



## CHEMISTRY

### BOOKS - TARGET CHEMISTRY (HINGLISH)

#### COORDINATION COMPOUNDS

##### Classical Thinking

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

A. covalent

B. ionic

C. coordinate

D. metallic

**Answer: C**



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

A. Urea

B. Haemoglobin

C. Chlorophyll

D. Cobalt(III) ammines

**Answer: A**

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**3.** According to Werner's theory transition metals possesses

A. two

B. three

C. five

D. infinite

**Answer: A**

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

A. It is exercised by metals towards negative groups.

B. It is non-rigid and non-directional

C. It is denoted by solid lines.

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

**Answer: D**



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

A. It is denoted by solid lines.

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

C. It is non-directional and non-rigid

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

**Answer: D**



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

- A. coordination sphere, ionization sphere
- B. ionization sphere, coordination sphere
- C. bonding sphere , antibonding sphere
- D. second sphere, first sphere

**Answer: A**



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

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

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

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

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

**Answer: B**



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

A. 2

B. 3

C. 1

D. 4

**Answer: D**



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



A. Ammonia

B. Methylamine

C. Hydrazinium

D. Nitrate

**Answer: D**



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**10.** Ammonia molecule and oxalate ion have \_\_\_\_\_ coordination sites respectively.

A. one , two

B. two,one

C. three, two

D. one , three

**Answer: A**



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**11.** An ambidentate ligand is one which

A. is linked to the metal atom at two points

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

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

D. forms chelate rings

**Answer: C**



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12. EDTA is a/an

A. hexadentate

B. tetradentate

C. unidentate

D. ambidentate

**Answer: A**



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

- A. metal chelates
- B. aromatic ligands
- C. alicyclic chelates
- D. cyclic metals

**Answer: A**



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

A. 3

B. 6

C. 4

D. 0

**Answer: B**



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

A. charge of metal ion and ligand

B. size of metal ion and ligands

C. inter-ligand repulsions

D. all of these

**Answer: D**



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

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

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

C. Different metal ions can show same coordination number

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

**Answer: D**



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

- A. coordination entity
- B. coordination number
- C. ligand
- D. counter ion

**Answer: A**

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**18.** Complexes with central metal bonded to one kind of donor atoms are known as \_\_\_\_\_.

- A. heteroleptic complexes
- B. homoleptic complexes



C. neutral complexes

D. metal chelates

**Answer: B**



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

A. heteroleptic

B. anionic

C. cationic

D. neutral

**Answer: C**



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

A. 0

B. 1

C. 2

D. 4

Answer: A



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

A. coordination sphere is  $K^+$

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

C. coordination number of Fe is 6

D. oxidation number of Fe is +2

**Answer: C**



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

\_\_\_\_\_.

A. they exhibit multiple oxidation states

B. they have large charge to radius ratio

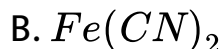
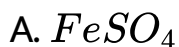
C. vacant orbitals to accommodate electrons are present

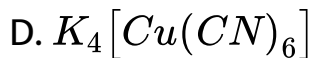
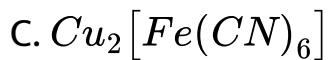
D. all of these

**Answer: D**

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**23.** Potassium ferrocyanide on reacting with copper sulphate yields a brown precipitate. The precipitate is \_\_\_\_\_.





**Answer: C**



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24. The CORRECT Sidgwick structure for ferrocyanide complex is \_\_\_\_\_.



**Answer: B**

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25. Effective atomic number (EAN) is \_\_\_\_\_.

- A. the number of electrons donated by the ligands
- B. number of electrons on the metal ion
- C. number of valence electrons of the central ion
- D. sum of electrons on the metal ion and the number of electrons donated by the ligands

**Answer: D**

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

A. 78

B. 76

C. 54

D. 86

**Answer: A**



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27.  $K_4[Fe(CN)_6]$  is \_\_\_\_\_.

(i) potassium hexacyanoferrous (II)

(ii) potassium hexacyanoferrate (II)

(iii) potassium ferrocyanide

(iv) hexacyanoferrate (III) potassium CORRECT answer is \_\_\_\_\_.

A. Only (i) and (ii)

B. Only (ii) and (iii)

C. Only (i) and (iii)

D. Only (ii) and (iv)

**Answer: B**



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

- A. pentacarbonylferrate (0)
- B. pentacarbonylferrate(III)
- C. pentacarbonyliron (0)
- D. pentacarbonyliron (II)

**Answer: C**



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

- A. potassium platinumhexachloride

B. potassium hexachloridoplatinum (IV)

C. potassium hexachloridoplatinate (IV)

D. potassium hexachloridoplatinum (II)

**Answer: C**



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**30.**  $NH_3$  group in a coordination compound is named as

\_\_\_\_\_.

A. ammonium

B. ammine

C. amino

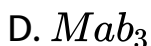
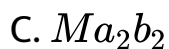
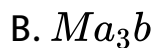
D. ammonia

**Answer: B**



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



**Answer: C**

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**32.** Geometrical isomerism in coordination compounds is exhibited by

- A. square planar and tetrahedral
- B. square planar and octahedral
- C. tetrahedral and octahedral
- D. square planar, tetrahedral and octahedral

**Answer: B**

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33.  $[Co(NH_3)_5SO_4]Br$  and  $[Co(NH_3)_5Br]SO_4$  shown \_\_\_\_\_ isomerism .

A. linkage

B. geometrical

C. ionization

D. optical

**Answer: C**



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

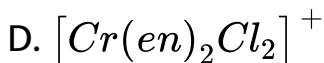
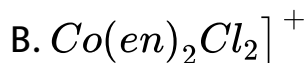
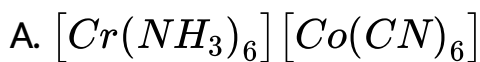
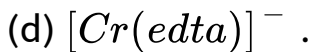
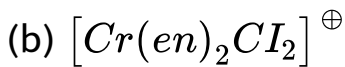
- A. ionization
- B. linkage
- C. coordination
- D. hydrate

**Answer: B**

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35. Which would exhibit coordination isomerism

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



**Answer: A**



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**36.** In coordination compounds , the hydrate isomers differ in \_\_\_\_\_.

