenyl hydroxylamine

688. Among the following the Newmann projections of *meso*-2, 3-butanediol are



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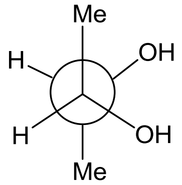

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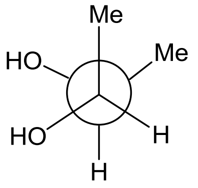
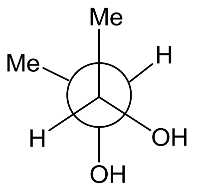


R

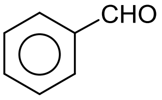


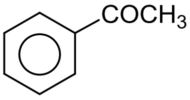
S

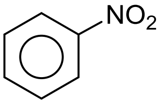
   a) P, Q b) P, R c) R, S d) Q, S

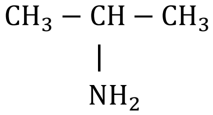
689. A new carbon-carbon bond is formed in:
   a) Cannizzaro’s reaction
   b) Friedel-Crafts reaction
   c) Clemmensen reduction
   d) None of the above

690. Which of the following compounds can exhibit tautomerism?

a) 

b) 

c) 

d) 
$CH_3 - \underset{\underset{NH_2}{|}}{CH} - CH_3$

691. The most basic compound among the following is:
a) Benzylamine b) Aniline c) Acetanilide d) p-nitroaniline

692. Which of the following has least oxidation state of Fe?
a) $K_3[Fe(OH)_6]$ b) $K_2[FeO_4]$
c) $FeSO_4(NH_4)_2SO_4 .6H_2O$ d) $[Fe(CN)_6]^{3-}$

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

694. Which is an excellent antiseptic?
a) Phenol b) Benzyl alcohol c) Benzaldehyde d) Acetic acid

695. Scientist who explained the structures and isomerism in the complex compound was:
a) Sidgwick b) Pauling c) Powell d) Werner

696. The cation that does not form an ammine complex with excess of ammonia is:
a) Al^{3+} b) Ag^{+} c) Cu^{2+} d) Cd^{2+}

697. The complex ion which has the highest magnetic moment among the following is
a) $[CoF_6]^{3-}$ b) $[Co(NH_3)_6]^{3+}$ c) $[Ni(NH_3)_4]^{2+}$ d) $[Ni(CN)_4]^{2-}$

698. For square planar complex of platinum (II), $[Pt(NH_3)(Br)(Cl)Py]^{2+}$, how many isomeric forms are possible?
a) Two b) Three c) Four d) Six

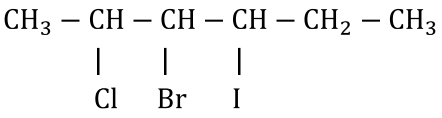
699. Which of the following has highest boiling point?
a) Benzene b) Phenol c) Toluene d) Ethyl benzene

700. A nitrogen containing organic compound on heating with chloroform and alcoholic KOH evolved very unpleasant smelling vapours. The compound could be:
a) Nitrobenzene b) Benzamide c) N,N-dimethyl amine d) Aniline

701. Which of the following 0.1 M complex compound solutions will have the minimum electrical conductivity?
a) Hexammine platinum (IV) chloride b) Chloropenta ammine platinum (IV) chloride
c) Dichloro tetrammine platinum (IV) chloride d) Trichloro triammine platinum (IV) chloride

702. False statement is
a) Aprotic solvents increase the enol content in tautomerism
b) Any deviation from the normal bond angles introduces angle strain in molecule
c) Diastereomers have identical physical properties
d) Chain isomers can also be position isomers

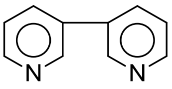
703. The correct IUPAC name of the compound is

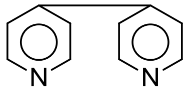

$CH_3 - \underset{\underset{Cl}{|}}{CH} - \underset{\underset{Br}{|}}{CH} - \underset{\underset{I}{|}}{CH} - CH_2 - CH_3$

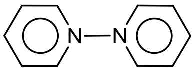
a) 4-bromo-5-chloro-3-iodo hexane b) 3-bromo-2-chloro-4-iodo hexane
c) 3-bromo-4-iodo -2-chloro hexane d) 2-bromo-3-bromo-4-iodo hexane

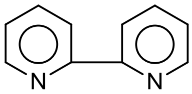
704. Benzyl chloride ($C_6H_5CH_2Cl$) can be prepared from toluene by chlorination with:
a) SO_2Cl_2 b) $SOCl_2$ c) S_2Cl_2 d) NaOCl

705. The compound 2,2'-bipyridine has the structure

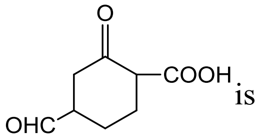
a) 

b) 

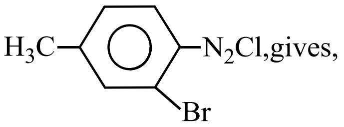
c) 

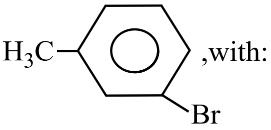
d) 

706. The IUPAC name of



a) 4-formyl-6-oxocyclohexane-1-carboxylic acid
b) 2-oxo-4-formyl cyclohexane-1-carboxylic acid
c) 6-oxo-4-formyl cyclohexane-1-carboxylic acid
d) 4-formyl-2-oxo cyclohexane-1-carboxylic acid

707. The diazonium salt  ,gives,



a) HCl/CuCl
b) HNO_2/Cu
c) C_2H_5OH/Cu
d) $SnCl_2$/HCl

708. Diethylenetriammine is:
a) Chelating agent
b) Polydentate ligand
c) Tridentate ligand
d) All of these

709. The no. of ions given by $[Pt(NH_3)_4Cl_2]Cl_2$ in aqueous solution is:
a) 2
b) 3
c) 4
d) 5

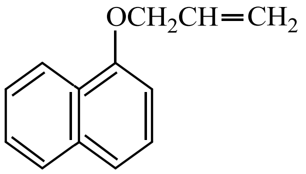
710. Aniline reacts with excess of bromine to give:
a) Benzyl bromide and hydrobromic acid
b) 2,4,6-tribromoaniline
c) 2-bromotoluene and hydrobromic acid
d) 2-bromophenol and hydrobromic acid

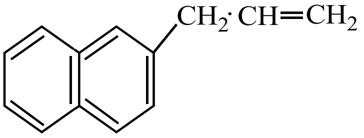
711. The coordination compounds,
$[Co(NH_3)_6]^{3+}[Cr(CN)_6]^{3-}$
and $[Cr(NH_3)_6]^{3+}[Co(CN)_6]^{3-}$ are example of
a) Linkage isomerism
b) Coordination isomerism
c) Ionisation isomerism
d) Geometrical isomerism

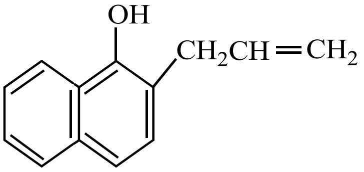
712. Both Co^{3+} and Pt^{4+} have a coordination number of six. Which of the following pairs of complexes will show approximately the same electrical conductance for their 0.001 M. aqueous solutions?
a) $CoCl_3 .4NH_3$ and $PtCl_4 . 4NH_3$
b) $CoCl_3 .3NH_3$ and $PtCl_4 . 5NH_3$
c) $CoCl_3 .6NH_3$ and $PtCl_4 . 5NH_3$
d) $CoCl_3 .6NH_3$ and $PtCl_4 . 3NH_3$

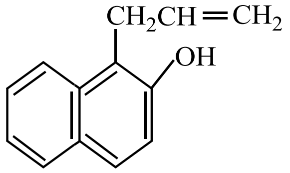
713. In SCN ligand if N is attached to central atom, the name of ligand is:
a) Thiocyanato-N
b) Cyanato-N
c) Thiocyanato-S
d) Cyanato-S

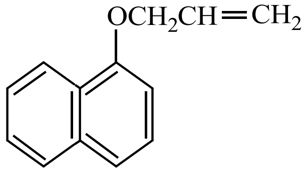
714. The product formed on heating



a) 

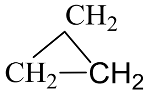
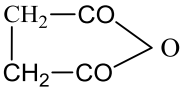
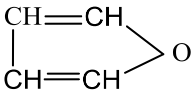
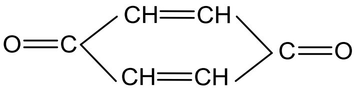
b) 

c) 

d) 

715. Oxidation of ethyl benzene by $KMnO_4$ gives:
   a) Benzyl alcohol b) Benzophenone c) Acetophenone d) Benzoic acid

716. One of the following statements regarding Reimer-Tiemann reaction is false:
   a) Reaction of phenol with $CHCl_3$ and KOH
   b) CCl_2 acts as a nucleophile
   c) Reaction of phenol with CCl_4 and NaOH
   d) Reaction of phenol with formaldehyde to form bakelite

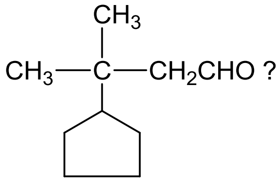
717. The structure representing a heterocyclic compound is
   a) 
   b) 
   c) 
   d) 

718. Phenol reacts with Br_2in CCl_4 at low temperature to give:
   a) m-bromophenol
   b) o-and p-bromophenol
   c) p-bromophenol
   d) 2,4,6-tribromophenol

719. The correct name of the compound $[Cu(NH_3)_4](NO_3)_2$, according to IUPAC system is
   a) Cuprammonium nitrate b) Tetrammine copper (II) dinitrate
   c) Tetrammine copper (II) nitrate d) Tetrammine copper (II) dinitrite

720. Nitroethane can exhibit one of the following kind of isomerism
   a) Metamerism b) Optical activity c) Tautomerism d) Position isomerism

721. What would be the correct IUPAC name of



   a) 3,3-dimethyl-3-cyclopentyl propanal
   b) 3-methyl-3-cyclopentyl butan-1-al
   c) 1-(1-methyl-1-formyl) methylethyl cyclopropane
   d) None of above

722. The number of unpaired electrons in the square planar $[Pt(CN)_4]^{2-}$ ion is
   a) 2 b) 1 c) 0 d) 3

723. The oxidation number of cobalt in $K[Co(CO)_4]$is
   a) +1 b) +3 c) −1 d) −3

724. IUPAC name of $Na_3[Co(NO_2)_6]$ is
   a) Sodium hexanitrito cobaltate (II) b) Sodium hexanitro cobaltate (III)
   c) Sodium hexanitrito cobaltate (III) d) Sodium cobaltinitrite(II)

725. The total number of possible isomers for the complex compound $[Cu(NH_3)_4][PtCl_4]$

a) 6 b) 5 c) 4 d) 3

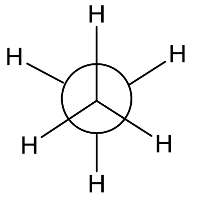
726. Benzaldehyde reacts with excess of anhydrous ethyl alcohol in the presence of HCl, gives:

a) C_6H_5COCl b) $C_6H_5COOC_2H_5$ c) $C_6H_5CH(OC_2H_5)_2$ d) $C_6H_5CH_2Cl$

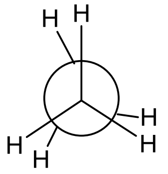
727. Which pair of isomerism is not possible together?

a) Chain and position b) Functional and position
c) Tautomerism and functional d) All of the above

728. Which type of conformation is shown by I and II?



(I)



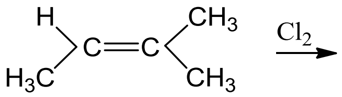
(III)

a) I is eclipsed, II is staggered b) II is eclipsed, I is staggered
c) Both are eclipsed d) Both are staggered

729. Which will give chiral molecule?

a) $CH_3COCl \xrightarrow{LiAlH_4}$ b) $C_2H_5CHO \xrightarrow[H^+/H_2O]{CH_3MgBr}$

c) $(CH_3)_2CHC_2H_5 \overset{Cu}{\rightarrow}$ d)



730. The neutral ligand is:

a) Chloro b) Hydroxo c) Ammine d) Oxalato

731. The effective atomic number of cobalt in the complex $[Co(NH_3)_6]^{3+}$ is

a) 36 b) 24 c) 33 d) 30

732. $K_4[Fe(CN)_6]$ is used to detect the presence of:

a) Metallic ion b) Ferrous ion c) Ferric ion d) None of these

733. *p*-nitro benzldehyde reacts with concentrated NaOH solution at room temperature to give:

a) *p*-nitrobenzamide
b) *p*-nitro benzyl alcohol and sod. *p*-nitrobenzoate
c) Benzaldehyde
d) *p*-nitrotoluene

734. But-1-ene and cyclobutane exhibit

a) Ring chain isomerism
b) Position isomerism
c) Tautomerism
d) Functional isomerism

735. The groups satisfying the secondary valencies of a cation in a complex are called:

a) Ligands b) Radicals c) Primary valencies d) None of these

736. Benzene was dicovered by:

a) Cavendish b) Faraday c) Berzelius d) Wöhler

737. The number of structural and configurational isomers of a bromo compound C_5H_9Br obatined by the addition of HBr on 2-pentyne respectively are

a) 1, 2 b) 2, 4 c) 4, 2 d) 2, 1

738. The primary valency of Fe in $K_3[Fe(CN)_6]$ is:

a) 3 b) 2 c) 1 d) Zero

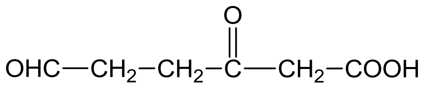
739. Which complex compound obeys 18-electron rule?

a) $[V(CO)_5]$ b) $[Fe(NH_3)_6]^{2+}$ c) $[Ni(CO)_6]$ d) $[Mn(H_2O)_6]^{2+}$

740. Two isomers X and Y with the formula $Cr(H_2O)_5ClBr_2$ were taken for experiment on depression in freezing point. It was found that one mole of X gave depression corresponding to 2 moles of particles and one mole of Y gave depression due to 3 moles of particles. The structural formula of X and Y respectively, are

a) $[Cr(H_2O)_5Cl]Br_2$; $[Cr(H_2O)_4Br_2]Cl.H_2O$
b) $[Cr(H_2O)_5Cl]Br_2$; $[Cr(H_2O)_3ClBr_2].2H_2O]$
c) $[Cr(H_2O)_5Br]BrCl$; $[Cr(H_2O)_4ClBr]Br.H_2O$
d) $[Cr(H_2O)_4Br_2]ClH_2O$; $[Cr(H_2O)_5Cl]Br_2$

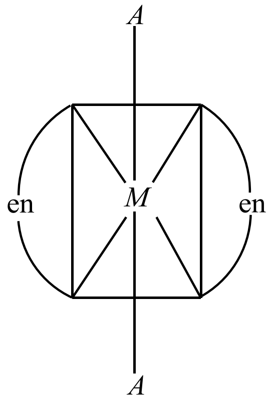
741. The IUPAC name of



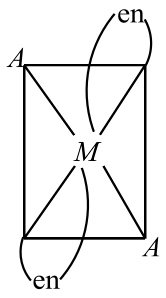
$$OHC-CH_2-CH_2-\overset{\overset{O}{\|}}{C}-CH_2-COOH$$ is

a) 1-formyl-3-oxo-pentanoic acid
b) 5-formyl-3-oxo pentanoic acid
c) 3-oxo-5-formyl pentanoic acid
d) 3-oxo-1-formyl pentanoic acid

742. The two complexes given below are:



and



a) Geometrical isomers
b) Position isomers
c) Optical isomers
d) Identical

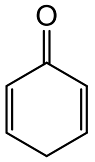
743. Which of the following statements is not correct?

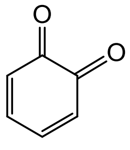
a) In oxyhaemoglobin Fe^{2+} is paramagnetic
b) During respiration the size of Fe^{2+} increases when it changes from diamagnetic to paramagnetic state
c) Four haeme groups are present in haemoglobin
d) Haeme is the prosthetic group and it is non-protein part

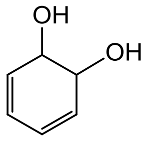
744. Chlorination of toluene in the presence of light and heat followed by treatment with aqueous NaOH gives:

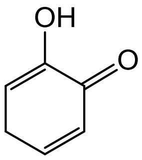
a) o-cresol
b) p-cresol
c) 2,4-dihydroxytoluene
d) Benzoic acid

745. Which of the following has maximum probability of showing tautomerism?

a) 

b) 

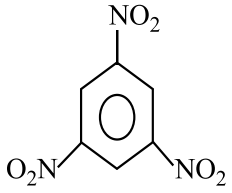
c) 

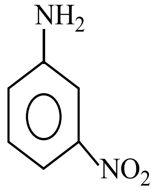
d) 

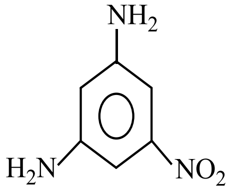
746. The halide which undergoes nucleophilic substitution most readily is:

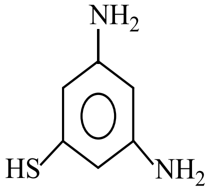
a) p-$H_3CC_6H_4Cl$
b) o-$H_3COC_6H_4Cl$
c) p-ClC_6H_4Cl
d) p-$O_2NC_6H_4Cl$

747. The major product (70% to 80%) of the reaction between m-dinitrobenzene with $(NH_4)_2S_x$ is:

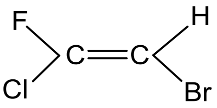
a) 

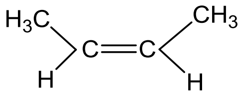
b) 

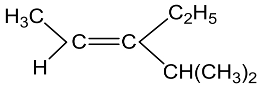
c) 

d) 

748. The $'E'$-isomer is

a) 

b) 

c) 

d) None of the above

749. The Baeyer angle strain is minimum in
a) Cyclopropane b) Cyclobutane c) Cyclopentane d) Cyclohexane

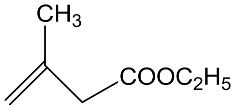
750. Among the following ions, which one has the highest unpaired electrons?
a) $[Cr(H_2O)_6]^{3+}$ b) $[Zn(H_2O)_6]^{2+}$ c) $[Fe(H_2O)_6]^{2+}$ d) $[Cr(H_2O)_6]^{3+}$

751. Which will give a white precipitate with $AgNO_3$ in aqueous solution?
a) $[Co(NH_3)_5Cl](NO_2)_2$ b) $[Pt(NH_3)_6]Cl_4$ c) $[Pt(en)Cl_2]$ d) $[Cu(NH_3)_4]SO_4$

752. The organic product formed in the reaction;
$C_6H_5COOCH_3 \xrightarrow[\text{(II)}H_2O]{\text{(I)}LiAlH_4}$:
a) $C_6H_5CH_2OH$ and CH_3OH
b) C_6H_5COOH and CH_4
c) $C_6H_5CH_3$ and CH_3OH
d) $C_6H_5CH_3$ and CH_4

753. Complexes with bidentate ligands are called:
a) Ligands b) Chelates c) Complexes d) None of these

754. Excited state configuration of Mn^{2+} is
a) t_{2g}^4 b) $t_{2g}^3 e_g^2$ c) $t_{2g}^4 e_g^2$ d) $t_{2g}^5 e_g^0$

755. The IUPAC name of


is
a) Ethyl acetylate b) Ethyl methyl butenoate
c) Ethyl acetoethanoate d) Ethyl (3-methyl) but-2-enoate

756. The compound which result from the coordination of carbon monoxide are known as
a) Carbon permono b) Electronic c) Carbonyls d) None of these

757. The correct IUPAC name of $AlCl_3(EtOH)_4$ is:
a) Aluminium(II) chloride-4-ethanol
b) Aluminium(III)chloride-4-ethanol
c) Aluminium(IV)chloride-4-hydroxy ethane
d) Aluminium chloride-4-ethanol

758. The IUPAC name of $[Co(NH_3)_6][Cr(C_2O_4)_3]$is
a) Hexaamine cobalt (III) tris (oxalato) chromium
b) Hexaamine cobalt (III) tris (oxalato) chromate(III)
c) Hexaamine cobalt tris (oxalato) chromium(III)
d) Hexaamine cobalt (III) chromium (III) oxalate

759. The insecticide, germicide gammexane is a formulation for:
a) DDT
b) Benzene hexachloride
c) Hexachlorobenzene
d) Chloral

760. Among $[Ni(CO)_4]^{2-}$, $[Ni(CN)_4]^{2-}$, $[NiCl_4]^{2-}$ species, the hybridisation states of the Ni atom are, respectively (Atomic no. of Ni=28)
a) sp^3, dsp^2, dsp^2 b) sp^3, dsp^2, sp^3 c) sp^3, sp^3, dsp^2 d) dsp^2, sp^3, sp

761. Which of the following complex ions is expected to absorb visible light?
a) $[Zn(NH_3)_6]^{2+}$
b) $[Sc(H_2O)_3(NH_3)_3]^{3+}$
c) $[Ti(en)_2(NH_3)_2]^{4+}$
d) $[Cr(NH_3)_6]^{3+}$

[At. no. Zn = 30, Sc = 21, Ti = 22, Cr = 24]

762. Chain isomers of $CH_3CH_2CH_2CH_2OH$ is/are

a) 2 b) 3 c) 4 d) 5

763. Although chlorobenzene does not give Ulmann's reaction. However, presence of…group in chlorobenzene at *o*-, *p*-position enables it to give Ulmann's reaction.

a) NO_2 b) NH_2 c) OH d) SO_3H

764. Which statement is true?

a) A compound with *R* configuration is the (+) enantiomer

b) If configuration changes from + to −, that essentially means inversion of configuration take place

c) An achiral molecule reacts to give a chiral molecule, always racemic forms

d) By breaking two bonds on the chiral centre configuration changes

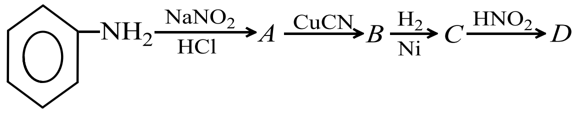
765. Which can be used for carrying out electrophilic aromatic substitution?

a) Water b) Liquid NH_3 c) Oleum d) Hydride ion

766. Which of the following can participate in linkage isomerism?

a) NO_2^- b) $H_2\ddot{N}CH_2CH_2\ddot{N}H_2$ c) H_2O d) $:NH_3$

767. Aniline in a set of reactions yielded a product *D*.



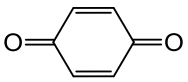
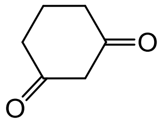
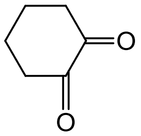
The structure of the product *D* would be:

a) $C_6H_5NHCH_2CH_3$ b) $C_6H_5CH_2OH$ c) $C_6H_5CH_2NH_2$ d) C_6H_5NHOH

768. The number of ions formed when cuprammonium sulphate is dissolved in water is

a) Zero b) 1 c) 2 d) 4

769. Tautomerism is not exhibited by :

a) $C_6H_5-CH=CH-OH$ b)

c)

d)


770. Benzaldehyde reacts with NH_3 to give:

a) Aniline b) Benzamide c) Phenylcyanide d) Hydrobenzamide

771. In coal-tar fraction of heavy oil, the aromatic compound present is:

a) Cresol

b) Pyridine

c) Benzene

d) Anthracene

772. Optical isomerism is shown by octahedral complexes

a) Having all monodentate ligands b) Having all the three bidentate ligands

c) Having two *trans* bidentate ligands d) Having two *trans* monodentate ligands

773. Which can be hydrolysed most easily?

a) $(C_6H_5)_3CCl$ b) $C_6H_5CH_2Cl$ c) $(C_6H_5)_2CHCl$ d) C_6H_5Cl

774. The most stable configuration of *n* butane will be

a) Skew boat b) Eclipsed c) Gauche d) Staggered-anti

775. Anhydrous aluminium chloride is used in Friedel-Craft's reaction because it is:

a) Electron rich

b) Soluble in ether

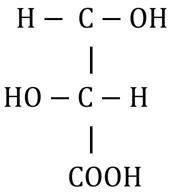
c) Ionizable to chloride and aluminium ions

d) Electron deficient molecule

776. The two isomers given below are

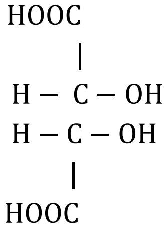
(i) COOH

|



$$\begin{array}{c}\mathrm{H-C-OH}\\ |\\ \mathrm{HO-C-H}\\ |\\ \mathrm{COOH}\end{array}$$

(ii)



$$\begin{array}{c}\mathrm{HOOC}\\ |\\ \mathrm{H-C-OH}\\ \mathrm{H-C-OH}\\ |\\ \mathrm{HOOC}\end{array}$$

a) Enantiomers b) Diastereomers c) Measomers d) Position isomers

777. Which of the following has lowest boiling point?

a) Phenol b) o-nitrophenol c) m-nitrophenol d) p-nitrophenol

778. The IUPAC name of $[Ni(NH_3)_4][NiCl_4]$ is

a) Tetrachloro nickel (II) – tetraammine nickel (II)

b) Tetraammine nickel (II) –tetrachloro nickel(II)

c) Tetraammine nickel (II) –tetrachloro nickelate(II)

d) Tetrachloro nickel (II) –tetraammine nickelate(0)

779. All ligands are:

a) Lewis acid b) Lewis base c) Neutral d) None of these

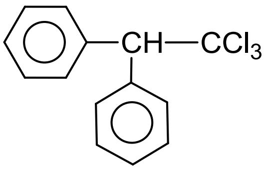
780. Aspirin is known as:

a) Phenyl salicylate b) Acetyl salicylate c) Methyl salicylic acid d) Acetyl salicylic acid

781. Which of the following has on optical isomer?

a) $[Co(NH_3)_3Cl]^+$ b) $[Co(en)(NH_3)_2]^{2+}$ c) $[Co(H_2O)_4(en)]^{3+}$ d) $[Co(en)_2(NH_3)_2]^{3+}$

782. The IUPAC name of the compound



is

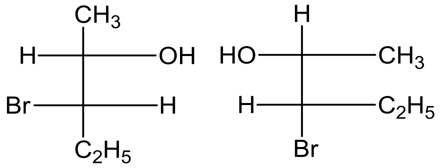
a) 1,1,1-trichloro-2,2-diphenyl ethane b) 2,4,5-trichloro hexanol

c) 2,2,2-trichloro bicyclo [4.4.0] nenone d) 2,2,2-trichloro-1,1-diphenyl ethane

783. The property by virtue of which a compound can rotate the plane of polarised light is known as

a) Polarisability b) Phosphorescence c) Optical activity d) Polarization

784. The molecules represented by the following two structures are



a) Epimers b) Diastereomers c) Enantiomers d) Identical

785. The IUPAC name of the coordination compound $K_3[Fe(CN)_6]$ is

a) Tripotassium hexacyanoiron (II) b) Potassium hexacyanoiron(II)

c) Potassium hexacyanoferrate (III) d) Potassium hexacyanoferrate (II)

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

a) $[Cr(NH_3)_6]^{3+}$ b) $[Co(NH_3)_6]^{3+}$ c) $[Ni(NH_3)_6]^{2+}$ d) $[Zn(NH_3)_6]^{2+}$

787. How many unpaired electrons are present in the central metal ion of $[CoCl_4]^{2-}$?

a) 3 b) 4 c) 5 d) 2

788. Show the coordination number of the metal ion, its oxidation number, the number of electrons in d-

orbitals and the number of unpaired electrons d-orbitals respectively in complex $[Co(H_2O)_4SO_3]Cl$.
a) 6, 3, 6, 4 b) 6, 3, 6, 0 c) 5, 3, 6, 4 d) 5, 3, 6, 0

789. Benzene reacts with.....to give acetophenone.
a) Acetyl chloride
b) Acetyl chloride in presence of anhy. $AlCl_3$
c) Anhy. $AlCl_3$
d) None of the above

790. Which group would you introduce into a drug or a dye to make it water soluble?
a) $—NO_2$ b) —Cl c) $—SO_3H$ d) —OH

791. In the coordination compound, $K_4[Ni(CN)_4]$,oxidation state of nickel is
a) -1 b) $+1$ c) 0 d) $+2$

792. The IUPAC name of $[Cr(NH_3)_4Cl_2]NO_3$ is:
a) Tetraaminodichlorochromium (I) nitrate
b) Tetraaminodichlorochromium (III) nitrate
c) Dichlorotetraamminechromium (III) nitrate
d) Tetraaminodichlorochromium (II) nitrate

793. Vanillin, used as a flavouring agent is:
a) An aliphatic alcohol b) An aromatic aldehyde c) A hydrocarbon d) A carbohydrate

794. Which of the following will exhibit optical isomerism?
a) $[Cr(en)(H_2O)_4]^{3+}$ b) $[Cr(en)_3]^{3+}$ c) $trans$-$[Cr(en)_2Cl_2]^+$ d) $[Cr(NH_3)_6]^{3+}$

795. Which one is a mixed ketone?
a) Benzophenone b) Benzenone c) Acetophenone d) Dibenzyl ketone

796. Transition metals can form complexes in:
a) Zero oxidation state b) Cation form c) Anion form d) All of these

797. Toluene on oxidation with air in presence of V_2O_5 yields:
a) Phenol b) Benzoic acid c) Benzaldehyde d) Benzyl alcohol

798. $[Pt((NH_3)_4]Cl_2$ is
a) Pyramidal b) Pentagonal c) Tetrahedral d) Square planar

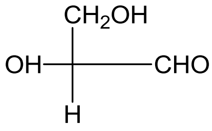
799. In $Fe(CO)_5$, the FE—C bond possess:
a) π-character only
b) Both σ and π-characters
c) Ionic character
d) σ-character only

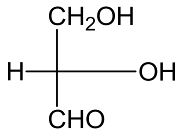
800. Which molecule has tetrahedral geometry?
a) $[Co(NH_3)_6]^{3+}$ b) $[Ni(CN)_4]^{2+}$ c) $Fe(CO)_5$ d) $[NiCl_4]^{2-}$

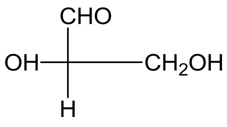
801. $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$ are the examples of:
a) Linkage isomerism
b) Geometrical isomerism
c) Ionization isomerism
d) Optical isomerism

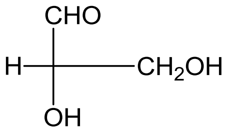
802. The compounds $R - NO_2$ and $R - ONO$ are
a) Geometrical isomers b) Functional isomers
c) Metamers d) Optical isomers

803. Which of the following Fischer projection formula is same as D-glyceraldehyde?

a)


b)


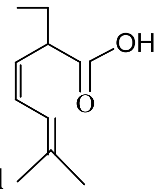
c)


d)


804. $[Fe(NO_2)_3Cl_3]$ and $[Fe(O— NO)_3Cl_3]$ shows
a) Linkage isomerism b) Geometrical isomerism

c) Optical isomerism
d) None of the above

805.



The IUPAC name of the compound is

a) 2-ethenyl-3-methyl cyclohexa-1, 3-diene
b) 2, 5-dimethyl hepta-2, 6-dienoic acid
c) 2, 6-dimethyl hepta-2, 5dienoic acid
d) 2, 3-dimethyl epoxyethane

806. When benzene sulphonic acid and p-nitrophenol are treated with $NaHCO_3$, the gases released respectively are:

a) SO_2, NO_2
b) SO_2, NO
c) SO_2, CO_2
d) NO_2, CO_2

807. Which of the following is non-ionizable?

a) $[Co(NH_3)_3Cl_3]$
b) $[Co(NH_3)_4Cl_2]Cl$
c) $[Co(NH_3)_5Cl]Cl_2$
d) $[Co(NH_3)_6]Cl_2$

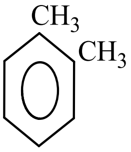
808. Increasing order of expected keto content

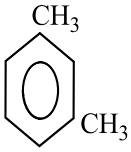
a) $CH_3COC_2H_5 > CH_3CHO > CH_3COCH_3 > CH_3COCH_2COCH_3$
b) $CH_3COCH_3 > CH_3CHO > CH_3COC_2H_5 > CH_3COCH_2COCH_3$
c) $CH_3CHO > CH_3COC_2H_5 > CH_3COCH_3 > CH_3COCH_2COCH_3$
d) $CH_3COCH_2COCH_3 > CH_3CHO > CH_3COCH_3 > CH_3COC_2H_5$

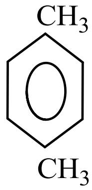
809. Which is colourless complex?

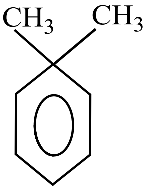
a) $Cu_2(CH_3COO)_4 \cdot H_2O$
b) Cu_2Cl_2
c) $CuSO_4 \cdot 5H_2O$
d) $[Cu(NH_3)_4]SO_4 \cdot SO_4 \cdot 4H_2O$

810. Which is not a reasonable structure for dimethyl benzene?

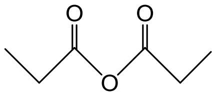
a) 

b) 

c) 

d) 

811.



The IUPAC name of the compound is

a) Propionic anhydride
b) Dipropanoic anhydride
c) Ethoxy propanoic acid
d) Propanoic anhydride

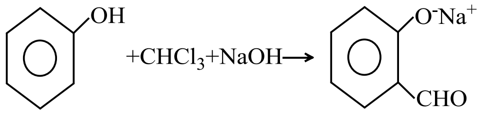
812. A mixture of benzene and aniline can be separated by:

a) Alcohol
b) Dil. HCl
c) Dil. NaOH
d) Hot water

813. The correct IUPAC name of the complex $Fe(C_5H_5)_2$ is

a) Cyclopentadienyl iron (II)
b) Bis (Cyclopentadienyl)iron (II)
c) Dicyclo pentadienyl ferrate (II)
d) Ferrocane

814.



The electrophile involved in the above reaction is:

a) dichloromethyl cation $(\overset{\oplus}{C}HCl_2)$
b) Dichlorocarbene $(:CCl_2)$
c) Trichloromethyl anion $(\overset{\ominus}{C}Cl_3)$
d) Formyl cation $(\overset{\oplus}{C}HO)$

815. Benzoyl Chloride is prepared from benzoic acid by:

a) Cl_2, hv b) SO_2Cl_2 c) $SOCl_2$ d) Cl_2, H_2O

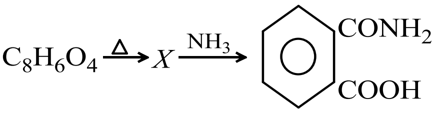
816. Which of the following ions forms most stable complex compound?
a) Fe^{3+} b) Mn^{2+} c) Ni^{2+} d) Cu^{2+}

817. Which one of the following cyano complexes would exhibit the lowest value of paramagnetic behaviour? (Atomic no. Cr=24, Mn=25, Fe=26, Co=27)
a) $[Co(CN)_6]^{3-}$ b) $[Fe(CN)_6]^{3-}$ c) $[Mn(CN)_6]^{3-}$ d) $[Cr(CN)_6]^{3-}$

818. Which of the following statements is not correct?
a) The complexes $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ differ in the state of hybridisation of nickel.
b) The complexes $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ differ in the magnetic properties.
c) The complexes $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ differ in geometry.
d) The complexes $[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ differ in primary valencies of nickel.

819. In the complexes $[Fe(H_2O)_6]^{3+}$, $[Fe(CN)_6]^{3-}$, $[Fe(C_2O_4)_3]^{3-}$ and $[FeCl_6]^{3-}$, more stability is shown by:
a) $[Fe(H_2O)_6]^{3+}$ b) $[Fe(CN)_6]^{3-}$ c) $[Fe(C_2O_4)_3]^{3-}$ d) $[FeCl_6]^{3-}$

820. In the reaction,



the intermediate 'X' is:
a) Phthalic anhydride b) Phthalic acid c) *o*-xylene d) Benzoic acid

821. Which of the following is π complex?
a) Trimethyl aluminium b) Ferrocene c) Diethyl zinc d) Nickel carbonyl

822. When phenol is reacted with chloroform and an alkali like NaOH, the compound formed is salicyladehyde. If we use pyrene in place of chloroform the product obtained is:
a) Salicyladehyde b) Phenolphthalein c) Salicylic acid d) Cyclohexanol

823. Among the properties (a) reducing (b) oxidizing (c) complexing, the set of properties shown by CN^- ion towards metal species is
a) B, c b) A, b, c c) C, a d) A, b

824. Which of the following is most powerful *meta* directing group?
a) $—NO_2$ b) $—SO_3H$ c) —CHO d) —COOH

825. Which among the following compounds will show metamerism?
a) $CH_3COC_3H_7$ b) $CH_3OC_2H_5$ c) $CH_3SC_2H_5$ d) CH_3OCH_3

826. The hybridization of $[PtCl_6]^{2-}$ ion is:
a) d^2sp^3 b) sp^2d^3 c) sp^3d d) sp^3d^2

827. The correct name of $[Pt(NH_3)_4Cl_2][PtCl_4]$ is
a) Tetrachloro platinum (II) dichloro tetrammine platinate
b) Dichloro tetremmine platinum (IV) tetrachloro platinate(II)
c) Tetrammine dichloro platinum (IV) tetrachloro platinate (II)
d) Tetrachloro platinum (II) tetrammine platinate (IV)

828. The oxidation state of iron in $K_4[Fe(CN)_6]$is
a) 1 b) 4 c) 3 d) 2

829. Formation of complex compound can be detected by:
a) Change in colour b) Change in solubility c) Change in pH d) All are correct

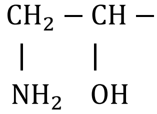
830. The complex that violates the EAN:
a) Potassium ferrocyanide
b) Potassium ferricyanide
c) Nickel carbonyl
d) Cobalt(III) hexaammine chloride

831. Chlorobenzene on heating with aqueous NH_3 under pressure in presence of Cu_2Cl_2 gives:
a) Aniline b) Benzamide c) *o*-dichlorobenzene d) Chloroaminobenzene

832. The complex, $[Pt(Py)(NH_3)BrCl]$ will have how many geometrical isomers?
a) 2
b) 3
c) 4
d) 0

833. Which one doesn't have π –bond?
a) Grignard reagent
b) Dibenzene chromium
c) Zeise's salt
d) Ferrocene

834. The IUPAC name of the compound



$$\underset{NH_2}{\underset{|}{CH_2}} - \underset{OH}{\underset{|}{CH}} - COOH$$

is
a) 1-hydroxy-2-aminopropanoic acid
b) 2-hydroxy-3-aminopropanoic acid
c) 3-amino-2-hydroxypropanoic acid
d) 2-hydroxy-1-aminopropanoic acid

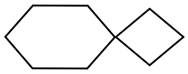
835. EDTA is a.....ligand.
a) Monodentate
b) Hexadentate
c) Bidentate
d) Tridentate

836. Thymol, a phenol derivative is mainly used as:
a) Germicide
b) Insecticide
c) Antibiotic
d) Fragrance compound and antiseptic

837. Which of the following complex has zero magnetic moment (spin only)?
a) $[Ni(NH_3)_6]Cl_2$
b) $Na_3[FeF_6]$
c) $[Cr(H_2O)_6]SO_4$
d) $K_4[Fe(CN)_6]$

838. Which compound is zero valent metal complex?
a) $[Ni(CO)_4]$
b) $K_3[Fe(CN)_6]$
c) $[Pt(NH_3)_2Cl_2]$
d) $[Cu(NH_3)_4SO_4]$

839.
The IUPAC name of



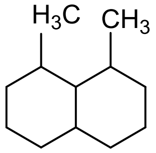
is
a) Bicyclo [5.5.0] nonane
b) Biphenyl
c) Cyclopropyl cyclohexane
d) Spiro [3.5] nonane

840. The tetrahedral crystal field splitting is only.....of the octahedral splitting.
a) 1/9
b) 2/9
c) 4/9
d) 5/9

841. IUPAC name of $[Co(ONO)(NH_3)_5]Cl_2$ is
a) Pentammine nitrocobalt (II) chloride
b) Pentammine nitrosocobalt (III) chloride
c) Pentammine nitritocobalt (III) chloride
d) Pentammine oxo-nitrocobalt (III) chloride

842. Point out the central ion ligand in the complex $K_2[Cd(CN)_4]$;
a) Cd^+, CN^{1-}
b) Cd^{2+}, CN^{1-}
c) Cd^{2+}, CN^{4-}
d) Cd^{2+}, CN^{2-}

843. Number of chiral centres in



is/are
a) 1
b) 2
c) 3
d) 4

844. From the equation, $3C_2H_2 \longrightarrow C_6H_6$, find the volume of acetylene (NTP) for the manufacture of 3 mole of benzene:
a) 67.2 litre
b) 134.4 litre
c) 201.6 litre
d) 33.8 litre

845. 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

846. Among $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$and $[NiCl_4]^{2-}$ species the hybridisation states of Ni atom are respectively:
a) sp^3, dsp^2, dsp^2 b) sp^3, dsp^2, sp^3 c) sp^3, sp^3, dsp^2 d) dsp^2, sp^3, sp^3

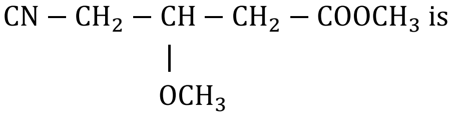
847. The chemical name of DDT is:
a) Dichloro dinitro toluene
b) Dichloro dimethyl toluene
c) p, p'-dichloro diphenyl trichloroethane
d) None of the above

848. The stability of complexes of Cu^{2+} , Ni^{2+}, Co^{2+} and Fe^{2+} varies in the order
a) $Cu^{2+} > Ni^{2+} > Co^{2+} > Fe^{2+}$ b) $Cu^{2+} > Fe^{2+} > Ni^{2+} > Co^{2+}$
c) $Ni^{2+} > Co^{2+} > Fe^{2+} > Cu^{2+}$ d) $Cu^{2+} < Ni^{2+} < Co^{2+} < Fe^{2+}$

849. The number of unpaired electrons in $Ni(CO)_4$ is
a) 0 b) 1 c) 3 d) 4

850. In sodium tetrafluorooxochromate(….), $Na_3[Cr(O)F_4]$ the left out place should be filled with which of the following roman numerals?
a) VI b) III c) IV d) None of these

851. The IUPAC name of compound



$$CN - CH_2 - \underset{\displaystyle OCH_3}{\underset{|}{CH}} - CH_2 - COOCH_3$$ is

a) 3-methoxy-4-cyano methyl butanoate b) Methyl-4-cyano-3-methoxy butanoate
c) 4-cyano-3-methoxy methyl butanoate d) Methyl-3-methoxy-4-cyano butanoate

852. Cumene is:
a) o-methyl phenol b) p-cresol c) Isopropyl benzene d) Phenyl n-propane

853. In Etard's reaction toluene is oxidised to benzaldehyde using:
a) H_2O_2
b) Cl_2
c) Chromium trioxide or CrO_2Cl_2
d) $KMnO_4$

854. Which of the following will exhibit geometrical isomerism?
a) Propene b) Butene-2
c) Butene-1 d) 1, 1-dichloro butane

855. Ferrocene is:
a) $Fe(\eta^5 - C_5H_5)_2$ b) $Fe(\eta^2 - C_5H_5)_2$ c) $Cr(\eta^5 - C_5H_5)_5$ d) $Os(\eta^5 - C_5H_5)_2$

856. Which one is an outer orbital complex?
a) $[Ni(NH_3)_6]^{2+}$ b) $[Mn(CN)_6]^{4-}$ c) $[Co(NH_3)_6]^{3+}$ d) $[Fe(CN)_6]^{4-}$

857. The pair of $[Co(SO_4)(NH_3)_5]Cl$ and $[CoCl(NH_3)_5]SO_4$ constitutes
a) Optical isomers b) Linkage isomers c) Coordination isomers d) Ionisation isomers

858. The IUPAC name of $K_2[Cr(CN)_2O_2(O)_2(NH_3)]$is
a) Potassiumammine dicyanodioxoperoxochromate (VI)
b) Potassiumammine cyanoperoxodioxochrometic (IV)
c) Potassiumammine dicyanodioxoperoxochromium (IV)
d) Potassiumammine dicyanodioxoperoxochromium (IV)

859. In spectrochemical series chlorine is above than water *i.e.*, $Cl > H_2O$, this is due to
a) Good π-acceptor properties of Cl
b) Strong σ −donor and good π-acceptor properties of Cl
c) Good π −donor properties of Cl
d) Larger size of Cl than H_2O

860. The type of isomerism shown by $[Co(en)_2(NCS)_2]Cl$ and $[Co(en)_2(NCS)Cl]NCS$ is:
a) Coordination b) Ionization c) Linkage d) All of these

861. Which ion shows only the coordination number 4 in complexes?

a) Pt^{2+}　　b) Cr^{3+}　　c) Fe^{3+}　　d) Pt^{4+}

862. The spin magnetic moment of cobalt in $Hg[Co(SCN)_4]$ is :

a) $\sqrt{3}$　　b) $\sqrt{8}$　　c) $\sqrt{15}$　　d) $\sqrt{24}$

863. Which of the following is not an isomer of but-1-yne?

a) But-2-yne
b) Buta-1-3-diene
c) Methyl cyclopropene
d) But-2-ene

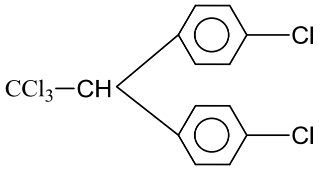
864. How many unpaired electrons are present in the central metal ion of $[CoCl_4]^{2-}$?

a) 2　　b) 3　　c) 4　　d) 5

865. The brown ring complex compound is formulated as $[Fe(H_2O)_5NO]SO_4$. The oxidation state of Fe is:

a) +1　　b) +2　　c) +3　　d) Zero

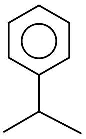
866. Correct IUPAC name of



is

a) Gammexane
b) Dichloro diphenyl trichloroethane
c) Diparachlorophenyl trichloroethane
d) 1,1,1-tirchloro-2,2-bis (4-chlorophenyl) ethane

867. IUPAC name of



is

a) Cumene
b) 2-phenyl propane
c) Phenyl propane
d) 1-(2-propyl) benzene

868. Which of the following gives violet colour with an alcoholic solution of $FeCl_3$?

a) Benzoic acid　　b) Toluene　　c) Salicylic acid　　d) Nitrobenzene

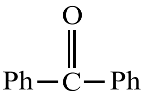
869. Which of the following is wrong statements?