- A. the number of water molecules of hydration only
- B. the number of water molecules only present as ligands
- C. their coordination number of the metal atom
- D. both (A) and (B)

**Answer: D**



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



- A. The bond formed between metal atom/ion is purely ionic.
- B. The number of vacant orbitals provided same as its coordination number.
- C. Each ligand has at least one orbital containing a lone pair of electrons.
- D. The geometry of the complex depends on the hybridisation of the central metal atom/ion.

**Answer: A**



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38. Inner complexes are formed when \_\_\_\_\_ orbitals are used for hybridisation.

A. nd

B. (n-1)d

C. (n+1)d

D. (n-2)d

**Answer: B**



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

- A. tetrahedral configuration with one unpaired electron
- B. square planar configuration with one unpaired electron
- C. tetrahedral configuration with all electrons paired
- D. square planar configuration with all paired electrons

**Answer: B**



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

\_\_\_\_\_.

- A. are both octahedral and paramagnetic
- B. are both octahedral and diamagnetic
- C. have same structures but some magnetic character
- D. have different structures but same magnetic character.

**Answer: C**



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

- A. It cannot explain the spherical properties of complex compounds.
- B. It cannot explain correlation of magnetic behaviour based on geometry of the complex.
- C. It can distinguish between weak field and strong field ligands.
- D. It accounts for coordinate bond formation due to overlap of vacant hybrid orbitals.

**Answer: C**



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

- A. purely covalent
- B. purely coordinate covalent
- C. polar covalent
- D. electrostatic

**Answer: D**



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43. The destruction of degeneracy and splitting of d-orbitals, due to repulsive forces is known as \_\_\_\_\_.

- A. crystal field splitting
- B. crystal field stabilization
- C. spin pairing
- D. kinetic stability

**Answer: A**



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

- A.  $4Dq$
- B.  $6Dq$

C.  $8Dq$

D.  $10Dq$

**Answer: D**

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

A. two

B. four

C. three



D. five

**Answer: D**



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

A.  $d^5$  (octahedral)

B.  $d^9$  (octahedral)

C.  $d^7$  (octahedral)

D.  $d^6$  (octahedral)

**Answer: A**



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

A. s-p

B. p-p

C. d-d

D. p-d

Answer: C



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

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

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

C.  $Ti^{4+}$  had  $3d^0$  configuration

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

**Answer: C**



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

- A. Mn-CO
- B. CO-CO
- C. hydrogen
- D. Mn-Mn

**Answer: D**



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50. In metal carbonyl , there is \_\_\_\_\_.

- A. no  $\pi$  bond between CO and metal atom
- B. only  $\sigma$  bond between metal atom and CO molecules
- C. one  $\sigma$  and one  $\pi$  bond ( back-donation) between metal atom and CO molecules
- D. the metal-carbon bonds does not exist at all

**Answer: C**

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

A. en is the strongest ligand.

B.  $CN^-$  is the strongest ligand.

C. these values cannot predict the strength of the ligand.

D. all ligands are equally strong.

**Answer: B**



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**52.** The stability of complex formed by metal ions of same charge with same ligand, \_\_\_\_\_.

A. increases with increase in atomic radii of metal ion

- B. increases with decrease in atomic radii of metal ion
- C. independent of atomic radii of metal ion
- D. depends on the atomic mass of metal ion

**Answer: B**

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**53.** Stability of the complex may depend on

- A. nature of ligand
- B. charge of the central metal ion
- C. radius of the central metal ion
- D. all of these

**Answer: D**

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

- A. a cyano
- B. a thiocyanide
- C. an isocyanide
- D. a carbonyl

**Answer: A**

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55. Which is a component of chlorophyll ?

A. Mg

B. Mn

C. Co

D. Fe

**Answer: A**



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56. Vitamin  $B_{12}$  contains

A. Mg

B. Co

C. Fe

D. Mn

**Answer: B**



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

A. Bis(methylglyoxal ) nickel (II)

B. Bis(dimethylglyoximate ) nickelate(IV)

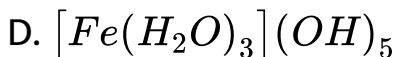
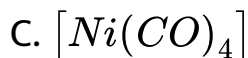
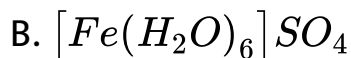
C. Bis(2, 3-butanedioldiooximato) nickel (II)

D. Bis(dimethylglyoximato) nickel (II)

**Answer: D**

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



**Answer: C**



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

- A. Does not explain  $\pi$ -bonding in complexes.
- B. Explains Kinetic and thermodynamic properties of some complexes.
- C. Explains colours exhibited by complexes due to d-d transitions.

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

**Answer: D**

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**60.** Which one of the following statements is INCORRECT ?

- A. Greater the stability constant of a complex ion, greater is the stability of the complex.
- B. Greater the charge on the central metal ion, greater is the stability of the complex.

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

D. Chelate complexes have low stability constants.

**Answer: D**

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## Critical Thinking

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

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

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

C. Primary valence are satisfied by neutral molecules.

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

**Answer: C**



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

A.  $Cl^-$  ion

B.  $Br^-$  ion

C. Both  $Cl^-$  and  $Br^-$  ion

D. Neither  $Cl^-$  and  $Br^-$  ion

**Answer: A**



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



This means that \_\_\_\_\_.

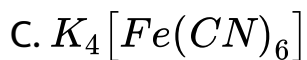
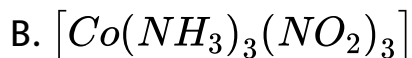
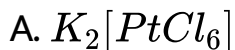
- A. two chlorine atoms satisfy primary valence and one chlorine atom satisfies secondary valence.
- B. two chlorine atoms satisfy primary as well as secondary valences
- C. Three chlorine atoms satisfy primary valence
- D. three chlorine atoms satisfy secondary valence.

**Answer: A**



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



**Answer: B**



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5. Bidentate ligand is \_\_\_\_\_.