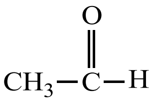
a) $Ni(CO)_4$, has zero oxidation number for Ni
b) $Ni(CO)_4$, has oxidation number +4 for Ni
c) Ni is metal
d) CO is gas

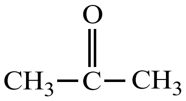
870. Which of the following represents a chelating ligand?

a) H_2O　　b) Cl^-　　c) OH^-　　d) DMG

871. The correct order of reactivity of PhMgBr with;


$Ph-\overset{\overset{O}{\|}}{C}-Ph$
(I)


$CH_3-\overset{\overset{O}{\|}}{C}-H$
(II)


$CH_3-\overset{\overset{O}{\|}}{C}-CH_3$
(III)

is:

a) $I > II > III$
b) $III > I > II$
c) $II > III > I$
d) $II > I > III$

872. Which of the following will give maximum number of isomers?

a) $[Co(NH_3)_4Cl_2]$　　b) $[Ni(en)(NH_3)_4]^{2+}$　　c) $[Ni(C_2O_4)(en)_2]$　　d) $[Cr(SCN)_2(NH_3)_4]^+$

873. CuCl reacts with KCN solution forming a complex. Coordination number of copper in the complex is:

a) 2　　b) 3　　c) 4　　d) 6

874. The terms stereoisomers, enantionmers and diastereomers will refer

a) Only to configurational isomers including geometric isomers
b) Only to configurational isomers
c) To both configurational as well as conformational isomers
d) To neither configuration nor conformational isomers

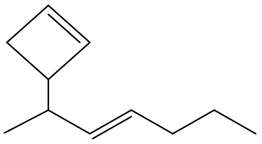
875. Aniline was acetylated. The product on nitration followed by alkaline hydrolysis gave:

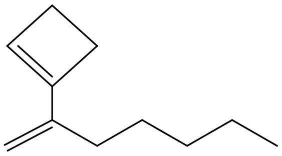
a) o-nitroacetanilide
b) o-and p-nitroaniline
c) m-nitroaniline
d) Acetanilide

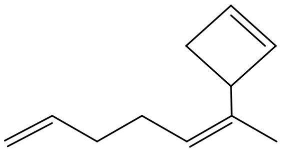
876. The IUPAC name of the compound $[CuCl_2(CH_3NH_2)_2$ is

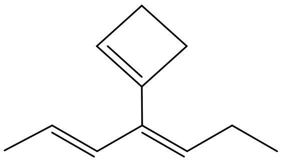
a) Dichloro bis (dimethyl amine) copper(II)
b) Dichloro bis (methyl amine) copper(II)
c) Dimethyl amine copper (II) chloride
d) Bis (dimethyl amine) copper (II) chloride

877. Which is the structure of compound 2-(1-cyclobutenyl)-1-hexene?

a)


b)


c)


d)


878. On explosion TNT gives:

a) $CO + N_2 + H_2 + CH_4 + CO_2$
b) $CO + N_2 + H_2$
c) $CO_2 + N_2 + H_2O$
d) $CO + N_2 + H_2O$

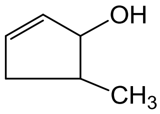
879. Hexafluoroferrate(III) ion is an outer orbital complex. The number of unpaired electrons present in it is:

a) 1
b) 5
c) 4
d) Unpredictable

880. The EAN of Fe in $K_3[Fe(CN)_6]$ is:

a) 36
b) 37
c) 38
d) 35

881. The IUPAC name of the compound



is

a) 4-methyl cyclopent-1-en-3-ol
b) 5-methyl cyclopent-2-en-1-ol
c) 2-methyl cyclopent-4-en-1-ol
d) 3-methyl cyclopent-1-en-2-ol

882. Which one amongst the following, exhibit geometrical isomerism?

a) $[Co^{III}(NH_3)_5Br]SO_4$
b) $Co^{III}[EDTA]^{1-}$
c) $[Cr^{III}(SCN)_6]^{3-}$
d) $[Pt^{II}(NH_3)_2Cl_2]$

883. Chiral molecules are those which are

a) Superimposable on their mirror images
b) Non-superimposable on their mirror images
c) Unstable molecules
d) Capable of showing geometrical isomerism

884. At room temperature the eclipsed and the staggered forms of ethane cannot be isolated because

a) Both the conformers are equally stable
b) They interconvent rapidly
c) There is a large energy barrier of rotation about the σ-bond
d) The energy difference between the conformers is large

885. 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

886. The IUPAC name of $Ni(CO)_4$ is:

a) Tetracarbonyl nickelate(0)
b) Tetracarbonyl nickelate(II)
c) Tetracarbonyl nickel(0)
d) Tetracarbonyl nickel(II)

887. 2-methyl phenol is:

a) o-cresol
b) Catechol
c) p-cresol
d) m-cresol

888. $NH_2 \cdot NH_2$ serves as:

a) Monodentate ligand b) Chelating ligand c) Bridging ligand d) Both (a) and (c)

889. For blasting purpose TNT is mixed with:
a) NH_4Cl b) NH_4NO_3 c) NH_4NO_2 d) $(NH_4)_2SO_4$

890. During the debromination of *meso*-dibromobutane, the major compound formed will be
a) *cis*-2-butene b) 1-butene c) *n*-butane d) *trans*-2-butene

891. The IUPAC name of $K_2[Cr(CN)_2O_2\ (O)_2(NH_3)]$ is
a) Potassium ammine dicyano dioxoperoxochromate (VI)
b) Potassium ammine cyano peroxodioxochromium(VI)
c) Potassium ammine cyano peroxodioxochromium(V)
d) Potassium ammine cyano peroxodioxochromatic (IV)

892. Benzene on reaction with a mixture of HNO_3 and H_2SO_4 followed by reaction of $Cl_2/FeCl_3$ gives:
a) 3-chloro-1-nitrobenzene
b) 2-chloro-1-nitrobenzene
c) 4-chloro-1-nitrobenzene
d) A mixture of 2-chloro and 4-chloro-1-nitrobenzene

893. The number of isomeric forms in which $[Co(NH_3)_4Cl_2]^+$ ion can occur is:
a) 2 b) 3 c) 4 d) 1

894. Nitration of benzene is:
a) Nucleophilic substitution
b) Electrophilic substitution
c) Electrophilic addition
d) Nucleophilic addition

895. Reimer-Tiemann reaction involves a:
a) Carbonium ion intermediate
b) Carbene intermediate
c) Carbanion intermediate
d) Free radical intermediate

896. Which does not have a carboxyl group?
a) Picric acid b) Ethanoic acid c) Aspirin d) Benzoic acid

897. In Cannizaro's reaction given below:

$$2PhCHO \xrightarrow{:\overset{\ominus}{O}H} PhCH_2OH + PhC\ddot{O}_2^{\ominus}$$

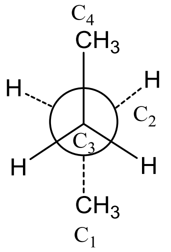
the slowest step is:
a) The transfer of hydride to the carbonyl group
b) The abstraction of proton from the carboxylic group
c) The deprotonation of $PhCH_2OH$
d) The attack of $:\overset{\ominus}{O}H$ at the carboxyl group

898. The oxidation state of Ag in Tollens' reagent is:
a) Zero b) +1 c) +2 d) +1.5

899. Hybridization of Fe in $[K_3Fe(CN)_6]$ is
a) sp^3 b) d^2sp^3 c) sp^3d^2 d) dsp^3

900. Which of the following is not isomeric with diethyl ether?
a) Methyl *n*-propyl ether b) Butan-1-ol
c) 2-methyl propan-2-ol d) Butan-2-one

901. In the given conformation C_2 is rotated about $C_2 - C_3$ bond anticlockwise by an angle of 120° then the conformation obtained is

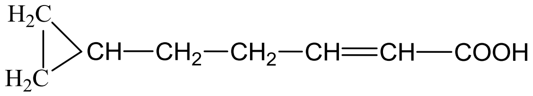


a) Fully eclipsed conformation b) Partially eclipsed conformation
c) Gauche conformation d) Staggered conformation

902. Crystal field stabilization energy for high spin d^4 octahedral complex is:
a) $-1.8\ \Delta_0$ b) $-1.6\ \Delta_0 + P$ c) $-1.2\ \Delta_0$ d) $-0.6\ \Delta_0$

903. Which kind of isomerism is exhibited by octahedral $[Co(NH_3)_4Br_2]Cl$?
a) Geometrical and ionisation
b) Geometrical and optical
c) Optical and ionisation
d) Geometrical only

904. The IUPAC name of the following compound is



a) 5-cyclopropyl pent-2-en-1-oic acid b) 6-cyclopropyl pent-2-en-1-oic acid
c) 5-cyclopropyl pent-1-en carboxylic acid d) 6-cyclopropyl pent-1-en carboxylic acid

905. Which of the following compounds will show a negative test with phenyl hydrazine?
a) Glucose b) Ethyl alcohol c) A cetaldehyde d) Benzophenone

906. Friedel-Craft's reaction is not possible in:
a) C_6H_5OH b) $C_6H_5C_2H_5$ c) $C_6H_5NO_2$ d) $C_6H_5CH_3$

907. The geometry of $Ni(CO)_4$ and $Ni(PPh_3)_2Cl_2$ are
a) Both square planar b) Tetrahedral and square planar respectively
c) Both tetrahedral d) Square planar and tetrahedral respectively

908. The number of isomers possible for square planar complex $K_2[PdClBr_2SCN]$ is:
a) 2 b) 3 c) 4 d) 6

909. The correct order for the wavelength of absorption in the visible region is
a) $[Ni(NO_2)_6]^{4-} < [Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+}$ b) $[Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+} < [Ni(NO_2)_6]^{4-}$
c) $[Ni(H_2O)_6]^{2+} < [Ni(NH_3)_6]^{2+} < [Ni(NO_2)_6]^{4-}$ d) $[Ni(NO_2)_6]^{4-} < [Ni(H_2O)_6]^{2+} < [Ni(NH_3)_6]^{2+}$

910. The IUPAC name of CCl_3CH_2CHO is
a) Chloral b) 1,1,1-trichloropropanol
c) 2,2,2-trichloropropanol d) 3,3,3-trichloropropanol

911. The coordination number of Cu in $[Cu(H_2O)_4]^{2+}$ complex is
a) 2 b) 1 c) 3 d) 4

912. Among the following, the correct statement is
a) Prefixes are written before the name of compound
b) Suffixes are written after the name of compound
c) The IUPAC name is always written as a single word
d) All of the above

913. In which of the following p-electrons of the halogens are not involved in delocalisation?
a) Chlorobenzene b) Bromobenzene c) Allyl chloride d) Vinyl chloride

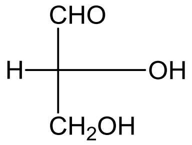
914. Which of the following does not have optical isomer?
a) $[Co(en)(NH_3)_2Cl_2]Cl$ b) $[Co(en)_2Cl_2]Cl$ c) $[Co(NH_3)_3Cl]$ d) $[Co(en)_3]Cl_3$

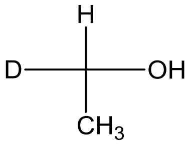
915. Ethylene diamine is an example of
a) Monodentate ligand b) Bidentate ligand c) Tridentate ligand d) Polydentate ligand

916. In chlorobenzene, the —Cl group:

a) Activates the benzene ring more via resonance effect than deactivating it via inductive effect
b) Deactivates the benzene ring more via inductive effect than activating it via resonance effect
c) Activates the benzene ring via resonance effect and deactivates it via inductive effect. Both these effects are more evenly matched
d) None of the above

917. The R-isomer among the following are


(i)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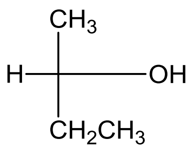
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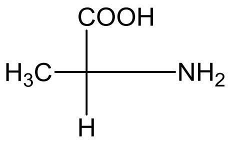

(iv)

a) (i) and (ii) b) (ii) and (iii) c) (iii) and (iv) d) (i) and (iii)

918. Which possesses tetrahedral shape (sp^3-hybridization of central atom)?
a) $[Zn(NH_3)_4]^{2+}$ b) $[Ni(CO)_4]$ c) $[Cd(NH_3)_4]^{2+}$ d) All are correct

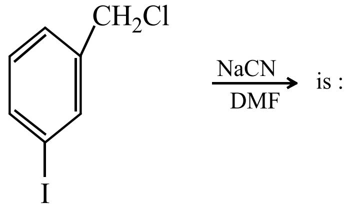
919. The reaction,
$C_6H_5CHO + CH_3CHO \xrightarrow{\text{Dil.NaOH}} C_6H_5CH{=}CHCHO$ is called:
a) Benzoin condensation
b) Claisen condensation
c) Perkin's reaction
d) Cannizaro's reaction

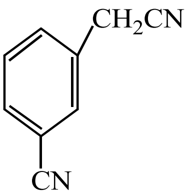
920. Complexation is shown by:
a) Ag b) Au c) Cu d) All of these

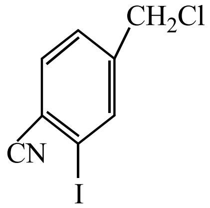
921. AgO in Ag(II) complex which is:
a) Diamagnetic b) Paramagnetic c) Ferromagnetic d) Neutral

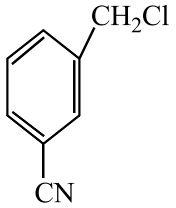
922. Acylation of benzene to produce aliphatic aromatic ketones is called:
a) Benzoin condensation
b) Hydroformylation
c) Friedel-Crafts reaction
d) None of these

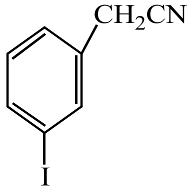
923. The structure of the major product formed in the given reaction



a) 

b) 

c) 

d) 

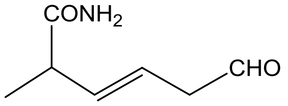
924. Chlorobenzene is prepared commercially by:
a) Grignard reaction b) Raschig process c) Wurtz - Fittig reaction d) Friedel-Crafts reaction

925. An aqueous solution of $CoCl_2$ on addition of excess of concentrated HCl turns blue to formation of
a) $[CoCl_4]^{2-}$ b) $[Co(H_2O)_2Cl_4]^{2-}$ c) $[Co(H_2O)_2 2Cl_4]^{2-}$ d) $[Co(H_2O)_4Cl_2]$

926. Which one of the following will not show geometrical isomerism?
a) $[Cr(NH_3)_4Cl_2]Cl$ b) $[Co(en)_2Cl_2]Cl$ c) $[Co(NH_3)_5NO_2]Cl_2$ d) $[Pt(NH_3)_2Cl_2]$

927. When ethyl benzoate is hydrolysed with aqueous alkali, the products present in the medium are:
a) $C_6H_5COOH, C_2H_5O^-$ b) $C_6H_5COO^-, C_6H_5OH$ c) C_2H_5OH, C_6H_5COOH d) $C_6H_5COO^-, C_2H_5O^-$

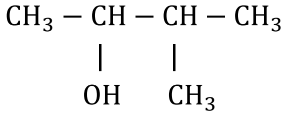
928. The IUPAC name of



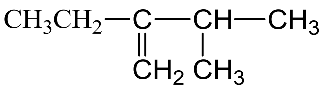
a) 2-carbamoyl hexanal b) 2-carbamoyl hex-3-en-1-al
c) 6-keto-2-methylhexanamide d) 5-formyl-2-methylpent-3-en-1-amide

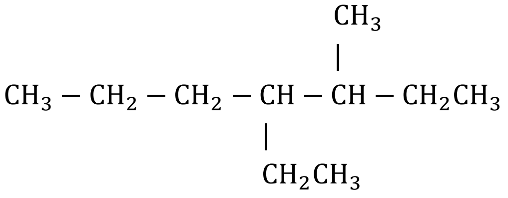
929. Which of the following is more basic than aniline?
a) *p*-Nitroaniline b) Benzylamine c) Diphenylamine d) Triphenylamine

930. Name of some compounds are given below. Which one is not in IUPAC system?

a) 
$CH_3-\underset{\mid \atop OH}{CH}-\underset{\mid \atop CH_3}{CH}-CH_3$
4-methyl-2-butanol

b) $CH_3-C\equiv C-CH(CH_3)_2$
4 methyl-2-pentyne

c) 
$CH_3CH_2-\underset{\| \atop CH_2}{C}-\underset{\mid \atop CH_3}{CH}-CH_3$
2 - ethyl-3- methyl - but -1- ene

d) 
$CH_3-CH_2-CH_2-\underset{\mid \atop CH_2CH_3}{CH}-\overset{CH_3 \atop \mid}{CH}-CH_2CH_3$
3-methyl-4-ethyl heptane

931. For which transition metal ions are low spin complexes possible?
a) Rh^{3+} b) Mn^{3+} c) Ru^{2+} d) All are correct

932. Which one is monodentate ligand?
a) F^- b) NO_2^- c) H_2O d) All are correct

933. Cyclic hydrocarbon molecule A has all the carbons and hydrogens in a single plane. All the carbon-carbon bonds are of same length and less than 1.54 Å and more than 1.34 Å. The C— C—C bond angle will be:
a) 120° b) 180° c) 100° d) $109^\circ28'$

934. Chlorine reacts with benzaldehyde to give:

a) Benzyl chloride b) Benzal chloride c) Benzoyl chloride d) Chlorobenzene

935. Phenol is:
- a) A base weaker than NH_3
- b) An acid stronger than carbonic acid
- c) An acid weaker than carbonic acid
- d) Neutral

936. Which one is example of octahedral complex?
a) $Cu(NH_3)_4^{2+}$ b) FeF_6^{3-} c) $Zn(NH_3)_4^{2+}$ d) $Ni(CN)_4^{2-}$

937. Which one of the following statement is correct?
- a) Ferric ions give a deep green precipitate on adding potassium ferrocyanide solution.
- b) On boiling a solution having K^+, Ca^{2+} and HCO_3^- ions, we get a precipitate of $K_2Ca(CO_3)_2$
- c) Manganese salt give a violet vortex test in reducing flame
- d) From a mixed precipitate of AgCl and AgI, ammonia solution dissolves only AgCl

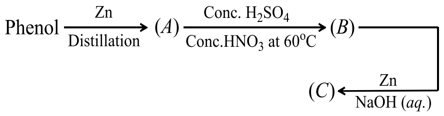
938. Which of the following fractions obtained in fractional distillation of coal-tar contains benzene and toluene?
- a) Light oil
- b) Heavy oil
- c) Middle oil
- d) Green oil

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

940. The C—C bond length in benzene is ……than C—C bond length in alkenes.
a) Less b) More c) Equal d) None of these

941. Which are generally used for preparing derivative of aldehydes and ketones?
- a) Hydroxylamine hydrochloride
- b) 2,4-dinitrophenylhydrazine
- c) Phenylhydrazinehydrochloride
- d) All of the above

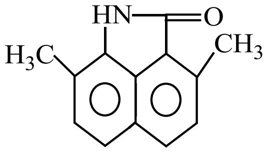
942. In the reaction,



The compounds (A), (B) and (C) are the following:
- a) Benzene, nitrobenzene and aniline
- b) Benzene, dinitrobenzene and m-nitroaniline
- c) Toluene, m-nitrobenzene and m-toluidine
- d) Benzene, nitrobenzene and hydrazobenzene

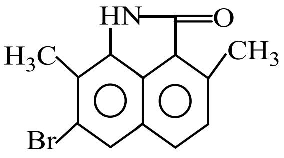
943. En is an example of a:
a) Monodentate ligand b) Bidentate ligand c) Tridentate ligand d) Hexadentate ligand

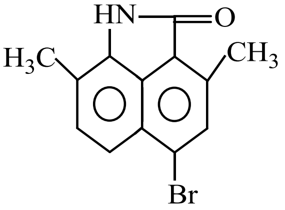
944. The major product obtained when Br_2/Fe is treated with

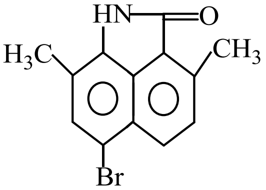


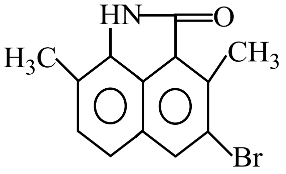
is:

a)

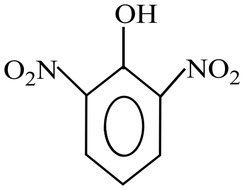


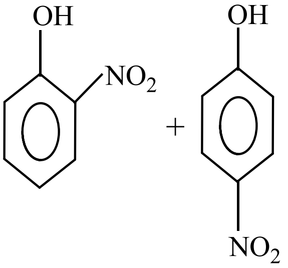
b) 

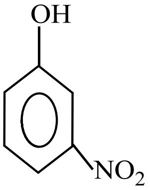
c) 

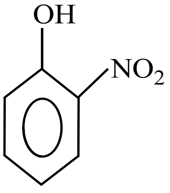
d) 

945. Phenol on treatment with dil. HNO_3 at room temperature gives:

a) 

b) 

c) 

d) 

946. In an octahedral structure, the pair of *d*-orbitals involved in $d^2\ sp^3$ hybridisation is

a) $d_{x^2-y^2}, d_{z^2}$
b) $d_{xz}, d_{x^2-y^2}$
c) d_{z^2}, d_{xz}
d) d_{xy}, d_{yz}

947. In which of the following ions has the metal atom EAN as 36?

a) $[Fe(CN)_6]^{4-}$
b) $[Fe(CN)_6]^{3-}$
c) $[PbCl_4]^{2-}$
d) $[Pd(CN)_6]^{2-}$

948. The number of ions given by $K[Pt(NH_3)_5Cl_5]$ in aqueous solution is:

a) 2
b) 3
c) 4
d) 1

949. CuCl is sparingly soluble in H_2O but it dissolves in KCl solution due to the formation of:

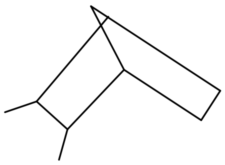
a) $K_2(CuCl_4)$
b) $K_3(CuCl_4)$
c) $K(CuCl_2)$
d) None of these

950. A characteristics group test for phenolic gp. is:

a) Libermann's nitroso reaction
b) Coupling with diazonium salt
c) $aq.\ FeCl_3$

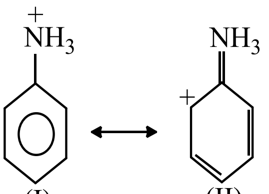
d) All of the above

951. Write the IUPAC name of the compound



a) 5, 6-dimethyl bicyclo [2,2,1] heptane
b) 2, 3-dimethyl bicyclo [2,2,1] heptane
c) 2, 3-dimethyl bicyclo [1,2,2] heptane
d) 3, 4-dimethyl bicyclo [2,1,2] heptane

952. Choose the correct statement from the ones given below for two anilium in:



(I) (II)

a) II is not an acceptable canonical structure because carbonium ions are less stable than ammonium ions
b) II is not an acceptable canonical structure because it is non-aromatic
c) II is not an acceptable canonical structure because the nitrogen has 10 valence electrons
d) II is an acceptable canonical structure

953. Which of the following statements is/are incorrect?
a) Metamerism belongs to the category of structural isomerism
b) Tautomeric structures are the resonating structures of a molecule
c) The violet colouration produce by a molecule with neutral ferric chloride solution indicates the presence of enolic group in the molecule
d) Geometrical isomerism is not shown by alkenes

954. Gives are (i) cyclohexanol; (ii) acetic acid; (iii) 2, 4, 6-trinitrophenol; and (iv) phenol. In these the order of decreasing acidic character will be:
a) (iii)>(ii)>(iv)>(i)
b) (ii)>(iii)>(i)>(iv)
c) (ii)>(iii)>(iv)>(i)
d) (iii)>(iv)>(ii)>(i)

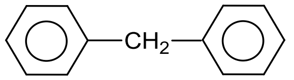
955. Phenol and benzoic acid can be distinguished by:
a) Aqueous $NaHCO_3$
b) Aqueous $NaNO_3$
c) Aqueous NaOH
d) Conc. H_2SO_4

956. The functional groups – OH, $-COOH$, $-CHO$, $-OCH_3$ attached to a chiral carbon is in the preference order
a) $OH > COOH > CHO > OCH_3$
b) $OCH_3 > OH > CHO > COOH$
c) $OCH_3 > OH > COOH > CHO$
d) $OCH_3 > COOH > CHO > OH$

957. The hypothetical complex chloro diaquatriammine cobalt(II) chloride can be represented as:
a) $[CoCl(NH_3)_3(H_2O)_2]Cl_2$
b) $[Co(NH_3)_3(H_2O)Cl_3]$
c) $[Co(NH_3)_3(H_2O)_2Cl]$
d) $[Co(NH_3)_3(H_2O)_3]Cl_3$

958. Which is expected to be paramagnetic?
a) $[Ni(H_2O)_6]^{2+}$
b) $[Ni(CO_4)]$
c) $[Zn(NH_3)_4]^{2+}$
d) $[Co(NH_3)_6]^{3+}$

959. The molecular formula of diphenyl methane

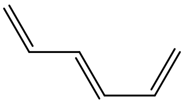


is $C_{13}H_{12}$

How many structural isomers are possible when one of the hydrogen is replaced by a chlorine atom?
a) 8
b) 7
c) 6
d) 4

960. Among the properties (A)reducing, (B) oxidising (C) complexing , the set of properties shown by CN^-ion towards metal species is
a) A, B
b) B, C
c) C, A
d) A, B, C

961.



In the double bonds are
a) cis, cis
b) $cis, trans$
c) $trans, cis$
d) $trans, trans$

962. The reaction of toluene with Cl_2 in presence of $FeCl_3$ gives 'X' and the reaction in presence of light gives 'Y'.Thus, 'X' and 'Y' are:
a) X=benzal chloride; $Y = o$-chlorotoluene
b) $X = m$-chlorotoluene; $Y = p$-chlorotoluene
c) $X = o$-and p-chlorotouene; Y=trichloro methyl benzene
d) X =benzal chloride; $Y = m$-chlorotoluene

963. Among the following four compounds:
a) Phenol b) Methyl phenol c) $meta$-nitrophenol d) $para$-nitrophenol

964. Which gives phthalic anhydride on reaction with hot, conc. H_2SO_4 in presence of Hg?
a) Naphthalene b) Phenol c) p-xylene d) m-xylene

965. *Cis-trans*-isomerism is found in square planar complexes of the molecular formula: (a and b are monodentate ligands)
a) Ma_4 b) Ma_3b c) Ma_2b_2 d) Mab_3

966. Which ion produces a small crystal field splitting (a weak ligand field)?
a) I^- b) Cl^- c) F^- d) All of these

967. Benzene undergoes substitution reaction more easily than addition because:
a) It has a cyclic structure
b) It has three double bonds
c) It has six hydrogen atoms
d) Of resonance

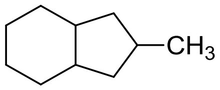
968. Isomers have essentially identical
a) Structural formula b) Chemical properties
c) Physical properties d) Molecular formula

969. Which of the following pair is not correctly matched?
a) Absorption peak for $[Cr^{III}(NH_3)_6]^{3+} = 21680\ cm^{-1}$
b) Effective atomic no. of Pt in $[PtCl_6]^{2-} = 84$
c) Crystal field stabilization energy of d^2 in weak ligand field $= (-)0.8\ \Delta_0$
d) Example of weak ligand field for d^5configuration $= [Mn^{II}F_6]^{4-}$

970. Aspirin (or acetyl salicylic acid) is obtained by action of CH_3COCl with:
a) Salicylic acid b) Phenol c) Benzaldehyde d) Aniline

971. CuCl dissolves in ammonia forming a complex. The coordination number of copper in the complex is:
a) 1 b) 2 c) 4 d) 6

972. IUPAC name of the following cycloalkane is



a) 8-methyl bicyclo [4,3,0] nonane b) 1-methyl bicyclo [4,3,0] nonane
c) 3-methyl bicyclo [4,3,0] nonane d) 4-methyl bicyclo [4,3,0] nonane

973. Schiff's bases are formed when aniline is condensed with:
a) Phenols b) Aromatic aldehydes c) Aryl chlorides d) Aliphatic alcohols

974. Which of the following is not an organometallic compound?
a) Zeise' s salt b) TEL c) Sodium ethoxide d) Ferrocene

975. Molecular formula $C_5H_{12}O$ will show
a) Position
b) Optical isomerism
c) Functional isomerism
d) All of these

976. Both Co^{3+} and Pt^{4+}have a coordination number of six. Which of the following pairs of complexes will show approximately the same electrical conductance for their 0.001 M aqueous solutions?
a) $CoCl_2.4NH_3$ and $PtCl_4.4NH_3$ b) $CoCl_3.3NH_3$ and $PtCl_4.5NH_3$
c) $CoCl_3.6NH_3$ and $PtCl_4.5NH_3$ d) $CoCl_3.6NH_3$ and $PtCl_4.3NH_3$

977. Which of the following is not an organometallic compound?

a) Sodium ethoxide b) Trimethyl aluminium
c) Tetraethyl lead d) Ethyl magnesium bromide

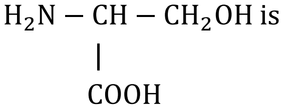
978. The number of water molecule(s) directly bonded to the metal centre in $CuSO_4 .5H_2O$ is

a) 1 b) 2 c) 3 d) 4

979. The formula of sodium nitroprusside is:

a) $Na_4[Fe(CN)_5NO_2]$ b) $Na_2[Fe(CN)_5NO]$ c) $NaFe[Fe(CN)_6]$ d) $Na_2[Fe(CN)_6NO_2]$

980. The IUPAC name of the compound



$H_2N - \underset{\underset{COOH}{|}}{CH} - CH_2OH$ is

a) 2-amino-2-carboxy pentanol b) 1-amino-2-hydroxy propanoic acid
c) 1-hydroxy-2-amino-3-propanoic acid d) 2-amino-3-hydroxy propanoic acid

981. Which of the following complex species does not involve inner orbital hybridisation?

a) $[CoF_6]^{3-}$ b) $[Co(NH_3)_6]^{3+}$ c) $[Fe(CN)_6]^{3-}$ d) $[Cr(NH_3)_6]^{3+}$

982. The EAN of nickel in $K_2[Ni(CN)_4]$ is:

a) 35 b) 34 c) 36 d) 38

983. The type of isomerism shown by, 6,6'-disitrodiphenic acid is

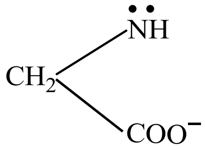
a) Conformational b) Optical c) Geometrical d) Functional

984. Which one of the following compounds forms benzoic acid on oxidation?

a) Chlorophenol b) Benzylchloride c) Chlorobenzene d) Chlorotoluene

985. Glycinato ligand is:

a)



b) Bidentate ligand
c) Two donor sites N and O^-
d) All of the above

986. Which one is the most likely structure of $CrCl_3 \cdot 6H_2O$, if 1/3 of total chlorine of the compound is precipitated by adding $AgNO_3$ to its aqueous solution?

a) $CrCl_3 \cdot 6H_2O$
b) $[Cr(H_2O)_3Cl_3] \cdot (H_2O)_3$
c) $[CrCl_2(H_2O)_4] \cdot Cl \cdot 2H_2O$
d) $[CrCl(H_2O)_5]Cl_2 \cdot H_2O$

987. Carbon in benzene undergoes sp^2-hybridization and the bond angle is 120°. The shape of benzene molecule is:

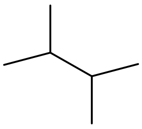
a) Linear b) Planar c) Pyramidal d) Planar hexagonal

988. The example of coordination isomerism is

a) $[Co\ (NH_3)_6]\ [Cr(CN)_6]$ and $[Cr(NH_3)_6]\ [Co(CN)_6]$ b) $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)_5SO_4]Br$
c) $Co(NH_3)_5NO_3]SO_4$and $[Co(NH_3)_5SO_4]NO_3$ d) $[Pt(NH_3)_4Cl_2]Br_2$ and $[Pt(NH_3)_4Br_2]Cl_2$

989. Coordination compounds have great importance in biological systems. In this context which of the following statement is incorrect?

a) Haemoglobin is the red pigment of blood and contains iron
b) Cyanocobalamin is B_{12} and contains cobalt
c) Chlorophylls are green pigments in plants and contains calcium
d) Carbocypeptidase-A an enzyme and contains zinc

990. The IUPAC name of the given structure  H is

a) Diisohexane b) Isohexane c) 2, 2-dimethylbutane d) 2, 3-dimethylbutane

991. Aniline on treating with phosgene gives:

a) Phenyl isocyanate b) A secondary base c) A neutral substance d) A tertiary base

992. On boiling with conc. hydrobromic acid, phenylethylether will yield:

a) Phenol and ethyl bromide
b) Bromobenzene and ethanol
c) Phenol and ethane
d) Bromobenzene and ethane

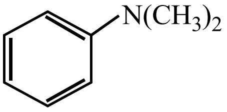
993. Ammonia gas does not evolve from the complex $FeCl_3.4NH_3$ but is gives white precipitate with aqueous solution of $AgNO_3$. Coordination number of central metal ion in above complex is six. Give IUPAC name of the complex.

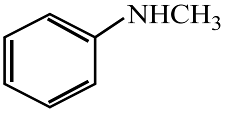
a) Ammonium trichloro triammine ferrum(III) b) Tetra ammine ferrum (III) chloride
c) Dichloro tetraammine ferrate (II) chloride d) Dichloro tetraammine ferrum (III) chloride

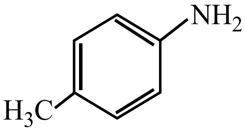
994. Nickel (Z=28) combines with a uninegative monodentate ligand X^- to form a paramagnetic complex$[NiX_4]^{2-}$. The number of unpaired electron (s) in the nickel and geometry of this complex ion are respectively

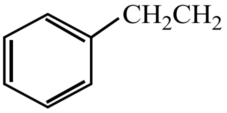
a) One , tetrahedral b) Two , tetrahedral c) One , square planar d) Two, square planar

995. Amongst the compounds given, the one that would form a brilliant coloured dye on treatment with $NaNO_2$ in dil. HCl followed by addition to an alkaline solution of β-naphthol is:

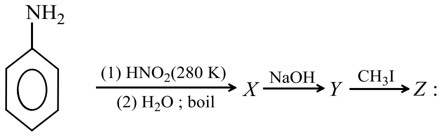
a) 

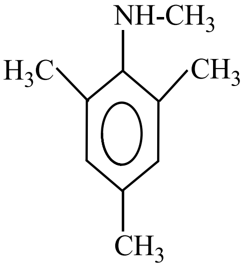
b) 

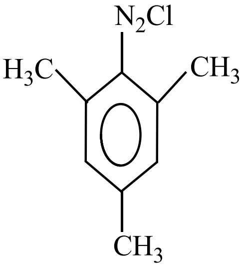
c) 

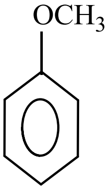
d) 

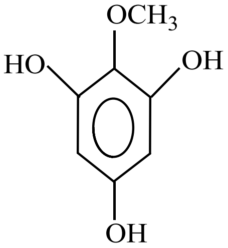
996. Identify 'Z' in the reaction given below;



a) 

b) 

c) 

d) 

997. A solution containing 2.675 g of $CoCl_3.6NH_3$ (molar mass =267.5 g mol^{-1}) is passed through a cation exchanger. The chloride ions obtained in solution were treated with excess of $AgNO_3$ to give 4.78 g of AgCl (molar mass=143.5 g mol^{-1}). The formula of the complex is
(Atomic mass of Ag=108 u)

a) $[Co(NH_3)_6]Cl_3$ b) $[CoCl_2(NH_3)_4]Cl$ c) $[CoCl_3(NH_3)_3]$ d) $[CoCl(NH_3)_5]Cl_2$

998. $[Cr(H_2O)_6]^{3+}$ ion has d-electrons equal to:

a) 2 b) 3 c) 4 d) 5

999. Enol form is more stable in

a) CH_3CHO b) CH_3COCH_3
c) $CH_3COCH_2COOC_2H_5$ d) Cyclohexanone

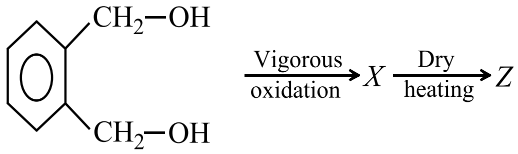
1000. The coordination number of cobalt in $[Co(en)_2Br_2]Cl_2$ is:

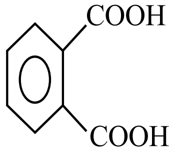
a) 2 b) 4 c) 6 d) 8

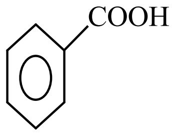
1001. Which one readily accepts a proton?

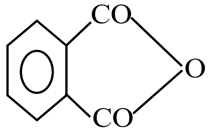
a) Acetylene b) Nitrobenzene c) Aniline d) Phenol

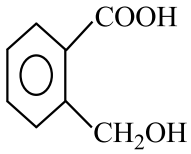
1002. Identify 'Z' in the reaction;



a) 

b) 

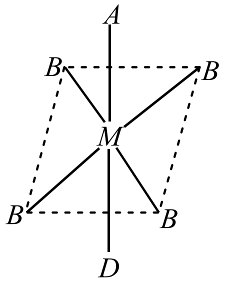
c) 

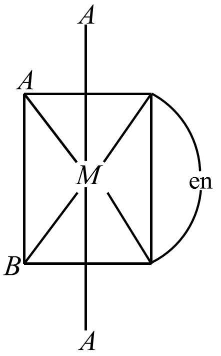
d) 

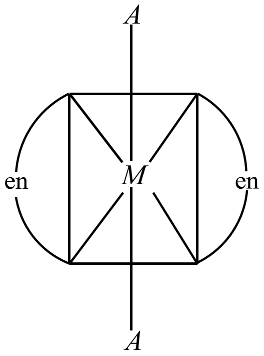
1003. The number of σ and π-bonds in a molecule of benzene is:

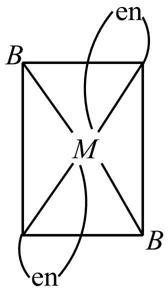
a) 6σ and 9π b) 9σ and 3π c) 12σ and 3π d) 6σ and 6π

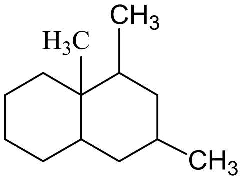
1004. The phenomenon of optical activity will be shown by:

a) 

b) 

c) 

d) 

1005. The correct name of the compound  is

a) 1,3,4-trimethyldecaline
b) 1,3,9-trimethyldecaline
c) 1,8,10-trimethyldecaline
d) 1,3,10-trimethyldecaline

1006. If NH_4OH is added to the $(PtCl_4)^{2-}$ ion, the complex formed represents:

a) Zero dipole
b) Finite dipole
c) Infinite dipole
d) All of these

1007. Which one of the following will be able to show *cis-trans*-isomerism?

a) M_{A_3B}
b) $M_{(AA')_2}$
c) M_{A_2BCD}
d) M_{A_4}

(AA' is unsymmetrical bidentate ligand, $ABCD$ are unidentate ligands.)

1008. The coordination number of a metal in coordination compound is

a) Same as primary valency
b) Sum of primary and secondary valencies
c) Same as secomdary valency
d) None of the above

1009. The IUPAC name of $K_4[Ni(CN)_4]$ is

a) Tetrapotassium tetracyanonickelate (II)
b) Potassium tetracyanonickel (II)
c) Potassium tetracyanonickelate (0)
d) Potassium tetracyanonickelate (II)

1010. Which of the following compounds shows optical isomerism?

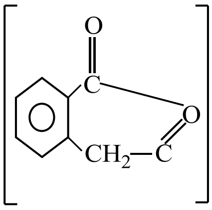
a) $[Co(CN)_6]^{3-}$
b) $[Cr(C_2O_4)_3]^{3-}$
c) $[ZnCl_4]^{2-}$
d) $[Cu(NH_3)_4]^{2+}$

1011. $[C_6H_5]_2Pd(SCN)_2]$ and $[(C_6H_5)_2Pd(NCS)_2]$ are:

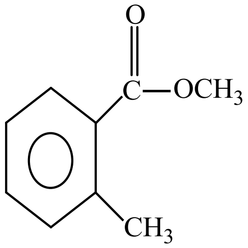
a) Linkage isomers
b) Coordination isomers
c) Ionization isomers
d) Geometrical isomers

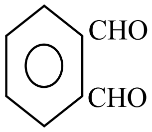
1012. Mark the correct statement

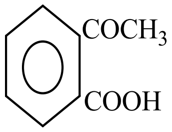
a) Ethane has two conformations of which staggered conformation is more stable than the eclipsed conformation
b) Ethane has an infinite number of conformations of which eclipsed conformation is more stable than the staggered conformation
c) Ethane has an infinite number of conformation of which staggered conformation has the maximum energy
d) Ethane has an infinite number of conformation of which the staggered conformation is possessed by majority of the molecules at room temperature

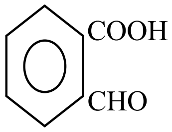
1013. Lactone  Can be obtained by which

Of the following on heating with alkali followed with acid hydrolysis?

a) 

b) 

c) 

d) 

1014. Which among the following will be named as dibromidobis (ethylene diamine) chromium (III) bromide?

a) $[Cr(en)_2Br_2]Br$
b) $[Cr(en)Br_4]^-$
c) $[Cr(en)Br_2]Br$
d) $[Cr(en)_3]Br_3$

1015. Which one of the following complex is an outer orbital complex?
(Atomic no. Mn=25, Fe=24, Co=27, Ni=28)

a) $[Fe(CN)_6]^{4-}$
b) $[Mn(CN)_6]^{4-}$
c) $[Co(NH_3)_6]^{3+}$
d) $[Ni(NH_3)_6]^{2+}$

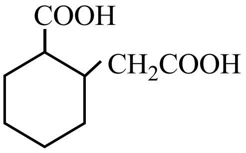
1016. Benzene can be directly obtained from:

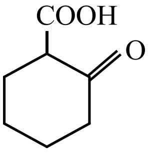
a) $CH \equiv CH$
b) $CH_2=CH_2$ and butadiene
c) Chlorobenzene
d) All of the above

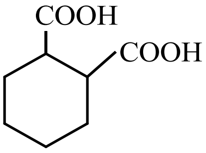
1017. Chlorobenzene on treatment with Raney nickel or Al in presence of alkali gives:

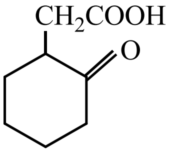
a) Benzene
b) Chlorophenol
c) Phenol
d) None of these

1018. The compound that undergoes decarboxylation most readily under mild condition is:

a) 

b) 

c) 

d) 

1019. Which ion is paramagnetic?

a) $[Ni(NH_3)_4]^{2+}$
b) $[Ni(CO)_4]$
c) $[Co(NH_3)_6]^{3+}$
d) $[Ni(CN)_4]^{2-}$

1020. Which kind of isomerism is exhibited by octahedral $[Co(NH_3)_4Br_2Cl]$?

a) Geometrical and ionization
b) Geometrical only
c) Geometrical and optical
d) Optical and ionisation

1021. Resorcinol and conc. H_2SO_4 in presence of phthalic anhydride produce a compound which is:

a) A dye
b) An antiseptic
c) An indicator
d) A detergent

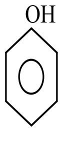
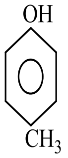
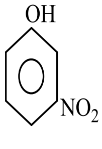
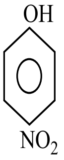
1022. Which of the following compounds shows optical isomerism?

a) $[Cr(C_2O_4)_3]^{3-}$ b) $[Cu(NH_3)_4]^{2+}$ c) $[Co(CN)_6]^{3-}$ d) $[ZnCl_4]^{2-}$

1023. The IUPAC name of $[Co(NH_3)_6]Cl_3$ is

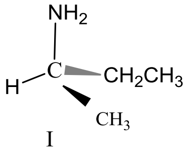
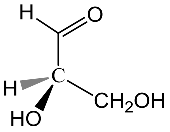
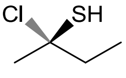
a) Hexamine cobalt (II) chloride
b) Triammine cobalt (III) trichloride
c) Hexamine cobalt (III) chloride
d) None of the above

1024. In the following compounds, the order of acidity is:


(I)

(II)

(III)

(IV)

a) III $> IV > I > II$ b) I $> IV > III > II$ c) II $> I > III > IV$ d) IV $> III > I > II$

1025. Consider the following structure and choose the correct statements

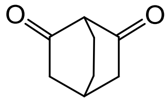

I

II

III

a) I and II have R-configuration
b) I and III have R-configuration
c) Only III has S-configuration
d) Both (a) and (c) are correct

1026. Benzaldehyde, when heated with concentrated KOH solution, gives:

a) $C_6H_5CH_2OH$
b) C_6H_5COOH
c) C_6H_5COOK
d) Mixture of C_6H_5COOK and $C_6H_5CH_2OH$

1027. Write the IUPAC name of the compound



a) Bicyclo-[2.2.2] octane-2,6-dione
b) Bicyclo-[2.2.2] octane-3,5-dione
c) Bicyclo –[2.2] octane 2,6-dione
d) Bicyclo [2,2] octane-3,5-dione

1028. 3-chloro-4-methyl benzene sulphonic acid on steam distillation gives:

a) Toluene b) m-chloro benzene sulphonic acid c) p-methyl benzene sulphonic acid d) o-chloro toluene

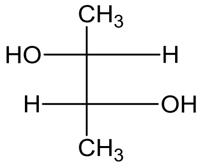
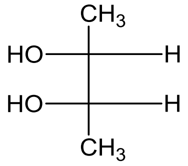
1029. The oxidation number of platinum in $[Pt(NH_3)_5Cl]Cl_3$ is

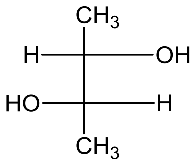
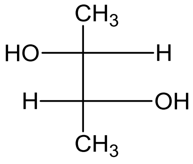
a) 2 b) 3 c) 4 d) 6

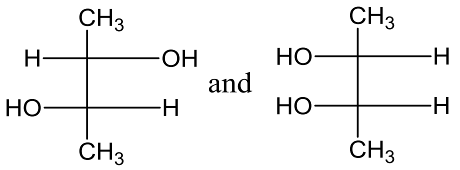
1030. Which of the following is not an organometallic compound?

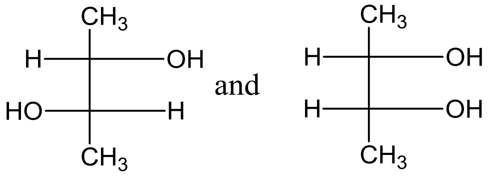
a) C_2H_5ONa b) CH_3Mgl c) Tetraethyl tin d) KC_4H_9

1031. Which of the following pairs of compounds are enantiomers?

a)  and 

b)  and 

c) 

d) 

1032. Which complex has square planar shape dsp^2-hybridization?

a) $[Ni(CN)_4]^{2-}$ b) $[Cu(NH_3)_4]^{2-}$ c) $[PtCl_4]^{2-}$ d) All of these

1033. The complex used as an anticancer agent is

a) cis-$[PtCl_2(NH_3)_2]$ b) Na_2CO_3
c) $trans$-$[Co(NH_3)_3Cl_3]$ d) cis-$K_2[PtCl_2Br_2]$

1034. Dyes are formed when diazonium salts react with:

a) Phenols
b) Aldehydes
c) Ketones
d) Alcohols

1035. Potassium ferrocyanide is a

a) Complex salt b) Double salt c) Normal salt d) Mixed salt

1036. The primary and secondary valencies of chromium in the complex ion, dichlorodioxalatochromium (III) , are respectively.

a) 3,4 b) 4,3 c) 3,6 d) 6,3

1037. The reaction, $C_6H_6 + CH_3Cl \xrightarrow[AlCl_3]{Anhydrous} C_6H_5CH_3 + HCl$
is an example of:

a) Friedel-Craft's reaction
b) Kolbe's synthesis
c) Wurtz's reaction
d) Grignard synthesis

1038. The correct statement related to IUPAC nomenclature is

a) If 2 or more chains of equal length are seen in the compound then the chain with minimum number of side chains will be preferred
b) If double and triple bonds are at symmetrical positions in a compound then triple bond gets lower preference
c) Correct IUPAC name of $CH_3COC_2H_5$ is ethyl methyl ketone
d) As far as possible, the IUPAC name of a compound is written as a single word

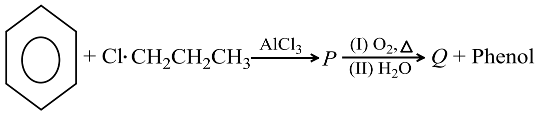
1039. Which of the following isomerism is shown by ethyl acetoacetate?