A. triethylenetetramine

B. ethylenediamine

C. EDTA

D.  $SCN^-$

**Answer: B**



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6. The neutral ligand is \_\_\_\_\_.

A. chloride

B. hydroxide

C. ammonia

D. oxalato

**Answer: C**



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

/

A. EDTA

B. en

C. Oxalate

D. Pyridine

**Answer: D**



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

A. O atoms only

B. N atoms only

C. two N atoms and four O atoms

D. three n atoms and three O atoms

**Answer: C**



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9.  $\text{NO}_2^-$  has two donor atoms (N and O). Which donor atom/s get/s linked with a metal, while forming a complex?

A. N only

B. O only

C. Either N or O

D. Both N and O

**Answer: C**



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10. In metal chelates, the coordination number is the\_\_\_\_\_.

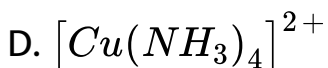
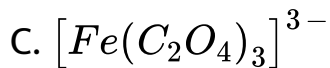
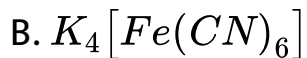
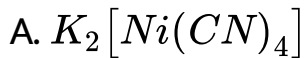
- A. number of ligands
- B. oxidation number of metal ion
- C. number of electron pairs involved in bonding
- D. charge on the ligand

**Answer: C**



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

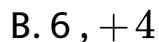
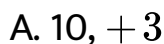


**Answer: C**



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





C. 2, +6

D. 6, +3

**Answer: D**



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

A. anionic and neutral

B. neutral and cationic

C. cationic and neutral

D. cationic and anionic

**Answer: C**



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14. An example for a double salt is

- A. potassium ferricyanide
- B. hexaamminecobalt(III) chloride
- C. copper sulphate
- D. Mohr's salt

**Answer: D**



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15. The effective atomic number for the complex ion

$[Pd(NH_3)_6]^{4+}$  is \_\_\_\_\_.

[Given : Pd(Z = 46)]

A. 54

B. 86

C. 36

D. 50

**Answer: A**



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16. As per IUPAC name , the name of the complex



- A. Cobalt diethylene diamminechloronitrate
- B. Chlorodiethyldiamminenitritocoblat (III)
- C. Chloronitritodiethyldiamminecobaltate (III)
- D. Chlorobis(ethylenediammine)nitrito-O cobalt (III)

**Answer: D**



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

A. Hexanitrito-O cobalt (III) sodium

B. Sodium cobalt nitrite

C. Sodium hexanitrocobaltate (III)

D. Sodium hexanitrocobaltate(III)

**Answer: D**



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**18.** IUPAC name of  $[Pt(NH_3)_3(Br)(NO_2)Cl]Cl$  is

A. Triamminechlorobromonitroplatinum (IV) chloride

B. Triamminebromonitrochloroplatinum(IV)chloride

C. Triamminebromochloronitrito-N platinum (IV) chloride

D. Triamminenitrochlorobromoplatinum (IV) chloride

**Answer: C**

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

A. Triamminechlorocyanonitrito-N cobalt (III)

B. Nitrochlorocyanotriammine cobalt(III)

C. Cyanonitrochlorotriammine cobalt (III)

D. Triamminenitrochlorocyano cobalt (III)

**Answer: A**



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

A. Pentaamminethiocyanato-N cobalt (III) chloride

B. Pentaamminethiocyanato-S cobalt (III) chloride

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

D. Pentaamminmercpto -N cobalt (III) chloride

**Answer: A**



21. Which of the following is CORRECT ?

A. The IUPAC name of  $Mn_3[(CO)_{12}]$  is

Dodecacarbonyltrimanganese (0).

B. The IUPAC name of  $K[BF_4]$  is

Tetrafluoridoboronpotassium (I).

C. The IUPAC name of  $K_3[Al(C_2O_4)_3]$  is

Potassiumtrioxalatealuminium (III).

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

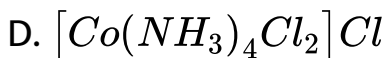
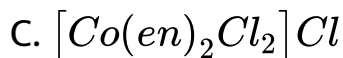
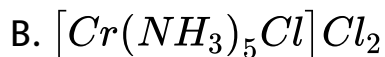
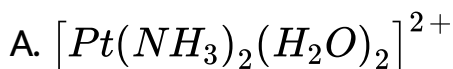
ferrocyanide.



**Answer: A**

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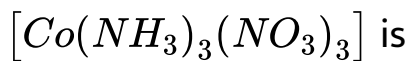
22. Out of the following , which will NOT show geometrical isothermism ?



**Answer: B**

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23. The number of geometrical isomers of



A. 2

B. 3

C. 4

D. 6

**Answer: A**



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

A. 

B. 

C. 

D. 

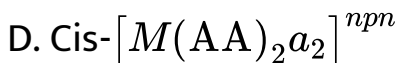
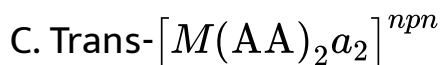
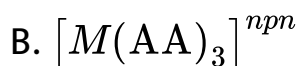
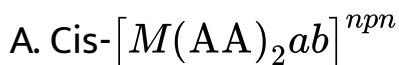
**Answer: A**



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25. Which of the following is optically inactive ?

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



**Answer: C**



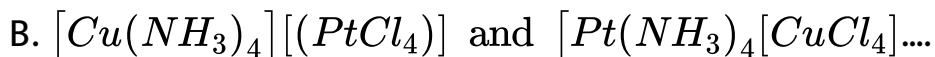
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26. Which one of the following pairs of isomers and types of isomerism are CORRECTLY matched ?

A.

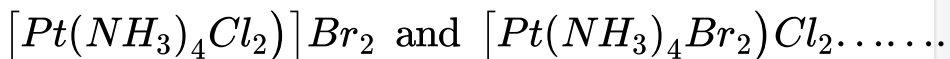


... Linkage



Coordination

C.



Ionization

D. All of these

**Answer: D**

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27. The complex salt having the molecular composition

$[Co(NO_2)(SCN)(en)_2]Br$  exhibits \_\_\_\_\_.

- A. cis-trans isomerism
- B. linkage isomerism
- C. ionization isomerism
- D. all of above

**Answer: D**

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

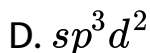
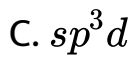
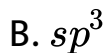
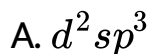
D. linkage isomerism, geometrical isomerism and ionization isomerism.

**Answer: D**



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



**Answer: D**



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

Complex is

- A. tetrahedral, paramagnetic
- B. tetrahedral , diamagnetic
- C. square planar , diamagnetic
- D. square planar, paramagnetic

**Answer: D**



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31. Which of the following statements is CORRECT ?

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

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

C. The  $[Ni(CN)_4]^{2-}$  ion has a square-planar geometry and is diamagnetic.

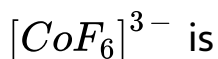
D. The  $[Cu(NH_3)_4]^{2+}$  ion has a tetrahedral geometry and is diamagnetic.

**Answer: C**



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32. The number of unpaired electrons in the complex ion



A. 4

B. 0

C. 2

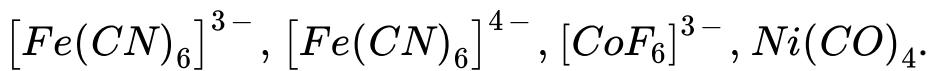
D. 3

**Answer: A**



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



A. I and IV

B. I and II

C. I and III

D. III and IV

**Answer: C**



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**34.** The strongest ligand in the following is \_\_\_\_\_.

A.  $CN^-$

B.  $Br^-$

C.  $HO^-$

D.  $F^-$

**Answer: A**



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

A. Square pyramidal

B. Octahedral

C. Linear

D. Trigonal bipyramidal

**Answer: D**



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

- A. The oxidation state of the metal in the carbonyls is zero.
- B. M-C  $\pi$  bond is formed by donation of electron pair from metal to carbon monoxide.
- C. Metal carbonyls are single bonded species .
- D.  $d\pi - p\pi$  overlap is observed in metal carbonyls.

**Answer: C**



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

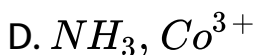
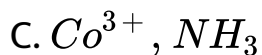
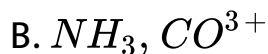
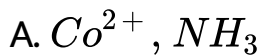
- A.  $\pi$  only
- B.  $\sigma$  only
- C. ionic only
- D. both  $\pi$  and  $\sigma$

**Answer: D**



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



**Answer: C**



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

A. Higher ionic radius of the metal ion.

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



C. Lower ionization potential of the metal ion.

D. Lower basicity of the ligand.

**Answer: B**



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40. The complexes formed by  $Cu^{2+}$  ion are more stable than those formed by  $Cd^{2+}$  ion because \_\_\_\_\_.

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

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

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

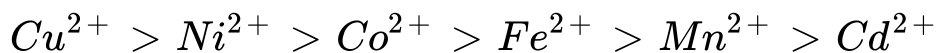
D.  $Cu^{2+}$  ion forms chelate compounds.

**Answer: B**

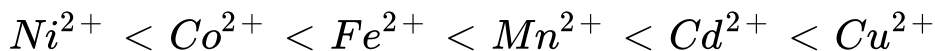
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**41.** Irving William order of stability of complexes of divalent metal ions with same ligands is \_\_\_\_\_.

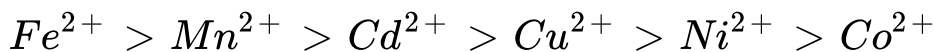
A.



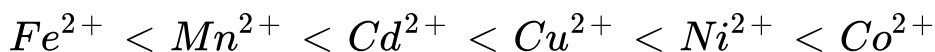
B.



C.



D.



**Answer: A**



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**42.** A reagent used for identifying nickel ion is:

A. potassium ferrocyanide

B. phenolphthalein

C. dimethylglyoxine

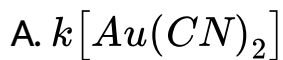
D. EDTA

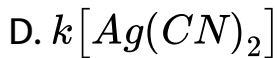
**Answer: C**



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





**Answer: D**



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44. The hardness of water is estimated by \_\_\_\_\_ method.

A. conductivity

B. EDTA

C. DMG

D. distillation

**Answer: B**



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45. Triphenyl phosphine is –

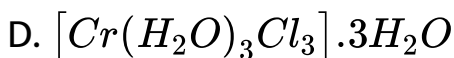
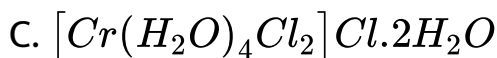
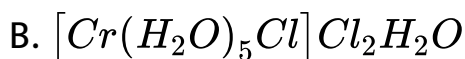
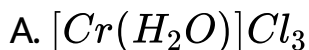
- A. neutral and monodentate ligand.
- B. neutral and tridentate ligand
- C. uninegative and unidentate ligand
- D. trinegative and tridentate ligand

**Answer: A**



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

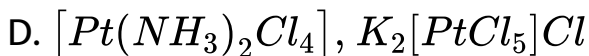
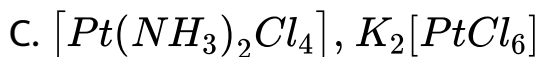
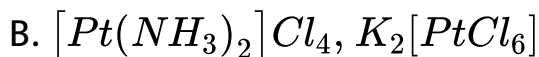
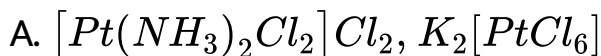


**Answer: C**



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



**Answer: C**



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

- A. geometry , magnetic moment
- B. magnetic moment ,colour
- C. geometry, hybridization
- D. hybridization , number of unpaired electrons.