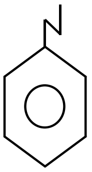
a) Geometrical isomerism b) Keto-enol tautomerism
c) Enantiomerism d) Diastereoisomerism

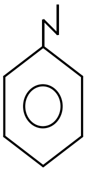
1040. The number of moles of ions given on complete ionisation of one mole of $[Co(NH_3)_6]Cl_3$ is/are

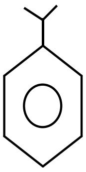
a) 4 b) 3 c) 2 d) 1

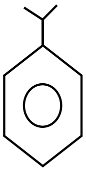
1041. The major products (P, Q) in the given reaction are:



a)  and CH_3CHO

b)  and CH_3COCH_3

c)  and CH_3COCH_3

d)  and CH_3CH_2CHO

1042. p-nitrophenol is stronger acid than phenol because nitro group is:

a) Electron withdrawing b) Electron donating c) Basic d) Acidic

1043. Among the following group, which deactivates benzene ring for electrophilic substitution:

a) Methyl b) Amino c) Hydroxyl d) Chlorine

1044. Iron has lowest oxidation state in:

a) $Fe(CO)_5$
b) Fe_2O_3
c) K_2feO_4
d) $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$

1045. The dihedral angle between the two methyl groups in Gauch conformation of n butane is

a) 120° b) 180° c) 45° d) 60°

1046. Increasing order of acid strength among p-methoxyphenol, p-methylphenol and p-nitrophenol is:

a) p-methylphenol < p-methoxyphenol < p-nitrophenol
b) p-methoxyphenol < p-methylphenol < p-nitrophenol
c) p-nitrophenol < p-methoxyphenol < p-methylphenol
d) p-nitrophenol < p-methylphenol < p-methoxyphenol

1047. Total number of isomeric alcohols with formula $C_4H_{10}O$ are

a) 1 b) 2 c) 3 d) 4

1048. What is the IUPAC name of $Na_2[Fe(CN)_5NO]$?

a) Pentacyanonitroso sodium ferrate b) Pentacyanonitroso sodium ferrate(II)
c) Sodium pentacyanonitroso ferrate(II) d) Sodium pentacyanonitroso ferrate

1049. Which of the following cations does not form an ammine complex with excess of ammonia?

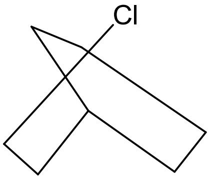
a) Ag^+ b) Cu^{2+} c) Cd^{2+} d) Na^+

105 In the complex $K_2[Fe(CN)_6]$

0.

a) The complex is high spin complex
b) Both Fe atoms are in the same oxidation state
c) The coordination number of iron is 4
d) Both Fe atoms are in different oxidation state

105 The number of chiral carbon atoms present in the molecule
1.



is

a) 3
b) 4
c) 2
d) 1

105 The complex that doesn't give a precipitate with $AgNO_3$ solution
2.

a) $[Co(NH_3)_33Cl_3]$
b) $[Co(NH_3)_6]Cl_3$
c) $[Ag(NH_3)_2]Cl$
d) $[Cr(NH_3)_4Cl_2]Cl$

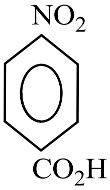
105 The IUPAC name of the given compound $[Co(NH_3)_5Cl]Cl_2$ is
3.

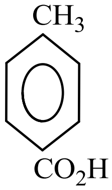
a) Penta amino cobalt chloride chlorate
b) Cobalt penta ammine chloro chloride
c) Pentamine chloro cobalt (III) chloride.
d) Penta amino cobalt (III) chlorate

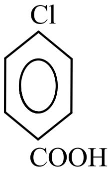
105 Amongst $Ni(CO)_4$, $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$
4.

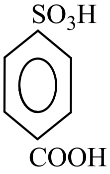
a) $Ni(CO)_4$ is diamagnetic,$[NiCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$ are paramagnetic
b) $Ni(CO)_4$ and $[NiCl_4]^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$is paramagnetic
c) $Ni(CO)_4$ and $[Ni(CN)_4]^{2-}$ are diamagnetic and $[NiCl_4]^{2-}$ is paramagnetic
d) $[NiCl_4]^{2-}$and $[Ni(CN)_4]^{2-}$ are diamagnetic and $Ni(CO)_4$ is paramagnetic

105 Which aromatic acid among the following is weaker than simple benzoic acid?
5.

a) 

b) 

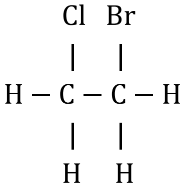
c) 

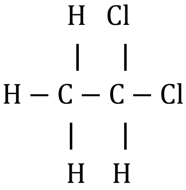
d) 

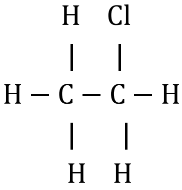
105 Which statement is incorrect?
6.

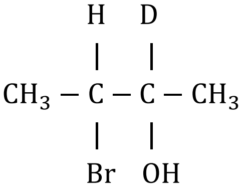
a) $Ni(CO)_4$-tetrahedral, paramagnetic
b) $[Ni(CN)_4]^{2-}$-square planar, diamagnetic
c) $Ni(CO)_4$-tetrahedral, diamagnetic
d) $[NiCl_4]^{2-}$ -tetrahedral, paramagnetic

105 Which of the following has asymmetric C-atom?
7.

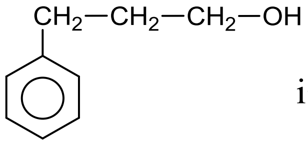
a) 
$\mathrm{H-\underset{H}{\overset{Cl}{C}}-\underset{H}{\overset{Br}{C}}-H}$

b) 
$\mathrm{H-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{Cl}{C}}-Cl}$

c) 
$\mathrm{H-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{Cl}{C}}-H}$

d) 
$\mathrm{CH_3-\underset{Br}{\overset{H}{C}}-\underset{OH}{\overset{D}{C}}-CH_3}$

105 The IUPAC name of
8.



is

a) 1-phenyl-3-propanol
b) 3-phenyl-1-propanol
c) 1-hydroxy-3-phenyl-propane
d) None of the above

105 The complexes $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$ are the examples of which type of

9. isomerism?

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

1060. Racemic tartaric acid is optically inactive due to

a) External compensation
b) Internal compensation
c) Presence of plane of symmetry
d) All of the above

1061. Nitration of aniline is done in:

a) Acidic medium
b) Alkaline medium
c) Neutral medium
d) In acidic medium by first converting it into acetanilide before nitration

1062. A bridging ligand possesses:

a) Polydentate or monodentate nature
b) Two or more donor centres
c) The tendency to get itself attached to two metal ions
d) All of the above

1063. What is the neutralization equivalent of benzoic acid?

a) 122
b) 61
c) 244
d) 488

1064. m-chlorobenzaldehyde on reaction with conc. KOH at room temperature gives:

a) Potassium m-chlorobenzoate and m-hydroxy benzaldehyde
b) m-hydroxybenzaldehyde and m-chlorobenzylalcohol
c) m-chlorobenzylalcohol and m-hydroxy benzylalcohol
d) Potassium m-chlorobenzoate and m-chlorobenzyl alcohol

1065. The oxidation number of Fe in brown ring $[Fe(H_2O)_5NO]^{2+}$ is

a) 0
b) +1
c) +2
d) +3

1066. $[Cr(H_2O)_6]Cl_3$ (at. No. of Cr=24) has a magnetic moment of 3.83 BM. The correct distribution of $3d$-electrons in the chromium of the complex:

a) $3d^1_{xy}, 3d^1_{yz}, 3d^1_{xz}$
b) $3d^1_{xy}, 3d^1_{yz}, 3d^1_{z^2}$
c) $(3d^1_{x^2-y^2}), 3d^1_{z^2}, 3d^1_{xz}$
d) $3d^1_{xy}, (3d^1_{x^2-y^2}), 3d^1_{yz}$

1067. Excess of silver nitrate solution is added to 100 mL of 0.01 M pentaaqua chloro chromium (III) chloride solution. The mass of silver chloride obtained in grams is [Atomic mass of silver is 108].

a) 287×10^{-3}
b) 143.5×10^{-3}
c) 143.5×10^{-2}
d) 287×10^{-2}

1068. The total number of possible structural isomers of the compound $[Cu^{II}(NH_3)_4][Pt^{II}Cl_4]$ are:

a) 3
b) 5
c) 4
d) 6

1069. A similarity between optical and geometrical isomerism is that :

a) Each gives equal number of isomers for a given compound
b) If in a compound one is present then so is the other
c) Both are included in stereoisomerism
d) They have no similarity

1070. In $[Ni(NH_3)_4]SO_4$, the valency and coordination number of Ni will be respectively

a) 3 and 6 b) 4 and 4 c) 4 and 2 d) 2 and 4

1071. C_6H_5CHO is different from aliphatic aldehyde in its reaction towards:

a) Tollen's reagent b) Schiff's reagent c) $NaHSO_3$ d) Fehling's solution

1072. Oxidation of naphthalene by acidic $KMnO_4$ gives:

a) Toluene b) Benzaldehyde c) Phthalic acid d) Benzoic acid

1073. The number of possible theoretical conformations of n-butane are

a) Two b) Three c) Four d) Infinite

1074. Which is correct order for acidic nature of following acids?

(I) PhCOOH (II) o - $NO_2C_6H_4COOH$

(III) p - $NO_2C_6H_4COOH$ (IV) m- $NO_2C_6H_4COOH$

a) $II > III > IV > I$ b) $II > IV > III > I$ c) $II > IV > I > III$ d) $I > II > III > IV$

1075. Salicylic acid when treated with zinc dust gives:

a) Phenol b) Salicyladehyde c) Benzene d) Benzoic acid

1076. Action of PCl_5 on salicylic acid produces:

a) o-chlorobenzoyl

b) o-hydroxybenzoyl chloride

c) o-chlorobenzoic acid

d) None of the above

1077. Which of the following species is most stable?

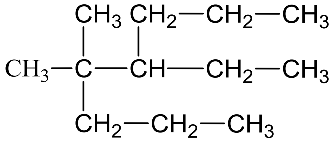
a) $p\text{-}O_2N{-}C_6H_4{-}\overset{+}{C}H_2$

b) $C_6H_5{-}\overset{+}{C}H_2$

c) $p\text{-}Cl{-}C_6H_4{-}\overset{+}{C}H_2$

d) $p\text{-}CH_3O{-}C_6H_4{-}\overset{+}{C}H_2$

1078. Give the IUPAC name of the following



$CH_3{-}C(CH_3)(CH_2{-}CH_2{-}CH_3){-}CH(CH_2{-}CH_2{-}CH_3){-}CH_2{-}CH_3$

a) 5-ethyl-4, 4-dimethyloctane b) 4-ethyl-5, 5-dimetyloctane

c) 3-ethyl-2-methyl-2-propyl hexane d) 4-ethyl-5-methyl, 5-propyl hexane

1079. Which of the following reacts with KCN to form benzoin?

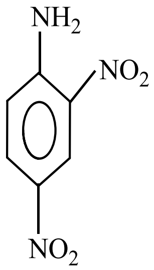
a) C_6H_5CHO b) C_6H_5Cl c) C_2H_5Cl d) $C_6H_5CH_3$

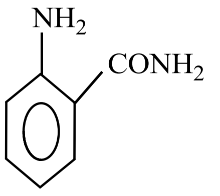
1080. Which one is an organometallic compound in the following?

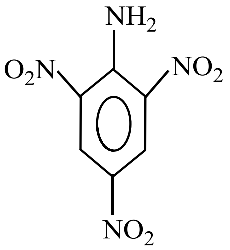
a) C_2H_5ONa b) $C_2H_5{-}S{-}S{-}C_2H_5$

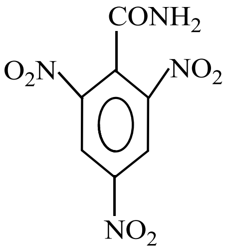
c) $Al_2(CH_3)_6$ d) $Al(C_6H_5S)_3$

1081. The formula of picramide is:

a) 

b) 

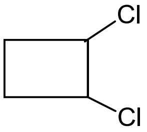
c) 

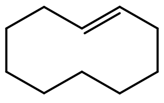
d) 

1082. An alkane forms isomers if minimum number of C-atom is:

a) 1
b) 2
c) 3
d) 4

1083. Which will form geometrical isomers?

a) 

b) $CH_3CH = NOH$
c) 
d) All of these

1084. Choose the option which show correct preferential order of groups among the following

a) $-COOH, -CHO, -OH, -NH_2$
b) $-NH_2, -OH, CHO, -COOH$
c) $-COOH, -OH, -NH_2, -CHO$
d) $-COOH, -NH_2, -CHO, -OH$

1085. The number of precipitable halide ions in $[Pt(NH_3)Cl_2Br]Cl$ is:

a) 2
b) 3
c) 4
d) 1

1086. Which of the following is polycyclic compound?

a) Xylene
b) Cumene
c) Styrene
d) Naphthalene

1087. Among acetic acid, phenol and n-hexanol, which of the compound(s) will react with $NaHCO_3$ solution to give sodium salt and CO_2?

a) Acetic acid and phenol
b) Acetic acid
c) Phenol
d) n-hexanol

1088. Nitrosobenzene can be isolated from nitrobenzene under:

a) Metal and acid
b) Zn dust and NH_4Cl
c) Alkaline sodium arsenite
d) None of the above

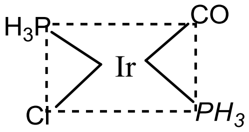
1089. Which of the following complexes is an outer orbital complex?

a) $[Fe(CN)_6]^{4-}$
b) $[Co(NH_3)_6]^{3+}$
c) $[Ni(NH_3)_6]^{2+}$
d) None of these

1090. In which of the following complex ion, the central metal ion is in a state of $sp^3\,d^2$ hybridisation?

a) $[Co(F_6)]^{3-}$
b) $[Co(NH_3)_6]^{3+}$
c) $[Fe(CN)_6]^{3-}$
d) $[Cr(NH_3)_6]^{3+}$

1091. Give name of the complex, name should specify the position of ligands



a) Bis*trans*phosphinecarbonylchloroiridium [II]
b) Carbonylchlorobis*trans*phosphineiridium[III]
c) Carbonylchlorobis*trans*phosphineiridium[I]
d) Chlorocarbonylbis*trans*phosphineiridium [I]

109 The function of anhydrous aluminium chloride in the Friedel-Crafts reaction is:

2.

a) To absorb water
b) To absorb hydrochloric acid
c) To produce an electrophile
d) To produce nucleophile

1093. Coordination isomerism is caused by interchange of ligands between the

a) Complex cation and complex anion
b) Inner sphere and outer sphere
c) Low oxidation and higher oxidation states
d) *cis* and *trans* structure

1094. Which aldehyde is used in the manufacture of perfumes?

a) Cinnamaldehyde
b) Salicyladehyde
c) Benzaldehyde
d) None of these

1095. Which of the following statements is not correct?

a) A *meso* compound has chiral centres but exhibits no optical activity
b) A *meso* compound has no chiral centres and thus are optically inactive
c) A *meso* compound has molecules in which one half of molecule is superimposable on the other even through chiral centre is present in them
d) A *meso* compound is optically inactive because the rotation caused by one half of molecule is cancelled by the rotation produced by another half

1096. The volume (in mL) of 0.1 M $AgNO_3$ required for complete precipitation of chloride ions present in 30 mL of 0.01 M solution of $[Cr(H_2O)_5Cl]Cl_2$, as silver chloride is close to

a) 3
b) 4
c) 5
d) 6

1097. Benzene is a resonance hybrid mainly of two Kekule structures. Hence:

a) Half of the molecules correspond to one structure, and half to the second structure
b) At low temperatures benzene can be separated into two structures
c) Two structures make equal contribution to resonance hybrid
d) An individual benzene molecule changes back and forth between two structures

1098. Keto form is more stable in

a) $CH_3COCH_2COOC_2H_5$
b) $CH_3COCH_2COCH_3$
c) CH_3COCH_3
d) $CH_3COCH_2COC_2H_5$

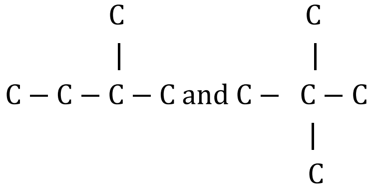
1099. The oxidation state and effective atomic number(EAN) of cobalt $(CoF_6)^{2-}$ are respectively

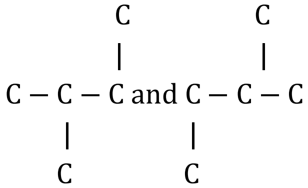
a) 3 and 36
b) 4 and 35
c) 4 and 37
d) 2 and 35

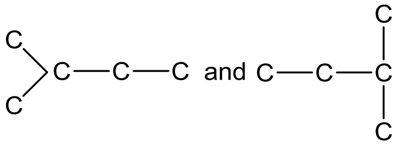
1100. Benzamide on reaction with $POCl_3$ gives:

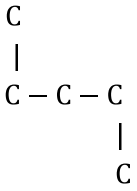
a) Aniline
b) Chlorobenzene
c) Benzylamine
d) Benzonitrile

1101. Which pair of carbon skeleton is an example of isomerism?

a) 
$C-C-\overset{C}{\overset{|}{C}}-C$ and $C-\overset{C}{\overset{|}{\underset{C}{\underset{|}{C}}}}-C$

b) 
$C-\underset{C}{\underset{|}{C}}-\overset{C}{\overset{|}{C}}$ and $\underset{C}{\underset{|}{C}}-\overset{C}{\overset{|}{C}}-C$

c) 

d) $C-C-C-C-C$ and 
$\overset{C}{\overset{|}{C}}-C-\underset{\underset{C}{|}}{C}$

1102. Electrolytic reduction of nitrobenzene in weak acidic medium gives:

a) Aniline
b) *p*-hydroxy aniline
c) Nitrobenzene
d) *N*-phenyl hydroxyl amine

1103. In complexes, metal atom acts as:

a) Lewis base
b) Bronsted acid
c) Bronsted base
d) Lewis acid

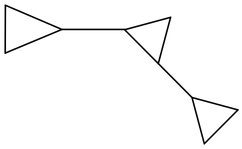
1104. When benzene is treated with concentrated HNO_3 at room temperature it will give:

a) CO_2 and H_2O
b) Nitrochlorobenzene
c) Dark red colour
d) Dinitrobenzene

1105. Which of the following compounds exhibit linkage isomerism?

a) $[Co(en)_3]Cl_3$
b) $[Co(NH_3)_6][Cr(CN)_6]$
c) $[Co(en)_2NO_2Cl]Br$
d) $[Co(NH_3)_5Cl]Br_2$

1106. The compound



have IUPAC name as

a) Tricyclopropyl
b) Tricyclopropane
c) 1,1', 2', 1''-tercyclo propane
d) None of the above

1107. The most stable conformation of chlorohydrin at room temperature is

a) Fully eclipsed
b) Partially eclipsed
c) Gauche
d) Staggered

1108. Among $Ni(CO)_4$, $[Ni(CN)_4]^{2-}$ and $[Ni(Cl)_4]^{2-}$:

a) $[Ni(CO)_4]$, $[NiCl_4]^{2-}$ are diamagnetic and $[Ni(CN)_4]^{2-}$ is paramagnetic
b) $[NiCl_4]^{2-}$, $[Ni(CN)_4]^{2-}$ are diamagnetic and $[Ni(CO)_4]$ is paramagnetic
c) $[Ni(CO)_4]$, $[Ni(CN)_4]^{2-}$ are diamagnetic and $[NiCl_4]^{2-}$ is paramagnetic
d) $[Ni(CO)_4]$ is diamagnetic and $[NiCl_4]^{2-}$, $[Ni(CN)_4]^{2-}$ are paramagnetic

1109. The complex $Hg[Co(CNS)_4]$ is correctly named as:

a) Mercury tetrathiocyanatocobaltate(II)
b) Mercury cobalt tetrasulphocyano(II)
c) Mercury tetrasulphocyanidecobaltate(II)
d) Mercury sulphocyanatocobalt(II)

1110. Which of the following compounds is not coloured?

a) $Na_2[CuCl_4]$
b) $Na_2[CdCl_4]$
c) $K_4[Fe(CN)_6]$
d) $K_3[Fe(CN)_6]$

111 Which one has square planar geometry?

1.

a) $[CoCl_4]^{2-}$ b) $[FeCl_4]^{2-}$ c) $[NiCl_4]^{2-}$ d) $[PtCl_4]^{2-}$

1112. Which exhibits highest molar conductivity?

a) $[Co(NH_3)_6]Cl_3$ b) $[Co(NH_3)_5Cl]Cl_2$ c) $[Co(NH_3)_4Cl_2]Cl$ d) $[Co(NH_3)_3Cl_3]$

1113. Coordination compounds have great importance in biological systems. In this context which of the following statement is incorrect?

a) Chlorophyll is green pigment in plants and contain calcium.
b) Haemoglobin is the red pigment of blood and contains iron.
c) Cyanocobalamin is vitamin B_{12} and contains cobalt.
d) Carboxypeptidase-A is an enzyme and contains zinc.

1114. Complex salt can be made by the combination of $[Co^{III}(NH_3)_5Cl]^x$ with

a) Cl^- b) $2Cl^-$ c) PO_4^{3-} d) $2K^+$

1115. Which of the following pairs represents linkage isomers?

a) $[Cu(NH_3)_4][PtCl_4]$ and $[Pt\,(NH_3)_4][CuCl_4]$ b) $[Pd(PPh_3)_2\,(NCS)_2]$ and $[Pd(PPh_3)_2\,(SCN)_2]$
c) $[Co(NH_3)_5]NO_3SO_4$ and $[Co(NH_3)_5SO_4]NO_3$ d) $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)_4]Cl_2$

1116. The reaction products of $C_6H_5OCH_3 + HI \xrightarrow{\Delta}$ is:

a) $C_6H_5OH + CH_3I$ b) $C_6H_5I + CH_3OH$ c) $C_6H_5CH_3 + HOI$ d) $C_6H_6 + CH_3OI$

1117. An aromatic amine (A) was treated with alcoholic potash and another compound (Y) when a foul smeling gas was formed with formula C_6H_5NC. (Y) was formed by reacting a compound (Z) with Cl_2 in the presence of slaked lime. Compound (Z) is:

a) $C_6H_5NH_2$ b) CH_3OH c) CH_3COCH_3 d) $CHCl_3$

1118. Chlorine is most reactive in:

a) CH_3Cl b) $CH_2{=}CHCl$ c) C_6H_5Cl d) $C_6H_5CH_2Cl$

1119. The C—C bond order in benzene is close to:

a) 1.5 b) 2.5 c) 3.0 d) 6.0

1120. Mixture $X = 0.02$ mole of $[Co(NH_3)_5SO_4]Br$ and 0.02 mole of $[Co(NH_3)_5Br]SO_4$ was prepared in 2 L of solution

1 L of mixture X + excess $AgNO_3 \longrightarrow Y$
1 L of mixture X + excess $BaCl_2 \longrightarrow Z$
Number of moles of Y and Z are

a) 0.01, 0.01 b) 0.01,0.02 c) 0.02, 0.01 d) 0.02, 0.02

1121. Phenol can be converted into salicylic acid by:

a) Etard's reaction
b) Kolbe's reaction
c) Reimer-Tiemann reaction
d) Both (b) and (c)

1122. $Fe_2(CO)_9$ is diamagnetic. Which of the following reasons is correct?

a) Presence of one CO as bridge group
b) Presence of monodentate ligand
c) Metal-metal (Fe-Fe) bond in molecule
d) Resonance hybridization of CO

112 The formula of dichlorobis (urea) copper(II) is:

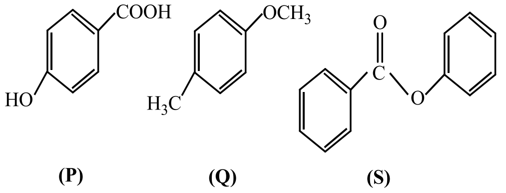
3.

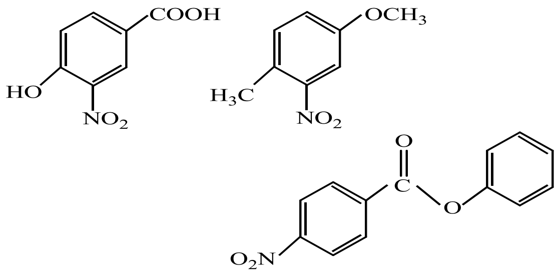
a) $[CuO = C(NH_2)_2]Cl_2$
b) $[CuCl_2\{O = C(NH_2)\}]$
c) $[Cu\{O = C(NH_2)_2\}Cl]Cl$
d) $[CuCl_2][O = C(NH_2)_2]H_2$

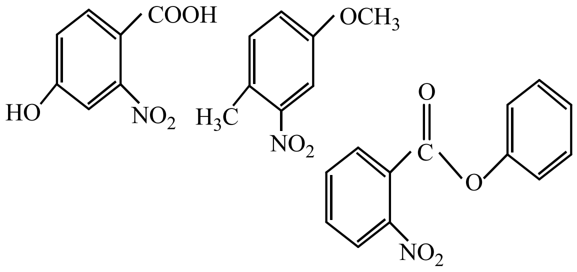
1124. Which of the following facts about the complex $[Cr(NH_3)_6]Cl_3$ is wrong?

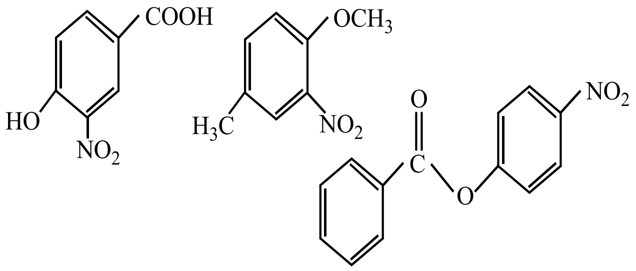
a) The complex involves d^2sp^3 hybridisation and is octahedral in shape.
b) The complex is paramagnetic.
c) The complex is an outer orbital complex.
d) The complex gives white precipitate with silver nitrate solution.

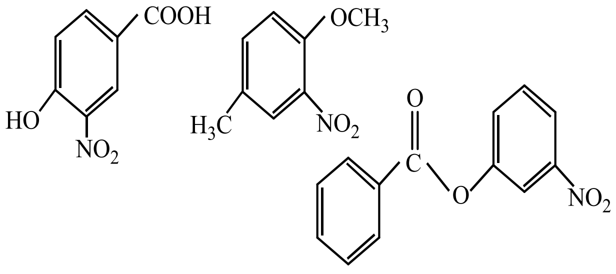
1125. The compounds P, Q and S were separately subjected to nitration using HNO_3/H_2SO_4 mixture. The major product formed in each case respectively, is:



a)


b)


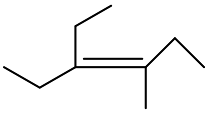
c)


d)


1126. Aromaticity of benzene is due to:

a) Ring
b) Three double bonds
c) Delocalisation of π-electrons

d) None of the above

1127. The IUPAC name of  is

a) 2, 2, 4, 4-tetramethyl pentane
b) 2, 2-dimethyl propane
c) 4-ethyl-3-methyl hex-3-ene
d) Ethyl isopropyl ethene

1128. Phenol is heated with a solution of mixture of KBr and $KBrO_3$. The major product obtained in the above reaction is:

a) 2-bromophenol
b) 3-bromophenol
c) 4-bromophenol
d) 2,4,6-tribromophenol

1129. The coordination number of a central metal atom in a complex is determined by

a) The number around a metal ion bonded by pi-bonds
b) The number of only anionic ligands bonded to the metal ion
c) The number of ligands around a metal ion bounded by sigma and pi-bonds both
d) The number of ligands around a metal ion bonded by sigma bonds

1130. The true statement about benzene is:

a) Because of unsaturation benzene easily undergoes additions
b) There are two types of C—C bonds in benzene molecule
c) There is a cyclic delocalisation of π-electrons in benzene
d) Monosubstitution of benzene gives three isomeric products

1131. Which reagent can convert $\rangle CO$ group to $\rangle C(C_6H_5)OH$?

a) C_6H_5OH
b) $C_6H_5CH_2OH$
c) C_6H_5MgBr
d) C_6H_5Cl

1132. Which has highest paramagnetism?

a) $[Cr(H_2O)_6]^{3+}$
b) $[Fe(H_2O)_6]^{2+}$
c) $[Cu(H_2O)_6]^{2+}$
d) $[Zn(H_2O)_6]^{2+}$

1133. Which is not true ligands metal complex?

a) Larger the ligand, the more stable is the metal-ligand complex
b) Highly charged ligand forms stronger bonds
c) Larger the permanent dipole moment of ligand, the more stable is the bond
d) Greater the ionization potential of central metal, the stronger the bond

1134. $[Co(NH_3)_4Cl_2]NO_2$ and $[Co(NH_3)_4Cl \cdot NO_2]Cl]$ are

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

1135. Acetophenone on oxidation by perbenzoic acid gives phenyl acetate. The reaction is named as:

a) Baeyer-Villiger oxidation
b) Perkin's reaction
c) Claisen condensation
d) Reformatsky reaction

1136. Friedel-Craft's reaction does not occur in case of:

a) Toluene
b) Benzene
c) Naphthalene
d) pyridine

1137. One mode of a complex compound $Co(NH_3)_5Cl_3$ gives three moles of ions on dissolution in water. One of the same complex reacts with two moles of $AgNO_3$ solution to yield two moles of $AgCl(s)$. The structure of the complex is

a) $[Co(NH_3)_3Cl_3] \cdot 2NH_3$
b) $[Co(NH_3)_4Cl_2] \cdot Cl \cdot NH_3$
c) $[Co(NH_3)_4Cl]Cl_2 \cdot NH_3$
d) $[Co(NH_3)_5Cl]Cl_2$

1138. C_6H_6 is a very good industrial solvent for:

a) Oil b) Fat c) Rubber d) All of these

1139. Salol is used as:

a) Antiseptic b) Antipyretic c) Both (a) and (b) d) None of these

1140. Presence of nitro gp. in benzene ring:

a) Deactivates the ring for S_E reaction
b) Activates the ring for S_E reactions
c) Renders the ring basic
d) Deactivates the ring for S_N reaction

1141. Which of the following complexes will show geometrical as well as optical isomerism? (en =ethylene diamine)

a) $[Pt(NH_3)_2Cl_2]$ b) $[Pt(NH_3)_2Cl_4]$ c) $[Pt(en)_3]^{4+}$ d) $[Pt(en)_2Cl_2]$

1142. The huge number of organic compounds is due to the fact that

a) Tetravalency of carbon b) Carbon possesses property of catenation
c) Carbon compounds exhibits polymerisation d) Both (b) and (c)

1143. When nitrobenzene is treated with Br_2 in presence of $FeBr_3$, the major product formed is m-bromonitrobenzene. Statements which are related to obtain the m-isomer are:

a) The relative electron density on $meta$ carbon is more than that of $ortho$ and $para$ positions
b) Loss of aromaticity when Br^+ attacks at the $ortho$ and $para$ positions and not at $meta$ position
c) Easier loss of H^+ to regain aromaticity from the meta position than from $ortho$ and $para$ positions
d) None of the above

1144. Which one of the following compounds when dissolved in water, gives a solution with pH more than 7?

a) $C_6H_5NH_2$ b) C_6H_5OH c) C_2H_5OH d) CH_3COCH_3

1145. Formula of ferrocene is:

a) $[Fe(CN)_6]^{4-}$ b) $[Fe(CN)_6]^{3+}$ c) $[Fe(CO)_5]$ d) $[(C_6H_5)_2Fe]$

1146. What is the EAN of nickel in $Ni(CO)_4$?

a) 38 b) 30 c) 36 d) 32

1147. One mole of the complex compound $Co(NH_3)5Cl_3$, gives 3 moles of ions on dissolution in water . One mole of the same complex reacts with two moles of $AgNO_3$ solution to yield two moles of $AgCl(s)$. The structure of the complex is

a) $[Co(NH_3)_5Cl]Cl_2$ b) $[Co(NH_3)_3Cl_2]. 2NH_3$
c) $[Co(NH_3)_4Cl_2]Cl. NH_3$ d) $[Co(NH_3)_4Cl]Cl_2. NH_3$

1148. Which one of the following has largest number of isomers?
(R=alkyl group, en=ethylenediamine)

a) $[Ru(NH_3)_4Cl_2]^+$ b) $[Co(NH_3)_5Cl]^{2+}$ c) $[Ir(PR_3)_2H(CO)]^{2+}$ d) $[CO(en)_2Cl_2]^+$

1149. Which complex is likely to show optical activity?

a) $Trans$-$[Co(NH_3)_4Cl_2]^+$.
b) $[Cr(H_2O)_6]^{3+}$
c) Cis-$[Co(NH_3)_2(en)_2]^{3+}$
d) $Trans$-$[Co(NH_3)_2(en)_2]^{3+}$

1150. A square planar complex is formed by hybridization of which atomic orbitals?

a) s, p_x, p_y, d_{yz} b) $s, p_x, p_y, d_{x^2-y^2}$ c) s, p_x, p_y, d_{z^2} d) s, p_x, p_y, d_{xy}

1151. The IUPAC name of the compound
$CH_2 - CH - CH - CH_2COCl$ is
| | |
COCl COCl COCl

a) 1, 2, 3, 4-butanetetrachlorocarbonyl
b) 1, 2, 3, 4-butanetetrachloroformyl
c) 1, 2, 4-butanetricarboxylic acid
d) None of the above

1152. Nitrobenzene can be prepared from benzene by using a mixture of conc. HNO_3 and conc. H_2SO_4. In the nitrating mixture HNO_3 acts as a:

a) Base b) Acid c) Reducing agent d) Catalyst

1153. In the compound lithium tetrahydroaluminate, the ligand is

a) H b) H^+ c) H^- d) None of these

: ANSWER KEY :

1)	b	2)	b	3)	c	4)	c	189)	d	190)	b	191)	b	192)	a
5)	b	6)	b	7)	c	8)	a	193)	d	194)	d	195)	a	196)	d
9)	c	10)	b	11)	c	12)	c	197)	b	198)	b	199)	c	200)	c
13)	d	14)	d	15)	c	16)	c	201)	b	202)	b	203)	d	204)	a
17)	b	18)	d	19)	b	20)	b	205)	b	206)	d	207)	d	208)	c
21)	a	22)	c	23)	d	24)	d	209)	b	210)	c	211)	c	212)	b
25)	d	26)	d	27)	d	28)	d	213)	c	214)	c	215)	b	216)	a
29)	b	30)	a	31)	d	32)	d	217)	a	218)	d	219)	b	220)	a
33)	d	34)	c	35)	a	36)	b	221)	d	222)	c	223)	c	224)	d
37)	d	38)	c	39)	c	40)	d	225)	a	226)	b	227)	c	228)	c
41)	a	42)	c	43)	c	44)	d	229)	b	230)	d	231)	c	232)	a
45)	b	46)	d	47)	b	48)	d	233)	b	234)	b	235)	d	236)	d
49)	b	50)	d	51)	d	52)	d	237)	b	238)	d	239)	a	240)	b
53)	a	54)	b	55)	b	56)	c	241)	a	242)	a	243)	b	244)	b
57)	a	58)	c	59)	a	60)	b	245)	a	246)	c	247)	b	248)	a
61)	c	62)	c	63)	a	64)	d	249)	c	250)	d	251)	d	252)	c
65)	c	66)	d	67)	c	68)	a	253)	c	254)	a	255)	a	256)	b
69)	d	70)	d	71)	c	72)	a	257)	b	258)	c	259)	d	260)	d
73)	a	74)	b	75)	d	76)	b	261)	d	262)	d	263)	c	264)	a
77)	c	78)	b	79)	c	80)	d	265)	b	266)	d	267)	b	268)	b
81)	d	82)	d	83)	c	84)	d	269)	b	270)	c	271)	d	272)	a
85)	b	86)	b	87)	c	88)	c	273)	d	274)	b	275)	c	276)	d
89)	d	90)	a	91)	c	92)	a	277)	d	278)	c	279)	c	280)	b
93)	c	94)	b	95)	a	96)	c	281)	a	282)	c	283)	b	284)	b
97)	b	98)	c	99)	b	100)	c	285)	b	286)	c	287)	b	288)	d
101)	d	102)	c	103)	d	104)	b	289)	c	290)	b	291)	d	292)	b
105)	d	106)	a	107)	b	108)	c	293)	b	294)	c	295)	c	296)	a
109)	a	110)	a	111)	b	112)	c	297)	c	298)	b	299)	d	300)	b
113)	b	114)	a	115)	d	116)	c	301)	a	302)	b	303)	b	304)	b
117)	c	118)	a	119)	b	120)	b	305)	a	306)	b	307)	b	308)	b
121)	a	122)	d	123)	d	124)	d	309)	b	310)	c	311)	b	312)	c
125)	d	126)	b	127)	a	128)	d	313)	c	314)	a	315)	a	316)	c
129)	b	130)	c	131)	d	132)	b	317)	b	318)	b	319)	d	320)	d
133)	c	134)	d	135)	d	136)	d	321)	b	322)	d	323)	d	324)	b
137)	c	138)	d	139)	b	140)	a	325)	d	326)	c	327)	b	328)	d
141)	b	142)	a	143)	a	144)	c	329)	b	330)	d	331)	d	332)	a
145)	a	146)	d	147)	d	148)	a	333)	d	334)	c	335)	b	336)	d
149)	a	150)	c	151)	a	152)	b	337)	d	338)	d	339)	b	340)	d
153)	b	154)	c	155)	a	156)	b	341)	b	342)	c	343)	a	344)	c
157)	d	158)	b	159)	b	160)	c	345)	b	346)	c	347)	a	348)	b
161)	b	162)	c	163)	d	164)	a	349)	c	350)	b	351)	a	352)	b
165)	a	166)	a	167)	b	168)	b	353)	d	354)	b	355)	b	356)	d
169)	b	170)	b	171)	c	172)	b	357)	b	358)	d	359)	d	360)	d
173)	c	174)	a	175)	c	176)	c	361)	d	362)	b	363)	b	364)	a
177)	c	178)	b	179)	a	180)	b	365)	a	366)	a	367)	c	368)	d
181)	c	182)	b	183)	a	184)	b	369)	a	370)	d	371)	c	372)	a
185)	b	186)	d	187)	c	188)	d	373)	d	374)	d	375)	c	376)	c

377)	c	378)	a	379)	d	380)	c	581)	d	582)	b	583)	c	584)	d
381)	d	382)	a	383)	d	384)	c	585)	b	586)	c	587)	b	588)	d
385)	d	386)	c	387)	a	388)	c	589)	a	590)	c	591)	b	592)	c
389)	c	390)	c	391)	b	392)	a	593)	c	594)	d	595)	b	596)	b
393)	c	394)	a	395)	c	396)	d	597)	c	598)	a	599)	b	600)	c
397)	a	398)	d	399)	b	400)	d	601)	a	602)	b	603)	d	604)	b
401)	a	402)	b	403)	c	404)	a	605)	d	606)	d	607)	d	608)	b
405)	b	406)	d	407)	b	408)	b	609)	c	610)	d	611)	b	612)	b
409)	a	410)	b	411)	c	412)	d	613)	a	614)	c	615)	a	616)	a
413)	b	414)	a	415)	a	416)	b	617)	d	618)	c	619)	c	620)	c
417)	d	418)	c	419)	c	420)	c	621)	c	622)	c	623)	a	624)	c
421)	c	422)	a	423)	c	424)	b	625)	a	626)	b	627)	d	628)	c
425)	d	426)	c	427)	a	428)	b	629)	a	630)	c	631)	a	632)	b
429)	d	430)	d	431)	a	432)	a	633)	c	634)	b	635)	a	636)	a
433)	c	434)	c	435)	a	436)	b	637)	c	638)	c	639)	c	640)	b
437)	a	438)	b	439)	a	440)	b	641)	d	642)	b	643)	a	644)	c
441)	b	442)	c	443)	b	444)	d	645)	c	646)	a	647)	c	648)	d
445)	a	446)	a	447)	a	448)	a	649)	a	650)	c	651)	a	652)	d
449)	b	450)	d	451)	b	452)	c	653)	d	654)	a	655)	d	656)	d
453)	c	454)	d	455)	a	456)	d	657)	b	658)	a	659)	b	660)	c
457)	a	458)	a	459)	c	460)	c	661)	d	662)	c	663)	b	664)	b
461)	c	462)	b	463)	b	464)	d	665)	c	666)	c	667)	c	668)	c
465)	a	466)	b	467)	a	468)	d	669)	d	670)	a	671)	c	672)	a
469)	c	470)	c	471)	c	472)	d	673)	a	674)	b	675)	b	676)	a
473)	d	474)	c	475)	b	476)	a	677)	c	678)	c	679)	c	680)	b
477)	b	478)	b	479)	c	480)	c	681)	a	682)	a	683)	c	684)	b
481)	b	482)	a	483)	a	484)	c	685)	c	686)	d	687)	b	688)	b
485)	a	486)	a	487)	d	488)	c	689)	b	690)	b	691)	a	692)	c
489)	b	490)	a	491)	c	492)	a	693)	a	694)	a	695)	d	696)	a
493)	d	494)	d	495)	a	496)	a	697)	a	698)	b	699)	b	700)	d
497)	c	498)	c	499)	a	500)	d	701)	d	702)	c	703)	b	704)	a
501)	a	502)	d	503)	b	504)	d	705)	d	706)	d	707)	c	708)	d
505)	b	506)	d	507)	a	508)	d	709)	b	710)	b	711)	b	712)	c
509)	b	510)	d	511)	b	512)	a	713)	a	714)	b	715)	d	716)	d
513)	d	514)	c	515)	b	516)	a	717)	c	718)	b	719)	c	720)	c
517)	a	518)	c	519)	a	520)	a	721)	b	722)	c	723)	c	724)	b
521)	b	522)	c	523)	d	524)	a	725)	a	726)	c	727)	c	728)	b
525)	a	526)	d	527)	d	528)	d	729)	b	730)	c	731)	a	732)	c
529)	d	530)	c	531)	a	532)	b	733)	b	734)	a	735)	a	736)	b
533)	b	534)	a	535)	b	536)	d	737)	b	738)	a	739)	b	740)	d
537)	a	538)	a	539)	b	540)	c	741)	b	742)	d	743)	a	744)	d
541)	c	542)	d	543)	a	544)	b	745)	d	746)	d	747)	b	748)	c
545)	d	546)	c	547)	d	548)	c	749)	c	750)	c	751)	b	752)	a
549)	a	550)	b	551)	b	552)	b	753)	b	754)	b	755)	d	756)	c
553)	d	554)	b	555)	a	556)	d	757)	b	758)	b	759)	b	760)	b
557)	a	558)	d	559)	c	560)	c	761)	d	762)	b	763)	a	764)	d
561)	a	562)	b	563)	c	564)	a	765)	c	766)	a	767)	b	768)	c
565)	c	566)	c	567)	c	568)	a	769)	b	770)	d	771)	a	772)	b
569)	c	570)	c	571)	b	572)	d	773)	a	774)	d	775)	d	776)	b
573)	b	574)	c	575)	d	576)	a	777)	b	778)	c	779)	b	780)	d
577)	a	578)	b	579)	b	580)	b	781)	d	782)	a	783)	c	784)	d

785)	**c**	**786)**	**b**	**787)**	**a**	**788)**	**c**
789)	**b**	**790)**	**c**	**791)**	**c**	**792)**	**c**
793)	**b**	**794)**	**b**	**795)**	**c**	**796)**	**d**
797)	**b**	**798)**	**d**	**799)**	**b**	**800)**	**d**
801)	**c**	**802)**	**b**	**803)**	**c**	**804)**	**a**
805)	**c**	**806)**	**d**	**807)**	**a**	**808)**	**c**
809)	**b**	**810)**	**d**	**811)**	**d**	**812)**	**b**
813)	**b**	**814)**	**b**	**815)**	**c**	**816)**	**b**
817)	**a**	**818)**	**d**	**819)**	**c**	**820)**	**a**
821)	**b**	**822)**	**c**	**823)**	**c**	**824)**	**a**
825)	**a**	**826)**	**d**	**827)**	**c**	**828)**	**d**
829)	**d**	**830)**	**b**	**831)**	**a**	**832)**	**b**
833)	**a**	**834)**	**c**	**835)**	**b**	**836)**	**d**
837)	**d**	**838)**	**a**	**839)**	**d**	**840)**	**c**
841)	**c**	**842)**	**b**	**843)**	**b**	**844)**	**c**
845)	**b**	**846)**	**b**	**847)**	**a**	**848)**	**d**
849)	**a**	**850)**	**b**	**851)**	**b**	**852)**	**c**
853)	**c**	**854)**	**b**	**855)**	**a**	**856)**	**a**
857)	**d**	**858)**	**a**	**859)**	**b**	**860)**	**b**
861)	**a**	**862)**	**c**	**863)**	**d**	**864)**	**b**
865)	**a**	**866)**	**d**	**867)**	**d**	**868)**	**c**
869)	**b**	**870)**	**d**	**871)**	**c**	**872)**	**d**
873)	**c**	**874)**	**a**	**875)**	**b**	**876)**	**b**
877)	**b**	**878)**	**a**	**879)**	**b**	**880)**	**d**
881)	**a**	**882)**	**d**	**883)**	**b**	**884)**	**b**
885)	**b**	**886)**	**c**	**887)**	**a**	**888)**	**d**
889)	**b**	**890)**	**d**	**891)**	**a**	**892)**	**a**
893)	**a**	**894)**	**b**	**895)**	**b**	**896)**	**a**
897)	**a**	**898)**	**b**	**899)**	**b**	**900)**	**d**
901)	**c**	**902)**	**d**	**903)**	**a**	**904)**	**a**
905)	**b**	**906)**	**c**	**907)**	**c**	**908)**	**c**
909)	**a**	**910)**	**d**	**911)**	**d**	**912)**	**c**
913)	**c**	**914)**	**c**	**915)**	**b**	**916)**	**b**
917)	**a**	**918)**	**d**	**919)**	**b**	**920)**	**d**
921)	**a**	**922)**	**c**	**923)**	**d**	**924)**	**b**
925)	**a**	**926)**	**c**	**927)**	**b**	**928)**	**d**
929)	**b**	**930)**	**d**	**931)**	**d**	**932)**	**d**
933)	**a**	**934)**	**c**	**935)**	**c**	**936)**	**b**
937)	**d**	**938)**	**a**	**939)**	**c**	**940)**	**b**
941)	**d**	**942)**	**d**	**943)**	**b**	**944)**	**c**
945)	**b**	**946)**	**a**	**947)**	**a**	**948)**	**a**
949)	**b**	**950)**	**d**	**951)**	**b**	**952)**	**c**
953)	**b**	**954)**	**a**	**955)**	**a**	**956)**	**c**
957)	**a**	**958)**	**a**	**959)**	**d**	**960)**	**c**
961)	**c**	**962)**	**c**	**963)**	**a**	**964)**	**a**
965)	**c**	**966)**	**d**	**967)**	**d**	**968)**	**d**
969)	**b**	**970)**	**a**	**971)**	**b**	**972)**	**a**
973)	**b**	**974)**	**c**	**975)**	**d**	**976)**	**c**
977)	**a**	**978)**	**d**	**979)**	**b**	**980)**	**d**
981)	**a**	**982)**	**b**	**983)**	**b**	**984)**	**b**
985)	**d**	**986)**	**c**	**987)**	**d**	**988)**	**a**
989)	**c**	**990)**	**d**	**991)**	**a**	**992)**	**a**
993)	**d**	**994)**	**b**	**995)**	**c**	**996)**	**c**
997)	**a**	**998)**	**b**	**999)**	**c**	**1000)**	**c**
1001)	**c**	**1002)**	**c**	**1003)**	**c**	**1004)**	**b**
1005)	**b**	**1006)**	**b**	**1007)**	**c**	**1008)**	**c**
1009)	**c**	**1010)**	**b**	**1011)**	**a**	**1012)**	**d**
1013)	**b**	**1014)**	**a**	**1015)**	**d**	**1016)**	**d**
1017)	**a**	**1018)**	**b**	**1019)**	**a**	**1020)**	**a**
1021)	**a**	**1022)**	**a**	**1023)**	**c**	**1024)**	**d**
1025)	**a**	**1026)**	**d**	**1027)**	**a**	**1028)**	**d**
1029)	**c**	**1030)**	**a**	**1031)**	**b**	**1032)**	**d**
1033)	**a**	**1034)**	**a**	**1035)**	**a**	**1036)**	**c**
1037)	**a**	**1038)**	**d**	**1039)**	**b**	**1040)**	**a**
1041)	**c**	**1042)**	**a**	**1043)**	**d**	**1044)**	**a**
1045)	**d**	**1046)**	**b**	**1047)**	**d**	**1048)**	**c**
1049)	**d**	**1050)**	**b**	**1051)**	**c**	**1052)**	**a**
1053)	**c**	**1054)**	**c**	**1055)**	**b**	**1056)**	**a**
1057)	**d**	**1058)**	**b**	**1059)**	**d**	**1060)**	**a**
1061)	**d**	**1062)**	**d**	**1063)**	**a**	**1064)**	**d**
1065)	**b**	**1066)**	**a**	**1067)**	**a**	**1068)**	**c**
1069)	**c**	**1070)**	**d**	**1071)**	**d**	**1072)**	**c**
1073)	**d**	**1074)**	**a**	**1075)**	**d**	**1076)**	**a**
1077)	**d**	**1078)**	**a**	**1079)**	**a**	**1080)**	**c**
1081)	**c**	**1082)**	**d**	**1083)**	**d**	**1084)**	**a**
1085)	**d**	**1086)**	**d**	**1087)**	**b**	**1088)**	**d**
1089)	**c**	**1090)**	**a**	**1091)**	**c**	**1092)**	**c**
1093)	**a**	**1094)**	**c**	**1095)**	**b**	**1096)**	**d**
1097)	**c**	**1098)**	**c**	**1099)**	**b**	**1100)**	**d**
1101)	**a**	**1102)**	**a**	**1103)**	**d**	**1104)**	**c**
1105)	**c**	**1106)**	**c**	**1107)**	**c**	**1108)**	**c**
1109)	**a**	**1110)**	**b**	**1111)**	**d**	**1112)**	**a**
1113)	**a**	**1114)**	**b**	**1115)**	**b**	**1116)**	**a**
1117)	**c**	**1118)**	**d**	**1119)**	**a**	**1120)**	**a**
1121)	**d**	**1122)**	**c**	**1123)**	**b**	**1124)**	**c**
1125)	**c**	**1126)**	**c**	**1127)**	**c**	**1128)**	**d**
1129)	**d**	**1130)**	**c**	**1131)**	**c**	**1132)**	**b**
1133)	**a**	**1134)**	**c**	**1135)**	**a**	**1136)**	**d**
1137)	**d**	**1138)**	**d**	**1139)**	**a**	**1140)**	**a**
1141)	**d**	**1142)**	**d**	**1143)**	**a**	**1144)**	**a**
1145)	**d**	**1146)**	**c**	**1147)**	**a**	**1148)**	**d**
1149)	**c**	**1150)**	**b**	**1151)**	**a**	**1152)**	**a**
1153)	**c**						

: HINTS AND SOLUTIONS :

1 **(b)**

Follow IUPAC rules.