**Answer: B**



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

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

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

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

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

**Answer: C**

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

A. contains 6 ions per molecule

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

C. does not contain any  $Cl^-$  ion

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

**Answer: C**



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

A. thiocyanato-N

B. cyanato-N

C. thiocyanato-S

D. cyanato-S

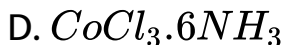
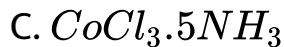
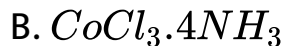
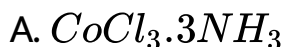
**Answer: A**



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## Competitive Thinking

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



**Answer: A**

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

A. 3 AgCl , 1 AgCl , 2 AgCl

B. 3 AgCl , 2 AgCl , 1 AgCl

C. 2 AgCl , 3 AgCl , 1 AgCl

D. 1 AgCl , 3 AgCl , 2 AgCl

**Answer: B**

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

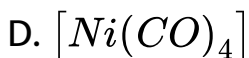
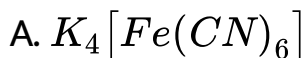
- A.  $[Co(NH_3)_3Cl_3] \cdot 2NH_3$
- B.  $[Co(NH_3)_4Cl_2]Cl \cdot NH_3$
- C.  $[Co(NH_3)_4Cl]Cl_2 \cdot NH_3$
- D.  $[Co(NH_3)_5Cl]Cl_2$

**Answer: D**



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



**Answer: A**



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5. Which of the following represents chelating ligand ?

A.  $H_2O$

B.  $OH^-$

C. DMG

D.  $Cl^-$

**Answer: C**



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

A. 1

B. 2



C. 3

D. 4

**Answer: B**



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

A. 

B. 

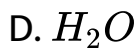
C. 

D. 

**Answer: C**

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**8. Which one is ambidentate ligand**



**Answer: B**

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

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

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

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

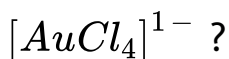
D. only anionic ligands bonded to the metal ion.

**Answer: C**



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10. What is the oxidation number of gold in the complex



A. +4

B. +3

C. +2

D. +1

**Answer: B**



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

\_\_\_\_\_.

A. + 3

B. + 4

C. + 2

D. + 6

**Answer: C**



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12. The CORRECT charge on and coordination number of

'Fe' in  $K_3[Fe(CN)_6]$  are \_\_\_\_\_.

A. + 2, 4

B. + 3, 6

C. + 2, 6

D. + 3, 3

**Answer: B**



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

A. 4 and 2

B. 4 and 3

C. 6 and 3

D. 6 and 2

**Answer: C**



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

A. 7

B. 8

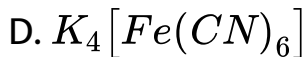
C. 9

D. 6

**Answer: C**

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**15. Which of the following is a neutral complex ?**



**Answer: A**

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16. Potassium ferrocyanide is a

- A. normal salt
- B. mixed salt
- C. double salt
- D. complex salt

**Answer: D**



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

A. 4

B. 5

C. 6

D. 10

**Answer: B**



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

A. 34

B. 35

C. 32

D. 36

**Answer: D**



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

A. 23

B. 27

C. 24

D. 29

**Answer: C**

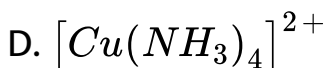
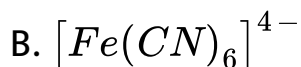


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**20.** Which of the following co-ordinate complexes is an exception to EAN rule ?

(Given atomic number

$Pt = 078, Fe = 26, Zn = 30, Cu = 29$ )



**Answer: D**

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

- A. Pentaamminenitrocobalt (III) chloride
- B. Pentaamminenitrito-O cobalt (III) chloride
- C. Pentaamminenitrosocobalt (III) chloride
- D. Pentaammineoxo-nitrocobalt (III) chloride

**Answer: B**

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

- A. tricyanoferrate (III) ion
- B. hexacyanoferrate (III) ion
- C. hexacyanoiron (III) ion
- D. hexacyanitoferrate (III) ion

**Answer: B**

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

- A. triamminetrinitrito-N cobalt (III)

B. triamminetrinitrito-N cobalt (II)

C. Hexacyanoiron (III) ion

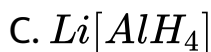
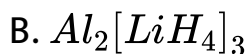
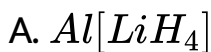
D. triamminetrinitrito-N cobaltate (III)

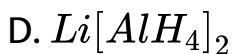
**Answer: A**



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**24.** What is the structural formula of lithium tetrahydrido aluminate



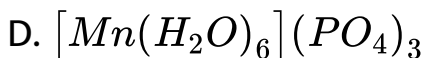
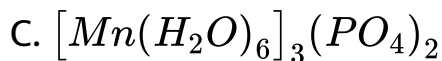
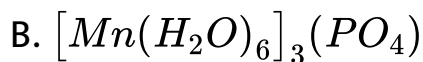
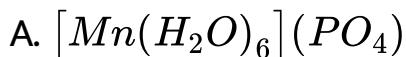


**Answer: C**



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



**Answer: C**



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26. As per IUPAC nomenclature, the name of the complex

$[Co(H_2O)_4(NH_3)_2]Cl_3$  is \_\_\_\_\_.

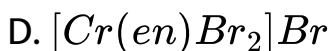
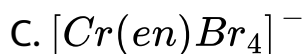
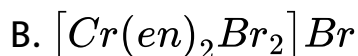
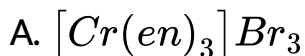
- A. Tetraaquadiaminecobalt (III) chloride
- B. Tetraaquadiaminecobalt (II) chloride
- C. Diamminetetraaquacobalt (II) chloride
- D. Diamminetetraaquacobalt (III) chloride

**Answer: D**



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



**Answer: B**



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

pyridine).

A. 2

B. 3

C. 4

D. 6

**Answer: B**



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

A.  $MA_3B$ - Square planar

B.  $MA_2B_2$ - Tetrahedral

C. MABCD- Square planar

D. MABCD - tetrahedral

**Answer: C**

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

A.  $[MA_5B]$

B.  $[MA_2B_4]$



**Answer: A**



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31. The existence of two different coloured complexes with the composition  $[Co(NH_3)_2Cl_2]^+$  is due to

A. ionization

B. linkage

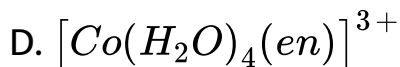
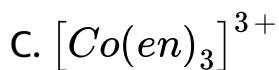
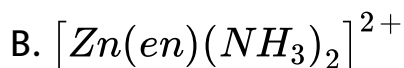
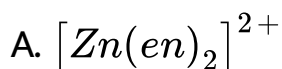
C. geometrical

D. coordination

**Answer: C**

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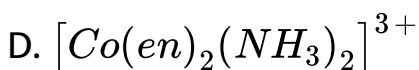
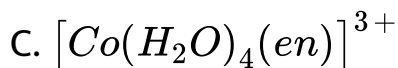
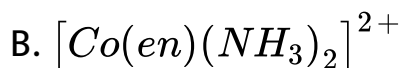
**32. Which of the following has an optical isomer ?**



**Answer: C**

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33. Which of the following has an optical isomer?



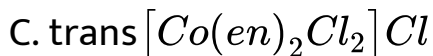
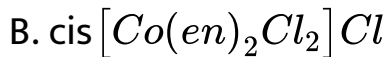
Answer: D



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





(en = ethylenediamine)

**Answer: B**



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**35.** Number of possible isomers for the complex

$[\text{Co}(\text{en})_2\text{Cl}_2]$  will be (en = ethylenediamine)

A. 3

B. 4



C. 2

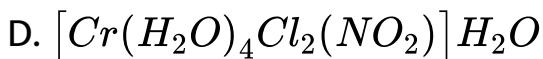
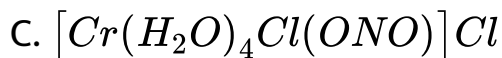
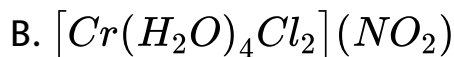
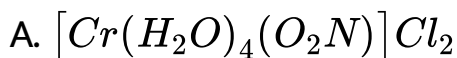
D. 1

**Answer: A**



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

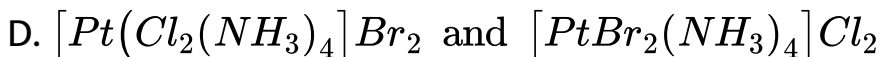
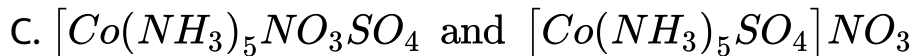
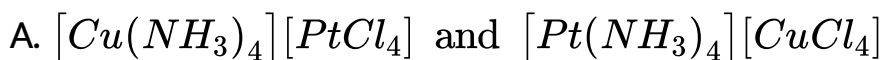


**Answer: B**



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37. Which of the following pairs represents linkage isomers?



**Answer: B**



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38. The complexes



are the examples of which type of isomerism ?

- A. Geometrical isomerism
- B. linkage isomerism
- C. ionization isomerism
- D. Coordination isomerism

**Answer: D**



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

- A. Ionization isomerism
- B. Linkage isomerism
- C. Coordination isomerism
- D. Solvate isomerism

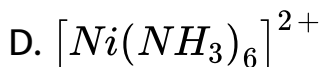
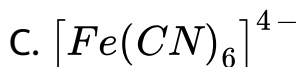
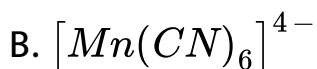
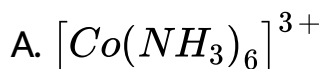
**Answer: C**



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

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

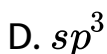
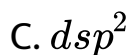
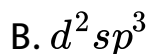
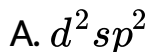


**Answer: D**



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

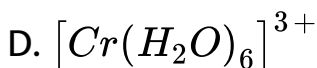
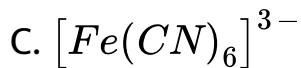
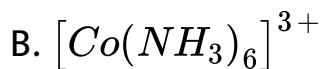
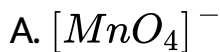


**Answer: C**



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



**Answer: A**



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

A. one , square planar

B. Two , square planar

C. one , tetrahedral

D. two, tetrahedral

**Answer: D**



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

A. 1.82 B.M.

B. 5.46 B.M.

C. 2.82 B.M.



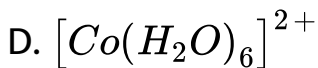
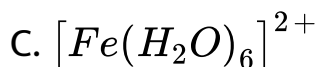
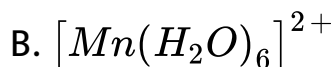
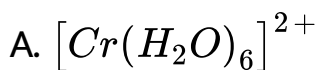
D. 1.41 B.M.

**Answer: C**



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

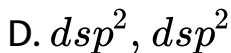
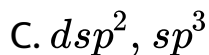
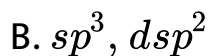
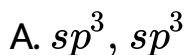


**Answer: D**

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**46.** Both  $[Ni(CO)_4]$  and  $[Ni(CN)_4]^{2-}$  are diamagnetic

The hybridisations of nickel in these complexes ,  
respectively are :



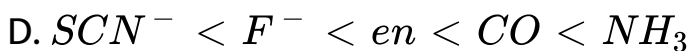
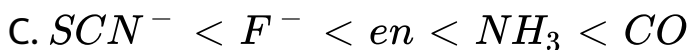
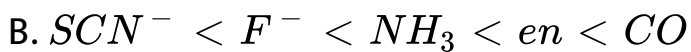
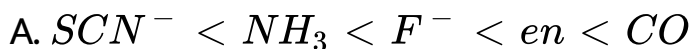
**Answer: B**





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47. Which of the following spectrochemical series is TRUE ?

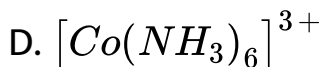
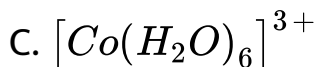
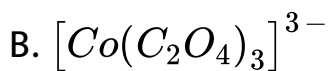
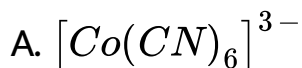


Answer: B



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48. In which of the following coordination entities the magnitude of  $\Delta_o$  (CFSE in octahedral field) will be maximum?