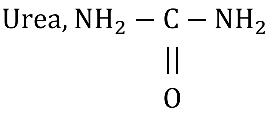
2 **(b)**

$$2CuSO_4 + 10KCN \longrightarrow 2K_3Cu(CN)_4 + (CN)_2 + 2K_2SO_4$$

3 **(c)**

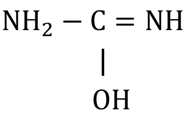
Follow definition of hydration isomerism.

4 **(c)**



Urea, $NH_2 - \underset{\underset{O}{||}}{C} - NH_2$

shows tautomerism as



$NH_2 - \underset{\underset{OH}{|}}{C} = NH$

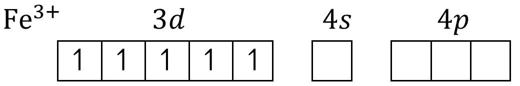
6 **(b)**

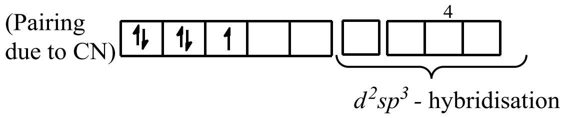
$C_6H_5ONa + RX \longrightarrow C_6H_5OR$ (Anisole)

7 **(c)**

Diamagnetic substances have all paired electron.

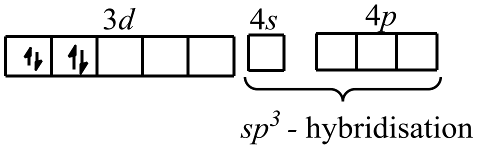
1. $[Fe(CN)_6]^{3-}$ Oxidation state of Fe=+3





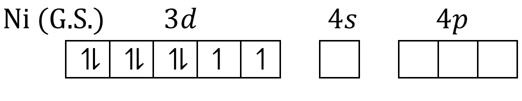
It has one unpaired electron and is paramagnetic.

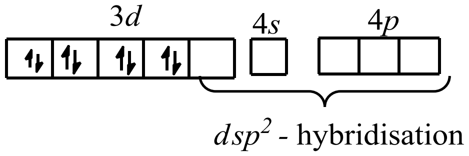
2. $[NiCl_4]^{2-}$ Oxidation state of Ni=+2



It has two unpaired electrons and is paramagnetic

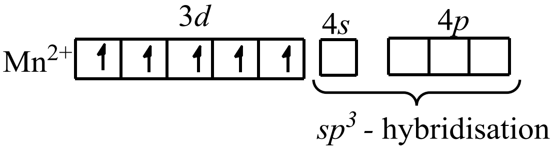
3. $Ni(CO)_4$ Oxidation state of Ni=0





It has no unpaired electron and is diamagnetic

4. $[MnCl_4]^{2-}$ Oxidation state of Mn = +2



∴ It is paramagnetic as it has five unpaired electrons.

8 **(a)**

CN^- is strongest field ligand. The spectrochemical series order is:

$I^- < Br^- < Cl^- < F^- < [C_2O_4]^{2-} < H_2O < py < NH_3 < en < NO_2^- < CN^- < CO$.

10 **(b)**

$[Co(NH_3)_5\,ONO]^{2+}$

Penta ammine nitrito cobalt (III) ion.

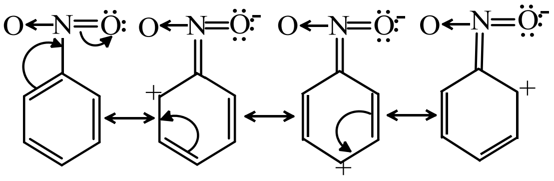
11 **(c)**

In $[Ag(NH_3)_2]Cl$, Ag^+contains d^{10} configuration. As others contain unpaired electrons

12 **(c)**

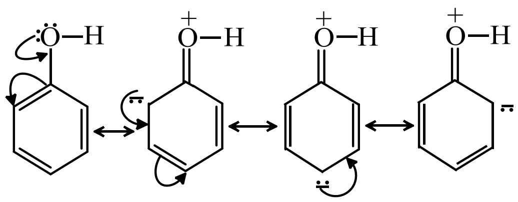
CH_3 gp., an o-and p-directing group attached in nucleus activates the ring for $S_E$reactions.

The presence of m-directing groups in benzene nucleous simply decreases electron density at o- and p-, whereas no change in electron density at m-position is noticed.



On the contrary o-and p-directing groups in nucleus increases the electron density at o- and p-position.

Thus, presence of o- and p-directing groups provide seats for $S_E$reactions or activates the ring, whereas presence of m-directing groups does not activate the ring and thus, deactivate the ring for S_E reactions



13 **(d)**

In both $[Co(NH_3)_6]^{3+}$ and $[CoF_6]^{3+}$, Co is present as Co^{3+}.

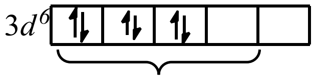
Thus, the electronic configuration of Co is

${}_{27}Co = [Ar]\ 3d^7, 4s^2$

${}_{27}Co^{3+} = [Ar] 3d^6, 4s^0$

In case of $[Co(NH_3)_6]^{3+}$, NH_3 is a strong field ligand, so pairing of electrons in $3d$-orbital takes place.

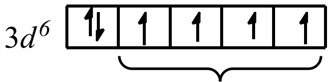
${}_{27}Co^{3+} = [Ar] 3d^6, 4s^0$



(no unpaired electron)

In $[CoF_6]^{3+}$, F is a weak field ligand, thus doesn't cause pairing. Hence,

${}_{27}Co^{3+} = [Ar] 3d^6, 4s^0$



4 unpaired electron

18 **(d)**

It is a test for primary amines. No doubt 2,4-dimethylaniline is also primary amine but it does not give test due to steric hindrance.

19 **(b)**

CN^- is strong field ligand because it is an example of pseudohalide. Pseudohalide ions are stronger coordinating ligands and they have the ability to form σ bond and π-bond.

20 **(b)**

Higher the charge and smaller the size of ligand, more stable is the complex formed

21 **(a)**

Trinitrobenzene is an explosive compound formed during nitration of C_6H_6 with fuming HNO_3.

22 **(c)**

A ligand is a species that is capable of donating an electron pair(s) to the central metal ion. The substances which are capable of donating an electron pair are called Lewis base, so a ligand is also a Lewis base.

23 **(d)**

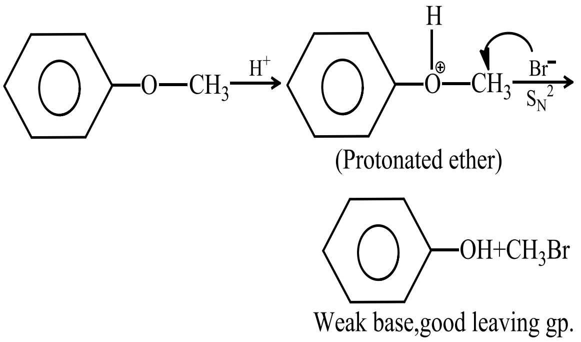
In $Ni(CO)_4$, Ni is in zero oxidation state. It has tetrahedral geometry but is diamagnetic. In $[Ni(CN)_4]^{2-}$, Ni is in +2 oxidation state. It is dsp^2 hybridised and have square planar shape. The compound is diamagnetic.

24 **(d)**

$[Co(CN)_6]^{3-}$ has d^2sp^3-hybridisation and six d-electrons are paired due to strong field ligand. Thus no unpaired electron.

25 **(d)**

$HBr \longrightarrow H^+ + Br^-$

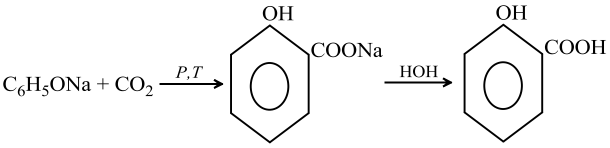


Ether reacts with acid to give protonated ether. The next step involves nucleophilic attack by halide ion with the displacement of weakly basic alcohol molecule.

26 **(d)**

Octahedral complex should have six hybridized orbitals.

27 **(d)**



Kolbe-Schmidt's reaction.

29 **(b)**

The pair of electron present with nitrogen will not be available to be donated as H^+ will consume that one.

30 **(a)**

It provides maximum number of ions (five) on ionization.

31 **(d)**

Follow Vorlander's rule.

32 **(d)**

Organometallic compounds are those in which metal is linked directly with carbon. CH_3Li, methyl lithium due to the presence of metal-carbon bond, is an organometallic compound.

33 **(d)**

The directive influence order is:

$$O^- > NR_2 > NHR > NH_2 > OH > OCH_3 \approx NHCOCH_3 > CH_3 > X$$

34 **(c)**

Hybridisation	Shape
dsp^2	Square planar

sp^3	Tetrahedral
sp^2	Trigonal planar

Hence, in tetrahedral complexes metal atom is sp^3 hybridised.

36 **(b)**

The number of ligands attached to the central metal ion is called the coordination number.

So, coordination numbers of Fe in $[Fe\,(CN)_6]^{4-}$, $[Fe(CN)_6]^{3-}$ and $[FeCl_4]^-$ are 6, 6 and 4 respectively.

37 **(d)**

Tautomers may or may not be metamers

38 **(c)**

EAN=$(\text{Atomic number} - \text{O.S} + 2\times\text{C.N.})$

Hence, EAN of Ni in $[Ni(CN)_4]^{2-} = (28 - 2 + 2 \times$ *4=34*

39 **(c)**

Electron repelling nature of methoxy gp. facilitate the protonation of alcohol.

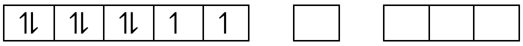
40 **(d)**

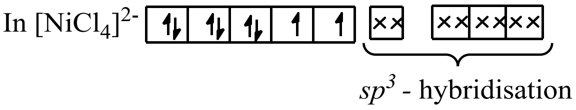
$[Ni(Cl)_4]^{2-}$ oxidation state of Ni is +2

So, configuration of

$Ni^{2+} = 1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^8$

In Ni^{2+} $3d$ $4s$ $4p$





Thus, due to sp^3-hybridisation of Ni^{2+} in $[NiCl_4]^{2-}$, the shape of $[NiCl_4]^{2-}$is tetrahedral.

41 **(a)**

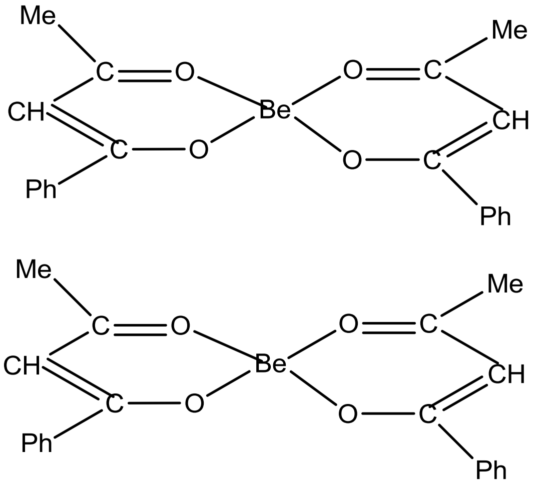
This is Sandmeyer's reaction.

42 **(c)**

p-nitrophenols are more acidic.

43 **(c)**

Benzoylacetonato beryllium exhibit optical isomerism as follows



bis (benzoylacetonato) beryllium (II) complex

44 **(d)**

Cl^- is a weak ligand but Cl^- cause the pairing of electron with large Pt^{2+} and consequently give dsp^2 hybridisation and square planar geometry.

45 **(b)**

It is a double salt;

$FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$

$\longrightarrow Fe^{2+} + 2SO_4^{2-} + 2NH_4^+$

46 **(d)**

Potassium ferrocyanide $K_4[Fe(CN)_6]$ will ionize as

$K_4[Fe(CN)_6] \rightleftharpoons 4K^+ + [Fe(CN)_6]^{4-}$

So, it will give five ions in solution

47 **(b)**

cis-platin is not a organimetallic compound because it has no carbon- metal bonding

48 **(d)**

Follow mechanism of Reimer-Tiemann reaction.

49 **(b)**

When n =even number then for two identical ends, number of geometrical isomers

$= 2^{n-1} + 2^{n/2-1}$

$= 2^1 + 2^0$

$= 3$

50 **(d)**

The characteristics of coordination number.

51 **(d)**

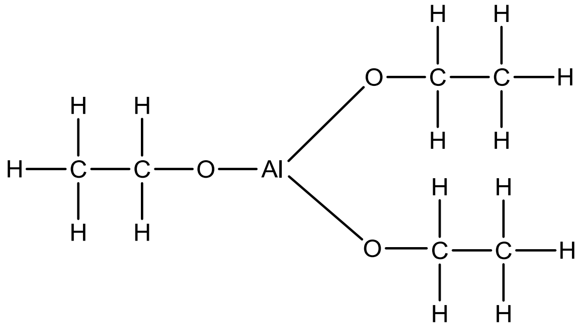
Aliphatic amines are more basic than aromatic amines as the later are more stablised due to resonance.

52 **(d)**

Aromatic hydrocarbons are called arenes with general formula C_nH_{2n-6y}, where $n \nless 6$ and y is no. of cyclic rings. Benzene has one ring and $n = 6$, *i.e.*, no. of carbon atoms. Thus, general formula is C_6H_6. All other aromatic hydrocarbons are derivative of benzene.

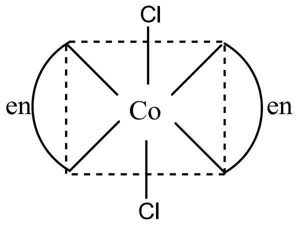
53 **(a)**

$Al(OC_2H_5)_3$ doesn't have metal-carbon bond.(*i.e.*, it is not an example of organometallic compound).

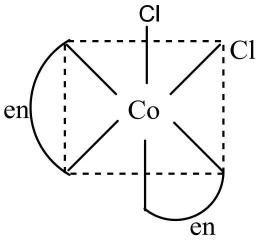


54 **(b)**

In $[Co(en)_2Cl_2]$, four isomers are possible, two geometrical isomers and two optical isomers.

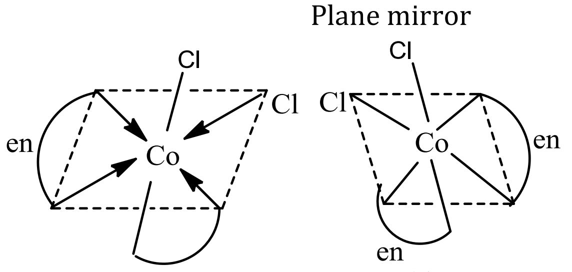


Trans-isomer



Cis-isomer

Now, *cis*-isomer also show optical isomerism. *Cis* isomer exists in enantiomeric form as it is unsymmetrical.



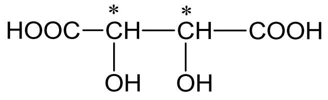
d-isomer

l-isomer

55 **(b)**

A carbon atom which is attached by four different group is called an asymmetric carbon atom or chiral centre

$HOOC(CHOH)_2COOH$ has two asymmetric carbon atom



56 **(c)**

Each π-electron is delocalised on each C-atom.

57 **(a)**

An orange-red dye is formed with $C_6H_5NH_2$.

59 **(a)**

Thiophene reacts more readily with H_2SO_4 than C_6H_6 giving thiophene sulphonic acid which is water soluble and thus, can be separated from C_6H_6. This can not be made by fractional distillation because thiophene and C_6H_6 both have nearly same b.p.

60 **(b)**

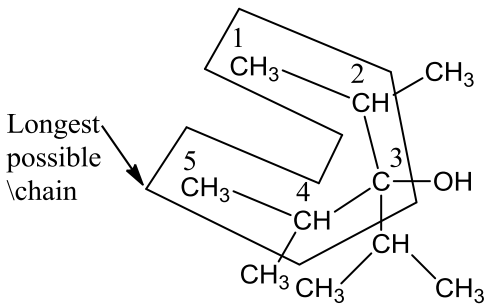
As cobalt is present as CO^{3+} and coordination number of cobalt is 6, the molecular formula of compound should be $CoCl_3 . yNH_3$. Now, as it gives a total of three ions when dissolved in water, its structural formula must be $[CoCl(NH_3)_5]Cl_2$

$[CoCl(NH_3)_5]Cl_2 \rightleftharpoons [CoCl(NH_3)_5]^{2+} + 2Cl^-$

Thus, only one Cl^- ion is satisfying both primary and secondary valency of Co^{3+} in this compound.

61 **(c)**

The structure of alcohol is



2,4-dimethyl-3-(1-methyl) ethyl pentan-3-ol

62 **(c)**

The transition metal cations during complex formation show *d*-*d* transition to give coloured ions.

63 **(a)**

$—CH_3$ gp. Shows +ve inductive effect and —OH gp. shows resonance effect which increases the electron density on C_6H_6 ring.

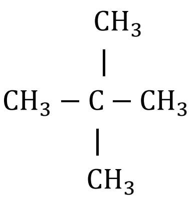
64 **(d)**

It produces least number of ions in solution.

66 **(d)**

The process is known as aromatisation or cyclization.

67 **(c)**



$$CH_3-\overset{\displaystyle CH_3}{\underset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-CH_3$$

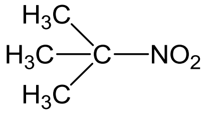
neo-pentane

The structure shows that all the hydrogen atoms are attached to primary C-atoms hence these are primary hydrogens

68 **(a)**

Follow IUPAC rules.

69 **(d)**



has no α-hydrogen. Hence, it will not show tautomerism

70 **(d)**

Both CN^- and NO_2^- are strong field ligands.

71 **(c)**

Prussian blue is

$Fe_4^{III}[Fe^{II}(CN)_6]_3$ or $M^IFe^{III}[Fe^{II}(CN)_6]$, where M^I is Na, K, Rb, Li, Cs.

73 **(a)**

Co^{3+}, Fe^{3+} and Cr^{3+} have $6d$-electrons, $5d$-electrons and $3d$-electrons respectively. Mn^{7+} has no d-electron.

74 **(b)**

All complexes of Co(III) have six ligands or coordination number of six and thus, are octahedral in shape.

75 **(d)**

NH_3 is weak as well as strong field ligand.

77 **(c)**

$[Pt(NH_3)_3Br(NO_2)Cl]Cl$

Triamminebromochloronitro platinum (IV) chloride.

78 **(b)**

Both the carbon attached to O are part of aromatic system.

79 **(c)**

Phenol is weak acid.

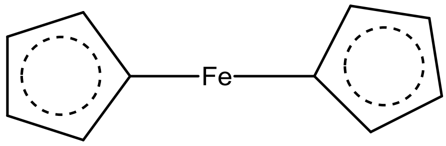
80 **(d)**

$[EDTA]^{4-}$is a hexadentate ligand because it donates six pairs of electrons to central metal atom in a complex.

82 **(d)**

Ferrocene of bi-(cyclopentadienyl) iron is an orange-crystalline solid. It is $Fe(\eta^5\text{-}C_5H_5)_2$. The structure of ferrocene is regarded as sandwiche structure, in which the iron atom is sandwiched between two C_5H_5 organic rings. The planes of the rings are parallel so that all the carbon atoms are at the same distance from the iron atom.

It is a π-bonded complex. Its structure is as



83 **(c)**

$[Cu(NH_3)_4]SO_4$

Oxidation number of

Cu ⇒ $x+4\times 0-2=0$

$x-2=0$

$x=+2$

O.N of Cu=+2

O.N of pt in $[Pt(NH_3)_2Cl_2]$

$x+2\times 0+2\times -1=0$

$x-2=0$

$x=+2$

O.N of Ni in $[Ni(CO)_4]$

$x+4\times 0=0$

$x=0$

O.N of Fe in $K_3[Fe(CN)_6]$

$3\times(+1)+x+6\times -1=0$

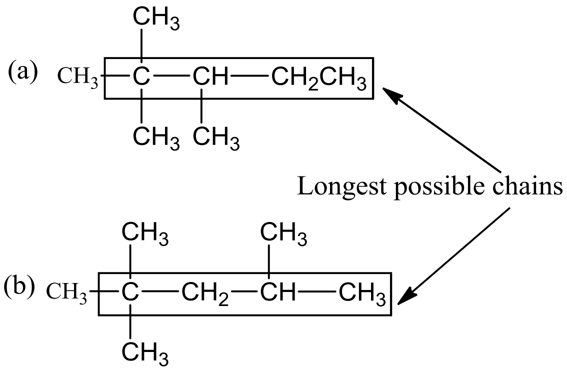
$3+x-6=0$

$x=+3$

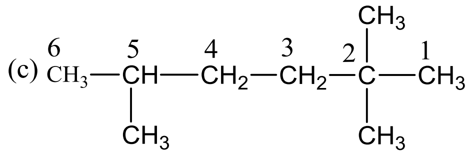
∴ $[Ni(CO)_4]$ is zero valent compound.

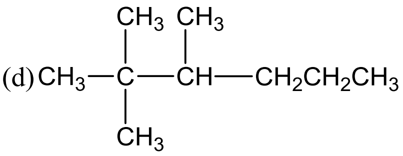
84 **(d)**

The compounds given have following structures



Longest possible chains





Out of these the (a) and (b) contain 5 C-atoms in their longest possible chains hence, these could not be the correct options for 2, 2, 3-trimethylhexane. Out of (c) and (d), the (c) is 2, 2, 5-trimethyl hexane and (d) is 2, 3, 3-trimethyl hexane

85 **(b)**

Phenoxy benzene is diphenyl ether.

86 **(b)**

Ziegler-Natta catalyst is an organometallic compound containing titanium. It is $TiCl_4$ and $(C_2H_5)_3Al$. It is used in the preparation of polyethylene.

$$nCH_2=CH_2\xrightarrow[TiCl_4+(C_2H_5)_3Al]{330-350\text{ K},1-2\text{ atm}}(-CH_2-CH_2-)_n$$

polyethylene

87 **(c)**

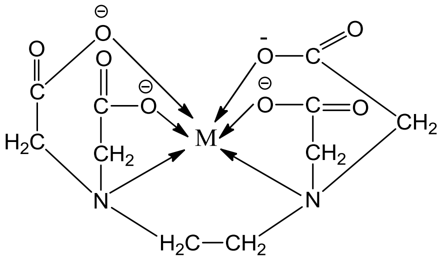
$Al_2(C_2H_5)_6 + TiCl_4$ is Zeigler Natta catalyst.

88 **(c)**

Transition metals have empty or half filled d-orbitals to accept electron pairs.

89 **(d)**

The number of atom of the ligand that are directly bound to the central metal atom or ion by coordinate bonds is known as the coordinate number of the metal or ion. It is actually the number of chemical bonds which the ligand form with the central metal atom or ion

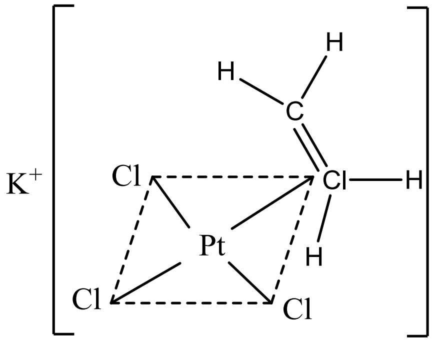


90 **(a)**

Acyl chlorides or acid amhydrides are used in acylation.

92 **(a)**

Zeise's salt, $K[PtCl_3(C_2H_4)]$is a π-bonded organometallic compound. Its structure is as



95 **(a)**

Follow IUPAC rules.

96 **(c)**

Since the complexes $[PtCl_2(NH_3)_4]Br_2$ and $[PtBr_2(NH_3)4Cl_2$have the same molecular formula but on ionisation they give different ions, they exhibit ionisation isomerism.

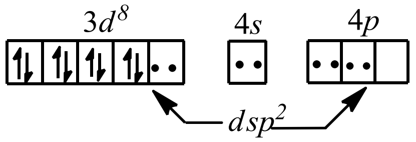
$$[PtCl_2(NH_3)_4]Br_2 \rightleftharpoons [PtCl_2(NH_3)_4]^{2+} + 2Br^-$$

$$[PtBr_2(NH_3)_4]Cl_2 \rightleftharpoons [PtBr_2(NH_3)_4]^{2+} + 2Cl^-$$

97 **(b)**

$Ni^{2+} + 4CN^- \rightarrow [Ni(CN)_4]^{2-}$

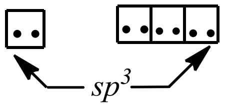
Here Ni^{2+} has d^8-configuration with CN^- as strong ligand.



d^8-configuration in strong ligand field gives dsp^2 hybridisation, hence square planar geometry.

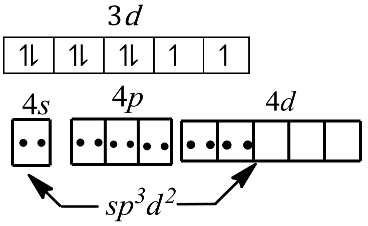
$Ni^{2+} + 4Cl^- \rightarrow [NiCl_4]^{2-}$

Here Ni^{2+} has d^8-configuration with CN^- as weak ligand.



d^8-configuration in weak ligand field gives sp^3hybridisation, hence tetrahedral geometry.

Ni^{2+} with H_2O forms $[Ni(H_2O)_6]^{2+}$ complex and H_2O is a weak ligand.



Therefore, $[Ni(H_2O)_6]^{2+}$has octahedral geometry.

98 **(c)**

Benzene ring is activates for $S_E$reaction by the $+I$effect as well as hyperconjugation of CH_3 group $-Cl$ deactivates as $-I$ effect predominates over $+M$ effect. $-NO_2$ group deactivates ring by $-I$ effect and $-M$ effect.

100 **(c)**

Alcohols are neutral.

101 **(d)**

—OH is o-and p-directing gp.

102 **(c)**

$[Fe(\eta^5 - C_2H_5)_2]$ is the organometallic compound which has σ and π bonds present

103 **(d)**

BHC is $C_6H_6Cl_6$ a saturated cyclic molecule.

104 **(b)**

The complexes can be written as follows

$[Co(NH_3)_6]Cl_3$, $[Co(NH_3)_5Cl]Cl_2$, $[Co(NH_3)_4Cl_4]Cl$

Hence, no. of primary valencies are 3, 2 and 1 respectively

105 **(d)**

$[Cr(NH_3)_5\ NO_2]Cl_2$ compound shows linkage isomerism because it has NO_2 group which is ambidentate ligand.

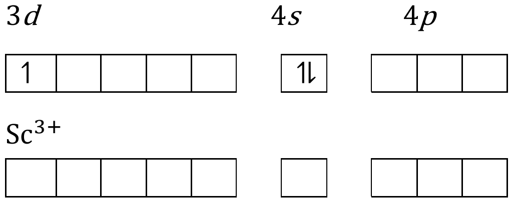
It can be linked *via* N atom (— NO_2) or *via* O atom (—ONO) to form two different isomers.

106 **(a)**

In $[Sc(H_2O)_6]^{3+}$,

Oxidation state of Sc is +3.

Sc (ground state)



∵ Sc^{3+} has no unpaired electron.

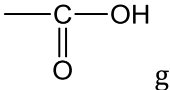
∴ $[Sc(H_2O)_6]^{3+}$ is diamagnetic and colourless.

107 **(b)**

$[MA_5B]$ due to absence of symmetry of 'B' ligand cannot exist in the form of *cis-trans* isomer.

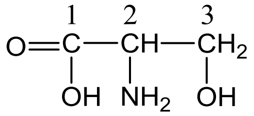
108 **(c)**

Out of the 3 functional groups attached



$-\overset{\displaystyle O}{\overset{\|}{C}}-OH$ group

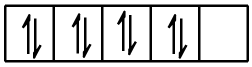
will be the principal functional group and rest as the substituents



2-amino-3-hydroxy propanoic acid

109 **(a)**

A transition metal complex absorbs visible light only when it has unpaired electron. Ni^{2+} in strong field ligand has configuration as



110 **(a)**

The directive influence order and tendency to release electron for *o*-and *p*-directing group is,

$$O_2^- > NR_2 > NHR > NH_2 > OH > OCH_3$$
$$\approx NHCOCH_3 > CH_3 > X$$

111 **(b)**

(a) In MnO_2, $FeCl_3$ oxidation states of Mn and Fe are +4 and +3 respectively.

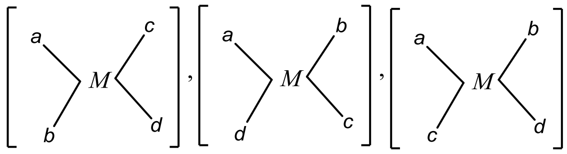
(b) In $(MnO_4)^-$, CrO_2Cl_2 oxidation states of Mn and Cr are +7 and +6 respectively.

(c) In $[Fe(CN)_6]^{3-}$, $[Co(CN)_3]$ oxidation states of Fe and Co are +3 and +3 respectively.

(d) $[NiCl_4]^{2-}$, $[CoCl_4]^-$ oxidation states of Ni and Co are +2 and +3 respectively.

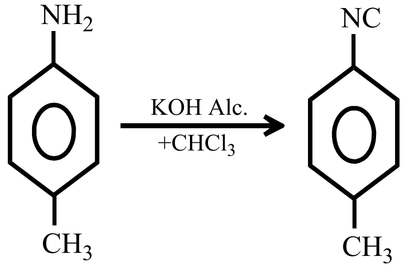
112 **(c)**

$[M(abcd)]$ complex is square planar so will have three geometrical isomers.



113 **(b)**

This is carbylamines reaction.



114 **(a)**

An experimental fact depending upon the ability of the ligand to cause crystal field splitting (*i.e.*, strength of ligand).

115 **(d)**

$K_3[Fe(CN)_5NO]$

Potassium pentacyanonitrosyl ferrate (II).

116 **(c)**

The *d*-*d* excitation is responsible for colour of $Ti(H_2O)_6^{3+}$ which has one unpaired electron.

117 **(c)**

The oxidation number of Fe in K_4 $[Fe(CN)_6]$is +2.

119 **(b)**

Both Ag and Au are extracted by complex formation method.

120 **(b)**

$EAN = 24 - 3 + 2 \times (6) = 33.$

121 **(a)**

According to Werner's theory, only those ions are precipitated which are attached to the metal atoms with ionic bonds and are present outside the coordination sphere.

$[Pt(NH_3)_6]Cl_4 \rightleftharpoons Pt(NH_3)_6^{4+} + 4Cl^-$

122 **(d)**

It is a fact.

123 **(d)**

In acidic solution, proton coordinate with ammonia to form NH_4^+. NH_4^+ does not act as ligand because nitrogen atom has no lone pair of electrons which it can donate to metal atom

124 **(d)**

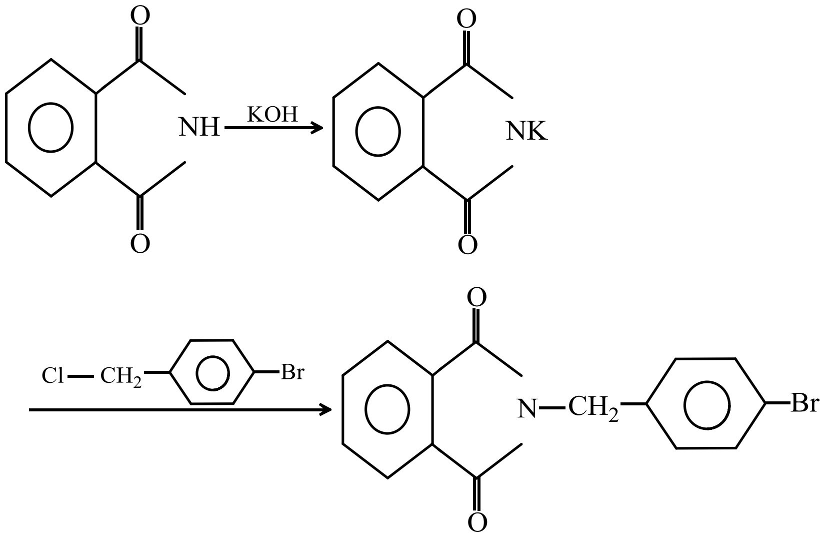
Disubstituted cyclic compounds and disubstituted alkenes show geometrical isomerism

125 **(d)**

$Ag(NH_3)_2^+$ has *sp*-hybridization and linear complex.

127 **(a)**

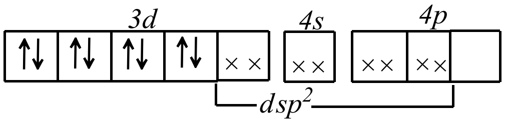
The replacement of Cl is due to the formation of stable benzyl carbocation. Alternatively Cl is present in side chain and thus replaced whereas Br is attached in benzene nucleus.



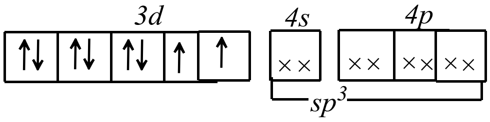
128 **(d)**

The electronic configuration of Ni in $[\mathrm{Ni(CN)_4}]^{2-}$, $[\mathrm{Ni(Cl)_4}]^{2-}$ and $\mathrm{Ni(CO)_4}$ are:

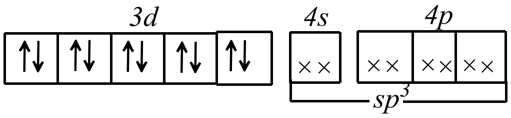
$\mathrm{Ni^{2+}}$ in $[\mathrm{Ni(CN)_4}]^{2-}$:



$\mathrm{Ni^{2+}}$ in $[\mathrm{Ni(Cl_4)}]^{2-}$:



Ni in $[\mathrm{Ni(CO)_4}]$:

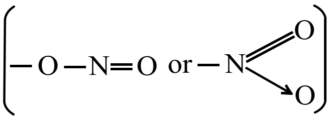


129 **(b)**

Replacement of $\mathrm{N_2Cl}$ by halogen atom of $\mathrm{Cu}X - \mathrm{H}X$ from benzene diazonium chloride is called Sandmeyer's reaction.

134 **(d)**

(i) $-\mathrm{NO_2}$ can show linkage

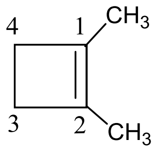


isomerism

130 **(c)**

Optical isomerism is shown by the type $[M(AA)X_2Y_2]$, $[M(AA)_3]$, $[M(AA)_2X_2]$

131 **(d)**

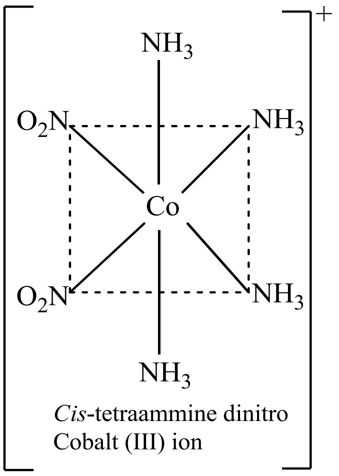


1,2-dimethyl cyclobut-1-ene

132 **(b)**

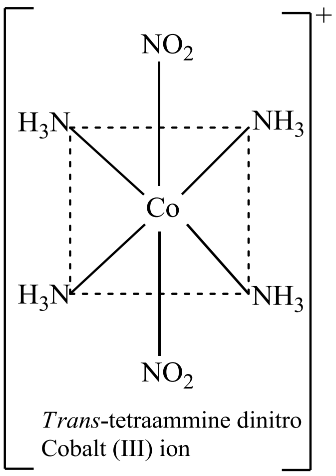
$\mathrm{HNO_3 + 2H_2SO_4 \longrightarrow NO_2^+ + 2HSO_4^- + H_3O^+}$.

(ii)



Cis-tetraammine dinitro Cobalt (III) ion

and



Trans-tetraammine dinitro Cobalt (III) ion

(iii) Also $[Co(NH_3)_4(NO_2)_2]Cl$ has its ionisation isomer as $[Co(NH_3)_4NO_2Cl]NO_2$.

135 **(d)**

Complex	Hybridization
$[Ni(CO)_4]$	sp^3
$[Ni(CO)_4]^{2-}$	dsp^2
$[CoF_6]^{3-}$	sp^3d^2
$[Fe(CN)_6]^{3-}$	d^2sp^3

136 **(d)**

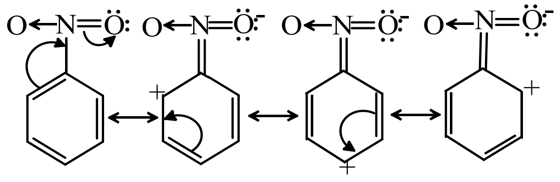
2, 4, 6-trinitrophenol is known as picric acid, an explosive.

137 **(c)**

It is a fact.

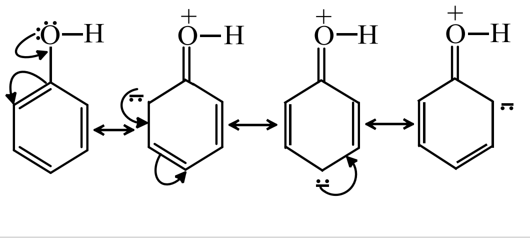
139 **(b)**

OH gp., an *o*- and *p*-directing group activates ring for reactions. The presence of *m*-directing groups in benzene nucleous simply decreases electron density at *o*- and *p*-, whereas no change in electron density at *m*-position is noticed.



On the contrary *o*-and *p*-directing groups in nucleus increases the electron density at *o*- and *p*-position.

Thus, presence of *o*- and *p*-directing groups provide seats for S_E reactions or activates the ring, whereas presence of *m*-directing groups does not activate the ring and thus, deactivate the ring for S_E reactions



140 **(a)**

If magnetic moment is zero the species should not have unpaired electrons.

141 **(b)**

Chlorophyll is a complex having Mg-atom.

142 **(a)**

Primary valency of metal is satisfied only by the anion. It is simply ionic valency. While secondary valency is satisfied by ligands (which can give a lone pair of electron). The ligands satisfying secondary valency, are always written in coordination sphere. This concept was given by Werner.

In $K_3[Fe(CN)_6]$, the CN^- ions satisfy both the primary as well as secondary valency of Fe^{3+} ion.

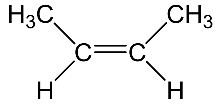
143 **(a)**

The following isomers the alkene have

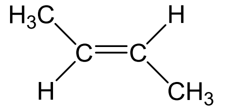
(i) $CH_3-CH_2-CH=CH_2$

(ii) $CH_3-CH=CH-CH_3$

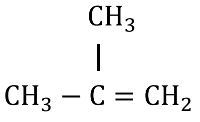
(iii)



(iv)



(v)



$CH_3-\overset{\overset{\displaystyle CH_3}{|}}{C}=CH_2$

145 **(a)**

According to postulates of Werner's theory for coordination compounds, metal atoms exhibit two types of valencies *i.e.*, primary valency and secondary valency. The primary valency is ionisable whereas the secondary valency is non-ionisable.

146 **(d)**

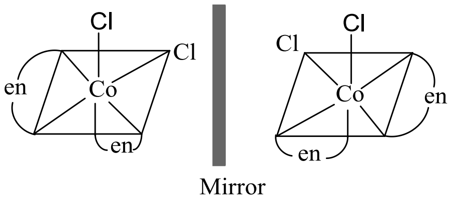
$[Fe(CN)_6]^{4-}$ is **diamagnetic** (Fe^{2+} has $3d^6$ configuration and the 6 electron pairs up in three d-orbitals followed by d^2sp^3-hybridisation). $[Cr(NH_3)_6]^{3+}$ is **paramagnetic** (Cr^{3+} has $3d^3$ configuration. Hybridisation is d^2sp^3. Due to 3 unpaired electrons it is **paramagnetic**)

$[Cr(CO)_6$: $Cr(Z = 25)$: $[Ar]^{18}4s^1, 3d^5$.
The one $4s$-electron pairs up with five $3d$-electrons in three d-orbitals. This is followed by d^2sp^3-hybridisation to give octahedral complex. No unpaired electron and hence complex is **diamagnetic**.

$Fe(CO)_5$: $Fe(Z = 26)$: $[Ar]^{18}4s^2, 3d^6$.
The six electrons in d-subshell pairs up in three d-orbitals. This is followed by d^2sp^3-hybridisation to give octahedral geometry with one vacant hybridised orbital. The resulting shape of the complex is square based pyramid. As there is no unpaired electron, the complex is **diamagnetic.**

147 **(d)**
A modified or extended Friedel-Crafts reaction.

148 **(a)**
cis$[Co(en)_2Cl_2]Cl$ is optically active hence, it will give a pair

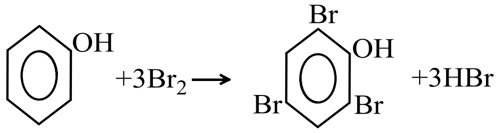


149 **(a)**
Δ_t is roughly 4/9 times to Δ_0.

150 **(c)**
Follow IUPAC rules.

151 **(a)**
Alkanes having less than four carbon atoms in basic chain will not show chain isomerism

152 **(b)**



3 mole of Br_2 are needed.

153 **(b)**
Diamethyl glyoxime forms a colour complex with nickel

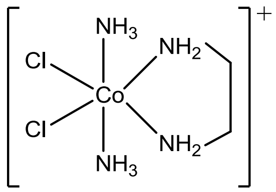
154 **(c)**
BF_4^- has sp^3-hybridisation and tetrahedral.

155 **(a)**
Oxidation state of iron in haemoglobin is +2.

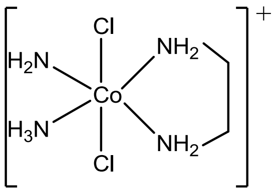
156 **(b)**

5. Geometrical isomers have same structural formula but differ in spatial arrangement of groups.

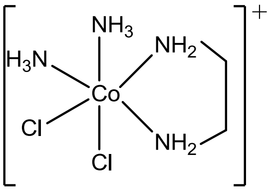
6. Different arrangement of atoms or groups in three dimensional space results in two optical isomers which are image of each other.



trans (w.r.t NH_3)
(optically inactive)



cis (w.r.t NH3)
(optically inactive)



(optically inactive)

Therefore, number of geometrical isomers, optical isomers and total number of isomers are 2, 2 and 3 respectively.

157 **(d)**
Hetero aromatics show aromatic nature due to $4n + 2\pi$ electrons.

158 **(b)**
CN^- ligand has strong ligand field because of higher value of Δ.

159 **(b)**
% Enantiomeric excess

$$= \frac{\text{observed specific rotation}}{\text{specific rotation of pure enantiomer}} \times 100$$

Observed specific rotation $= \frac{3/4}{100} \times (+16°) \times 100$
$= +12°$

160 **(c)**
Follow IUPAC rules.

161 **(b)**
$[(C_6H_5)_3P)_3RhCl]$ or $[(Ph_3P)_3RhCl]$ is a Wilkinson's catalyst, the most widely used of all catalysts for homogeneous hydrogenation.

162 **(c)**
Halogens attack double bond of C_6H_6 in presence

of light. In absence of light as well as in presence of only $AlCl_3$, S_E reactions are noticed.

163 **(d)**

$[Pt(NH_3)_6]Cl_4$ complex gives five ions in the solution.

$[Pt(NH_3)_6]Cl_4 \rightleftharpoons [Pt(NH_3)_6]^{4+} + 4Cl^-$

164 **(a)**

The EAN for Cu in $[Cu(NH_3)_4]^{2+}$ is 35 and not 36, the next inert gas at. No.

165 **(a)**

$1 \times 3 + a + 6 \times (-1) = 0, \quad \therefore a = +3$

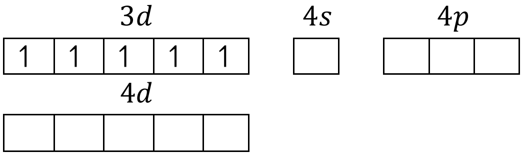
166 **(a)**

In $NaOC_2H_5$, Na is attached to O-atom.

167 **(b)**

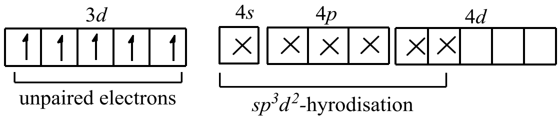
In $[Mn(H_2O)_6]^{2+}$, Mn is present as Mn^{2+}or Mn (II), so its electronic configuration

$=1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^5$



In $[Mn(H_2O)_6]^{2+}$, the coordination number of Mn is six, but in presence of weak field ligand, there will be no pairing of electrons in $3d$. So, it will form high spin complex due to presence of five unpaired electron.

In $[Mn(H_2O)_6]^{2+}$

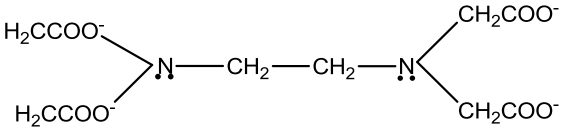


170 **(b)**

Due to aromatic nature; $C_6H_5CH_2OH$ is exception and does not burn with sooty flame.

171 **(c)**

EDTA (Ethylenediaminetetraacetic acid)



It is hexadentate (6 electron pairs) that's why for octahedral complex only one EDTA is required.

173 **(c)**

It is Friedel-Crafts reaction.

174 **(a)**

Resonance in phenoxide ion makes it more stable. More stable is ion less stable is phenol or more is acidic nature.

175 **(c)**

Triethylenediamine cobalt(III) chloride is $[Co(NH_2CH_2CH_2NH_2)_3]Cl_3$; $NH_2CH_2CH_2NH_2$ is bidentate ligand and thus, coordination no. $= 3 \times 2 = 6$.

177 **(c)**

CO is a neutral ligand, so the oxidation state of metal in metal carbonyls is always zero.

$[Ni(CO)_4]$

$x+(0\times4)=0$

$x=0$

178 **(b)**

$FeCl_3 + Cl_2 \longrightarrow FeCl_4^- + Cl^+$

179 **(a)**

$[Ni(CN)_4]^{2-}$ has dsp^2-hybridization while $[Ni(Cl_4)^{2-}]$ and $[Ni(CO_4)]$ have sp^3-hybridization.

180 **(b)**

$3C_2H_2 \overset{\Delta}{\rightarrow} C_6H_6$

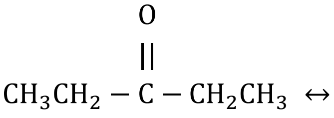
182 **(b)**

$Cr^{2+}, Mn^{2+}, Fe^{2+}$and Ni^{2+} have 4, 5, 4 and 2 unpaired electrons respectively.