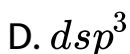
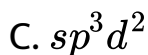
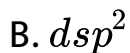
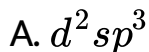


**Answer: A**



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



**Answer: A**



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

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

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

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

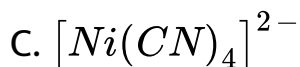
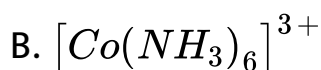
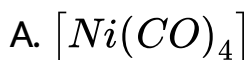
D.  $[\text{Co}(\text{CN})_6]^{3-}$  has no unpaired electrons and will be in a high-spin configuration.

**Answer: A**



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51. Which of the following complexes is paramagnetic

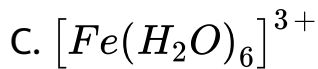
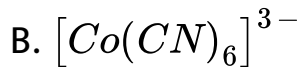
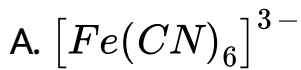


**Answer: D**



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

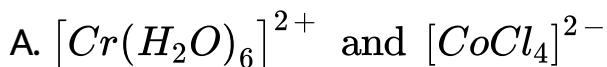


**Answer: C**

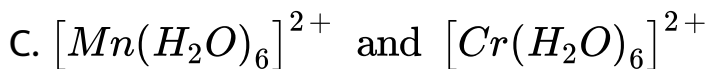
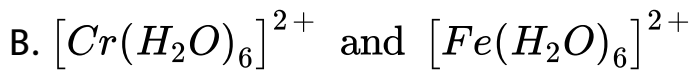
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**53.** The pair having the same magnetic moment is \_\_\_\_\_.

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



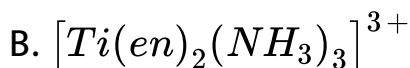
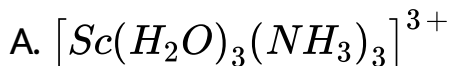


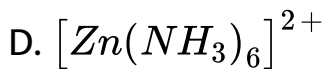


**Answer: B**

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



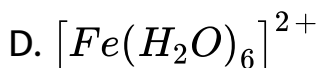
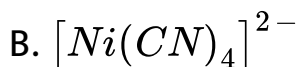
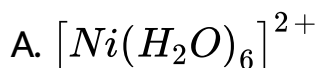


**Answer: C**



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



**Answer: B**



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

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

A. 0

B. 2

C. 3

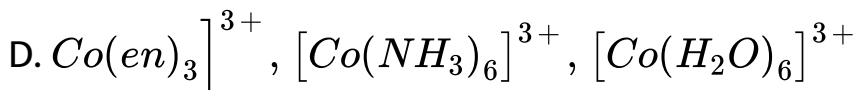
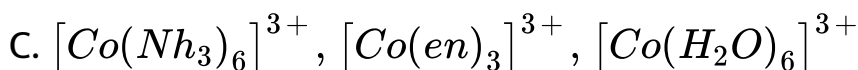
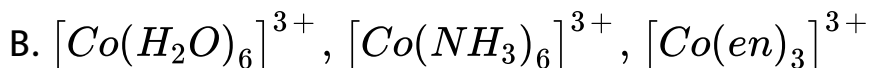
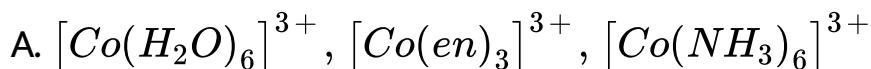
D. 1

Answer: B



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

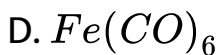
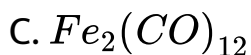
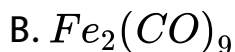
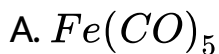


**Answer: D**



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58. Finely divided iron combines with CO to give \_\_\_\_\_.

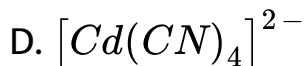
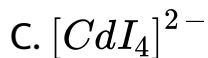


**Answer: A**



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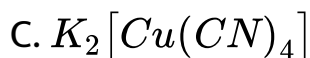
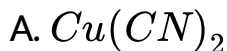
59. Which of the following has the highest stability constant at 298 K ?

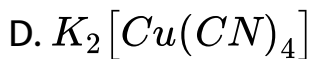


**Answer: D**

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60.  $CuSO_4$ , solution with excess of KCN gives \_\_\_\_\_.

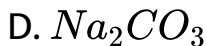
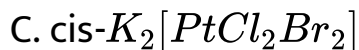
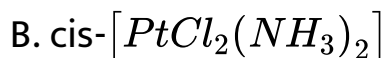
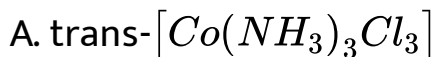




**Answer: C**

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61. The complex used as an anticancer agent is \_\_\_\_\_.



**Answer: B**

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

A. ethane-1, 2-diamine

B. EDTA

C. dimethylglyoxine

D. None of these

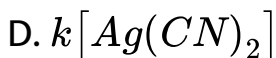
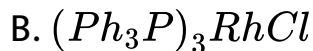
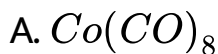
**Answer: B**



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63. Wilkinson catalyst is





**Answer: B**



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

A. 40 mL

B. 20 mL

C. 60 mL

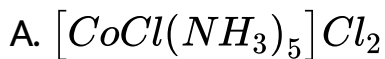
D. 80 mL

**Answer: B**



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**65.** A solution contains 2.675 g of  $CoCl_{3.6}NH_3$  ( molar mass = 267.5 g  $mol^{-1}$  ) 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. The formula of the complex is \_\_\_\_\_.