183 **(a)**

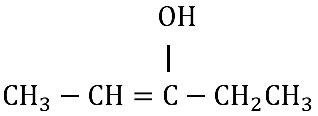
It is a reason for the fact.

186 **(d)**



$$CH_3CH_2-\overset{\overset{\displaystyle O}{||}}{C}-CH_2CH_3 \leftrightarrow$$

(keto form)



$$CH_3-CH=\overset{\overset{\displaystyle OH}{|}}{C}-CH_2CH_3$$

(enol form)

187 **(c)**

Non-polr part C_6H_5 —shows more hydrophobic nature.

189 **(d)**

All involve d^2sp^3-hybridization.

191 **(b)**

Aromatic amines are less basic than aliphatic amines. Also presence of electron attracting group decreases the basic character of aromatic amines.

192 **(a)**

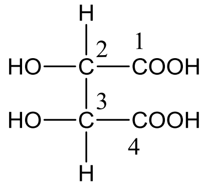
Follow IUPAC rules.

193 **(d)**

All are weak field ligands and thus, give high spin complex.

194 **(d)**

Tartaric acid is



2,3-dihydroxybutane-1,4-dioic acid

195 **(a)**

β_4 for $[ML_4]^{2-}$ can be written as

$$\beta_4 = \frac{[ML_4]^{2-}}{[M^{2+}][L^-]^4} = 2.5 \times 10^{13}$$

The overall formation equilibrium constant can be written as

$$k = \frac{[ML_4]^{2-}}{[M^{2+}][L^{-1}]^4}$$

$k = \beta_4 = 2.5 \times 10^{13}$

196 **(d)**

$[Cr(NH_3)_4Cl_2]^+$

Let oxidation state of Cr $= x$

$NH_3 = 0$

$Cl = -1$

Net charge $= +1$

$\therefore [Cr(NH_3)_4Cl_2]^+$

$x + 4 \times 0 + 2(-1) = +1$

$\therefore \quad x = +3$

197 **(b)**

Phenols are acidic; alcohols are neutral.

198 **(b)**

$2 \times a + 4 \times (-2) + 2 \times 0 + 2 \times 0 = -2, \quad \therefore a = +3$

199 **(c)**

CH_3MgI (Grignard reagent) is an organometallic compound due to C— Mg bond.

200 **(c)**

Effective atomic number =electrons in Cr^{3+} +electrons form $6NH_3$ ligands.

$= 21 + 6 \times 2 = 33$

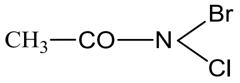
203 **(d)**

Hückel rule for aromaticity suggests that an aromatic compound must possess $(4n + 2)\pi$-electrons, where $n = 0, 1, 2 \ldots$, etc., as well as π-electrons cloud should embrace all the carbon atoms of the cyclic systems.

204 **(a)**

$C_6H_5OH + \text{Zn dust} \longrightarrow C_6H_6$.

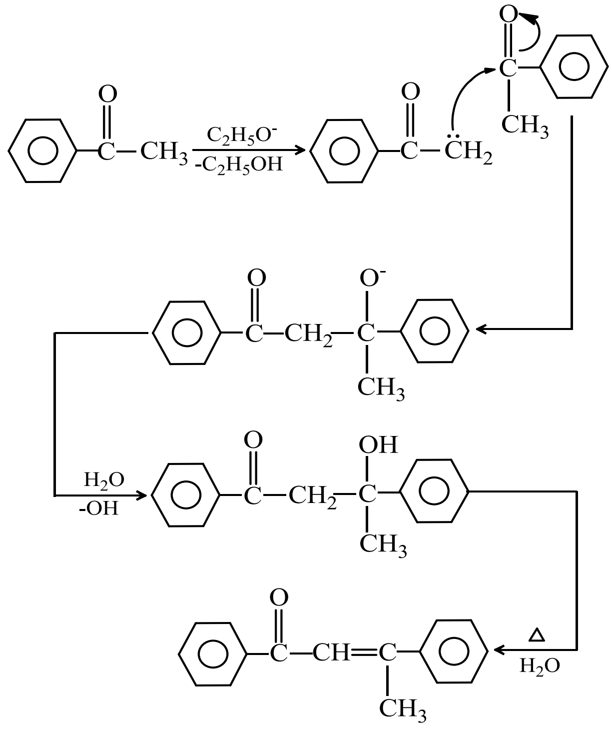
205 **(b)**



N-bromo-N-chloro ethanamide

206 **(d)**

It is condensation reaction.



207 **(d)**

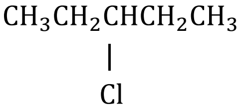
Due to more canonical forms.

208 **(c)**

$2C_6H_5SO_2.OH \xrightarrow{P_2O_5} (C_6H_5SO_2)_2O$

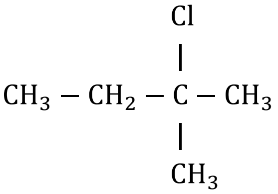
209 **(b)**

Isomeric substances that differ only in the arrangement of carbon atoms forming the base chain are known as chain isomers



$CH_3CH_2\underset{\substack{|\\ Cl}}{C}HCH_2CH_3$

and



$CH_3 - CH_2 - \overset{\substack{Cl\\ |}}{\underset{\substack{|\\ CH_3}}{C}} - CH_3$

If the compound with the same molecular formula differ in the position of the same functional group on the identical base chain the compounds are called position isomers

210 **(c)**

In $K_3[Fe(CN)_6]$, the ligands are negative which is present in coordination spheres shows a dual behavior. It may satisfied both primary and secondary valencies while, neutral ligand satisfied only secondary valencies

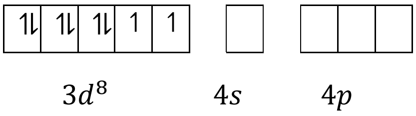
211 **(c)**

A number of transition metals form polymetallic carbonyls.

212 **(b)**

$Ni : 3d^8 4s^2 \quad Ni^{2+} : 3d^8$

Since, Cl is a weak field ligand, it doesn't cause paring of electron.



Number of unpaired electrons, n=2

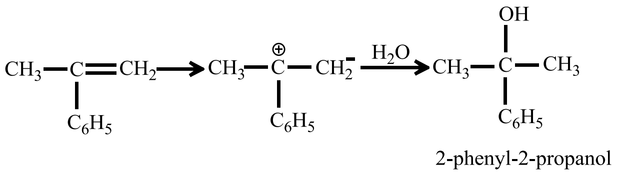
$\mu = \sqrt{n(n+2)} = \sqrt{2(2+2)\text{BM}} = \sqrt{8}\text{ BM} = 2.82\text{ BM}$

213 **(c)**

Follow IUPAC rules.

214 **(c)**

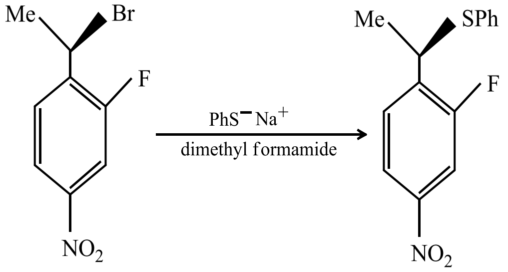
The reaction occurs via., electrophilic addition following Markownikoff's rule,.



215 **(b)**

C_6H_5OH is also called carbolic acid.

216 **(a)**



It is easier to do nucleophilic substitution on alkyl halides than on aryl halides.

217 **(a)**

Oxidation state of Co in K $[Co(CO)_4]$is

$+1 + x + 4 \times 0 = 0$

$x = -1$(For co)

218 **(d)**

Bakelite is formed as a result of condensation of HCHO and phenol.

219 **(b)**

Based on spectrochemical series , ligands arranged in increasing order of crystal field strength are as

$NH_3 < en < CN^- < CO$

222 **(c)**

Follow mechanism of sulphonation on xylene.

224 **(d)**

All these are used to explain *o*-, *p*- directing nature of $—CH_3$ gp.

225 **(a)**

The separation of racemic mixture back into *d* and *l* isomers is known as resolution. It can be done by

(I) mechanical method

(II) bio-chemical method using enzymes

(III) chemical method (salt formation)

227 **(c)**

Alkanes are not dissolved in H_2SO_4.

228 **(c)**

Monomeric form of iron carbonyl is $Fe(CO)_5$.

229 **(b)**

Molecular formula of naphthalene is $C_{10}H_8$.

230 **(d)**

It is clear from the chemical formulae that Ag is central metal atom and ligands are 2 ammonia molecule

Hence, compound is $[Ag(NH_3)_2]Cl$

231 **(c)**

For $[M\,abcd]$square planar complex, the number of possible geometrical isomers is three which is obtained by fixing the position of one of the ligands say *a* while the other ligands *b*, *c* and *d* are placed *trans* to it.

232 **(a)**

Follow exceptions of Vorlander's rule.

233 **(b)**

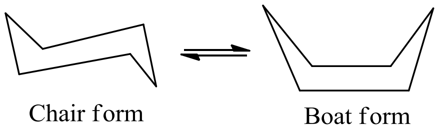
Follow IUPAC rules.

234 **(b)**

Coordination number is equal to total number of ligands in a complex

235 **(d)**

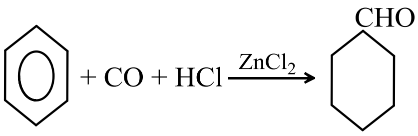
Chair and boat conformations of cyclohexane differ in energy by 44 kJ/mol



236 **(d)**

Ligands form coordinate bond with central atom or ion and donate electron pair.

238 **(d)**

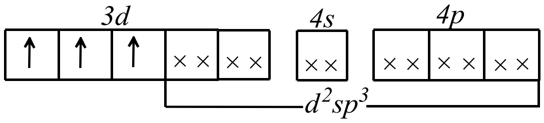


This is Gattermann-Koch reaction -CHO gp. in C_6H_6 nucleus.

239 **(a)**

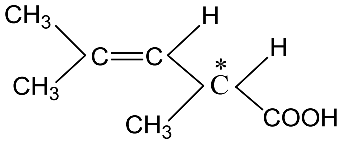
$[Cr(NH_3)_6]^{3+}$ has three unpaired electrons.

Electronic configuration of Cr^{3+} in $Cr(NH_3)_6$ is:



×× Electron pair donated by NH_3.

240 **(b)**



The above compound has chiral centre
Hence, it can exhibit optical isomerism while geometrical isomerism is not possible due to presence of identical groups on double bonded carbon atom

241 **(a)**

It has no unpaired electron.

242 **(a)**

COOH
|
H − C − OH
| plane of symmetry
H − C − OH
|
COOH

Meso tartaric acid is optically inactive due to the presence of molecular symmetry. It I optically inactive due to internal compensation, *ie*, the effect of one half of the molecule is neutralized by other

243 **(b)**

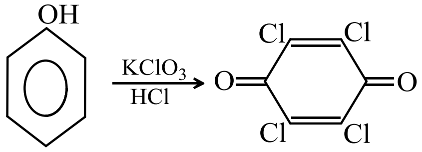
Smaller is cation, more is effective nuclear charge, more is the tendency to attract electron pair from ligands.

245 **(a)**

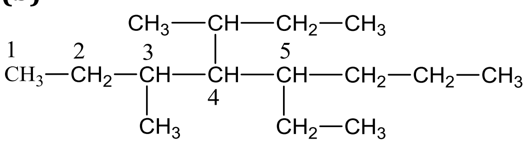
Presence of o-, p-directing gp. facilitates the SE reactions.

246 **(c)**

$K_2S_2O_8$ gives quinol; $KMnO_4$ gives mesotartaric acid.



247 **(b)**

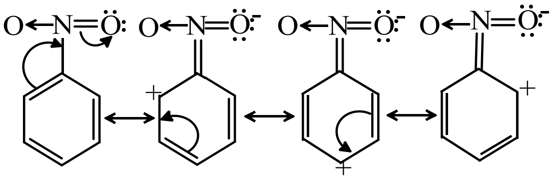


The compound is substituted octane, it has branches at carbon-3, carbon-4, carbon-5. The name is

4-sec-butyl-5-ethyl-3-metyl octane

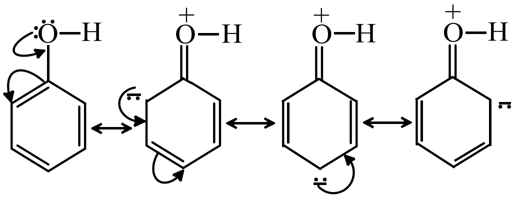
248 **(a)**

The presence of m-directing groups in benzene nucleous simply decreases electron density at o- and p-, whereas no change in electron density at m-position is noticed.



On the contrary o-and p-directing groups in nucleus increases the electron density at o- and p-position.

Thus, presence of o- and p-directing groups provide seats for S_E reactions or activates the ring, whereas presence of m-directing groups does not activate the ring and thus, deactivate the ring for S_E reactions



249 **(c)**

CuF_2 is blue coloured crystalline solid.

250 **(d)**

Different ionization gives different colour.

251 **(d)**

The complex has coordination number of six which is found in octahedral complex.

252 **(c)**

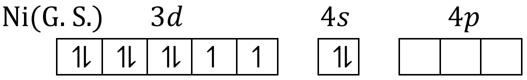
BF_3 has incomplete octet and is Lewis acid; it cannot donate electron pair.

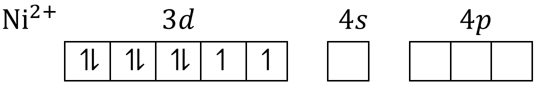
253 **(c)**

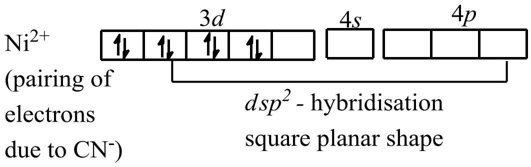
Methyl thiomethyl group is inserted at *ortho* position by heating phenol with dimethyl sulphoxide and pyridine $-SO_3/(CH_3CO)_2O$.

254 **(a)**

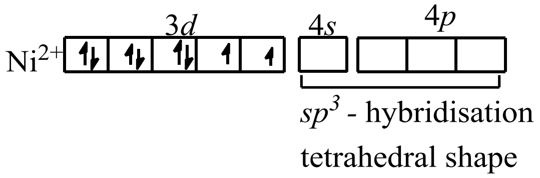
$Ni(CN)_4^{2-}$





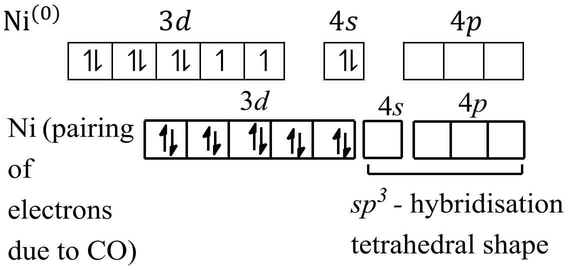


$Ni(CN)_4^{2-}$
Ni is in +2 oxidation state.



$Ni(CO)_4$

Oxidation state of Ni is zero



255 **(a)**

4-methyl benzene sulphonic acid is stronger than acetic acid thus it will release acid from sodium acetate.

256 **(b)**

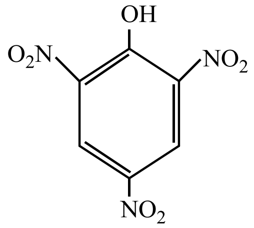
Phthalein test is characteristics of phenols.

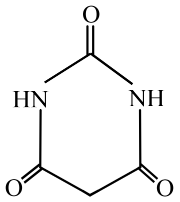
257 **(b)**

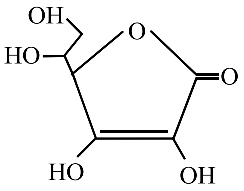
$[Cr(NH_3)_6][Co(CN)_6]$ is isomer to $[Cr(CN)_6][Co(NH_3)_6]$, i.e., ligands are partially changes in complex anion and complex cation.

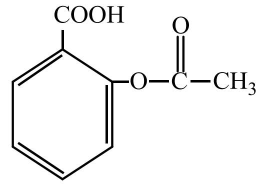
259 **(d)**

Aspirin is acetyl salicylic acid.


Picric acid


Barbituric acid


Ascorbic acid


Aspirin

Thus, only aspirin has carboxylic group.

260 **(d)**

Replacement of H-atom of ring usually takes place following S_E reaction mechanism.

261 **(d)**

$[Co(NH_3)_4]Cl_3 \rightleftharpoons [Co(NH_3)_4]^{3+} + 3Cl^-$

262 **(d)**

Because there is direct bonding of metal ion with carbon

263 **(c)**

CuCl in NH_4OH absorbs CO.

265 **(b)**

It is a fact.

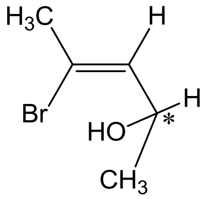
267 **(b)**

$-COOH$ gp. is *meta* directing gp.

268 **(b)**

$[Ni(H_2O)_4]SO_4 + NH_4OH \rightarrow [Ni(NH_3)_4]SO_4$

269 **(b)**



Compound has one chiral carbon atom thus, it has two geometrical (*cis* and *trans*) and two optical isomers

270 **(c)**

The directive influence order and tendency to release electron for *o*-and *p*-directing group is,

$$O_2^- > NR_2 > NHR > NH_2 > OH > OCH_3 \approx NHCOCH_3 > CH_3 > X$$

271 **(d)**

In organometallic compound, carbon atom is directly bonded to metal atom. Methyl lithium (CH_3Li) is an organometallic compound.

272 **(a)**

This is crossed Cannizzaro's reaction in which HCHO is oxidized.

$C_6H_5CHO + HCHO \xrightarrow{NaOH} C_6H_5CH_2OH + HCOONa$.

273 **(d)**

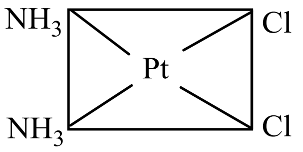
Gammexane is $C_6H_6Cl_6$.

274 **(b)**

Each ligand donates one electron pair.

275 **(c)**

7. is isomer of $[Pt(NH_3)_2Cl_2]$ which is used as an anticancer drug for treating several types of malignant tumours.



(*cis*-platin)

276 **(d)**

$C_6H_5CHO \xrightarrow{Reduction} \underset{\text{Benzyl alcohol.}}{C_6H_5CH_2OH.}$

277 **(d)**

Petroleum and coal are main sources of aromatic compounds.

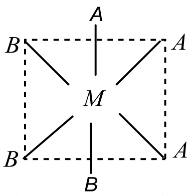
279 **(c)**

1 2 3 4
$CH_2 - CH - CH_2 - CH_2$
| | |
CN CN CN

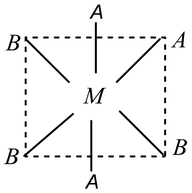
Butane-1,2,4-tricarbonitrile

280 **(b)**

Fac-mer isomerism is associated with $[MA_3B_3]$ type complexes.



cis isoment (-*Fac* isomer)



trans isoment (*Mer*- isomer)

282 **(c)**

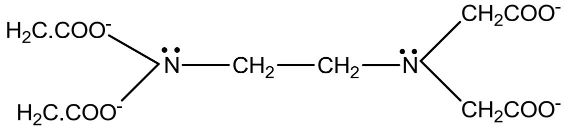
Intramolecular H-bonding gives rises to lower m.p.

283 **(b)**

Mn does not form mononuclear carbonyl.

284 **(b)**

Ethylenediamine tetraacetic acid is a hexadentate ligand because it has six donor centres.



ethylene diamine tetra acetate ion

285 **(b)**

H H
| |
(i) − H − C − C − Cl 1,1-dichloro ethane
| |
H Cl

(ii) H H
| |
H − C − C − H 1,2-dichloro ethane
| |
Cl Cl

Both are position isomers

286 **(c)**

Hybridisation	Geometry of complex
sp^3	Tetrahedral
dsp^2	Square planar
d^2sp^3	Octahedral
sp^2d^2	Not possible

287 **(b)**

$CH_3 - CH = CH - COOC_2H_5$ is Ethyl-2-butenoate

288 **(d)**

Waxes are not obtained obtained by destructive distillation of wood or coal.

289 **(c)**

Formaldehyde and benzophenone are also obtained.

290 **(b)**

It ionizes to Fe^{3+} and SO_4^{2-}.

291 **(d)**

These are the concepts of Werner's theory.

293 **(b)**

In $K_3[Co(CO_3)_3]$, cobalt shows the +3 oxidation state *i.e.*, (d^6) ion. Hence, Co (+3) has four unpaired electrons so, it is paramagnetic.

The magnetic moment of Co(+3)

In $K_3[Co(CO_3)_3] = \sqrt{n(n+2)}$ BM

$= \sqrt{4(4+2)}$ BM=4.9 BM

Where, n=number of unpaired electrons

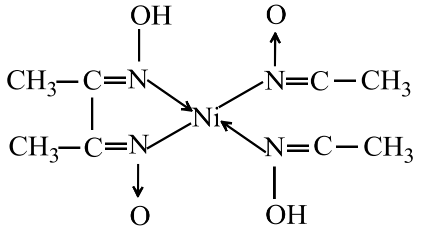
CO_3^{2-} is a weak field bidentate ligand, so $3CO_3^{2-}$ ligands occupy six orbitals, thus it shows $sp^3\,d^2$ hybridisation and octahedral in shape.

296 **(a)**

Some heterocyclic compounds (hetero aromatics) possess aromatic nature. Follow Hückel rule.

297 **(c)**

Nickel reacts with dimethylglyoxime to give red ppt. of nickel-dimethyl glyoxime complex.



298 **(b)**

$C_6H_5NH_2 \xrightarrow{NaNO_2+HCl} C_6H_5N_2Cl \xrightarrow{SnCl_2+HCl} C_6H_5NHNH_2$

299 **(d)**

$-CH_3$ gp. is o-and p-directing $FeCl_3$ is halogen carrier.

300 **(b)**

It has coordination number of six and thus, should have six hybridized orbitals, $i.e.$, d^2sp^3-hybridization.

301 **(a)**

For $K_4[Fe(CN)_6]$, the EAN of Fe^{2+} ion $=(26-2+12)=36$.

Hence it follows EAN rule, as its EAN is equal to number of electrons of Kr (inert gas), *i.e.*, 36.

302 **(b)**

OCH_3 gp. an o – and p –directing group activates ring for S_E reactions.

303 **(b)**

Anilium hydrochloride gives white ppt. with $AgNO_3$.

305 **(a)**

This is a fact for given statement.

307 **(b)**

Ortho, *meta* and *para*.

308 **(b)**

Follow IUPAC rules.

309 **(b)**

8. $Mn^+ = 3d^5, 4s^1$. In presence of CO effective config $3d^6, 4s^0$.

Three lone pair of back bonding with vacant orbital of C in CO.

9. $Fe^0 = 3d^6, 4s^2$. In presence of CO effective config $3d^8$.

Four lone pair for back bonding with CO.

10. $Cr^0 = 3d^4, 4s^2$. Effective configuration $= 3d^6$.

Three lone pair for back bonding with CO.

11. $V^- = 3d^4, 4s^2$. Effective configuration $= 3d^6$.

Three lone pair for back bonding with CO.

Maximum back bonding in $Fe(CO)_5$, therefore CO bond order is lowest here.

311 **(b)**

d^4: Forms outer complex in high spin and forms inner complex in low spin. It cannot form octahedral complex.

d^6 : In low spin it forms inner octahedral complex and in high spin forms outer octahedral complex.

d^8 : Forms only outer spin octahedral complex.

312 **(c)**

Bromo group, o- and p-directing.

313 **(c)**

The given statement represents only ether.

314 **(a)**

Due to asymmetric carbon atom.

315 **(a)**

This is a fact for the given statement.

316 **(c)**

$CN^-$and OH^- are strong nucleophiles.

$[Fe(OH)_5]^{3-}$ is not formed.

317 **(b)**

The prefixes erythro and threo are used in systems containing two asymmetric carbons when two of the groups are the same and the third is different. The erythro-isomer has identical groups as the same side when a drawn in Fischer projection and threo-isomer has them on opposite side

318 **(b)**

Main fractions of coal-tar and the compounds present there in are:

	Main fraction	Temp. range	Chief constituents

1.	Light oil or crude naphtha	80-170°C	Benzene, toluene, xylenes, etc.
2.	Middle oil or carbolic acid	170-230°C	Phenol, naphthalene, pyridine, etc.
3.	Heavy oil or creosote oil	230-270°C	Cresols, naphthalene quinolone, etc.
4.	Green oil or anthracene oil	270-360°C	Anthracene, phenanthrene, etc.
5.	Pitch	Residue	90-94% of carbon

319 **(d)**

The order of reactivity depends on the stability of intermediate carbocation formed due to heterolytic cleavage of C—X bond.

320 **(d)**

Greater is the number of chelate rings, greater is stability of the chelate. Hence, five fused cyclic system is most stable for a chelate.

321 **(b)**

$HNO_3 + H_2SO_4$ acts as nitration mixture.

323 **(d)**

The negative charge density on V-atom favours easy electron pair donation.

324 **(b)**

Due to acidic nature.

325 **(d)**

If a substance rotates the plane polarised light in clockwise direction it is dextrorotatory (+). If it rotates the plane polarised light in anticlockwise direction then it is laevorotatory (−)

326 **(c)**

$$C_6H_6 \xrightarrow{\text{HCN+HCl}} C_6H_5CH{=}NH \xrightarrow{\text{HOH}} C_6H_5CHO$$

327 **(b)**

EAN of Fe in $K_4Fe(CN)_6 = 26 - 2 + 2 \times 6 = 36$; the at. no. of next inert gas.

329 **(b)**

Both Ni $(CO)_4$ and $Ni(PPh_3)_2Cl_2$ have sp^3-hybridisation

331 **(d)**

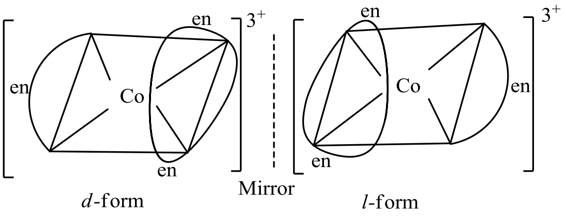
All are examples of strong ligand field, because all have greater value of Δ; Δ represents the strength of ligand field.

332 **(a)**

Due to rearrangement because 2° carbon is more stable than 1° carbon.

333 **(d)**

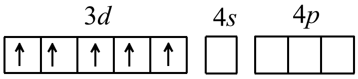
Tris –(ethylenediamine) cobalt(III) bromide ($[Co(en)_3]Br_3$)exhibits optical isomerism.



334 **(c)**

$K_3[FeF_6]$

$Fe^{3+} = [Ar]\, 3d^5\, 4s^0$



Number of unpaired electrons=5

Magnetic moment $=\sqrt{n(n+2)} = \sqrt{s(s+2)}$

$= \sqrt{35} = 5.91$ BM

335 **(b)**

EAN of Cr $= 24 - 3 + 6 \times 2 = 33$.

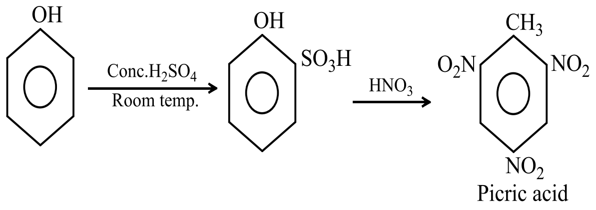
336 **(d)**

Paramagnetic character ∝ number of unpaired electrons.

$_{25}Mn^{2+}$ ion has maximum unpaired (five unpaired electrons)

electrons. So, $[Mn(H_2O)_6]^{2+}$ is most paramagnetic.

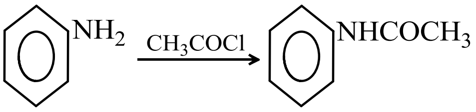
337 **(d)**



Note : The reaction gives 2, 4, 6-trinitrophenol. Choice is not given. Only option left is o-nitrophenol, which is not formed in this course of reaction.

338 **(d)**

NH_2 in aniline is highly susceptible to oxidant and therefore nitration of aniline is carried out by protecting it against oxidation by acetyl chloride.



339 **(b)**

—COOH is $meta$-directing group.

340 **(d)**

$[Co(NO_2)(NH_3)_5]Cl_2$

Pentaammine nitrito –N- cobalt (III) chloride.

341 **(b)**

The ionisation isomer of

$[Cr(H_2O)_4Cl\,(NO_2)]Cl$ is $[Cr(H_2O)_4Cl_2](NO_2)$ because of exchanging of ligand and counter ions.

342 **(c)**

All can be prepared from phenol.

343 **(a)**

Only iodobenzene gives Ulmann's reaction,

$$2C_6H_5I \xrightarrow{Cu} C_6H_5\text{—}C_6H_5$$

344 **(c)**

Fischer projection can be manipulated by rotating a group of any three ligands in clockwise (D) or anticlockwise (L) direction, the fourth ligand does not change its position

345 **(b)**

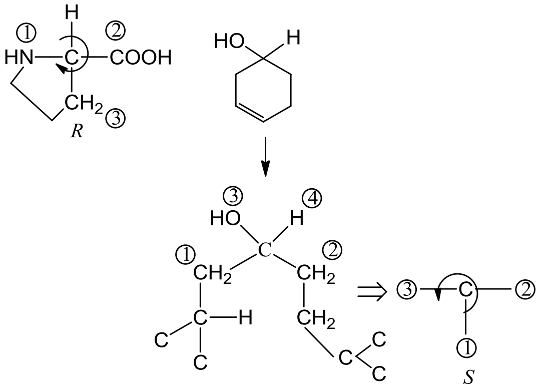
A strong filed ligand produces low spin complexes.

347 **(a)**

Ni in $[Ni(H_2O)_6]^{2+}$ has two unpaired electrons in it.

348 **(b)**

Compounds in which a chiral centre is part of a ring are handed in a analogous fashion



351 **(a)**

$$C_6H_6 + CH_3Cl \xrightarrow{AlCl_3\ \text{anhy.}} C_6H_5CH_3$$

352 **(b)**

The formula of hexamine copper (II) sulphate is$[Cu(NH_3)_6]SO_4$. It dissolve in water as

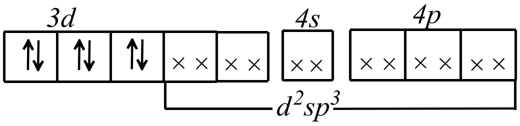
$$[Cu(NH_3)_6]SO_4 \rightleftharpoons \underbrace{[Cu(NH_3)_6]^{2+} + SO_4^{2-}}_{\text{2 ions}}$$

354 **(b)**

Complex of type $[M(AA)_3]$ show optical isomerism.

355 **(b)**

Electronic configuration of Fe^{2+} in $K_4Fe(CN)_6$ is:



×× Electron pair donated by CN^-.

356 **(d)**

$$\underset{6}{CH_3} - \underset{5}{CH_2} - \underset{4}{C} \equiv \underset{3}{C} - \underset{2}{CH} = \underset{1}{CH_2}$$

hex-1-en-3-yne

357 **(b)**

Oxidation state of Ni in K_2NiF_6 is +4; the highest among all.

359 **(d)**

Substituents always get higher number than the principal functional group while, numbering the longest possible chain

360 **(d)**

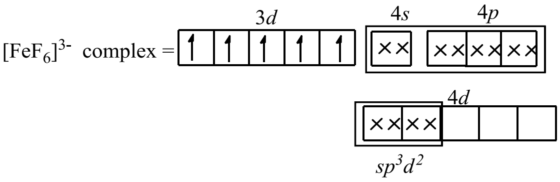
Draw different isomers.

362 **(b)**

Metal carbonyl organometallic compounds possess both σ-and π-characters.

363 **(b)**

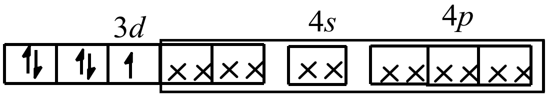
F^- is a weak field ligand and $[FeF_6]^{3-}$ is an outer-orbital complex



$[FeF_6]^{3-}$ shows $sp^3\,d^2$ hybridisation and Fe^{3+} has five unpaired electrons.

In $[Fe(CNS)_6]^{3-}$, CNS^- is a strong field ligand and is inner orbital complex.

$[Fe(CNS)_6]^{3-}$



sp^3d^2 - hybridisation

$[Fe(CNS)_6]^{3-}$ shows $d^2\,sp^3$ hybridisation and has one unpaired electron.

Hence, the reaction.

$[Fe(CNS)_6]^{3-} \rightarrow [FeF_6]^{3-}$

takes place with increase in magnetic moment.

364 **(a)**

Presence of three $\text{—}NO_2$gp. in chlorobenzene activates Cl atom to show S_N reactions.

365 **(a)**

Complex compounds or complex salts containing two different metallic elements give tests for only one element. For example, potassium hexacyanoferrate (II), $K_4[Fe(CN)_6]$ gives tests only for K^+ ions and not for Fe^{2+} ions.

$K_4[Fe(CN)_6] \rightleftharpoons 4K^+ + [Fe(CN)_6]^{4-}$

366 **(a)**

Only primary valencies are ionized.

$[Co(NH_3)_5Br]SO_4 \xrightarrow{BaCl_2} [Co(NH_3)_5Br]^{2+} + BaSO_4$

$[Co(NH_3)_5SO_4]Br \xrightarrow{AgNO_3} [Co(NH_3)_5SO_4] + AgBr$

0.01 mole of each by 0.01 mole of reactants.

367 **(c)**

Wilkinson's catalyst, $(Ph_3P)_3RhCl$

$RH^+ = [Kr]\ 4d^8s^0$

ie, dsp^2 hybridisation

Rh atom in Wilkinson's catalyst is dsp^2 hybridised giving a square planar shape to the molecule

368 **(d)**

H_2O is weak field ligand, thus Co^{2+} has only 3 unpaired electrons.

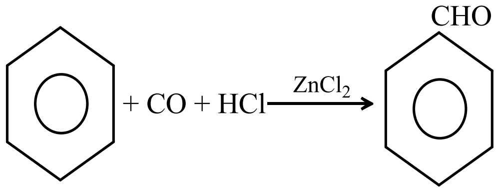
369 **(a)**

If an enantiomerically pure acid is treated with racemic mixture of an alcohol having a chiral carbon, the product formed will be optically active mixture

370 **(d)**

Cyclopropane is most strained since it has a maximum angle strain of $24° - 44'$

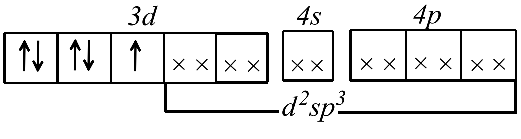
371 **(c)**



this is Gattermann-Koch reaction to introduce $-CHO$ gp. in C_6H_6 nucleus.

372 **(a)**

Mn in $Mn(CN)_6^{4-}$ has configuration:



373 **(d)**

It does not ionize to give Cl^- ions and thus, white ppt. of AgCl will not be obtained.

375 **(c)**

$[Pt(C_2H_4)Cl_3]$

$x + 0 + (-1) \times 3 = 0$

$x + (-3) = 0$

$x = +3$

377 **(c)**

Ni^{2+} has two unpaired ($3d^8$) electrons. CN^- is strong field ligand and thus all the eight electrons are paired giving dsp^2-hybridisation.

379 **(d)**

Coal-tar is source of all these.

380 **(c)**

Halogen attached to benzene nucleus is stabilized due to resonance.

382 **(a)**

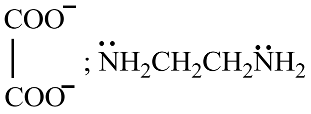
$-NO_2$ group is reduced to $-NH_2$ by Sn/HCl.

383 **(d)**

Each central atom attains the EAN equal to at. No. of next inert gas Kr, *i.e.*, 36.

384 **(c)**

A bidentate ligand has two donor sites available for coordination, *e.g.*,



$\begin{matrix} COO^- \\ | \\ COO^- \end{matrix}\ ;\ \ddot{N}H_2CH_2CH_2\ddot{N}H_2$

385 **(d)**

$-N_2Cl$ is reduced to H by either of these reducing agents.

386 **(c)**

Fe is present in the form of complex ion, *i.e.*, $[Fe(CN)_6]^{3-}$ which is not ionized to Fe^{3+} and CN^-.

387 **(a)**

$[Co(NH_3)_5SO_4]Br \rightleftharpoons [Co(NH_3)_5SO_4]^+ + Br^-$

$[Co(NH_3)_5Br]SO_4 \rightleftharpoons [Co(NH_3)_5Br]^{2+} + SO_4^{2-}$

The molecular formula of both of the above compounds is same but on ionisation they give different ions in solution, so they are called ionization isomers.

390 **(c)**

Phenols are weak acids and do not react with $NaHCO_3$ (a weak base).

391 **(b)**

$C_6H_5CH = CHCOOH$ is cinnamic acid; it has unsaturation.

392 **(a)**

Magnetic moment of

$K_3[Fe(CN)_6]$=1.7 BM

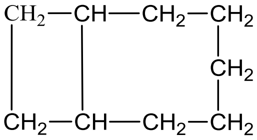
Magnetic moment=$\sqrt{n(n+2)}$

n =number of unpaired electrons present in molecule

$1.7=\sqrt{n(n+2)}$

$-n^2 + 2n - 2.89 = 0$ then $n = 0.97$ or 1

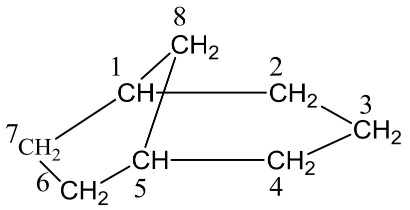
393 **(c)**



This compound contains 9 carbon atoms and corresponding alkane is nonane. Three bridges contain 5, 2 and 0 carbon atoms. Therefore, the name of the compound is bicyclo [5.2.0] nonane

395 **(c)**

The compound have structure as written below



bicyclo [3.2.1] octane

396 **(d)**

It is m-directing gp.

397 **(a)**

Carbylamines reaction.

400 **(d)**

$C_6H_5SO_3Na + NaOH \longrightarrow C_6H_5ONa + NaHSO_3$

$C_6H_5ONa \xrightarrow[H^+]{HOH} C_6H_5OH + NaOH$

401 **(a)**

The stability order of conformations of cyclohexane is

Chair > twist boat > boat > half chair

402 **(b)**

Phenolic group is susceptible for oxidation and thus, to obtain o- and p-nitrophenol dil. HNO_3 is used in place of conc. $HNO_3 + H_2SO_4$.

403 **(c)**

Lower is mol. Wt. lower is b.p., also 1, 2-dihydroxy benzene show chelation and thus have lower b.p. than 1,3 and 1,4-derivatives.

Phenol 1,2-dihydroxyb 1,3-dihyroxyb 1,4-dihydroxyb

enzene enzene

enzene

m.p. 43°C < 105°C <110°C <170°C

b. p. < < <

405 **(b)**

$K_2[PtCl_6] \rightleftharpoons 2K^+ + [PtCl_6]^-$

407 **(b)**

Phenols are weakly acidic due to resonance.

408 **(b)**

Follow IUPAC rules.

409 **(a)**

Compounds having coordination number six and following the general formula show geometrical and optical isomerism.

$M_{A_4B_2}, M_{A_4BC}, M_{A_3B_3}$ *and* $M_{(AA)_2B_2}$show geometrical isomerism and

$M_{A_2X_2Y_2}, M_{A_2X_2YZ}, M_{A_2XYZL}$

M_{ABXYZL}, $M_{(AA)_3}, M_{(AA)_2}X_2$ show optical isomerism. (AA) is bidentate ligand.

410 **(b)**

$[Co(NH_3)_4Cl_2]Cl$, Its IUPAC name is tetraammine dichloro cobalt III chloride.

411 **(c)**

The ease of hydrolysis depends upon the magnitude of the +ve charge on the carbonyl group.

412 **(d)**

All are the common uses of nitrobenzene.

413 **(b)**

$K_4[Ni(CN)_4] \longrightarrow 4K^+ + [Ni(CN)_4]^{4-}$

$x+(4\times -1)=-4$

$x-4=-4$

$x=0$

414 **(a)**

Presence of —OH gp. in C_6H_6 nucleus increases acidic nature.

416 **(b)**

Halogen attached on side chain behaves as in aliphatic molecule.

417 **(d)**

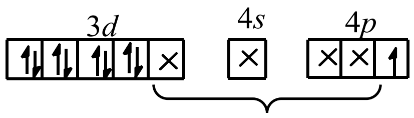
Cyclohexane is an aliphatic cyclic compound.

418 **(c)**

12. In $[Cu(NH_3)_4]^{2+}$, Cu is present as Cu^{2+}

$$Cu^{2+} = [Ar]3d^9 4s^0$$

$[Cu(NH_3)_4]^{2+} = [Ar]$



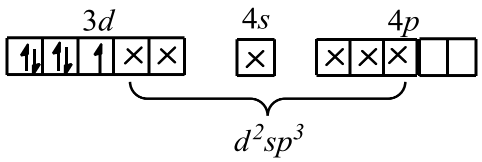
(NH_3 being a strong field ligand shifts one electron from 3d-orbital to 4p-orbital.)

13. In $[Ni(CO)_4]$, CO is a neutral ligand

14. In $[Fe(CN)_6]^{3-}$, Fe is present as Fe^{3+}.

$$Fe^{3+} = [Ar]3d^5 4s^0$$

$[Fe(CN)_6]^{3-} = [Ar]$



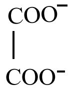
Thus, its hybridization is d^2sp^3 not sp^3d^2, i.e., it is an inner orbital complex.

15. $[Co(en)_3]^{3+}$ contains total 36 electrons, *i.e.* follows EAN rule.

420 **(c)**

Optical isomerism is very common in octahedral complexes having general formula $[M_{A_2B_2C_2}]^{n-}, [M_{ABCDE}]^{n-}, [M_{(AA)_3}]^{n-}$, $[M_{(AA)_3B_2}]^{n-} [M_{(AA)_3BC}]^{n-}$ and $[M_{(AB)_3}]^{n-}$

where *AA* is symmetrical bidentate ligand like



$\begin{array}{c} COO^- \\ | \\ COO^- \end{array}$

and *AB* is unsymmetrical bidentate ligand.

421 **(c)**

$[Co(NH_3)_5NO_2]Cl_2 \rightleftharpoons [Co(NH_3)_5NO_2]^{2+} + 2Cl^-$

$2Cl^- + Ag^+(\text{excess}) \longrightarrow 2AgCl \downarrow$

422 **(a)**

C_6H_5C is benzo gp.

423 **(c)**

It is the reason for given fact.

424 **(b)**

d^6-cation with low spin has electronic configuration $t_{2g}^6 e_g^0$.

Total energy= $(-0.4\ \Delta_0$ per $e^- \times 6) + (e^-$ pairing energy of 3 pairs)

$$= -2.4\ \Delta_0 + 3P$$

$$= -\frac{12}{5}\Delta_0 + 3P$$

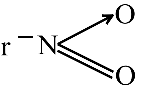
426 **(c)**

It is DDT, *i.e.*, p, p' -dichloro diphenyl trichloroethane.

428 **(b)**

$[Cr(NO_2)(NH_3)_5]$ Cl show linkage isomerism.

NO_2^- can link $^-O-N=O$ or

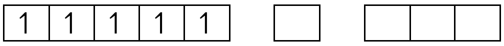


429 **(d)**

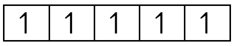
Cl, being a weak field ligand, does not cause pairing of *d*-electrons of the metal atom and thus, forms outer orbital complex as.

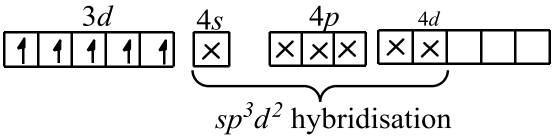
In $[Fe(Cl)_6]^{3-}$, Fe is present as Fe^{3+}

$Fe^{3+} = [Ar]3d^5\ 4s^0\ 4p^0$



$[Fe(Cl)_6]^{3-} = [Ar]$





sp^3*d*^{2} hybridisation

430 **(d)**

$_pK_a$ for (a), (b), (c) and (d) are 4.17, 4.09, 3.49 and 3.43 respectively.

431 **(a)**

$[H_2EDTA]^{2-} + Mg^{2+} \rightarrow [MgEDTA]^{2+} + 2H^+$

16. In this complex, four donor sites are occupied by oxygen and two donor sites are occupied by nitrogen.

17. This complex is six coordinated.

18. Complex $[MgEDTA]^{2-}$ is colourless.

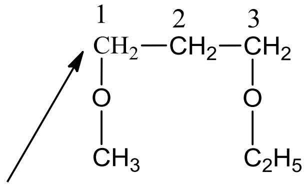
19. Increase in $[H^+]$decreases pH of the solution.

433 **(c)**

Different compounds having the same molecular formula but different properties are called isomers

434 **(c)**

In the compound



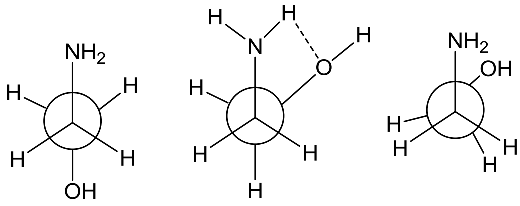
Numbering will be done from this end because both are side chains and $-OCH_3$ is smaller than $-OC_2H_5$

3-ethoxy-1-methoxy-propane

435 **(a)**

Each carbon in benzene is sp^2-hybridized.

436 **(b)**



Anti Gauche Eclipsed

So, gauche form stabilized by intermolecular hydrogen bonding hence, gauche is more stable than anti

437 **(a)**

$AgCN + KCN \longrightarrow K[Ag(CN)_2]$.

438 **(b)**

Carbocyclic compounds which resemble aliphatic compounds in their properties are called alicylic compounds

439 **(a)**

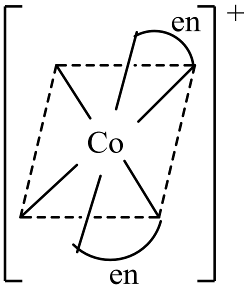
—NO_2 gp. is deactivating gp.

440 **(b)**

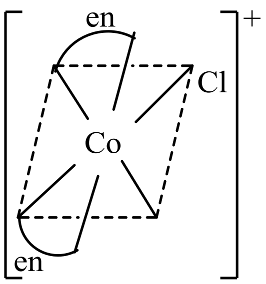
The molecule contains three chlorine atoms out of which only two are ionized.

441 **(b)**

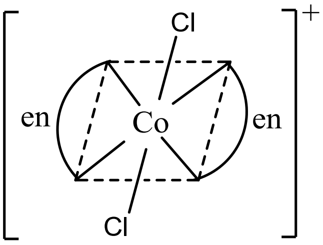
$[Co(en)_2Cl_2]^+$ have three optical isomers which are given below.



d-cis form



l-cis form



trans-meso form

442 **(c)**

The reaction carried out in alkaline pH, *ie*, 9 − 11

444 **(d)**

NO_2 gp. withdraws electrons from o –and p-position and thus, deactivates the ring. This deactivation stabilises the negatively charged intermediates formed during reaction and thus, replacement of—Cl becomes easier.

446 **(a)**

$Ti(C_2H_5)_4$is an organometallic compound because there is direct bonding of metal ion with carbon.

447 **(a)**

Octahedral $Co(NH_3)_4Br_2Cl$ shows ionisation and geometrical isomerism.

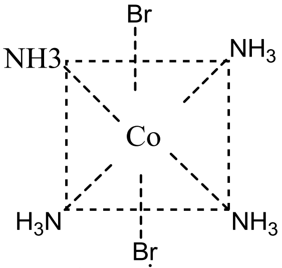
In ionisation isomerism ligands show different coordination sphere and the anions present outside the coordination sphere.

These are exchanged with each other as follows

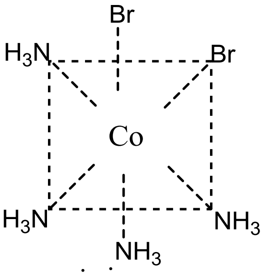
$$Co(NH_3)_4Br_2Cl \rightleftharpoons [Co(NH_3)_4Br_2]^+ + Cl^-$$
I

$$[Co(NH_3)_4BrCl]Br \rightleftharpoons [Co(NH_3)_4Br\,Cl]^+ + Br^-$$
II

In geometrical isomerism, coordination number of central atom (cobalt) is six and shape is octahedral, so it shows following geometrical isomers.



trans-isomer



cis-isomer

448 **(a)**

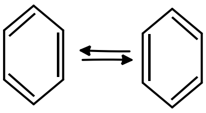
Aliphatic amines are stronger base than aromatic amines.

449 **(b)**

Follow Hückel rule.

450 **(d)**

⇄ sign represents oscillating structures (Kekule) for C_6H_6 ;



451 **(b)**

$C_6H_5CHCl_2 \xrightarrow{HOH} C_6H_5CHO$.

453 **(c)**

Cr has coordination no. 6 in its carbonyl and other complexes.

454 **(d)**

Neutral $FeCl_3$ $(aq.)$ gives violet coloured complex with phenol.

455 **(a)**

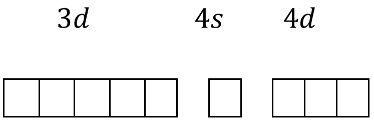
$[CoF_6]^{3-}$ is an outer complex having sp^3d^2-hybridization.

456 **(d)**

$[Sc(CN)_6]^{3-}$

Sc=21=$1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2, 3d^1$

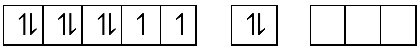
Sc^{3+} =



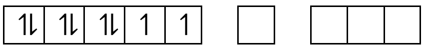
No unpaired electron

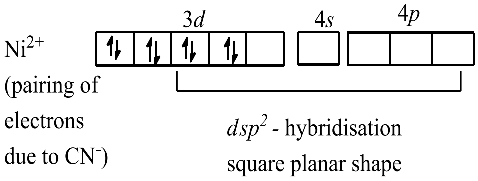
$Ni(CN)_4^{2-}$

Ni(G. S.) 3d 4s 4p



Ni^{2+} 3d 4s 4p

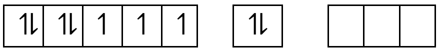




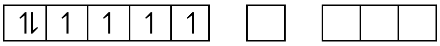
It has no unpaired electron hence, diamagnetic.

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

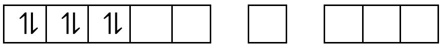
Co (G.S.) $3d$ $4s$ $4p$



Co^{3+} $3d$ $4s$ $4p$



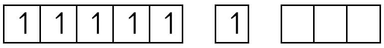
Co^{3+} $3d$ $4s$ $4p$



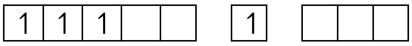
(Pairing
due to CN^-)

$[Cr(CN)_6]^{3-}$

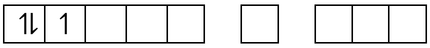
Cr (G.S.) $3d$ $4s$ $4p$



Cr^{3+} $3d$ $4s$ $4p$



Cr^{3+} $3d$ $4s$ $4p$



(due to CN^-)

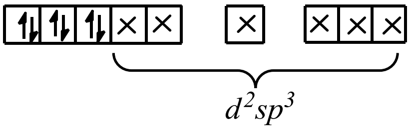
It has one unpaired electron so, paramagnetic.

458 **(a)**

$[Fe(CN)_6]^{4-} \rightarrow Fe^{2+} \rightarrow$

(Strong field)

$1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^6$



CN^- is strong field ligand, it cause pairing while $C_2O_4^{2-}$ and F^- are weak field ligands and don't causes pairing.

Hence, $[Fe(CN)_6]^{4-}$ due to the absence of unpaired electrons is diamagnetic.

459 **(c)**

${}_{28}Ni^{2+}$ in $[Ni(NH_3)_6]^{2+}$ has $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^8$ configuration. It uses 4th orbital to show sp^3d^2 hybridisation to form outer complex with 2 unpaired electrons in $3d$-orbital.

460 **(c)**

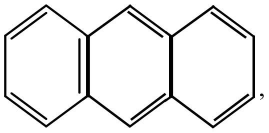
Moth repellent due to insecticide nature.

461 **(c)**

The number of unidentate ligand in the complex ion is called coordination number.

462 **(b)**

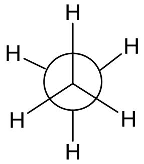
Anthracene is



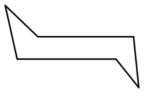
7double bonds and thus, 14 π- electrons.

463 **(b)**

In ethane and cyclohexane, staggered and chair forms are more stable respectively



Staggered from of ethane



Chair from of cyclohexane

464 **(d)**

$(CH_3)_4Sn$ has no π-bond.

465 **(a)**

Halogens however o- and p-directing group but deactivate ring for S_E reactions due to electron withdrawing nature.

466 **(b)**

It is the reason for the fact.

467 **(a)**

$-NO_2$ gp. is deactivating gp.

470 **(c)**

The side reaction produces diphenyl ether. The yield may be increased by adding little diphenyl ether with $C_6H_5Cl + NaOH$.

471 **(c)**

Atoms or groups donating electron pair to metal are ligands.

472 **(d)**

Aniline is insoluble in water.

473 **(d)**

CrO_2Cl_2 has + 6 oxidation state of Cr.

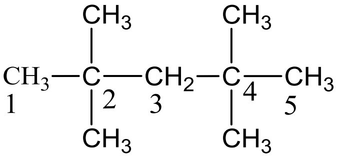
475 **(b)**

It is a method to estimate hardness of water.

476 **(a)**

Both are non-polar; like gets dissolved in like.

477 **(b)**



$$CH_3-\overset{CH_3}{\underset{CH_3}{C}}-CH_2-\overset{CH_3}{\underset{CH_3}{C}}-CH_3$$

There are two carbon atoms, *ie*, C-2 and C-4 are tertiary C-atoms

478 **(b)**

Rosenmund's reaction.

479 **(c)**

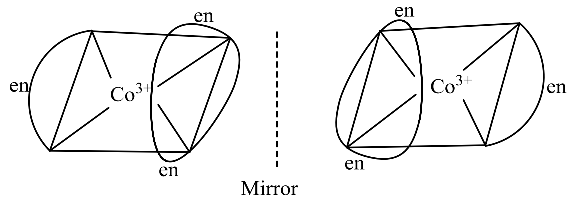
$C_6H_5CHO \xrightarrow{Zn-Hg/HCl} C_6H_5CH_3$

480 **(c)**

F^- has lowest Δ_o value depending upon the splitting power of d-orbitals

481 **(b)**

Complex $[Co(en)_3]^{3+}$ has no plane of symmetry and centre of symmetry that's why it is optically active.



482 **(a)**

It is preparation of DDT.

483 **(a)**

Light oil mainly contains $C_6H_6, C_7H_8, C_8H_{10}$, etc.

484 **(c)**

Coordination number is the number of ligand σ-bonded to metal-atom. Hence, coordination number of Xin $[X(SO_4)(NH_3)_5]Cl$ is 6. Let oxidation state of Xin the complex be 'y' then

$$y+(-2)+5(0)+(-1)=0$$
$$y-2-1=0$$
$$y=+3$$

485 **(a)**

$C_6H_5CH_3 \xrightarrow[hv]{Cl_2} C_6H_5CH_2Cl$

In presence of light substitution occurs is side chain.

486 **(a)**

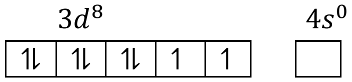
$[CoCl_3(NH_3)_3]$ cannot ionize in solution because three chloride ions satisfy primary and secondary valencies. It will not be precipitated by the addition of$AgNO_3$.

487 **(d)**

For $[Ni(CN)_4]^{2-}$, oxidation state of Ni is +2.

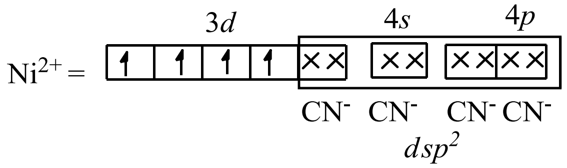
CN^-=strong field ligand

Ni^{2+}(ground state)=



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

Ni^{2+} =

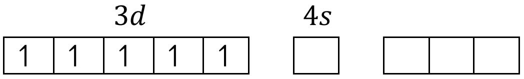


dsp^2 hybridisation, *i.e.*, square planar geometry, zero unpaired electron, *i.e.*, zero magnetic moment

For $[MnBr_4]^{2-}$, oxidation state of Mn is +2.

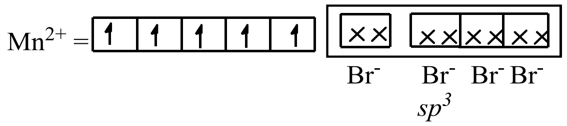
Br^-= weak field ligand

Mn^{2+} (in ground state)



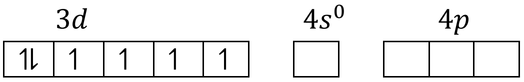
In $[MnBr_4]^{2-}$,

Mn^{2+} =



sp^3 hybrisation, *i.e.*, tetrahedral geometry, five unpaired electrons, *i.e.*, magnetic moment=5.9

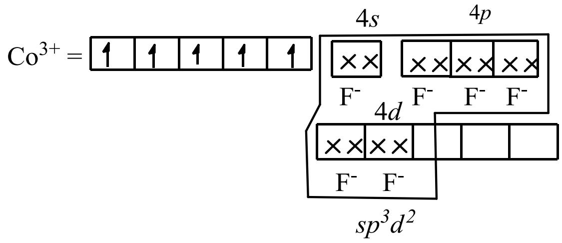
Co^{3+} in ground state=



For $[CoF_6]^{3-}$, oxidation state of Co is +3.

F^-=weak field ligand

In $[CoF_6]^{3-}$



$sp^3\,d^2$ hybridisation *i.e.*, octahedral geometry four unpaired electrons *i.e.*, magnetic moment is 4.91 BM.

489 **(b)**

An experimental value.

491 **(c)**

A commonly used food preservative.

492 **(a)**

$C_6H_5ONa + C_2H_5I \longrightarrow \underset{\text{Phenetole}}{C_6H_5OC_2H_5} + NaI$

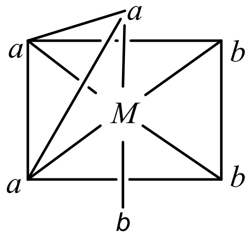
493 **(d)**

Metal carbonyl are regarded as the coordination compounds formed by the donation of lone pair of electron of CO into the suitable empty orbital of zero valent transition metals such as Ni, Fe etc. Therefore, the M— C bond is coordinate covalent.

494 **(d)**

When the three ligands (with same donor atoms) are on the same triangular face of the octahedron, the isomer is called *facial* or *fac* isomer.

The octahedral complex is *facial* or *fac* isomer.



In this complex, the three ligands are on the same triangular face of the octahedron.

495 **(a)**

Number of unpaired electrons in $[Fe(CN)_6]^{4-}$ is zero.

Thus, magnetic moment

$$=\sqrt{n(n+2)}=0 \text{ BM}$$

(n=unpaired electrons)

n in $[MnCl_4]^{2-}=5, \sqrt{35}$ BM

n in $[CoCl_4]^{2-}=3, \sqrt{15}$ BM

496 **(a)**

Orange-red dye is formed with aniline.

499 **(a)**

It is a fact. Follow *ortho* effect.

500 **(d)**

Half chair is transition state conformation between the chair and boat conformation. The energy difference between the chair and half chair conformation being 44 kJ mol^{-1}. Hence it is most unstable

501 **(a)**

The M—C π-bond in metal carbonyl which is formed by the donation of an electron pair from a filled d-orbital of metal into the vacant antibonding π-orbital of CO, strengthens the M—C σ— bond. This is called synergic effect and is usually observed in metal carbonyls. Thus $[Ni(CO)_4]$ exhibits synergic effect.

503 **(b)**

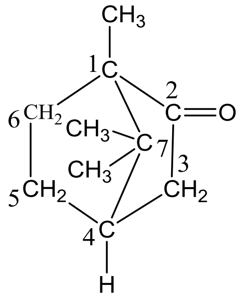
$$Pt \xrightarrow{\text{Aqua regia}} H_2[PtCl_6] \overset{\Delta}{\rightarrow} PtCl_4 + 2HCl$$

504 **(d)**

Follow IUPAC rules.

505 **(b)**

The structure of the compound is



1,7,7-trimethyl bicyclo [2.2.1] heptan-2-one

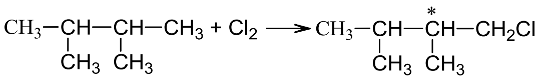
506 **(d)**

$-CH_3$ gp. is *ortho* and *para* directing.

507 **(a)**

Estimation of calcium and magnesium is done by EDTA.

508 **(d)**



$$CH_3-\underset{CH_3}{CH}-\underset{CH_3}{CH}-CH_3 + Cl_2 \longrightarrow CH_3-\underset{CH_3}{CH}-\underset{CH_3}{\overset{*}{C}H}-CH_2Cl$$

2,3-dimethyl butane 1-chloro-2,3-dimethyl butane

Due to the presence of chiral centre it shows the optical activity and its mirror image are non superimposable hence it shows one enantiomer pair

$$CH_3-\underset{CH_3}{CH}-\underset{CH_3}{CH}-CH_2Cl \quad | \quad ClCH_2-\underset{CH_3}{CH}-\underset{CH_3}{CH}-CH_3$$

509 **(b)**

C_6H_6 and other aromatic compounds show characteristics S_E reactions.

510 **(d)**

$CH_2 = CH - CH = CH - CH = CH - CH_3$

1 2 3 4 5 6 7

Hepta-1,3,5-triene

511 **(b)**

1 2 3

$CH_2 - CH - CH_2$

| | |

CHO CHO CHO

Propane-1, 2, 3-tricarbaldehyde

512 **(a)**

The attacking species in sulphonation is SO_3.

$H_2SO_4 \longrightarrow H_3O^+ + SO_3 + HSO_4^-$

513 **(d)**

$CHCl_3$ has no reaction with Br_2.

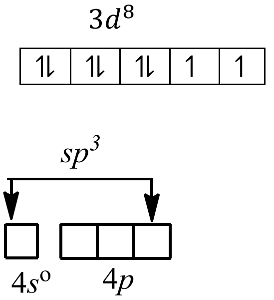
514 **(c)**

$[NiCl_4]^{2-}$; oxidation number of Ni,

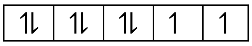
$x-4=-2$

$\therefore x=+2$

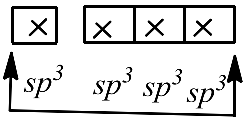
$Ni_{(28)} = [Ar]3d^8, 4s^2$



Ni^{2+}[Ar]



$[NiCl_4]^{2-}$



***sp^3* -hydrid orbitals, tetrahedral**

Cl^- is a weak ligand and thus unpaired electrons are not paired. Lone pairs from $4Cl^-$are accommodated in four sp^3 hybrid orbitals.
N=unpaired electron=2, paramagnetic
Magnetic moment (spin only)

$$=\sqrt{N(N+2)}\text{ BM}=\sqrt{8}=$$

2.828 BM

515 **(b)**

Pyridine shows $S_E$reactions at position-3 preferentially and at 2,4-positions under specific conditions.

516 **(a)**

$K[Ag(CN)_2] \rightleftharpoons K^+ + [Ag(CN)_2]^{1-}$

517 **(a)**

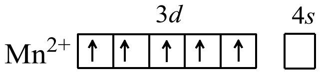
Its coordination number will be 6 because it is bonded with three bidentate ligands
$x+3(-2)+3(+1)=0 \Rightarrow x=+3$

518 **(c)**

The four ions on ionisation are possible only when three Cl^- are outside the coordination sphere.
$[Pt(NH_3)_5Cl]Cl_3 \rightleftharpoons [Pt(NH_3)_5Cl]^{3+} + 3Cl^-$

519 **(a)**

In presence of H_2O which is a weak ligand no pairing occurs which results in unpaired electrons left in the compound, due to which it shows paramagnetism



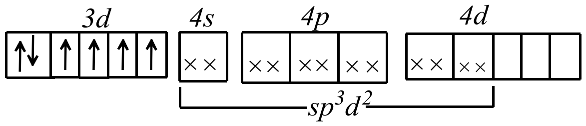
520 **(a)**

This is a fact.

521 **(b)**

It is outer complex having $sp^3d^2[CoF_6]^{3-}$ ion.

Electronic configuration of Co^{3+} in $[CoF_6]^{3-}$ is:



×× Electron pair donated by F^-

523 **(d)**

The two given compound have same composition but in solution both will give different ions. The isomerism is known as ionisation isomerism

524 **(a)**

Coordination number is the maximum covalency shown by a metal or metal ion. It is the maximum number of ligands attached to metal by sigma bonds or coordinate bonds.

525 **(a)**

$C_6H_5COOH + N_3H \longrightarrow C_6H_5NH_2 + CO_2 + N_2$; this is Schmidt's reaction.

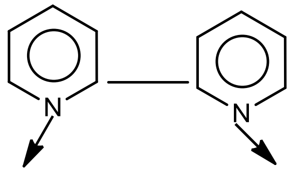
526 **(d)**

Each possess the tendency to have coordination number equal to six.

527 **(d)**

Hexadentate ligand donates six pair of electrons to central atom.

(a) 2, 2-dipyridyl-bidentate ligand



(b) DMG-bidentate ligand

$CH_3-C=N-O\rightarrow$
$\quad\;\;|$
$CH_3-C=N\rightarrow$
$\qquad\quad|$
$\qquad\;\;OH$

(c) Ethylenediamine-pentadentate ligand

∴ None of the given ligand is hexadentate ligand.

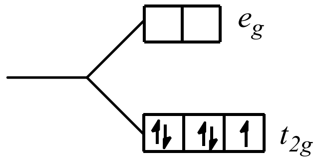
528 **(d)**

$\underset{\text{Base}}{HNO_3} + \underset{\text{Acid}}{H_2SO_4} \longrightarrow NO_2^+ + H_3O^+ + HSO_4^-$

529 **(d)**

20. d^5 in strong field

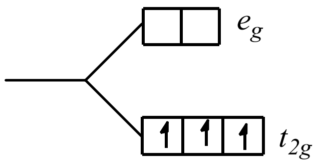
n =unpaired electron=1



Magnetic moment$=\sqrt{n(n+2)BM}$

$$=\sqrt{3}\text{ BM}=1.73\text{ BM}$$

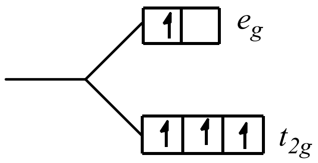
21. d^3 in strong/weak field



$$n=3$$

Magnetic moment$=\sqrt{15}=3.87$ BM

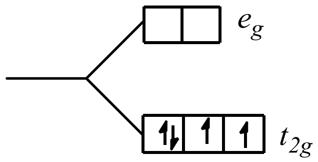
22. d^4 in weak field



$$n=4$$

Magnetic moment$=\sqrt{24}=4.90$ BM

23. d^4 in strong field

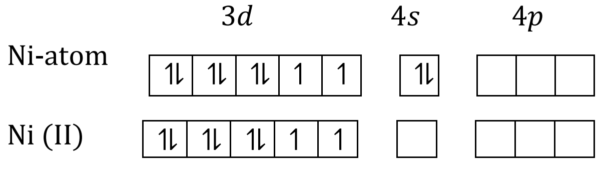


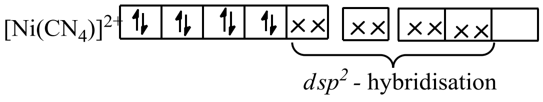
$n=2$

Magnetic moment$=\sqrt{8}=2.83$ BM

531 **(a)**

$[Ni(CN)_4]^{2-}$ion has dsp^2 hybridisation, zero magnetic moment and square planar structure.





It has no unpaired electrons hence, its magnetic moment is zero.

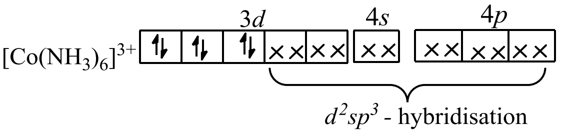
534 **(a)**

$_{21}Sc=[Ar]3d^1 4s^2$

$Sc^{3+}=[Ar]3d^0 4s^0$no unpaired electrons in d-subshell, so it is diamagnetic and colourless.

536 **(d)**

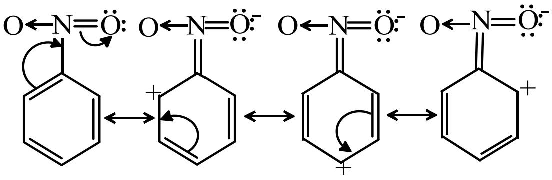
In $[Co(NH_3)_6]^{3+}$ the oxidation state of Co is +3.



$[Co(NH_3)_6]^{3+}$ does not contain unpaired electron hence, its magnetic moment is zero.

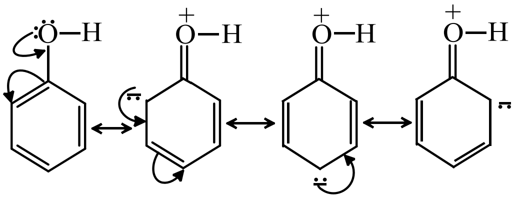
537 **(a)**

Presence of o-, p-directing groups in benzene nucleus activates ring for $S_E$reaction. Presence of m-directing deactivates ring for S_E reaction. Also halogens deactivating gp. Due to $-IE$ inspite of o- and p-directing nature. The presence of m-directing groups in benzene nucleous simply decreases electron density at o- and p-, whereas no change in electron density at m-position is noticed.



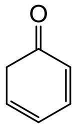
On the contrary o-and p-directing groups in nucleus increases the electron density at o- and p-position.

Thus, presence of o- and p-directing groups provide seats for $S_E$reactions or activates the ring, whereas presence of m-directing groups does not activate the ring and thus, deactivate the ring for S_E reactions



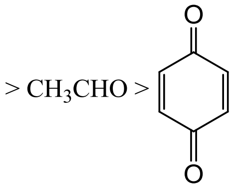
539 **(b)**

The percentage of enolic contents of some common compounds in decreasing order will be



$> C_6H_5COCH_2COCH_3 > CH_3COCH_2COCH_3$

$> C_6H_5COCH_2COCH_3 > CH_3COCH_2COCH_3$
$> CH_3COCH_2COOC_2H_5 > CH_3COCH_2CHO$
$> CH_3COCH_3$



$> C\text{H}_3\text{CHO} >$

540 **(c)**

Mn forms $\text{Mn}_2(\text{CO})_{10}$ carbonyl.

541 **(c)**

Picric acid has phenolic gp.

542 **(d)**

(i) The sum of oxidation states of all atoms in a compound is zero.

(ii) Oxidation state of metal in carbonyl is zero.

(a) $\text{K}_4\text{Fe(CN)}_6$

Let, oxidation state of Fe in $\text{K}_4\text{Fe(CN)}_6 = x$

$\therefore \quad +4+x+(-1\times 6)=0$

$\therefore \quad x=+2$

(b) K_2FeO_4

Let, oxidation state of Fe in $\text{K}_2\text{FeO}_4 = x$

$\therefore \quad +1\times 2+x+(-2\times 4)=0$

$\therefore \quad x=+6$

(c) $\text{Fe}_2 2\text{O}_3$

Let, oxidation state of Fe in $\text{Fe}_2\text{O}_3 = x$

$\therefore \quad 2x+(-2\times 3)=0$

or $\quad 2x=6$

$\therefore \quad x=\frac{6}{2}=+3$

(d) Fe(CO)_5

Oxidation state of Fe in $\text{Fe(CO)}_5=0$

$\therefore$ Oxidation state of Fe is least in Fe(CO)_5.

543 **(a)**

The name of $[\text{Pt(NH}_3)_4\text{Cl}_2]^{2+}, [\text{PtCl}_4]^{2-}$ is tetraamminedichloroplatinum (IV) tetrachloroplatinate (II). Since, positive ion is written first and negative ion later.

544 **(b)**

Resorcinol is *meta* hydroxyphenol.

545 **(d)**

The compounds of nickel are green coloured due to $d-d$ transition in presence of ligand in Ni^{2+} cations.

546 **(c)**

$\text{C}_6\text{H}_5\text{CH}_3 \xrightarrow{\text{Cl}_2} \text{C}_6\text{H}_5\text{CCl}_3 \xrightarrow{\text{HOH}} \text{C}_6\text{H}_5\text{COOH}$

547 **(d)**

Geometrical isomerism is found in compounds having coordination no. 4 (square planar and not tetrahedral shape) as well as coordination no. 6.
Coordination no. 4 (square planar)
$M_{A_2BC}, M_{A_2B_2}$
Showing geometrical isomerism $\quad M_{ABCD}$
Coordination no. 6 (octahedral)
$M_{A_4B_2}, M_{A_4BC}$
Showing geometrical isomerism.
$M_{A_3B_3}, M_{(AA)_2B_2}$

548 **(c)**

Follow text.

549 **(a)**

Presence of electron repelling gp. decreases the acidic strength.

$\text{C}_6\text{H}_5\text{COOH}$ $\quad$ p-methyl benzoic $\quad$ p-chloro
phenol $\quad$ phenol
acid
Ka 6.76×10^{-5} $\quad$ 1.26×10^{-5} $\quad$ $4.16\times$
10^{10} $\quad$ 1.05×10^{-10}

551 **(b)**

It becomes brown (due to oxidation) on standing in air.

552 **(b)**

It is characteristics of aromatic compounds.

553 **(d)**

The colour of the complex $\text{COCl}_3\cdot 5\text{NH}_3\cdot \text{H}_2\text{O}$ is pink.

554 **(b)**

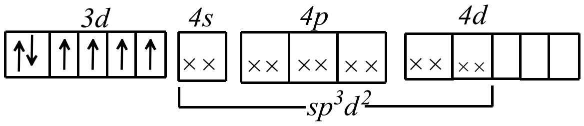
$2+4\times(-1)=x, \quad \therefore x=-2$

555 **(a)**

Halide ligands have low values of Δ.

556 **(d)**

Electronic configuration of Co^{3+} in $[\text{CoF}_6]^{3-}$ is:



×× Electron pair donated by F^-

558 **(d)**

Let the oxidation state of Fe in $[\text{Fe(H}_2\text{O)}_5\text{NO}]\text{SO}_4$ is x.
$[\text{Fe(H}_2\text{O)}_5\text{NO}]^{2+}$
$\Rightarrow \quad x+0+1=2$
$\therefore \quad x=+1$

Here, NO exists as nitrosyl ion (NO^+).

559 **(c)**

EAN=Z–(ON)+2 (C.N.)

where, O.N.=oxidation number

C.N.=coordination number

Z= atomic number

$[Fe(CN)_6]^{4-}$:

$$EAN=26-(2)+2(6)$$
$$=26-2+12=36$$

561 **(a)**

In the complex $K_3[FeF_6]$, Fe is present in +3 oxidation state.

$_{26}Fe=[Ar]3d^6 4s^2$

$Fe^{3+}=[Ar]3d^5$

1	1	1	1	1

Hence, number of unpaired electrons is five as F is weak ligand.

Magnetic moment=$\sqrt{n(n+2)}$

$$=\sqrt{5(5+2)}$$
$$=5.91 \text{ BM}$$

563 **(c)**

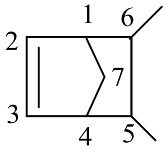
No doubt C— D bond cleavage is slower than C— H bond due to isotopic effect but rate of overall substitution is determined by the slow attachment of electrophile to carbocation (Morrison-Boyd 15.14P-532).

564 **(a)**

Due to synergic bond formation, bond order decreases and bond length increases a little.

566 **(c)**

It is a bicyclic compound having two common carbon atoms and three bridges. So, the IUPAC name is



5, 6-dimethyl bicyclo [2.2.1] hept-2-ene

567 **(c)**

$Fe^{3+}+[Fe(CN)_6]^{4-}\longrightarrow$

$Fe_4[Fe(CN)_6]_{3\,\text{Prussian blue}}$

568 **(a)**

The effective magnetic moment of a paramagnetic substance is given by the relation

$\mu=\sqrt{n(n+2)}$ BM.

where, n=number of unpaired electrons.

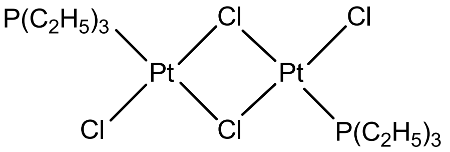
In $[FeF_6]^{3-}$, Fe^{3+} has five unpaired electrons.

μ of $[FeF_6]^{3-}=\sqrt{n(n+2)}$

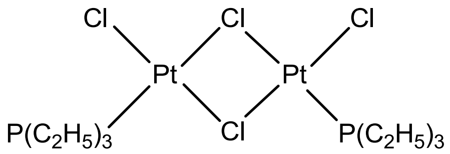
$$=\sqrt{5(5+2)}$$
$$=\sqrt{35}=5.92 \text{ BM.}$$

569 **(c)**

$[PtCl_2.P(C_2H_5)_3]_2$ can exhibit geometrical isomerism, the geometrical isomers are



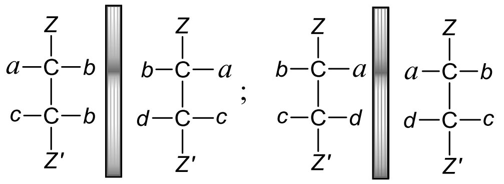
trans isomer



cis isomer

570 **(c)**

The minimum possible isomers of compound will be

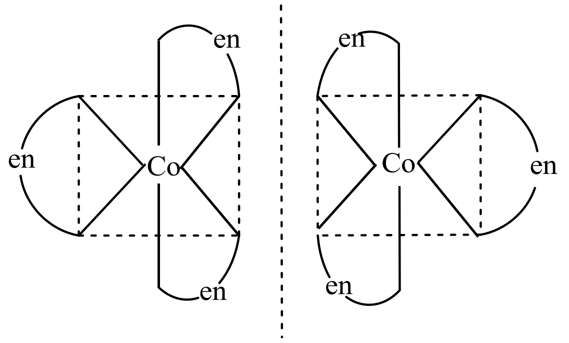


571 **(b)**

$C_2O_4^{2-}$ is a bidentate group. As the complex contains three bidentate groups, the central metal ion has a coordination number of 6.

572 **(d)**

$[Co(en)_3]^{3+}$ has d and l forms as



573 **(b)**

Ru forms two carbonyls with zero oxidation number. Mononuclear $Ru(CO)_5$ and trinuclear $Ru_3(CO)_{12}$.

574 **(c)**

Oxidation state of nitrogen in $(N_2H_5)_2SO_4$is

$4x+10-2=0$

$x=-2$

575 **(d)**

Linkage isomerism is exhibited by ambidentate ligands (ligands having two coordination sites). *e.g.*, NO_2^-.

If the bonding is through N, the ligand is named as

nitro and if it is through O, it is named as nitrito.
$NO_2^- \rightarrow$ nitro —N
$ONO^- \rightarrow$nitrito —O

577 **(a)**
Due to resonance of electron pair in aniline, nitroaniline and acetanilide, these are weaker than $C_6H_5CH_2$ which does not involve lone pair of N in resonance. The basic order is: Benzyl amine >Aniline > Acetanilide > Nitroaniline.

578 **(b)**
Effective atomic no. (EAN) = at. No. of central atom –oxidation state +2 × (no. of ligands)=
$28 - 0 + 2 \times 4 = 36$
$EAN = 78 - 4 + 2 \times 6 = 86$.

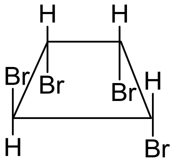
579 **(b)**
$[Cu(NH_3)_4]SO_3 \rightleftharpoons [Cu(NH_3)_4]^{2+} + SO_4^{2-}$

580 **(b)**
Ammonia is not an ambident legand so it can donate electron only by N-atom

582 **(b)**
12σ and 3π.

583 **(c)**
—OH gp. is activating whereas Cl— is deactivating.
—CH_3 gp. is less activating than OH.

584 **(d)**

The compound 

is symmetrical with respect to centre of the molecule

585 **(b)**
Two *cis* and *trans* forms.

586 **(c)**
p-nitrophenol is more stronger acid than phenol.

587 **(b)**
$$C_6H_5CH_3 \xrightarrow{[O]} C_6H_5COOH \xrightarrow{NaOH} C_6H_5COONa \xrightarrow{CaO+NaOH} C_6H_6$$

588 **(d)**
Staggered conformation is most stable due to its minimum energy

589 **(a)**
$[Co(NH_3)_5Br]SO_4 \rightleftharpoons [Co(NH_3)_5Br]^{2+} + SO_4^{2-}$
$Pb^{2+} + SO_4^{2-} \longrightarrow \underset{\text{White insoluble}}{PbSO_4 \downarrow}$

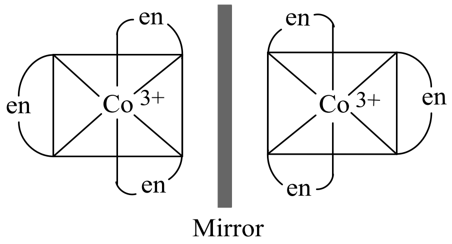
590 **(c)**
$Fe^{2+}, Co^{5+}, Ti^{3+}$, and V^{3+} have 4, 4, 1, 2 unpaired electron respectively. The pairing leads Fe^{2+} with no unpaired electron.

591 **(b)**
Os (Z=76) : [Xe] $4f^{14}, 5d^6, 6s^2$
Hence, the coordination number in an osmium complex may increase to 8.

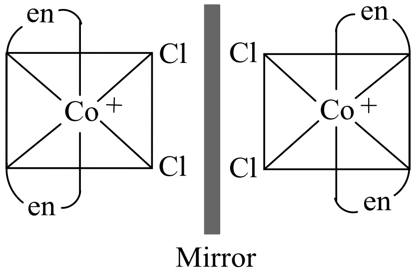
592 **(c)**
Phenol has antiseptic property.

593 **(c)**
$$C_6H_5CH = CHCOOH \xrightarrow{NaOH+CaO} \underset{\text{(Styrene)}}{C_6H_5CH = CH_2}$$

594 **(d)**
$[Co(en)_3Cl_3$ *ie*, $[Co(en)_3]^{3+}$



cis$[Co(en)_2Cl_2]Cl$ *ie*, *cis* $[Co(en)_2Cl_2]^+$



595 **(b)**
The compound in which ligands form ring with the metal are called chelate complex.

597 **(c)**
Benzaldehyde undergoes Cannizzaro's reaction.

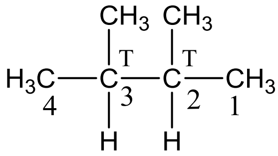
600 **(c)**
Coordination isomerism is possible when both positive and negative ions of a salt are complex ions and the two isomers differ in distribution of ligands in the cation and the anion

601 **(a)**
This is bromination of acetanilide, a S_E reaction.

602 **(b)**
The primary valency is ionizable valency. It corresponds to oxidation state of metal. The primary valency is always satisfied by anion.
$$\underset{(A)}{[Co(NH_3)_6]Cl_3} \longrightarrow [Co(NH_3)_6] + 3Cl^-$$
∴ Number of primary valency is 3
$$\underset{(B)}{[Co(NH_3)_5Cl]Cl2} \longrightarrow [Co(NH_3)_5Cl] + 2Cl^-$$
∴ Number of primary valency is 2
$[Co(NH_3)_4Cl_2]Cl \longrightarrow [Co(NH_3)_4] + Cl^-$
∴ Number of primary valency is 1.

603 **(d)**
The carbon atom which is attached to three

carbon atoms is called tertiary carbon atom. C_6H_{14} has two tertiary carbons hence, its structure is as



2,3-dimethyl butane

604 **(b)**
The ligand NO_2 has two types of linkage with central atom. In NO_2, it is the N-atom which is donor and in O—NO it is the O atom which donates electron pair.

605 **(d)**
Tetraethyl lead is organometallic compound.

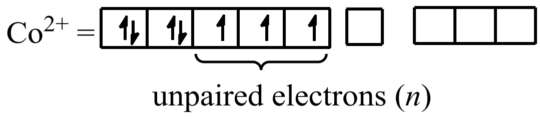
606 **(d)**
$C_6H_5OH + PCl_5 \longrightarrow (C_6H_5)_3PO_4$ is main product.

609 **(c)**
Directive influence order
$—OH > —OCH_3 > —CH_3 > —NHCOCH_3 > —CH_2OH$ of *o*-, *p*- gps. This is due to effect of $+R$ directing influence of gp.

610 **(d)**
$[PtCl_4]^{2-}$ shows dsp^2 hybridization because internal d-orbitals participate in its hybridization.

611 **(b)**
Dynamite, TNT, TNB, trinitroglycerine are explosive.

612 **(b)**
In $Hg[Co(SCN)_4]$, Co is present as Co^{2+}. The configuration of Co^{2+} is given as following
$[Ar]3d^7\ 4s^0$



$\therefore$ Magnetic moment $(\mu) = \sqrt{n(n+2)}$

$$\sqrt{3(3+2)} = \sqrt{15}\text{ BM}$$

614 **(c)**
In metal carbonyls CO has ox. no. equal to zero.

615 **(a)**
$[NiCl_4]^{2-}$ has tetrahedral shape. In this complex, Ni is in the +2 oxidation state and Ni^{2+} ion always forms tetrahedral complexes

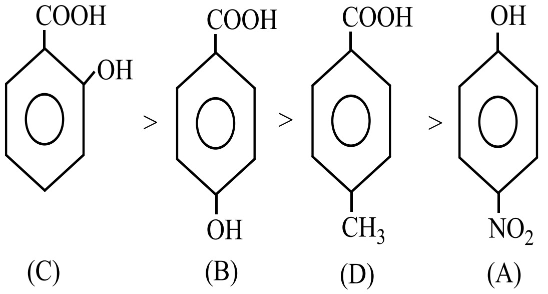
616 **(a)**
It is a differentiating point in between complex and double salt.

617 **(d)**
All possess lesser number of unpaired electrons.

618 **(c)**
Structures $K_4[Fe(CN)_6]$, $K_3[Co(CN)_6]$, $K_2[Ni(CN)_4]$ are diamagnetic.

619 **(c)**
Wilkinson's catalyst is used for hydrogenation of alkenes

620 **(c)**
Due to *ortho* effect; *ortho* benzoic acid is most acidic because its anion is highly stabilized due to strong intramolecular H-bonding.



K_a: 1.0×10^{-3} 2.9×10^{-5} 1.26×10^{-5} 6.9×10^{-8}

623 **(a)**
C_6H_5COOH is acid; phenol also as acid.

624 **(c)**
Cis-isomer of $[Pt(NH_3)_2Cl_2]$ is used as anticancer drug.

626 **(b)**
$[Co(en)_2Cl_2]^+$ shows geometrical as well as optical isomerism

628 **(c)**
Lab method for preparation of benzaldehyde.

629 **(a)**
The ligand at least consist one donor atom having a lone pair of electrons which it can donate to metal atom or ion

630 **(c)**
Aniline is steam volatile.

631 **(a)**
CFSE (crystal field splitting energy) for octahedral complex, Δ_0 depends on the strength of negative ligand. Spectrochemically it has been found that the strength of splitting is as follows
$CO > \underline{CN^-} > NO_2^- > en > \underline{NH_3} > py >$
$NCS^- > H_2O > O^{2-} > OX^{2-} > OH^- > F^- >$
$Cl^- > SCN^- > S^{2-} > Br^- > I^-$
Therefore, magnitude of Δ_0 will be highest in case of $[Co(CN)_6]^{3-}$.

632 **(b)**
$K_2[PtCl_6]$
Potassium hexachloroplatinate (IV).

633 **(c)**

The complex formed by the reaction of $NiSO_4$, pyridine and $NaNO_2$ gives $[Ni(py)_4](NO_2)_2$ a blue-coloured salt.

634 **(b)**

$C_6H_5CHO \xrightarrow{KOH(aq.)} C_6H_5COOH + C_6H_5CH_2OH$

635 **(a)**

Only m-cresols give tribromo derivatives on treatment with Br_2 water.

636 **(a)**

$[E(en)_2C_2O_4]NO_2$

$\therefore$ Coordination number of $E = 6$

$\therefore$ Oxidation number of $E = 3[E^{3+} + 0 + (-2) + (-1) = 0]$

637 **(c)**

$C_6H_5CHO \xrightarrow{PCl_5} C_6H_5CHCl_2$

638

	Complex	Isomerism shown
(a)	$[Co(en)]^{3+}$	Optical only
(b)	$[Ni(NH_3)_5Br]^+$	No geometrical isomer
(c)	$[Co(NH_3)_2(en)_2]^3$	*Cis* and *trans*
(d)	$[Cr(NH_3)_4(en)]^{3+}$	No geometrical isomer

(c)

639 **(c)**

Presence of $—NO_2$ at p-position increases acidic character.

640 **(b)**

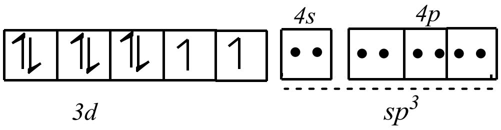
Alkanes are saturated hydrocarbons without any functional group, hence can show chain isomerism only

641 **(d)**

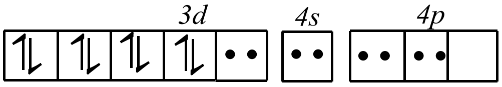
Both have different molecular formulae.

642 **(b)**

Ni in $[Ni(CO)_4]$: .....$3s^2, 3p^6, 3d^8, 4s^2$



Ni in $[Ni(CN)_4]^{2-}$: .....$3s^2, 3p^6, 3d^8, 4s^2$



643 **(a)**

The product (K) is formed through simple nucleophilic substitution while major product (L) is formed through $\sim H^-$ shift *via* S_N1 reaction and methoxy group stabilizes the carbocation intermediate of product(L).

645 **(c)**

In the Grignard reaction magnesium metal forms an organometallic bond

$RX + Mg \xrightarrow{\text{Dry ether}} R—Mg—X$

Grignard reagent

646 **(a)**

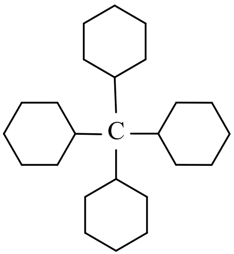
Aromatic hydrocarbons are called arenes with general formula C_nH_{2n-6y}, where $n \nless 6$ and y is no. of cyclic rings. Benzene has one ring and $n = 6$, $i.e.$, no. of carbon atoms. Thus, general formula is C_6H_6. All other aromatic hydrocarbons are derivative of benzene.

647 **(c)**

It is a fact.

648 **(d)**

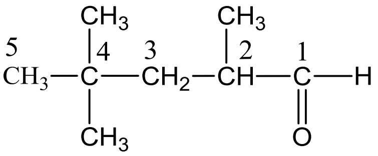
Tri and tetravalent bridges derived from methane are given the prefix methyno and methyno respectively



methyno-1,1,1,1,-tetracyclohexane

649 **(a)**

The structure of the compound is



$$\overset{5}{C}H_3—\overset{4}{C}(CH_3)_2—\overset{3}{C}H_2—\overset{2}{C}H(CH_3)—\overset{1}{C}(=O)—H$$

2,4,4-trimethyl pentanal.

650 **(c)**

$C_6H_5COONa \xrightarrow{NaOH+CaO} C_6H_6$.

651 **(a)**

Complementary colours of absorbed light are seen.

652 **(d)**

Presence of $—SO_3H$ gp. increases solubility of drug or dyes.

653 **(d)**

It is a fact.

654 **(a)**

The directive influence order is:

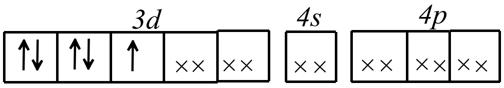
$O^- > NR_2 > NHR > NH_2 > OH > OCH_3 \approx NHCOCH_3 > CH_3 > X$

655 **(d)**

Ti^{4+}: $3d^0$ and Cu^+ : $3d^{10}$ can not show d-d-transition and thus colourless.

656 **(d)**

Fe^{3+} in $[Fe(CN)_6]^{3-}$ is:



657 **(b)**

The IUPAC name of $[Ni(PPh_3)_2Cl_2]^{2+}$ is dichloro bis (triphenylphosphine) nickel (II).

658 **(a)**

It is neutral complex as it does not ionize in solution state.

659 **(b)**

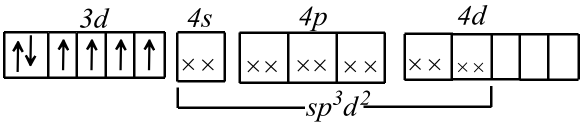
Higher is the stability constant of ligand, lesser is its dissociation, more is its stability.

660 **(c)**

It is a fact.

661 **(d)**

Electronic configuration of Co^{3+} in $[CoF_6]^{3-}$ is:



×× Electron pair donated by F^-

662 **(c)**

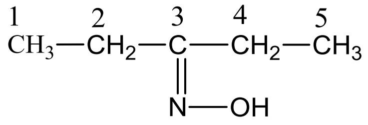
CH_3 is o–and p–directing gp.

663 **(b)**

Ag^+ has two coordination number forms complex with excess of CN^-, *ie* $Ag(CN)_2$

665 **(c)**

| |
−C − N group is called amino
| |
while – C = N group is called imino
| |



N-hydroxy-3-imino-pentane

666 **(c)**

The coordination compound $[Co(en)_2Cl_2]Cl$ doesn't show ionization isomerism.

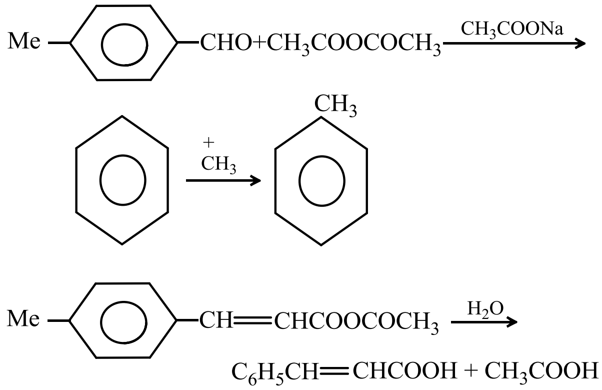
669 **(d)**

Nitrogen and oxygen are common donor atoms in ligands

670 **(a)**

$$C_6H_5NH_2 + CH_3COCl \xrightarrow{NaOH} C_6H_5NHCOCH_3$$

671 **(c)**



This is Perkin's reaction.

672 **(a)**

$K_4[Fe(CN)_6](aq) \rightleftharpoons 4K^+(aq) + [Fe(CN)]^{4-}(aq)$

It gives **five** ions in solution.

$[Co(NH_3)_6]Cl_3(aq)$

$\rightleftharpoons [Co(NH_3)_6](aq) + 3Cl^-(aq)$

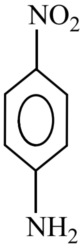
It gives **four** ions in solution.

$[Cu(NH_3)_4]Cl_2(aq)$

$\rightleftharpoons [Cu(NH_3)_4]^{2+}(aq) + 2Cl^-(aq)$

It gives **three** ions in solution.

673 **(a)**

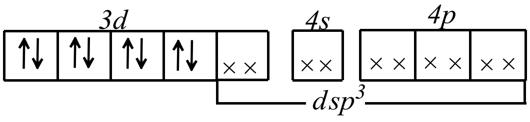


; $\mu = \sqrt{\mu_1^2 + \mu_2^2 + 2\mu_1\mu_2 \text{ COS } \alpha}$

μ_1 and μ_2 both for NO_2 (electron withdrawing) and NH_2 (electron releasing) gp. act in some direction.

674 **(b)**

Electronic configuration of Fe in $Fe(CO)_5$ is:



×× Electron pair donated by CO.

675 **(b)**

Turnbull's blue is $KFe^{II}[Fe^{III}(CN)_6]$.