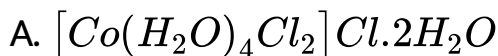


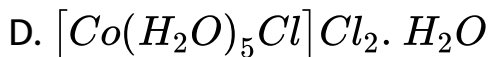
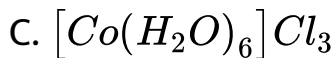
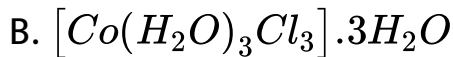
**Answer: B**



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

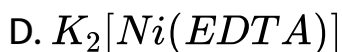
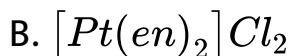
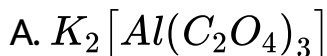




**Answer: D**

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**67.** The most stable complex among the following is

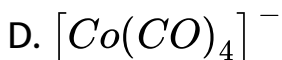
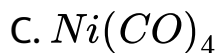
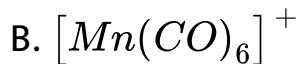
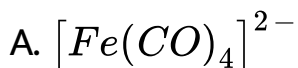


**Answer: D**

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

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



**Answer: A**

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

- A. six
- B. three
- C. one
- D. two

**Answer: C**



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70. Complex salt can be made by the combination of

$[Co^{III}(NH_3)_5Cl]^x$  with



**Answer: C**



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

A. all ionic

B. all covalent

C. ionic and covalent

D. ionic, covalent and coordinate covalent

**Answer: D**



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

A. 0

B. 1



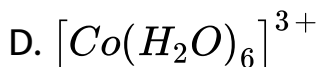
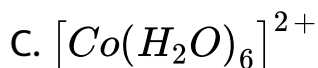
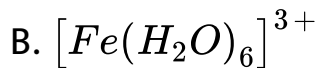
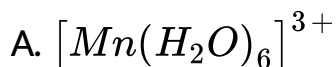
C. 4

D. 6

**Answer: A**

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



**Answer: B**

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

A.  $L_4 < L_3 < L_2 < L_1$

B.  $L_1 < L_3 < L_2 < L_4$

C.  $L_3 < L_2 < L_4 < L_1$

D.  $L_1 < L_2 < L_4 < L_3$

**Answer: B**

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

- A. Rusting of iron sheets.
- B. Decolourization of blue  $CuSO_4$  solution by iron.
- C. Formation of  $Fe(CO)_5$  from Fe.
- D. Liberation of  $H_2$  from steam by iron at high temperature

**Answer: C**

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

- A. tetrachloridoaurate (III)
- B. tetrachloridoaurate (I)
- C. tetrachloridaurate (II)
- D. dichloridoaruate (III)

**Answer: A**

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## Evaluation Test

1. The primary valence of the metal ion in the coordination compound  $Na_2[Co(CN)_4]$  is \_\_\_\_\_.

A. four

B. zero

C. two

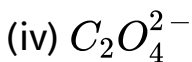
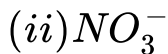
D. six

**Answer: C**



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2. Among the following which are ambidentate ligands ?



A. (i) and (ii)

B. (iii) and (iv)

C. (i) and (v)

D. (iii) and (vi)

**Answer: C**



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3. Which of the following has highest molar conductivity

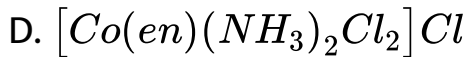
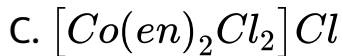
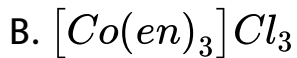
- A. Diamminedichloridoplatinum (II)
- B. Tetraamminedichloridocobalt (III) chloride
- C. Potassium hexacyanoferrate (II)
- D. Hexaaquachromium (III) bromide

**Answer: C**

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4. Which of the following does not have optical isomer

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



**Answer: A**



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

A. 0

B. 2.84

C. 4.9

D. 5.92



**Answer: A**

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6. Both geometrical and optical isomerism are exhibited by

- A. Dichlorobis(ethylenediamine)cobalt (III) ion
- B. Pentaamminechloridocobalt (III) ion
- C. Triamminotrichloridocobalt (III) ion
- D. Tetraamminedichloridocobalt (III) ion

**Answer: A**

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

A. 4 and +2

B. 6 and +3

C. 3 and +3

D. 3 and 0

**Answer: B**



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

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

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

The number of moles of  $Y$  and  $Z$  are

A. 0.01 , 0.01

B. 0.02, 0.01

C. 0.01 , 0.02

D. 0.02 , 0.02

**Answer: A**



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

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

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

C. two pentagonal  $Mn(CO)_5$

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

**Answer: A**



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

A. hydroxylamine

B. nitrite

C. nitrosylium

D. methylamine

**Answer: C**



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

\_\_\_\_\_ respectively.

A. 3, -3 and 6

B. -3, 3 and 6

C. 3, 0 and 4

D. 3, 0 and 4

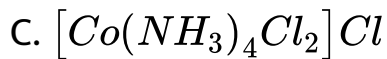
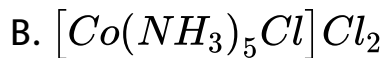
**Answer: B**



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

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



**Answer: C**

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

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

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

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

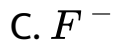
D.  $\frac{1}{4}$

**Answer: B**



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**14.** Which of the following is a  $\pi$ -acid ligand?



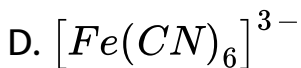
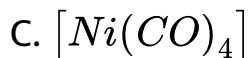
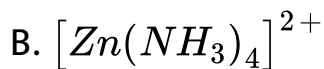
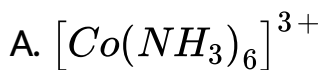
**Answer: B**





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



**Answer: D**



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

A. linkage

B. coordination

C. ionization

D. geometrical

**Answer: A**



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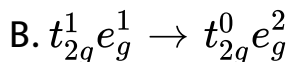
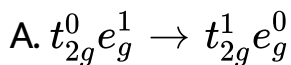
17. The IUPAC name of the complex  $[CrCl_2(H_2O)_4]NO_3$  is \_\_\_\_\_.

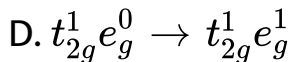
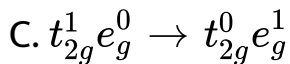
- A. dichloridotetraaquachromate (III) nitrate
- B. tetraaquadichloridochromium (III) nitrate
- C. chromiumtetraaquadichlorido nitrate
- D. dichloridotetraaquachromium nitrate

**Answer: B**

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

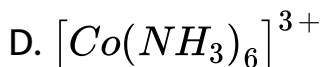
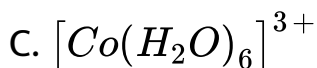
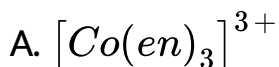




**Answer: C**

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



**Answer: B**



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