679 **(c)**

Each carbon in C_6H_6 is sp^2-hybridized and thus, C—C bond is sp^2-sp^2.

680 **(b)**

Change in composition of coordination sphere yield ionisation isomers

681 **(a)**

The IUPAC name of $K_2[Ni(CN)_4]$ is Potassium tetracyanonickelate (II).

683 **(c)**

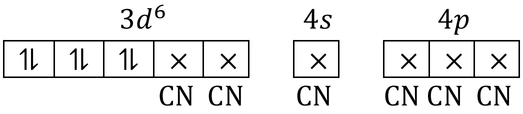
It is a characteristic fact.

684 **(b)**

$K_4[Fe(CN)_6]4K^+ + [Fe(CN)_6]^{4-}$

The oxidation number of Fe in $[Fe(CN)_6]^{4-}$ is +2.

$Fe^{2+}: 1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^6, 4s^0 4p$



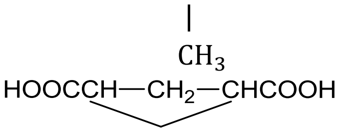
Since, CN^- is a strong field ligand, pairing occurs and the hybridisation of $[Fe(CN)_6]^{4-}$ is d^2sp^3 and structure is octahedral.

685 **(c)**

$CH_3CHClCH_2C_6H_5 \xrightarrow{KOH(aq.)} CH_3CHOHCH_2C_6H_{5_{1-phenyl\ propan-2-ol}}$.

686 **(d)**

All the compounds in which there should be restricted rotation about a bond in the molecule, show geometrical isomerism. Oximes of the type $CH_3-CH=N-OH$, $C_6H_5-CH=N-OH$, $C_6H_5-C=N-OH$ and cyclic

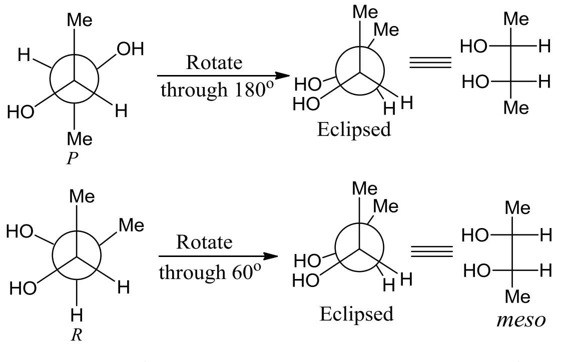


Compound like show geometrical isomerism

687 **(b)**

The oxidation of aniline by $K_2Cr_2O_7 + H_2SO_4$ (conc.) gives *p*-benzoquinone.

688 **(b)**



Here, *P* and *R* represent *meso*-compound

689 **(b)**

Friedel-Crafts reaction involves new C— C bond.

691 **(a)**

Rest all show less tendency to donate electron pair due to resonance.

692 **(c)**

(a) $K_3[Fe(OH)_6]$

Let oxidation state of Fe in

$K_3[Fe(OH)_6] = x$

$(+1\times3)+x+(-1\times6)=0$

$\therefore \quad x=+3$

(b) $K_2[FeO_4]$

Let oxidation state of Fe in $K_2[FeO_4]=x$

$(+1\times2)+x+(4\times-2)=0$

$x=+6$

$FeSO_4.(NH_4)_2SO_4.6H_2O$

Let oxidation state of Fe in

$FeSO_4.(NH_4)_2SO_4.6H_2O=x$

$\therefore \quad x+(-2)+2+(-2)=0$

$x=+2$

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

Let oxidation state of Fe in

$[Fe(CN)_6]^{3-}=x$

$\therefore \quad x+(6\times-1)=-3$

$\therefore \quad x=+3$

$FeSO_4.(NH_4)_2SO_4$ has Fe in lowest oxidation state.

693 **(a)**

CO is a strong ligand, all the six electrons of the valence shell of Cr is paired and spin only magnetic moment=0

694 **(a)**

Phenol is used in carbolic soaps.

695 **(d)**

Werner proposed theory for complex compounds to explain the structure and isomerism in them.

696 **(a)**

It is p-block element and thus, has no tendency to form complex.

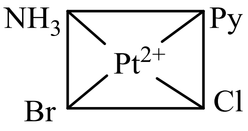
697 **(a)**

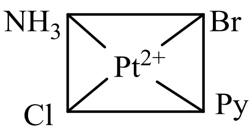
In

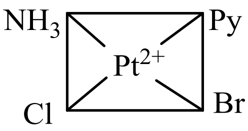
$[CoF_6]^{3-}$ complex ion Co^{3+} is $sp^3\,d^2$ hybridized. F^- is weak ligand and cannot pair up the *d*-electrons so, complex is high spin. Due to four unpaired electrons it is highly paramagnetic.

698 **(b)**

[*Mabcd*] type complexes exist in three isomeric forms.







699 **(b)**

Due to H-bonding.

700 **(d)**

A characteristics reaction of primary amine. This is carbylamines reaction.

701 **(d)**

The formula of given complex are as follows:

(a) Hexammineplatinum (IV) chloride

$[Pt(NH_3)_6]Cl_4$

(b) Chloropentammine platinum (IV) chloride

$[Pt(NH_3)_5Cl]Cl_3$

(c) Dichhlorotetrammine platinum (IV) chloride

$[Pt(NH_3)_4Cl_2]Cl_2$

(d) Trichlorotriammine platinum (IV) chloride

$[Pt(NH_3)_3Cl_3]Cl$

In aqueous solution the complex ionise is

$[Pt(NH_3)_3\,Cl_3]Cl \rightleftharpoons [Pt(NH_3Cl_3]^+ +\ Cl$

Trichlorotriammine platinum (IV) 2 ions chloride gives the minimum number of ions in the solution. Hence, it has the minimum electrical conductivity.

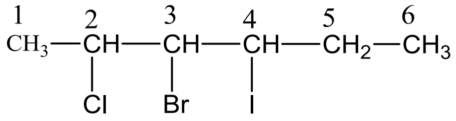
702 **(c)**

Diasteromers have different physical properties such as m. pt, b. pt solubilities

703 **(b)**

The decreasing order of priority of prefix in numbering the carbon chain of an organic compound is

Bromo $>$ *Chloro* $>$ *Iodo*

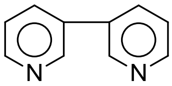


$\overset{1}{CH_3}-\underset{Cl}{\overset{2}{CH}}-\underset{Br}{\overset{3}{CH}}-\underset{I}{\overset{4}{CH}}-\overset{5}{CH_2}-\overset{6}{CH_3}$

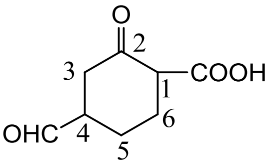
3-bromo-2-chloro-4-iodo hexane

705 **(d)**

The structure of the compound 2, 2'-bipyridine is



706 **(d)**



4-formyl-2-oxo-cyclohexane-1-carboxylic acid

Note : If a compound contains two or more substituents then numbering is done in such a way that the sum of the locants is the lowest

707 **(c)**

$-N_2Cl$ gp. Is reduced to $-H$ by reducing agent C_2H_5OH/Cu.

708 **(d)**

All are the required facts for diethyl triamine.

709 **(b)**

$[Pt(NH_3)_4Cl_2]Cl_2 \rightleftharpoons [Pt(NH_3)_4Cl_2]^{2+} + 2Cl^-$.

711 **(b)**

When ligands are exchanged between metal atoms, coordination isomerism results. Hence, $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$ represents coordination isomerism.

712 **(c)**

$Co^{3+}$and $Pt^{4+} = 6$ coordination number

$CoCl_3\,.6NH_3$ and $PtCl_4\,.5NH_3$

$[Co(NH_3)_6]Cl_3 \xrightarrow{\text{In solution}} [Co(NH_3)_6]^{3+} + 3Cl^-$

$[PtCl(NH_3)_5\,]Cl_3 \xrightarrow{\text{In solution}} [PtCl(NH_3)_5]^{3+} + 3Cl^-$

Number of ionic species are same in the solution of both complexes, therefore their equimolar solutions will show same conductance.

713 **(a)**

Thiocyanato-N is the name when ligand SCN has electron pair donated by N-atom to metal.

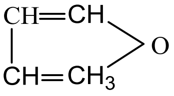
715 **(d)**

Any side chain is oxidised to $-COOH$.

716 **(d)**

This is another reaction.

717 **(c)**



(Furan)

is heterocyclic compound

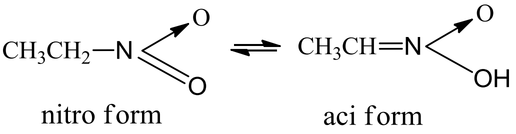
719 **(c)**

$[Cu(NH_3)_4](NO_3)_2$

tetrammine copper (II) nitrate.

720 **(c)**

Nitorethane exhibits tautomerism



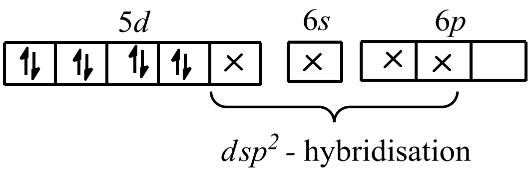
722 **(c)**

The electronic configuration Pt=[Xe]

$4\,f^{14}, 5d^9, 6s^1$

$\therefore\ Pt^{2+} = [Xe]4f^{14}, 5d^8, 6s^0$

$[Pt(CN)_4]^{2-} = [Xe]4f^{14}$



$\therefore$ No unpaired electron is present in $[Pt(CN)_4]^{2-}$ ion.

723 **(c)**

Let the oxidation number of cobalt is x in K $[Co(CO)_4]$.

$$1+x+0=0$$
$$x=-1$$

724 **(b)**

The IUPAC name of $Na_3[Co(NO_2)_6]$ is sodium hexanitrocobaltate (III).

725 **(a)**

1.$[Cu(NH_3)_4][PtCl_4]$
2.$[Cu(NH_3)_3Cl]\cdot[PtCl_3(NH_3)]$
3.$[Cu(NH_3)_2]\cdot[PtCl_2(NH_3)_2]$ *cis*
4.$[Cu(NH_3)_2Cl_2][PtCl_2(NH_3)_2]$ *trans*
5.$[Cu(NH_3)Cl_3]\cdot[Pt(Cl)(NH_3)_3]$
6.$[Pt(NH_3)_4]\cdot[CuCl_4]$

727 **(c)**

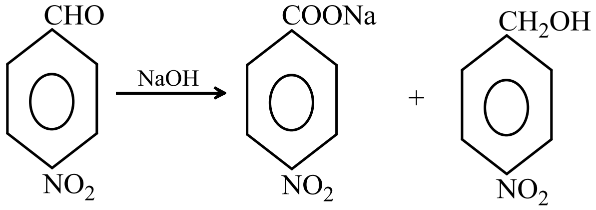
Tautomerism and functional isomerism is not possible together

732 **(c)**

$Fe^{3+} + K_4Fe(CN)_6 \longrightarrow \underset{\text{Prussian blue}}{KFe[Fe(CN)_6]} + 3K^+$

733 **(b)**

This is Cannizzaro's reaction.



734 **(a)**

$CH_3-CH_2-CH=CH_3$ and
CH_2-CH_2
| |
CH_2-CH_2
exhibit ring chain isomerism

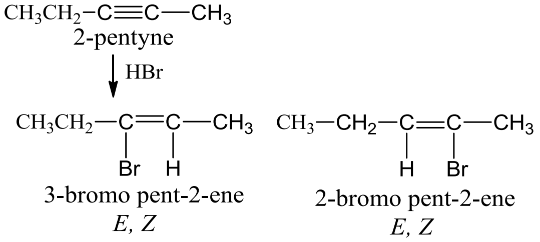
735 **(a)**

Follow Werner's theory.

736 **(b)**

Faraday for the first time isolated C_6H_6 from coal-tar.

737 **(b)**



Structural isomers (position) = 2
Stereo isomers = 4

738 **(a)**

According to Werner's theory, the primary valency of a metal is equal to the no. of charge on complex ion, $i.e.$, 3 on $[Fe(CN)_6]^{3-}$

739 **(b)**

The complex which contains 18 valence electrons, follows 18-electron rule.

(a) In $[V(CO)_5]$
The number of valence electrons
$= 5+(2\times5)$
$= 15\ e^-$

(b) In$[Fe(NH_3)_6]^{2+}$,
The number of valence electrons
$=6+(6\times2)=6+12=18\ e^-$

(c) In $[Ni(CO)_6]$,
The number of valence electrons$=10+(2\times 6)=22\ e^-$

(d) In $[Mn(H_2O)_6]^{2+}$,
The number of valence electrons$=5+(6\times2)=17\ e^-$

Thus, only $[Fe(NH_3)_6]^{2+}$follows 18-electron rule.

740 **(d)**

One mole of Xgave depression corresponding to 2 moles of particles, *i.e.*, on ionisation Xgives 2 moles of ions , thus it contains only 1 ion outside the coordination sphere and its structural formula is $[Cr(H_2O)_4Br_2]Cl.\,H_2O$ while Ygives 3 moles of ions, thus it contains two ions outside the coordination sphere and its structural formula is $[Cr(H_2O)_5\ Cl]Br_22$

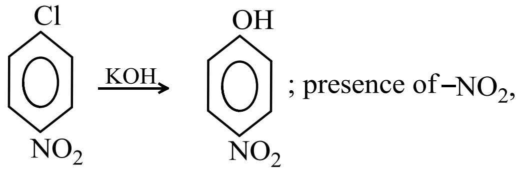
742 **(d)**

Both represent only one molecule and no isomerism.

743 **(a)**

Haemoglobin is porphyrin complex of ferrous iron being coordinated to four nitrogen atoms and additionally coordinated to a water reversible by a molecule. The water molecule appears to be replaceable reversible by a molecule of oxygen to give oxyhaemoglobin. Fe^{2+} is diamagnetic due to strong field ligands.

746 **(d)**



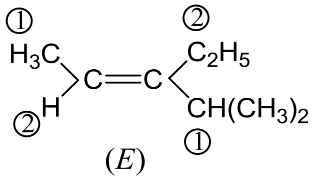
—CN and —COOH gp. at p-position facilitate replacement of Cl gp. by S_N reactions to show normal S_N reactions.

747 **(b)**

$(NH_4)_2S_x$ brings in selective reduction of one of the two —NO_2 group at m-position.

748 **(c)**

If the highest priority groups on two carbon atoms of the double bond are on the opposite side, the configuration is E. (Entgegen)



(*E*)

749 **(c)**

Cyclopentane possess 0°44′ angle strain which is minimum

750 **(c)**

$[Fe(H_2O)_6]^{2+}$ has four unpaired electrons

751 **(b)**

$[Pt(NH_3)_6]Cl_4 \rightleftharpoons Pt(NH_3)_6 + 4Cl^-$

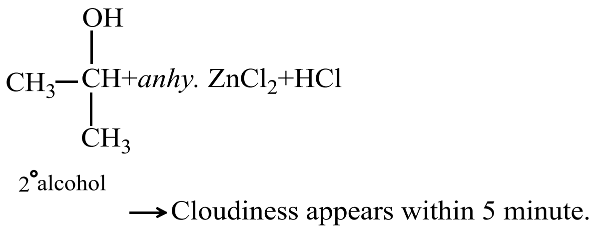
$Ag^+ + Cl^- \longrightarrow AgCl \downarrow_{\text{White ppt.}}$

752 **(a)**

$CH_3(CH_2)_3{\cdot}NH_2 \xrightarrow[CHCl_3]{KOH\ alc.} CH_3(CH_2)_3NC + 3KCl + 3H_2($

$CH_3—C\equiv CH + Amm \cdot AgNO_3 \longrightarrow CH_3C\equiv C \cdot Ag + HNO_3$

$CH_3 \cdot CH_2COOCH_3 + NaOH \overset{\Delta}{\rightarrow} CH_3CH_2COONa + CH_3OH$



$CH_3—\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}H + anhy.\ ZnCl_2 + HCl \longrightarrow$ Cloudiness appears within 5 minute.

2°alcohol

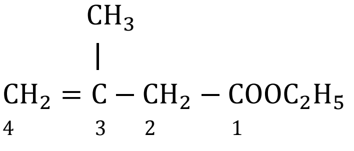
754 **(b)**

Configuration of Mn^{2+} is

$[Ar]3d^5$

According to CFSE (crystal field stabilisation energy), in excited state of Mn^{2+} ion, three electrons go in t_{2g} level $\left(d_{xy}, d_{yz} \text{ and } d_{zx}\right)$ and two electrons go in e_g level (d_{z^2} and $D_{x^2-y^2}$).

755 **(d)**



$\underset{4}{CH_2} = \underset{3}{\overset{\overset{CH_3}{|}}{C}} - \underset{2}{CH_2} - \underset{1}{COOC_2H_5}$

ethyl (3-methyl) but-2-enoate

756 **(c)**

eg, $Fe(CO)_5$, $Ni(CO)_4$,etc.,

757 **(b)**

Follow IUPAC rules.

758 **(b)**

$[Co(NH_3)_6][Cr(C_2O_4)]_3$ its IUPAC name is hexa amine cobalt (III) tris (oxalato) chromate (III).

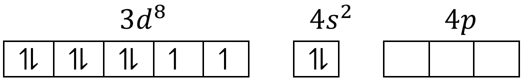
759 **(b)**

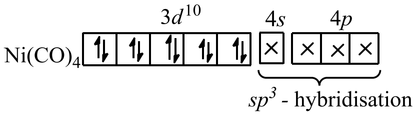
Gammexane is $C_6H_6Cl_6$.

760 **(b)**

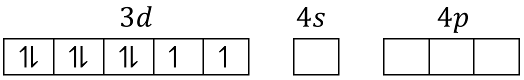
1.In $Ni(CO)_4$, nickel is sp^3-hybridised because in it oxidation state of NI is zero. So, configuration of

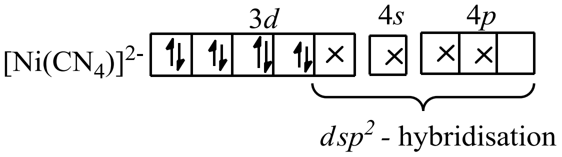
${}_{28}Ni = 1s^2 2s^2 2p^6, 3s^2 3p^6 3d^8, 4s^2$





2.In $[Ni(CN)_4]^{2-}$, nickel is present as Ni^{2+}, so its configuration$=1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^8$

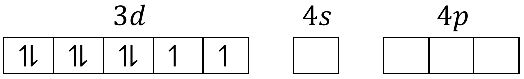


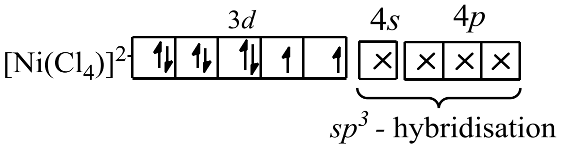


CN^-

is strong field ligand, hence it makes Ni^{2+} electrons to be paired up.

In $[NiCl_4]^{2-}$ species, nickel is present as Ni^{2+}, so its configuration$=1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^8$





Cl^-

is weak field ligand, hence Ni^{2+} electrons are not paired.

761 **(d)**

Ti^{4+} : $3d^0$

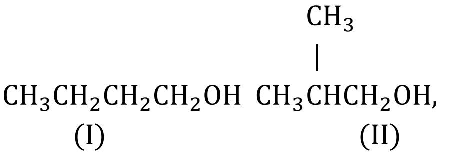
Cr^{3+} : $3d^3$ Completely filled or empty *d*-orbitals are colourless.

Zn^{2+} : $3d^{10}$

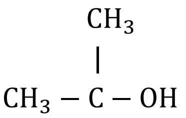
Sc^{3+} : $3d^0$

762 **(b)**

Possible isomers are as follows :

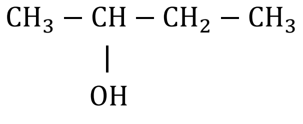


$\underset{(I)}{CH_3CH_2CH_2CH_2OH}$ $\underset{(II)}{CH_3\overset{\overset{CH_3}{|}}{C}HCH_2OH}$,



$CH_3 - \overset{\overset{CH_3}{|}}{C} - OH$

|
CH_3
(III)



$$CH_3 - \underset{\underset{OH}{|}}{CH} - CH_2 - CH_3$$

(IV)

Here, only (I), (II) and (III) are chain isomers

763 **(a)**

2,2-dinitrodiphenyl or 4,4-dinitrodiphenyl is formed.

764 **(d)**

We have that by breaking two bond on the chiral centre configuration changes

765 **(c)**

Use of oleum ($H_2SO_4 + SO_3$) produces inclusion of $-SO_3H$ gp. in C_6H_6 ring.

766 **(a)**

NO_2^- can participate in linkage isomerism because it may be bonded to metal through nitrogen or through oxygen.

$[(NH_3)_5CoNO_2]Cl_2$	and	$[(NH_3)_5CoONO]Cl_2$
Pentaamminenitro cobalt (III) chloride		pentaamminenitro cobalt (III) chloride

768 **(c)**

Cuprammonium salt, $[Cu(NH_3)_4]SO_4$

$[Cu(NH_3)_4]SO_4 \rightleftharpoons [Cu(NH_3)_4]^{2+} + SO_4^{2-}$

So, it will give two ions in water

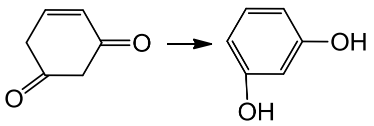
769 **(b)**

(a) Shows tautomerism since aldehydes are more stable than vinyl alcohols

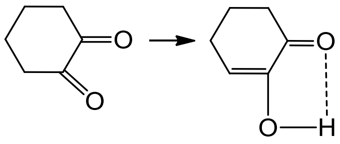
$C_6H_5 - CH = CHOH \leftrightarrow C_6H_5CH_2 - CH_2 - CH_2 = 0$

(b) Does not show tautomerism because it does not have hydrogens at α-positions

(c) Shows tautomerism because enol form is stabilized by H-bonding



(d) Shows tautomerism because enol form is stabilized by aromatic character



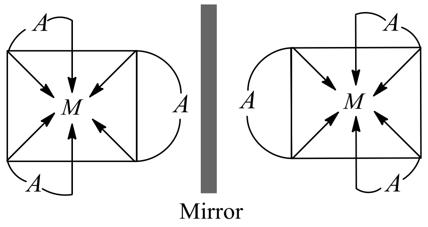
771 **(a)**

Main fractions of coal-tar and the compounds present there in are:

	Main fraction	Temp. range	Chief constituents
1.	Light oil or crude naphtha	80-170°C	Benzene, toluene, xylenes, etc.
2.	Middle oil or carbolic acid	170-230°C	Phenol, naphthalene, pyridine, etc.
3.	Heavy oil or creosote oil	230-270°C	Cresols, naphthalene quinolone, etc.
4.	Green oil or anthracene oil	270-360°C	Anthracene, phenanthrene, etc.
5.	Pitch	Residue	90-94% of carbon

772 **(b)**

Octahedral complexes containing three bidentate ligands shows optical isomerism If A is a bidentate ligand then complex of type MA_3 show optical isomerism



773 **(a)**

Cl atom attached in side chain behaves as aliphatic in nature.

775 **(d)**

Due to electron deficient molecule it accepts lone pair of electron to produce electrophile.

$AlCl_3 + Cl_2 \longrightarrow AlCl_4^- + Cl^+$

777 **(b)**

o –nitrophenol has intramolecular H-bonding.

778 **(c)**

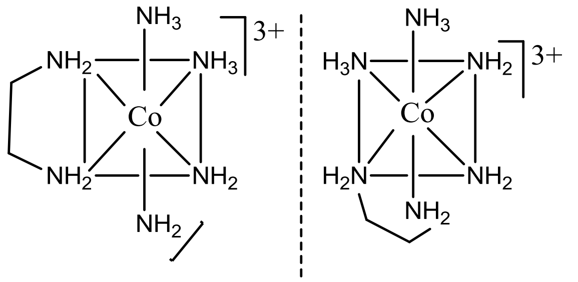
IUPAC name is tetraammine nickel (II) – tetrachloronickelate (II).

779 **(b)**

Ligands are electron pair donor.

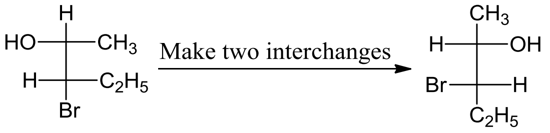
781 **(d)**

Cis- form of $[Co(en)_2(NH_3)_2]^{3+}$ is optically active.



784 **(d)**

After two interchanges at each of the two chiral carbon atoms in second structure in such a way that CH_3 group is held vertically upward and C_2H_5 group vertically downward, we get first structure



Thus, the two structures are identical

785 **(c)**

$K_3[Fe(CN)_6]$

cation anion

Oxidation state of Fe in anion $=+3$

Thus, it is potassium hexacyanoferrate (III).

786 **(b)**

In $[Zn(NH_3)_6]^{3+}$, Zn exists as Zn^{2+}

${}_{30}Zn: 3d^{10}, 4s^2$

$Zn^{2+}: 3d^{10}$; Thus, no unpaired electron but it is outer orbital complex.

In $[Co(NH_3)_6]^{3+}$, Co exists as Co^{3+}

${}_{27}Co: 3d^7, 4s^2$

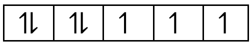
$Co^{3+}: 3d^6$; It is d^2sp^3 inner orbital complex with 3 electron paired in $3d$.

787 **(a)**

In $[CoCl_4]^{2-}$ ion, central metal atom i.e., cobalt is in +2 oxidation state. Hence,

${}_{27}Co=[Ar]3d^7\,4s^2$

$\therefore {}_{27}Co^{2+}=[Ar]3d^7$



Hence, number of unpaired electrons is three as Cl is weak ligand.

788 **(c)**

Coordination number is the number of ligands in the coordination sphere. Hence, the coordination number of cobalt ion in $[Co(H_2O)_4SO_3]Cl$ is 5.

Let the oxidation number of Co is x.

$x+4(0)+(-2)+(-1)=0$

$x+0-2-1=0$

$x=3$

Number of unpaired electrons in d-orbital are 4 because H_2O is a weak ligand and therefore, pairing of d-electrons is not possible.

789 **(b)**

$$C_6H_6 + CH_3COCl \xrightarrow{AlCl_3} C_6H_5COOCH_3$$

790 **(c)**

—SO_3H is water soluble.

791 **(c)**

$+1\times4+x-1\times4=0$

$4+x-4=0 \Rightarrow x=0$ for Ni

792 **(c)**

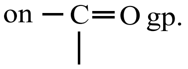
Follow IUPAC nomenclature.

793 **(b)**

Due to bitter almond smell. It is $CH_3O(OH)C_6H_3CHO$.

795 **(c)**

$C_6H_5COCH_3$ acetophenone is a mixed ketone having one alkyl and other phenyl gp. attached



on $-\underset{|}{C}=O$ gp.

796 **(d)**

These are the facts about transition metal atoms to act as central atom.

798 **(d)**

Since, hybridization is dsp^2 so, it is square planar

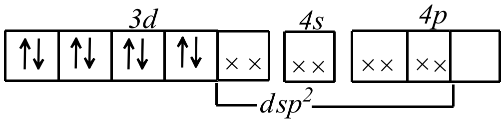
799 **(b)**

Metal-carbon bond in metal carbonyls has σ as well as π characters.

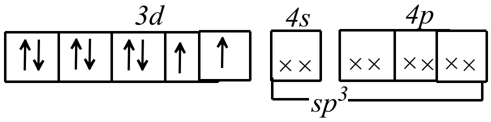
800 **(d)**

The electronic configuration of Ni in $[Ni(CN)_4]^{2-}$, $[Ni(Cl)_4]^{2-}$ and $Ni(CO)_4$ are:

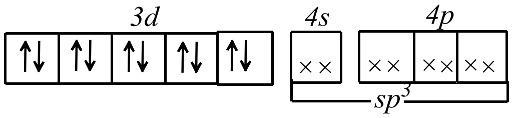
Ni^{2+} in $[Ni(CN)_4]^{2-}$:



Ni^{2+} in $[Ni(Cl_4)\ ]^{2-}$:



Ni in $[Ni(CO)_4]$:



801 **(c)**

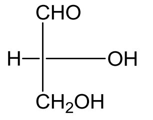
Both produce different ions in solution state:

$[Co(NH_3)_5Br]SO_4 \rightleftharpoons [Co(NH_3)_5Br]^{2+} + SO_4^{2-}$

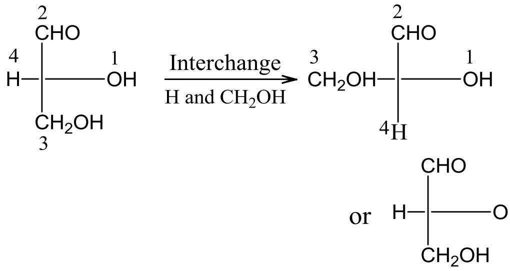
$[Co(NH_3)_5SO_4]Br \rightleftharpoons [Co(NH_3)_5SO_4]^{1+} + Br^-$

803 **(c)**

The configuration in which – OH group is on right side, H-atom is on left side, —CHO group is on upper side and CH_2OH is on lower side found in Fischer projection known as D-configuration



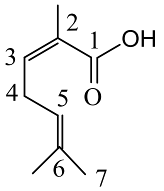
D-glyceraldehyde



804 **(a)**

Linkage isomerism is shown by those complexes which have an ambidentate ligand such as NO_2^-, CN^- and $SC\overline{N}$ etc. In $[Fe\ (NO_2)_3Cl_3]$, N is dono donor atom.

805 **(c)**



2,6-dimethyl hepta-2, 5-dienoic acid

806 **(d)**

$NaHCO_3$ reacts with acids to give CO_2 from HCO_3^- ion.

$H^+ + HCO_3^- \longrightarrow H_2O + CO_2 \uparrow$

807 **(a)**

The species within the coordination sphere does not ionize.

808 **(c)**

The reverse of enolic contents of compound is ketonic contents. Thus, the correct order of ketonic contents are

$$CH_3CHO > CH_3COC_2H_5 > CH_3COCH_3 > CH_3COCH_2COCH_3$$

809 **(b)**

The anhydrous complexes of Cu_2^{2+} do not involve d-d transition and are thus, colourless.

810 **(d)**

The valence of C-atom of ring is 5 at two methyl gp. attachment.

812 **(b)**

Aniline is basic and thus, reacts with acid.

814 **(b)**

The Riemer-Tiemann reaction is followed by dichloro carbene mechanism.

815 **(c)**

$C_6H_5COOH \xrightarrow{SOCl_2} C_6H_5COCl + SO_2 + HCl$; $-OH$ group is replaced by PCl_5, PCl_3 or $SOCl_2$.

816 **(b)**

Mn^{2+}will have half filled more stable d^5 configuration and without distributing it an outer orbital complex can be formed

817 **(a)**

	Hybridization	Unpaired electrons	Magnetic moment
1.$[Co(CN)_6]^{3-}$	d^2sp^3	0	0
2.$[Fe(CN)_6]^{3-}$	d^2sp^3	1	$\sqrt{3}$ BM
3. $[Mn(CN)_6]^{3-}$	d^2sp^3	2	$\sqrt{8}$ BM
4.$[Cr(CN)_6]^{3-}$	d^2sp^3	3	$\sqrt{15}$ BM

Thus, least paramagnetism is in (a).

818 **(d)**

The primary valencies of Ni, in the complexes $[Ni(Cl_4)]^{2-}$and $[Ni(CN)_4]^{2-}$ is same *i.e.*, (+II). Primary valencies are those valencies which a metal exhibits in the formation of its simple salt, these are non-directional. It is also referred as oxidation state of central metal atom.

819 **(c)**

The central metal ion is Fe^{3+} and $C_2O_4^{2-}$is negative bi-dentate ligand which forms more stable complex than neutral or mono-dentate ligand.

821 **(b)**

In π-complex, organic ligands use their π system to bond with metal, *e*.g., ferrocene.

823 **(c)**

CN^- ions act both as reducing agent as well as good complexing agent

824 **(a)**

The order of *meta* directing, gp. is:

$$Me_3N^+ > NO_2 > CN > SO_3H > CHO > COCH_3 > COOH$$

825 **(a)**

$CH_3COC_3H_7$ can exhibit metamerism

$$CH_3 - \overset{\overset{O}{||}}{C} - CH_2CH_2CH_3,\quad CH_3 - \overset{\overset{O}{||}}{C} - \overset{\overset{CH_3}{|}}{CH} - CH_3$$

and

$$CH_3CH_2 - \overset{\overset{O}{||}}{C} - CH_2CH_3$$

826 **(d)**

It has coordination no. six and thus, octahedral or sp^3d^2 -hybridization.

828 **(d)**

Let the oxidation state of iron in $K_4[Fe(CN)_6]$is x.

$$4(+1)+x+6(-1)=0$$
$$4+x-6=0$$
$$x=+2$$

829 **(d)**

These are the methods to test complex formation.

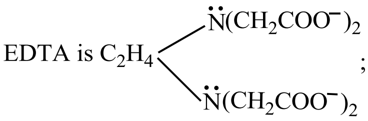
830 **(b)**

EAN of Fe in $K_3Fe(CN)_6$ is: $26-3+2\times 6=35$, *i. e.*, not 36 the next inert gas.

833 **(a)**

Grignard reagent is a σ-bonded organometallic compound because all the bonds present in the reagent are single bonds.

835 **(b)**



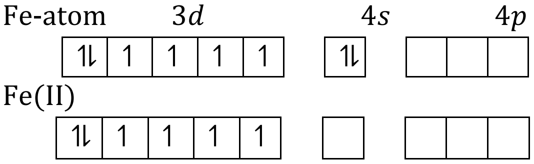
EDTA is $C_2H_4\begin{cases}\ddot{N}(CH_2COO^-)_2\\ \ddot{N}(CH_2COO^-)_2\end{cases}$; it has six positions (*i.e.*, six electron pairs) available for attachment at central metal atom.

836 **(d)**

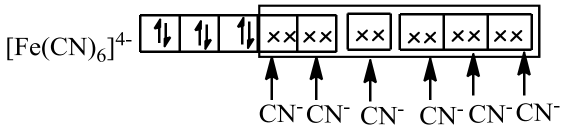
Thymol is 3-hydroxy-l-isopropyl-4-methyl benzene ($C_{10}H_{14}O$), a white crystalline phenol derivative, has smell of thyme, occurs in many essential oils used as fragrant material as well as mild antiseptic.

837 **(d)**

Ferrocyanide ion $[Fe(CN)_6]^{4-}$ is diamagnetic in nature hence $K_4[Fe(CN)_6]$ complex has zero magnetic moment.



$d^2\ sp^3$ hybridisation



838 **(a)**

CO ligand has zero oxidation state, that is why $[Ni(CO)_4]$ is a zero valent metal complex

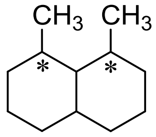
840 **(c)**

A characteristic; follow ligand field theory.

842 **(b)**

Central ion is Cd^{2+} and ligand is CN^-.

843 **(b)**



In compound two chiral carbon atoms are present

844 **(c)**

9 mole or 9 × 22.4 litre of C_2H_2 are needed.

845 **(b)**

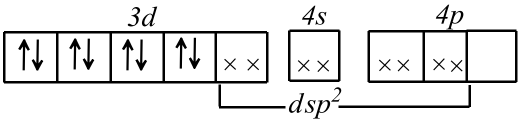
IUPAC name of sodium nitroprusside $Na_2[Fe(CN)_5NO]$ is sodium pentacyanonitrosyl ferrate (III) because in it NO is neutral ligand and the oxidation number of Fe is III, which is calculated as

2×ON of Na+ ON of Fe +5×ON of CN
+1×ON of NO=0
2×(+1)+ON of Fe +5× (-1) +1×0=0
ON of Fe =5-2=+3

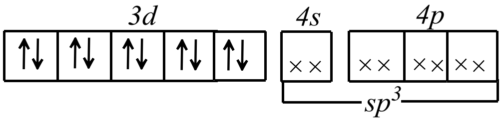
846 **(b)**

The electronic configuration of Ni in $[Ni(CN)_4]^{2-}$, $[Ni(Cl)_4]^{2-}$ and $Ni(CO)_4$ are :

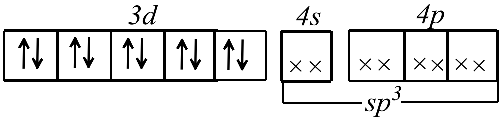
Ni^{2+} in $[Ni(CN)_4]^{2-}$:



Ni^{2+} in $[Ni(Cl)_4]^{2-}$:



Ni^{2+} in $[Ni(CO)_4]$:



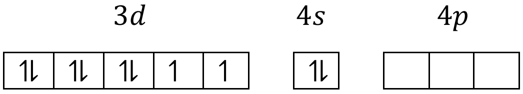
848 **(d)**

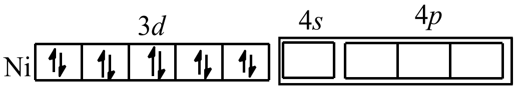
When cations have same charge but number of d-electrons are different then the stability (or CFSE) decreases with increase in the number of d-electrons. Therefore, the correct order is

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

849 **(a)**

Oxidation state of Ni in $Ni(CO)_4$ is zero.





sp^3 - hybridisation

CO is a strong ligand. It causes pairing of electrons. Hence, there is no unpaired electrons in $Ni(CO)_4$.

850 **(b)**

Ox. no. of Cr is calculated as:

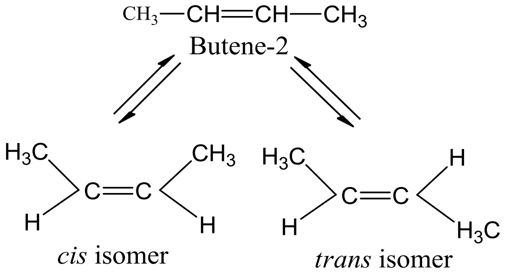
$3\times 1+a+1\times(-2)+4\times(-1)=0;\quad \therefore a=+3$

853 **(c)**

CrO_3 or CrO_2Cl_2 and a mixture of $K_2Cr_2O_7 + H_2SO_4 + NaCl$ can also be used.

854 **(b)**

Butane-2 exhibit geometrical (*cis*, *trans*) isomerism



855 **(a)**

Ferrocene is a π complex $Fe(\eta^5-C_5H_5)_2$.

856 **(a)**

Ni in $[Ni(NH_3)_6]^{2+}$ has sp^3d^2 (outer complex) having octahedral geometry.

857 **(d)**

These examples are ionisation isomers because of chloride and sulphate ions.

859 **(b)**

When ligands are arranged in ascending order of crystal field splitting energy, Δ, they produce a spectrochemical series.

In comparison to H_2O, Cl is strong σ-donor and good π-acceptor, therefore it is a strong ligand than H_2O. Hence, in the spectrochemical series Cl is above than water.

860 **(b)**

On ionization different species are formed to show ionization isomerism:

$[Co(en)_2(NCS)_2]Cl \rightleftharpoons [Co(en)_2(NCS)_2]+Cl^-$

$[Co(en)_2(NCS)Cl]NCS$

$\rightleftharpoons [Co(en)_2(NCS)Cl]+NCS^-$

861 **(a)**

Pt^{2+} has square planar complexes with coordination number four.

862 **(c)**

In $Hg[Co(SCN)_4]$, Co exists as Co^{2+}

${}_{27}Co\ :\ 3d^7, 4s^2$

${}_{27}Co^{2+}\ :\ 3d^7$

SCN^- a strong field ligand provides four electron to pair to show sp^3-hybridisation in $[Co(SCN)_4]^{2-}$ and thus three unpaired electrons exists on CO^{2+}.

$\therefore$ Magnetic moment $=\sqrt{n(n+2)}=\sqrt{3(3+2)}=\sqrt{15}$

863 **(d)**

But-2-ene and but-1-yne do not have same molecular formula, thus are not isomers

$CH_3-CH=CH-CH_3$ $\quad$ $CH_3-CH_2-C\equiv CH$

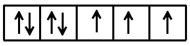
But-2-ene $\quad$ but-1-yne

(C_4H_8) $\quad$ (C_4H_6)

864 **(b)**

${}_{27}Co \longrightarrow [Ar]3d^74s^2$

$Co^{2+} \longrightarrow 3d^74s^0$



Number of unpaired electrons = 3

865 **(a)**

NO in iron complexes has ox. no. equal to one.

$a+5\times 0+1-2=0,\quad \therefore a=+1$

868 **(c)**

Due to the presence of phenolic gp.

869 **(b)**

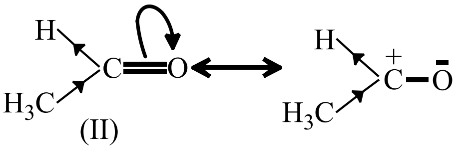
$Ni(CO)_4$ has a O.N. zero for Ni

870 **(d)**

Because it is a polydentate ligand which binds the central atom nickel forming a ring structure

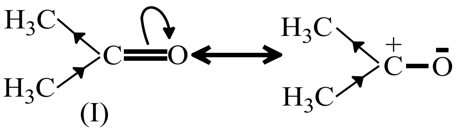
871 **(c)**

Carbonyl compounds react with Grignard reagent following nucleophilic addition. More +ve is charge on C^+ centre of carbonyl gp., easier is nucleophile attack.



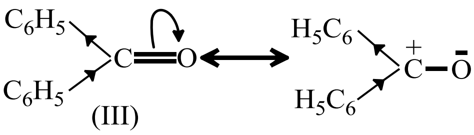
(II)

(Positive charge on C^+ is dispersed due to $+I.E.$ of CH_3 gp.)



(I)

(Positive charge on C^+ is dispersed more due to $+I.E.$ of two CH_3 *gp*.)



(III)

(Positive charge on C^+ is intensified due to $-I.E.$ of C_6H_5 gps.)

But in (III) conjugation of >CO gp. with π system of benzene nucleus following resonance deactivates C^+ centre to attack by nucleophile. Resonance effect overpowers over $-I.E.$ of C_6H_5 gp.

872 **(d)**

$[Cr(SCN)_2(NH_3)_4]^+$ shows geometrical (or *cis-trans*) and linkage isomerism.

873 **(c)**

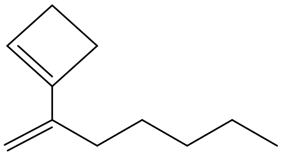
$CuCl + 4KCN \longrightarrow K_3[Cu(CN)_4] + KCl$.

Thus, coordination no. of Cu is four.

876 **(b)**

The IUPAC name of the compound $[CuCl_2(CH_3NH_2)_2]$ is dichloro bis-(methyl amine) copper (II).

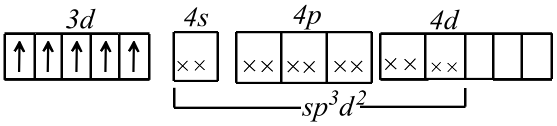
877 **(b)**



2-(1-cyclobutenyl)-1-hexane

879 **(b)**

Electronic configuration of $[FeF_6]^{3-}$ is:



×× Electron pair donated by F^-

880 **(d)**

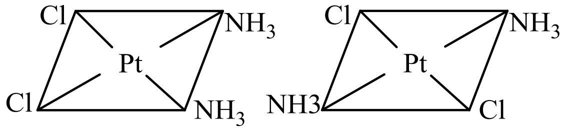
Effective atomic no. (EAN) = at. No. of central atom –oxidation state +2 × (no. of ligands)=

$28 - 0 + 2 \times 4 = 36$

$EAN = 26 - 3 + 2 \times (6) = 35$

882 **(d)**

$[Pt^{II}(NH_3)_2Cl_2]$ shows geometrical isomerism.



(orange yellow) (pale yellow)

884 **(b)**

Staggered and eclipsed conformers cannot be physically separated because the energy difference between them is so small that they most readily interconvent at room temperature

885 **(b)**

A species or group of atoms can act as ligand only when it carries an unshared pair, *i.e.*, lone pair of electrons.

886 **(c)**

Follow IUPAC rules.

888 **(d)**

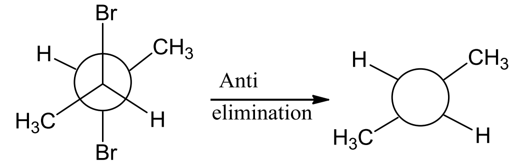
$NH_2 \cdot NH_2$ serves as monodentate as well as bridging ligand because a 3-membered ring will be too strained to be stable.

889 **(b)**

TNT mixed with NH_4NO_3 gives explosive material.

890 **(d)**

During debromination, *meso*-dibromobutane form *tran*-2-butene



meso-2,3-dibromobutane *trans*-2-butene

891 **(a)**

The IUPAC name of compound is

$K_2[Cr(CN)_2O_2(O)_2(NH_3)$is

Potassium ammine dicyano dioxoperoxo

chromate (VI)

893 **(a)**

It can show ionization isomerism: $[Co(NH_3)_4Cl_2]^+$ and $[Co(NH_3)_4Cl]^{2+}Cl$.

894 **(b)**

Replacement of H-atom of ring usually takes place following $S_E$reaction mechanism.

895 **(b)**

Follow mechanism of Reimer-Tiemann reaction.

896 **(a)**

It is 2,4,6-trinitrophenol.

897 **(a)**

Follow mechanism of cannizzaro's reaction.

898 **(b)**

Ag in Tollens' reagent exists as Ag_2O

$$2 \times a + 1 \times (-2) = 0$$

$$\therefore a = +1$$

899 **(b)**

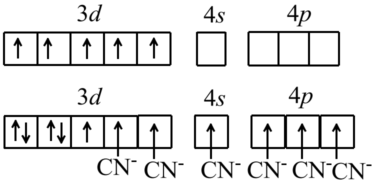
$K_3[Fe(CN)_6]$

Electronic configuration of $Fe = [Ar]3d^6 4s^2$

Electronic configuration of $Fe^{3+} = [Ar]3d^5$

Number of ligand (Coordination number)=6

Nature of ligand in strong field

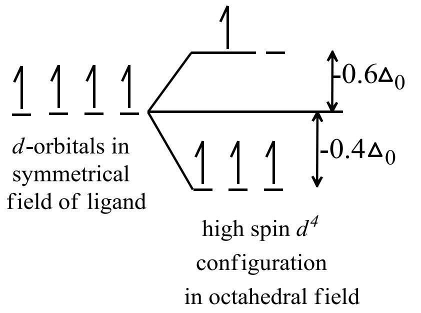


Hybridisation of Fe is d^2sp^3

900 **(d)**

Butan-2-one $CH_3 - \overset{\overset{O}{||}}{C} - CH_2 - CH_3$ is not isomeric with diethyl ether $CH_3CH_2 - O - CH_2 - CH_3$. Because both are differing in molecular formula

902 **(d)**



CFSE = $3\lambda(-0.4)\Delta_0 + 0.6(\Delta_0) = 0.6\ \Delta_0$

905 **(b)**

Only carbonyl compounds show this test.

906 **(c)**

Presence of *meta* directing gp. Deactivates ring for Friedel-Crafts reaction.

907 **(c)**

$Ni(CO)_4$ and $Ni(PPh_3)_2Cl_2$ are tetrahedral in geometrical shape, because coordination number of Ni is four in both cases.

908 **(c)**

Geometrical isomers (*cis* and *trans*) and linkage isomers (−SCN and − CNS).

909 **(a)**

The absorption of energy of the observation of colour in a complex transition compounds depends on the charge of the metal ion and the nature of the ligands attached. The same metal ion with different ligands shows different absorption depending upon the type of ligand. The presence of weak field ligands make the central metal ion to absorb low energies *ie*, of higher wavelength. The field strength of ligands can be obtained from spectrochemical series, *ie*,

(weak field) $I^- < Br^- < S^{2-} < Cl^- < NO_3^- < F^- < OH^-$

$< H_2O < NH_3 < NO_2 < CN^- < CO$ (strong field)

911 **(d)**

The total number of monodentate ligands attached to the central metal is known as coordination number. Hence, in $[Cu(H_2O)_4]^{2+}$ coordination number of Cu atoms is 4.

912 **(c)**

Prefixes and suffixes are written before and after the root word respectively and not before and after the compound

The IUPAC name of a compound is written as single word

913 **(c)**

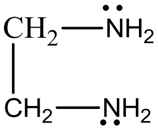
$CH_2{=}CH{-}CH_2Cl \leftrightarrow ClCH_2{-}CH{=}CH_2$.

914 **(c)**

$[Co(NH_3)_3Cl_3]$ does not have optical isomers because it is of formula MA_3B_3 which does not show optical isomerism

915 **(b)**

Ethylenediamine is a bidentate ligand.



916 **(b)**

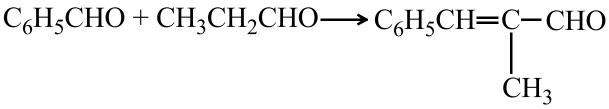
Electron withdrawing nature or $-IE$ increases the activation of ring more effectively, however resonance opposes inductive effect for attachment at *o*-and *p*-position and hence, makes less deactivation for *o*-and *p*-positions.

918 **(d)**

All involves sp^3-hybridization.

919 **(b)**

Chaisen condensation involves condensation of benzaldehyde with aliphatic aldehydes or ketones having two α-H-atoms, *e*. g.,



$$C_6H_5CHO + CH_3CH_2CHO \longrightarrow C_6H_5CH{=}\underset{\displaystyle CH_3}{\underset{|}{C}}{-}CHO$$

920 **(d)**

All are transition elements with d-orbitals not filled to capacity.

921 **(a)**

Ag(II) has a d^9-configuration and must contain unpaired electron but AgOis diamagnetic because AgO does not contain Ag(II) but is a mixed oxide of $Ag^IAg^{III}O_2$.

922 **(c)**

Friedel-Crafts reaction involves alkylation or acylation in benzene nucleus using alkylating or acylation reagents in presence of anhy. $AlCl_3$.

924 **(b)**

$2C_6H_6 + 2HCl + O_2 \rightarrow 2C_6H_5Cl + H_2O$

925 **(a)**

$CoCl_2$ is a weak Lewis acid, reacting with chloride ions to produce salt containing the terrahedral $[CoCl_4]^{2-}$ion. $CoCl_2$ is blue when anhydrous, and a deep magenta colour when hydrated, for this reason it is widely used as an indicator for water

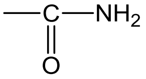
926 **(c)**

Octahedral complexes of the type MA_5B do not show geometrical isomerism.

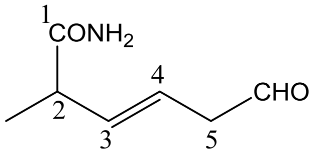
927 **(b)**

$C_6H_5COOC_2H_5 \xrightarrow{NaOH} C_6H_5COONa + C_2H_5OH$

928 **(d)**

In this compound  is principal functional group

While – CHO is substituent group, hence

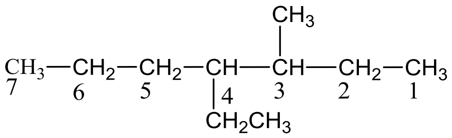


5-formyl-2-methyl pent-3-en-1-amide

929 **(b)**

$C_6H_5CH_2NH_2$ has least negative inductive effect and thus shows more basic nature.

930 **(d)**



$$\overset{7}{CH_3}-\overset{6}{CH_2}-\overset{5}{CH_2}-\underset{CH_2CH_3}{\overset{4}{CH}}-\overset{CH_3}{\underset{3}{CH}}-\overset{2}{CH_2}-\overset{1}{CH_3}$$

4-ethyl-3-methyl heptane

Note : The prefix in a compound should be arranged in alphabetical order

931 **(d)**

All possess lesser number of unpaired electrons.

932 **(d)**

A monodentate ligand has one donor site available for coordination.

933 **(a)**

It is benzene.

934 **(c)**

$C_6H_5CHO \xrightarrow{Cl_2} C_6H_5COCl$

935 **(c)**

Phenol is weak acid.

936 **(b)**

The coordination number in $[FeF_6]^{3-}$ is 6, hence it is a octahedral complex

937 **(d)**

$AgCl + 2NH_3 \longrightarrow \underset{\text{Soluble}}{[Ag(NH_3)_2]Cl}$

938 **(a)**

Main fractions of coal-tar and the compounds present there in are:

	Main fraction	Temp. range	Chief constituents
1.	Light oil or crude naphtha	80-170°C	Benzene, toluene, xylenes, etc.
2.	Middle oil or carbolic acid	170-230°C	Phenol, naphthalene, pyridine, etc.
3.	Heavy oil or creosote oil	230-270°C	Cresols, naphthalene quinolone, etc.
4.	Green oil or anthracene oil	270-360°C	Anthracene, phenanthrene, etc.
5.	Pitch	Residue	90-94% of carbon

939 **(c)**

The coordination number (C.N.) of a metal atom in a complex is the total number of bonds formed by metal with ligands.

In case of tetrahedral complexes the number of bonds formed between metal and ligand is four. So, coordination number is also four.

940 **(b)**

Due to resonance bond length become identical and is 1.40 Å. Whereas in alkane C—C bond is 1.54 Å and in alkene it is 1.34 Å.

941 **(d)**

$C{=}O + H_2NNHC_6H_5 \longrightarrow C{=}NNHC_6H_5$

All reagents do so.

944 **(c)**

Electrophilic substitution occurs at electron rich centres usually at o- and p-positions. The ring attached with —NH will develop more electron density at o- and p-positions. Since o-position is blocked, thus electrophile will attach at p-position.

945 **(b)**

Follow text.

946 **(a)**

In the formation of d^2sp^3 hybrid orbitals, two $(n-1)d$ orbitals of e_g set *i.e.*, $(n-1)\ d_{z^2}$ and $(n-1dx2-y2$orbitals, one ns and three $npnpx, npy$ and npz orbitals combine together and form six d^2sp^3 hybrid orbitals.

947 **(a)**

EAN of Fe $= 26 - 2 + 6 \times 2 = 36$.

948 **(a)**

$K[Pt(NH_3)_5Cl_5] \rightleftharpoons K^+ + [Pt(NH_3)_5Cl_5]^-$

949 **(b)**

$3KCl + CuCl \longrightarrow K_3[CuCl_4]$; this is soluble in water.

950 **(d)**

All are characteristics tastes for phenol.

952 **(c)**

N cannot have more than 8 elements in its valence shell.

953 **(b)**

Tautomeric structures of a molecule are not the resonating structures of the molecule

954 **(a)**

2, 4, 6-trinitrophenol is strong acid than acetic acid but phenol is less acidic than acetic acid.

955 **(a)**

Phenol being weak acid does not react with aq. $NaHCO_3$.

956 **(c)**

If two atoms directly attached to the double bond have the same atomic number, then the elative priority of the groups is determined by a similar comparison of the atomic numbers of the next elements in the groups. Thus, the preference order of given group is

$OCH_3 > OH > COOH > CHO$

957 **(a)**

Follow IUPAC name.

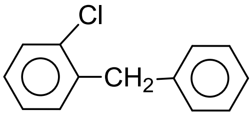
958 **(a)**

It possesses d^8 configuration of Ni^{2+}.

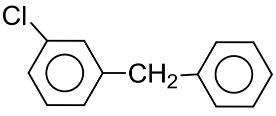
959 **(d)**

There are four structural isomers possible for diphenyl methane when one H-atom is replaced by a Cl-atom

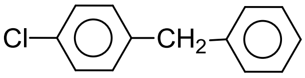
(I)



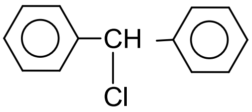
(II)



(III)



(IV)



960 **(c)**

CN^- is a better complexing agent (C) as well as a reducing agent(A)

Thus, properties (A) and (C) are shown.

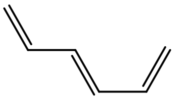
Property (C):$Ni^{2+} + 4CN^- \longrightarrow [Ni(CN)_4]^{2-}$

Property(A):

$\overset{II}{Cu}Cl2 + 5KCN \longrightarrow K_3[\overset{I}{Cu}(CN)_4] + \frac{1}{2}(CN)_2 + 2KCl$

(CN^- reduces Cu^{2+} to Cu^+)

961 **(c)**

In  the double bonds are *trans* and *cis*. The first and third bonds are identical

963 **(a)**

p –nitrophenol is most acidic (among these) as it has electron withdrawing $-NO_2$ gp.

965 **(c)**

Geometrical isomerism is found in compounds having coordination no. 4 (square planar and not tetrahedral shape) as well as coordination no. 6.

Coordination no. 4 (square planar)

$M_{A_2BC}, M_{A_2B_2}$

Showing geometrical isomerism M_{ABCD}

Coordination no. 6 (octahedral)

$M_{A_4B_2}, M_{A_4BC}$

Showing geometrical isomerism.

$M_{A_3B_3}, M_{(AA)_2B_2}$

966 **(d)**

Follow crystal field theory.

967 **(d)**

Due to resonance C_6H_6 is stabilized and normal addition reactions (except addition of H_2, Cl_2 and ozonolysis) are not observed in C_6H_6.

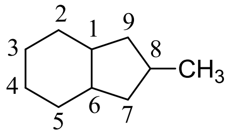
969 **(b)**

EAN of Pt in $[PtCl_6]^{2-} = 86$

971 **(b)**

$CuCl + NH_3 \longrightarrow [Cu(NH_3)_2]Cl$. The coordination no. = No. of ligands attached.

972 **(a)**



Longest system : 1,2,3,4,5,6

Next longest system : 6,7,8,1

Shortest system : 1,6

The IUPAC name of compound is

8-methyl bicyclo [4,3,0] nonane

973 **(b)**

Aniline on condensation with aromatic aldehyde gives Schiff's base.

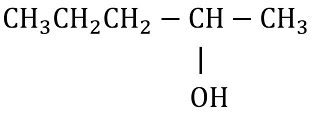
974 **(c)**

Organometallic compounds are those compounds in which metal is directly attached to the carbon atom. In sodium ethoxide, sodium attached to oxygen atom, hence it is not an organometallic compound.

975 **(d)**

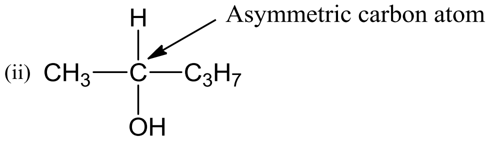
(i) $CH_3CH_2CH_2CH_2CH_2OH$

and



$CH_3CH_2CH_2 - \underset{\underset{OH}{|}}{CH} - CH_3$

are Position isomers



(ii) $CH_3-\overset{H}{\underset{OH}{C}}-C_3H_7$

Due the presence of asymmetry, optical isomerism is possible

(iii) $CH_3CH_2CH_2CH_2CH_2OH$ and $CH_3CH_2OCH_2CH_2CH_3$ are functional isomerism

976 **(c)**

Co^{3+} and Pt^{4+} have 6 coordination number.

$CoCl_3.6NH_3$ and $PtCl_4.5NH_3$

$[Co(NH_3)_6Cl_3 \xrightarrow{\text{In solution}} [Co(NH_3)_6]^{3+} + 3Cl^-$

$[PtCl(NH_3)_5Cl_3 \xrightarrow{\text{In solution}} [PtCl(NH_3)_5]^{3+} + 3Cl^-$

Number of ionic species are same in the solution of both complexes, therefore their equimolar solutions will show same conductance.

977 **(a)**

Organometallic compounds are those compounds in which carbon atom is directly linked to metal. But in sodium ethoxide as oxygen is attached to attached to sodium metal so, it is not a organometallic compound

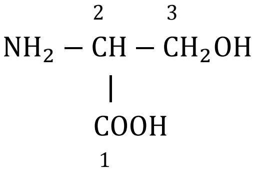
978 **(d)**

$[Cu(H_2O_4)]SO_4.H_2O$ coordination number of Cu is 4.

979 **(b)**

Sodium nitroprusside is $Na_2[Fe(CN)_5NO]$.

980 **(d)**

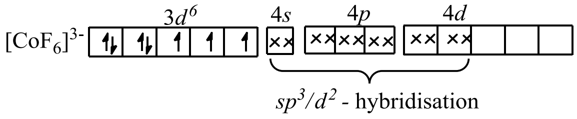


$$NH_2-\overset{2}{\underset{\underset{1}{COOH}}{CH}}-\overset{3}{CH_2OH}$$

2-amino-3-hydroxy propanoic acid

981 **(a)**

$[CoF_6]^{3-}$is an outer orbital complex ion. It involves outer orbital hybridisation. It has sp^3d^2-hybridisation because F^- is a weak ligand.



982 **(b)**

Effective atomic no. (EAN) = at. No. of central atom –oxidation state +2 × (no. of ligands)=

$28-0+2\times4=36$

$EAN=28-2+2\times4=34$.

983 **(b)**

Due to restricted rotation about the carbon-carbon single bond joining the two phenyl groups, the molecule as a whole is chiral and thus shows optical isomerism

984 **(b)**

Any side chain is oxidised to COOH gp.

985 **(d)**

These are facts about glycinato ligand.

986 **(c)**

According to Werner's theory, only those ions are precipitated which are attached to the metal atoms with ionic bonds and are present outside the coordination sphere.

987 **(d)**

sp^2-hybridization leads to planar hexagonal shape.

988 **(a)**

Coordination isomerism is caused by interchange of ligands with the metal atoms.

989 **(c)**

Chlorophyll are green pigment in plant and contain magnesium instead of caleium

991 **(a)**

$C_6H_5NH_2 + Cl_2OC \longrightarrow C_6H_5N=C=O + 2HCl$

992 **(a)**

$C_6H_5OC_2H_5 \xrightarrow{HBr} C_6H_5OH + C_2H_5Br$

993 **(d)**

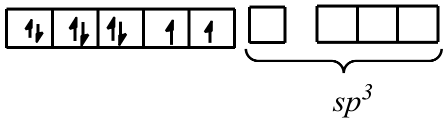
$[Fe(NH_3)_4 . Cl_2]Cl$

Tetraammine dichloro ferrum III chloride.

994 **(b)**

$_{28}Ni=[Ar]\ 3s^2\ 3p^6 4s^2\ 3d^8$

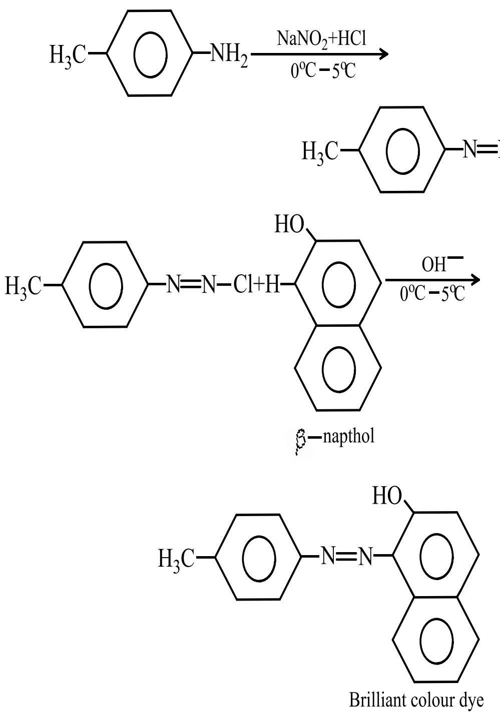
$Ni^{2+}=[Ar]\ 3s^2\ 3p^6\ 3d^8$



Nickel has two unpaired electrons and geometry is tetrahedral due to sp^3 hybridisation.

995 **(c)**

It is a test for $-NH_2$ gp attached on benzene nucleus following diazotisation and coupling reaction.



997 **(a)**

Mole of $CoCl_3.6NH_3 = \frac{2.675}{267.5} = 0.01$

$AgNO_3(aq) + Cl^-(aq) \longrightarrow AgCl \downarrow$ (white)

Moles of $AgCl = \frac{4.78}{143.5} = 0.03$.

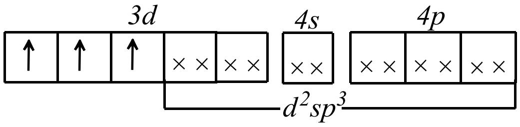
1. mole $CoCl_3.6NH_3$ gives $= 0.03$ mol AgCl

$\therefore$ 1 mole $CoCl_3.6NH_3$ ionizes to gives $= 3$ mol Cl^-

Hence, the formula of compound is $[Co(NH_3)_6]Cl_3$.

998 **(b)**

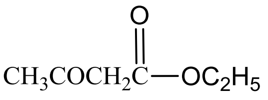
Electronic configuration of Cr in $[Cr(H_2O)_6]^{3+}$ is : $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^3$.



×× Electron pair donated by H_2O

999 **(c)**

The stabilising effect of enolic form is the intramolecular hydrogen bond present in enols. This provides another source of increasing bonding and hence, increased stabilization. Thus,


$CH_3COCH_2\overset{\overset{\displaystyle O}{\|}}{C}—OC_2H_5$ is more stable

100 **(c)**

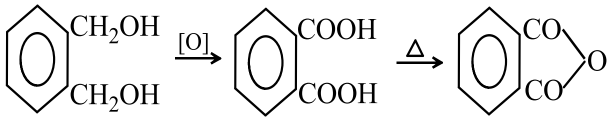
0 Each en has two coordinate bonds; each Br has one coordinate bond.

100 **(c)**

1 Aniline is base.

100 **(c)**

2 Two COOH on vicinal carbon atom lose H_2O on heating.



100 **(c)**

3 Benzene has 6 C—C, 6 C—H σ-bonds and 3C=Cπ-bonds.

100 **(b)**

4 Rest all have plane of symmetry.

100 **(b)**

6 The number of unpaired electrons in complex $[Pt(NH_3)_2]Cl_2$ are two.

100 **(c)**

7 Geometrical isomerism is found in compounds having coordination no. 4 (square planar and not tetrahedral shape) as well as coordination no. 6.

Coordination no. 4 (square planar)

$M_{A_2BC}, M_{A_2B_2}$

Showing geometrical isomerism M_{ABCD}

Coordination no. 6 (octahedral)

$M_{A_4B_2}, M_{A_4BC}$

Showing geometrical isomerism.

$M_{A_3B_3}, M_{(AA)_2B_2}$

100 **(c)**

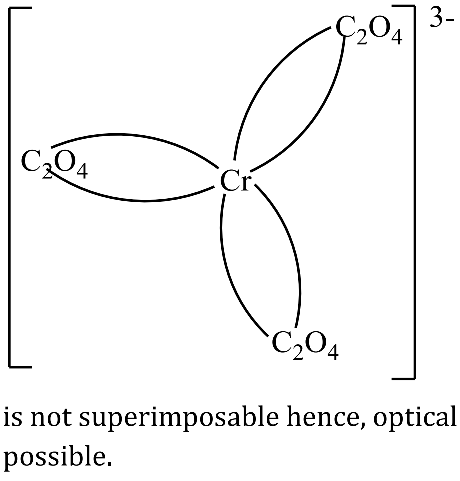
8 According to the modern view primary valency of complex compound it its oxidation number while secondary valency is the coordination number

100 **(c)**

9 The IUPAC name of $K_4[Ni(CN)_4]$ is potassium tetracyanonickelate (0).

101 **(b)**

0



Mirror image is not superimposable hence, optical isomerism is possible.

101 **(a)**

1 S-atom is donor in SCN and N-atom is donor in NCS. The linkage isomerism arises when Iigand has two possibilities to attach on central atom.,

101 **(d)**

2 Ethane has an infinite number of conformation but staggered and eclipsed are preferred. Ethane molecule would exist in the staggered conformation due to its minimum energy and maximum stability

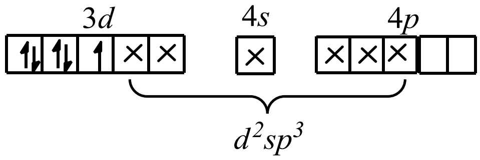
101 **(a)**

4 Follow IUPAC rules

101 **(d)**

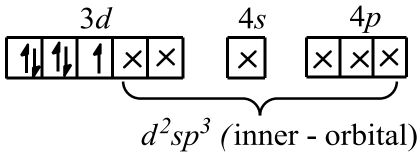
5 The complex in which nd orbitals are used in hybridisation, are called outer orbital complex.

26. $[Fe(CN)_6]^{4-}$ =



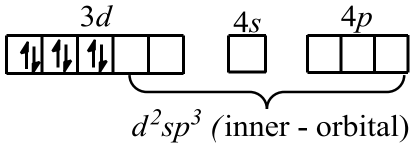
27.

$[Mn(CN)_6]^{4-}$ =



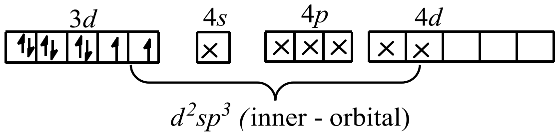
28.

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



29.

$[Ni(NH_3)_6]^{2+}$ =



101 **(d)**

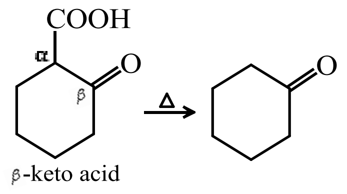
6 In each case aromatisation leads to formation of C_6H_6.

101 **(a)**

7 $C_6H_5Cl \xrightarrow{H_2-\text{Ni or Al/NaOH}} C_6H_6$;

101 **(b)**

8 β-keto acids undergo decarboxylation most easily on heating.



101 **(a)**

9 Ni in $[Ni(H_2O)_6]^{2+}$ has two unpaired electrons in it.

102 **(d)**

4 An electron attracting group $(-NO_2)$ disperses the negative charge on phenoxide ion and thus, makes it more stable or increases the acidic character of phenol. The substitution is more effective at p-position than in the m-position as the former involves a resonating structure bearing negative charge on the carbon attached to the electron withdrawing group. Also presence of electron repelling gp. $(-CH_3)$ intensifies the negative charge on phenoxide ion and thus, makes phenol less acidic.

102 **(d)**

6 $2C_6H_5CHO \xrightarrow{NaOH} \underset{\text{Oxidised}}{C_6H_5COOH} + \underset{\text{Reduced}}{C_6H_5CH_2OH}$

102 **(c)**

9 Let the ON of Pt in$[Pt(NH_3)_5Cl]Cl_3$ is x.

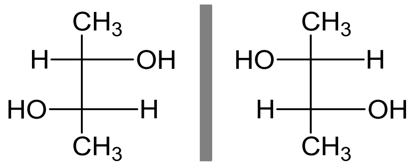
$$x+5\times(0)-1-3=0$$
$$x-4=0$$
$$x=+4$$

103 **(a)**

0 Organometallic compounds have carbon-metal bond, hence CH_3Mgl, tetraethyl tin and KC_4H_9 are organometallic compounds while C_2H_5ONa is not an organometallic compound due to absence of carbon-metal bond.

103 **(b)**

1 Optical isomers of a compound which are non-superimposable but related to each other as an object and its mirror are called enantiomers



103 **(d)**

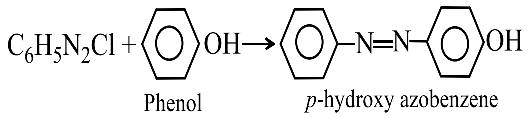
2 All involve dsp^2-hybridization.

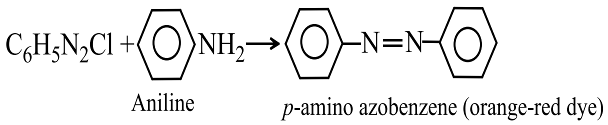
103 **(a)**

3 *Cis*- isomer of $[Pt(NH_3)_2Cl_2]$ is used as an anticancer drugs for treating several type of malignant tumours when it is inject into the blood stream the more reaction Cl groups are lost so, the Pt atom bonds to a N-atom in guanosine (a part of DNA). This molecule can bond to two different guanosine units and by bridging between them it upsets the normal reproduction of DNA

103 **(a)**

4





These are coupling reactions.

103 **(a)**
5 In $K_4Fe(CN)_6$, the species retains its identity in solid as well as solution state

103 **(c)**
6 The formula of dichlorodioxalatochromium (III) is $[Cr(Cl_2)(ox)_2]^{3-}$
Primary valency of a metal (Cr)in the complex
$\equiv$ oxidation number of that metal
$= +3$
Secondary valency of chromium in complex
=coordination number
=+6
($\because$ Coordination number is the number of ligands attached to the central metal ion and oxalate ion is a bidentate ligand *i.e.*, can coordinate at two positions)

103 **(a)**
7 Friedel-Crafts reaction involves alkylation or acylation in benzene nucleus using alkylating or acylating reagents in presence of anhy. $AlCl_3$.

103 **(d)**
8 According to IUPAC system, the IUPAC name of a compound is written as single word as far as possible

103 **(b)**
9
$$\underset{\text{(keto)}}{CH_3-\overset{\overset{O}{\|}}{C}-CH_2-\overset{\overset{O}{\|}}{C}-OC_2H_5} \rightleftharpoons$$
$$\underset{\text{(enol)}}{CH_3-\overset{\overset{OH}{|}}{C}=CH-\overset{\overset{O}{\|}}{C}-OC_2H_5}$$

104 **(a)**
0 $[Co(NH_3)_6]Cl_3$ gives four mole of ions on complete ionisation.
$[Co(NH_3)_6]Cl_3 \rightleftharpoons [Co(NH_3)_6]^{3+} + 3Cl^-$

104 **(a)**
2 It is a reason for the fact.

104 **(d)**
3 Halogens no doubt o-and p-directing gp. but they deactivate the ring.

104 **(a)**
4 In metal carbonyls CO has ox. no. equal to zero.

104 **(d)**
5 The dihedral angle is 60°

104 **(b)**
6 $_pK_a$ are 10.21, 10.14 and 7.15 respectively.

104 **(d)**
7 (i) $CH_3CH_2CH_2CH_2OH$ (ii) $CH_3CH_2-\underset{\underset{OH}{|}}{CH}-CH_3$

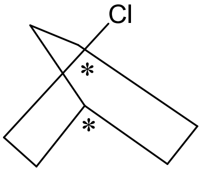
(iii) $CH_3-\overset{\overset{CH_3}{|}}{CH}-CH_2OH$ (iv) $CH_3-\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}-OH$

104 **(c)**
8 $Na_2[Fe(CN)_5NO]$
Sodium pentacyanonitroso ferrate (II).

104 **(d)**
9 Na^+ does not possess the tendency to form complex ion because of non-availability of d-orbitals.

105 **(b)**
0 In the complex $K_2Fe[Fe(CN)_6]$ both the iron atoms are present in same oxidation state

105 **(c)**
1 Carbon bonded with four different groups is known as chiral carbon atom. In case of given compound

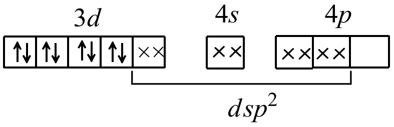


The number of chiral carbon atoms are two

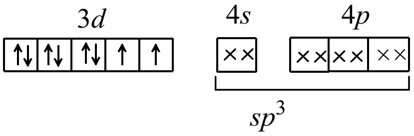
105 **(a)**
2 $[Co(NH_3)_3Cl_3]$ does not give a precipitate with $AgNO_3$solution because all the chloride ions are non-ionizable.
$[Co(NH_3)_3Cl_3] \rightleftharpoons$does not ionise

105 **(c)**
3 The IUPAC name of the compound $[Co(NH_3)_5Cl]Cl_2$ is pentaammine chloro cobalt (III) chloride.

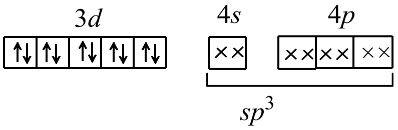
105 **(c)**
4 The electronic configuration of Ni in $[Ni(CN)_4]^{2-}$, $[NiCl_4]^{2-}$ and $Ni(CO)_4$ are as following
Ni in $[Ni(CN)_4]^{2-}$



Ni^{2+} in $[NiCl_4]^{2-}$



Ni in $[Ni(CO)_4]$



CO and CN^- are strong ligands so, they induces pairing of electrons so, their complexes are diamagnetic which, Cl^- is a weak ligand so, it does not induce the pairing of electrons so, its complex is paramagnetic

105 **(b)**
5 Presence of CH_3 gp. (an electron repelling group) decreases acidic character in benzoic acid. Presence of electron withdrawing gps. (NO_2, Cl, SO_3H) increases the acidic nature.

105 **(a)**
6 $Ni(CO)_4$ is a tetrahedral complex and is diamagnetic due to the absence of unpaired electron.

105 **(d)**
7 Such a carbon atom to which four different atoms or groups are attached is called asymmetric carbon

H D
| |
$CH_3 - C - C - CH_3$
|* |*
Br OH

105 **(d)**
9 Coordination sphere is interchanged.

106 **(a)**
0 Racemic tartaric acid is optically inactive due to external compensation. Racemic tartaric acid is an equimolar mixture of optically active *d*- and *l*-forms. This form of tartaric acid is optically inactive due to external compensation

106 **(d)**
1 $-NH_2$ gp. is highly susceptible to oxidant (HNO_3) and thus, first protected by acetylation.

106 **(d)**
2 All are the required facts for bridging ligands.

106 **(a)**
3 C_6H_5COOH is monobasic acid;
$\therefore$ Mol. wt. = Eq. wt.

106 **(d)**
4 Cannizzaro's reaction.

106 **(b)**
5 NO is in NO^+ form.
Let the oxidation state of Fe is x

$$x+0\times5+(+1)=+2$$
$$x=2-1$$
$$x=+1$$

Hence, the oxidation number of Fe in brown ring $[Fe(H_2O)_5NO]^{2+}$ is +1.

106 **(a)**
6 $Cr^{3+}: 1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^3$ $.The\ 3d^1_{xy}, 3d^1_{xz}, 3d^1_y$ has lower energy.

106 **(a)**
7 Number of moles of pentaaqua chloro chromium III chloride in the solution.
$n = \frac{0.01\times100}{1000}=0.001$
1 mole of $[Cr(H_2O)_5Cl]Cl_2$ gives 2 moles of chloride ions.
Moles of chloride ions $=0.001 \times 2=0.002$
Mass of AgCl produced $=0.002 \times 143.5$
$=287.0\times 10^{-3}$g

106 **(c)**
8 The four isomers are:
$[Cu(NH_3)_4][PtCl_4]$, $[Cu(NH_3)_4Cl]$
$[PtCl_3(NH_3)]$; $[Pt(NH_3)_3Cl][CuCl_3(NH_3)]$, [
.

106 **(c)**
9 Both optical isomerism and geometrical isomerism are examples of stereoisomerism.

107 **(d)**
0 $[Ni(NH_3)_4]SO_4$
$x \quad 0 \quad -2$
$x + 0 + (-2) = 0 \Rightarrow x = +2$ is valency and 4 is C.N. of Ni

107 **(d)**
1 C_6H_5CHO does not reduce Fehling's solution.

107 **(d)**
3 *n*-butane can exist in an infinite number of conformations

107 **(a)**
4 This is correct order of acidic nature of nitrobenzoic acids. Also follow ortho effect.

107 **(d)**
7 Positive charge on $-\overset{+}{C}H_2$
is dispersed due to electron releasing nature of methoxy group.

108 **(c)**

0 An organometallic compound is considered as a substance contains a carbon-metal bond *e.g.*, $Al_2(CH_3)_6$.

108 **(c)**

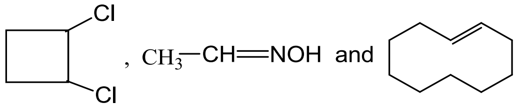
1 Picramide is 2, 4, 6-trinitroaniline.

108 **(d)**

2 Except alkynes, chain isomerism is observed when the number of carbon atoms is four or more than four

108 **(d)**

3 The isomerism which arises due to restricted rotation about a bond in a molecule is known as geometrical isomerism



All of these form geometrical isomers

108 **(a)**

4 The choice of principal functional group is made on the basis of the following order
Carboxylic acid > sulphonic acid > anhydride > esters > acid halide > acid amide > nitrile > aldehyde > ketone > alcohol > amine

108 **(d)**

5 $[Pt(NH_3)Cl_2Br]Cl \rightleftharpoons [Pt(NH_3)Cl_2Br]^+ + Cl^-$
$Cl^- + Ag^+ \longrightarrow AgCl$

108 **(b)**

7 $-COOH$ gp. reacts with $NaHCO_3$ to give effervescence.

108 **(d)**

8 $C_6H_5NO_2 \xrightarrow{Fe/H_2O_2(v)} C_6H_5NO$

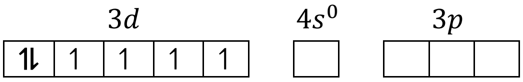
108 **(c)**

9

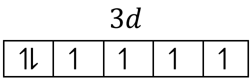
Complex ion	Hybridisation of central atom
$[Fe(CN)_6]^{4-}$	d^2sp^3(inner)
$[Mn(CN)_6]^{4-}$	d^2sp^3(inner)
$[Co(NH_3)_6]^{3+}$	d^2sp^3(inner)
$[Ni(NH_3)_6]^{2+}$	sp^3d^2(outer)

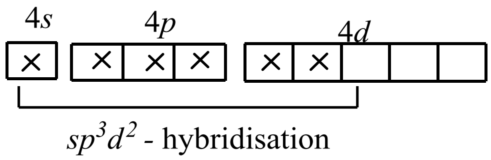
109 **(a)**

0 Electronic configuration of Co^{2+} ion
(a)



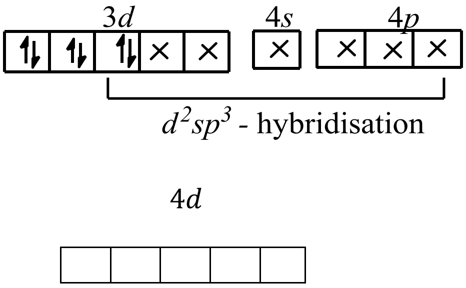
$[CoF_6]^{3-}$ ion



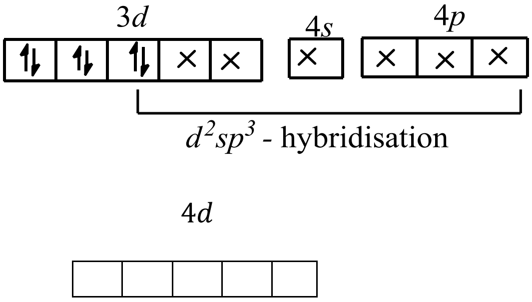


F^- is a weak ligand. It cannot pair up electrons with *d*-subshell and forms outer orbital octahedral complex.

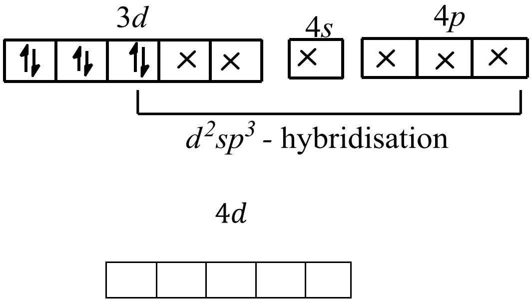
(b) $[Co(NH_3)_6]^{3+}$ ion



(c) $[Fe(CN)_6]^{3+}$ ion



(d) $[Cr(NH_3)_6]^{3+}$ ion



NH_3 and CN^- are strong ligands. So, they form their inner orbital complex.

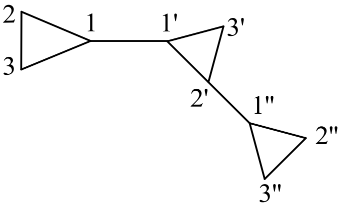
109 **(c)**

1 The name of complex is Carbonylchlorobis*trans*phosphineiridium (I).

109 **(a)**

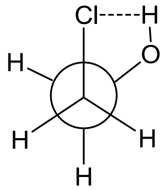
3 Coordination isomerism is caused by the interchange of ligands between complex cation and complex anion

109 **(c)**
4 Due to bitter almond smell.
109 **(b)**
5 Compounds which do not show optical activity inspite of the presence of chiral carbon atoms are called *meso*-compounds
109 **(d)**
6 mmol of complex $=30\times0.01=0.3$ Also, 1 mole of complex $[Cr(H_2O)_5Cl]Cl_2$ gives only two moles of chloride ion when dissolved in solution.
$[Cr(H_2O)_5Cl]Cl_2 \longrightarrow [Cr(H_2O)_5Cl]^{2+} + 2\,Cl^-$
$\Rightarrow$mmol of Cl^- ion produced from its 0.3 mmol $=0.6$
Hence, 0.6 mmol of Ag^+ would be required for precipitation.
$\Rightarrow$ 0.60 mmol of $Ag^+=0.1\text{ M}\times V$ (in mL)
$\Rightarrow$ $V=6$ mL
109 **(c)**
7 This is Kekule's view for C_6H_6 structure.
109 **(c)**
8 $C=O$ double bond of a carbonyl group is a stronger bond ($>C=O$, 364 kJ/mol) than the $C=C$ bond strength 250 kJ/mol) of the enol. Thus, CH_3COCH_3 is more stable
109 **(b)**
9 Effective atomic number (EAN) =Atomic no. of metal
-Oxidation no.+ Coordination no.×2
For$[CoF_6]^{2-}$, the oxidation state of cobalt is 4.
$EAN=(27-4)+6\times2$
$=23+12=35$
110 **(d)**
3 Metal atom or cation acts as Lewis acid or electron pair acceptor.
110 **(c)**
4 The nitration of C_6H_6 does not occur at room temperature. The solution becomes dark red due to absorption of NO_2 given out by HNO_3.
110 **(c)**
5 $[Co(en)_2NO_2Cl]Br$ exhibits linkage isomerism because the NO_2 group can exist as nitrito (—ONO) and nitro (—NO_2) group. The linkage isomers of $[Co(en)_2NO_2Cl]Br$ are as $[Co(en)_2NO_2Cl]Br$ and $[Co(en)_2ONOCl]Br$.
110 **(c)**
6 The compound will be numbered as and can be named as unbranched assembles containing 3 or more identical cycles

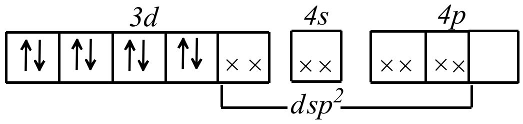


1,1',2',1"-terycyclo propane

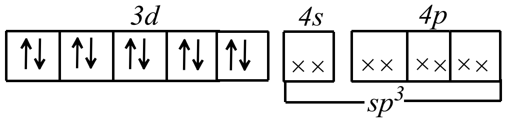
110 **(c)**
7



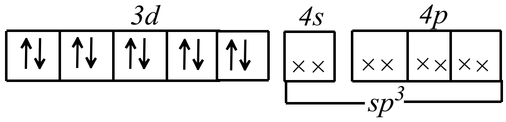
The gauch conformation is most stable due to presence of H-bonding between H atom of OH and Cl
110 **(c)**
8 The electronic configuration of Ni in $[Ni(CN)_4]^{2-}$, $[Ni(Cl)_4]^{2-}$ and $Ni(CO)_4$ are :
Ni^{2+} in $[Ni(CN)_4]^{2-}$:



Ni^{2+} in $[Ni(Cl)_4]^{2-}$:



Ni^{2+} in $[Ni(CO)_4]$:



110 **(a)**
9 Follow IUPAC rules.
111 **(b)**
0 Cd has no unpaired electron in $[CdCl_4]^{2-}$ ion.
111 **(d)**
1 It is a fact.
111 **(a)**
2 On ionization it gives maximum number of (four) ions.
111 **(a)**
3 Chlorophyll contains Mg, hence (a) is incorrect statement.
111 **(b)**
4 $[Co(NH_3)_5Cl]^{2+} + 2Cl^- \longrightarrow [Co(NH_3)_5Cl]Cl_2$
111 **(b)**
5 Linkage isomerism is caused due to presence of ambidentate ligands.
$[Pd(PPh_3)_2(NCS)_2]$and $[Pd(PPh_3)_2\,(SCN)_2]$ are linkage isomers due to SCN, ambidentate ligand.

111 **(a)**
6 $C_6H_5OCH_3 \overset{HI}{\rightarrow} C_6H_5OH + CH_3I$

111 **(c)**
7 $C_6H_5NH_2 + KOH + (Y) \longrightarrow C_6H_5NC$;(Y) is $CHCl_3$; (Y) is formed from $(Z) + Cl_2 + Ca(OH)_2$ and thus,(Z) is CH_3COCH_3 .

111 **(d)**
8 Halogen attached on side chain behaves as in aliphatic molecule.

111 **(a)**
9 MO theory reveals bond order in C_6H_6 lies in between 1 and 2.

112 **(a)**
0 $[Co(NH_3)_5SO_4]Br + AgNO_3 \longrightarrow [Co(NH_3)_5 \cdot$ SO4+AgBr

0.02mol (Y)

$[Co(NH_3)_5Br]SO_4 + BaCl_2$
$\longrightarrow [Co(NH_3)_5\ Br]Cl_2 + BaSO_4$

0.02mol (*Z*)

On using one liter solution we will get 0.01 mole Y and 0.01 mole Z

112 **(c)**
2 Metal-metal (Fe-Fe) bond pairs up the unpaired electrons.

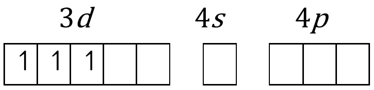
112 **(b)**
3 Follow IUPAC rules.

112 **(c)**
4 $[Cr(NH_3)_6] \quad Cl_3 \rightleftharpoons$
Coordinate sphere Ionisable

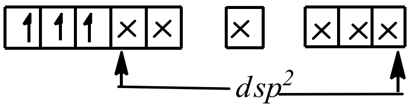
$[Cr(NH_3)_6]^{3+} + 3Cl^- \xrightarrow{AgNO_3} AgCl\downarrow$
white precipitate

$Cr(24)[Ar]3d^5\ 4s^1$
$Cr^{3+}[Ar]3d^3\ 4s^0$

Cr^{3+} [Ar]



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



☒ Indicates lone-pair of NH_3 donated to Cr

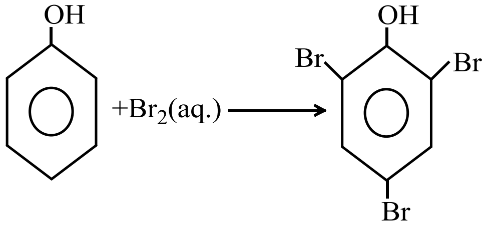
30. d^2sp^3 hybridisation, octahedral, thus, correct.
31. There are three unpaired electrons, hence paramagnetic, thus correct.
32. d^2sp^3-inner orbital complex, thus incorrect
33. Due to ionisable Cl^-ions, white precipitate with $AgNO_3$, thus correct.

Therefore, (c) is wrong.

112 **(c)**
5 NO_2^+ attacks at *ortho*-*para* for (P) w. r. t. OH
NO_2^+ attacks at *ortho*-*para* for (Q) w. r. t. CH_3 and OCH_3 both
NO_2^+ attacks at *ortho*-*para* for (S) with respect to $-OCOC_6H_5$

112 **(c)**
6 Follow molecular orbital theory for C_6H_6.

112 **(d)**
8 $5KBr(aq.) + KBrO_3(aq.) \longrightarrow 3Br_2(aq.)$
or $5Br^- + Br^{5+} \longrightarrow 3Br_2^0$



2,4,6-tribromophenol

112 **(d)**
9 The number of atoms of the ligand that are directly bounded to the central metal atom or ion by coordinated bond is known as the coordination number of the metal atom or ion. Coordination number of metal =number of σ bonds formed by metal with ligand

113 **(c)**
0 Follow MO diagram for C_6H_6.

113 **(b)**
2 $[Fe(H_2O)_6]^{2+}$ has four unpaired electrons; $[Cr(H_2O)_6]^{3+}$, $[Cu(H_2O)_6]^{2+}$ and $[Zn(H_2O)_6]^{2+}$ have 3, 1, 0 unpaired electrons, respectively.

113 **(a)**
3 Larger is the ligand, less stable is metal-ligand bond.

113 **(c)**
4 Both produces different ions in solution state
$[Co(NH_3)_4Cl_2]NO_2 \rightleftharpoons [Co(NH_3)_4Cl_2]^+NO_2^-$
$[Co(NH_3)_4Cl \cdot NO_2]Cl$
$\rightleftharpoons [Co(NH_3)_4Cl \cdot NO_2]^+ + Cl^-$

113 **(a)**
5 The name of reaction is Baeyer-Villiger oxidation.
$C_6H_5COCH_3 \xrightarrow[\text{acid}]{\text{Perbenzoic}} C_6H_5COOCH_3$

113 **(d)**
6 Pyridine undergoes $S_E$reactions at 3-position but under vigorous conditions, nitration, sulphonation and halogenation occurs only at 300°C. Friedel-Crafts reaction is not observed in pyridine because electron pair on N-atom (Lewis base) form complex with $AlCl_3$ (Lewis acid) and

a+ve charge on N-atom so produced decreases the activity of pyridine for $S_E$reaction.

113 **(d)**

7 $2Cl^-$ ions are inisable

$\therefore [Co(NH_3)_5Cl]Cl_2 \rightleftharpoons \underbrace{[Co(NH_3)_5Cl]^{2+} + 2Cl^-}_{\text{3 ions}}$

$2Cl^- + 2AgNO_3 \longrightarrow 2AgCl + 2NO_3^-$

113 **(d)**

8 Benzene is very good solvent.

113 **(a)**

9 Salol is phenyl salicylate and is used as antiseptic.

114 **(a)**

0 $-NO_2$ gp. is deactivating gp. for S_E reaction.

114 **(d)**

1 Geometrical isomerism is found in compounds having coordination no. 4 (square planar and not tetrahedral shape) as well as coordination no.6.

Coordination no. 4 (square planar)

$M_{A_2BC}, M_{A_2B_2}$.,

Showing geometrical isomerism M_{ABCD}.

Coordination no. 6 (octahedral)

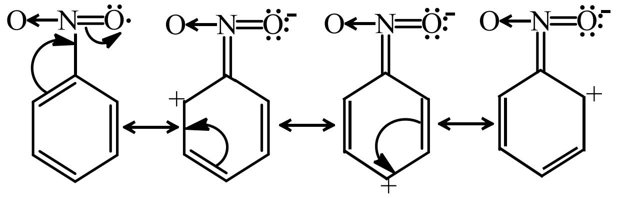
$M_{A_4B_2}, M_{A_4BC}$,

Showing geometrical isomerism.

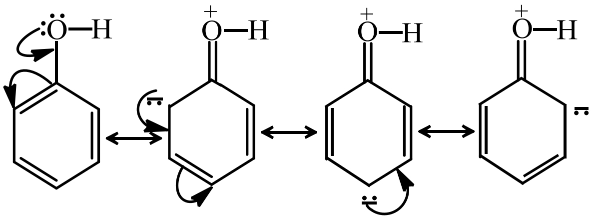
$M_{A_3B_3}, M_{(AA)_2B_2}$

114 **(a)**

3 The presence of m-directing groups in benzene nucleus simply decreases electron density at o- and p- whereas no change in electron density at m-position is noticed.



On the contrary o- and p-directing groups in nucleus increase the electron density at o- and p-position.



Thus, presence of o- and p-directing groups provide seats for S_E reactions or activates the ring, whereas presence of m-directing groups does not activate the ring and thus, deactivate the ring for $S_E$reactions.

114 **(a)**

4 Aniline is basic.

114 **(d)**

5 Ferrocene is diphenyl iron complex.

114 **(c)**

6 Effective atomic number (EAN)

$= \text{Atomic no.} - \text{O.S.} + 2 \times \text{C.N.}$

$= 28\text{-}0+2\times4$

$= 28+8$

$= 36$

114 **(d)**

8 $[CO(en)_2Cl_2]$ forms optical and geometrical isomers.

114 **(c)**

9 Only *cis*-octahedral compounds show optical activity.

115 **(b)**

0 A square planar complex results from dsp^2-hybridisation involving $(n\text{-}1)\ d_{x^2-y^2}, ns, np_x$ and np_y atomic orbitals.

115 **(a)**

2 HNO_3 accepts a proton from H_2SO_4.

$H_2SO_4 \rightleftharpoons H^+ + HSO_4^-$

$HNO_3 + H^+ \longrightarrow H_2O + NO_2^+$

115 **(c)**

3 Lithium tetrahydroaluminate is $Li[Al(H)_4]$