



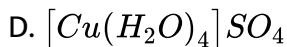
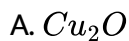
## CHEMISTRY

### BOOKS - NCERT FINGERTIPS CHEMISTRY (HINGLISH)

#### COORDINATION COMPOUNDS

##### Warners Theory Of Coordination Compound

1. Copper sulphate dissolves in ammonia due to the formulation of

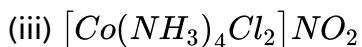
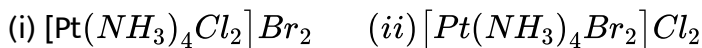


**Answer: B**



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2. Consider the following isomers.



Which of the following observations is correct ?

- A. (i) will give a part yellow and (ii) will give a white precipitate with  $\text{AgNO}_3$  solution .
- B. (iii) will give a white precipitate with  $\text{AgNO}_3$  solution .
- C. (i) , (ii) and (iii) will give white precipitate with  $\text{AgNO}_3$  solution .
- D. None of the above isomers will give white precipitate with  $\text{AgNO}_3$  solution .

**Answer: A**



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3. The number of ions given by  $[Pt(NH_3)_6]Cl_4$  in aqueous solution will be

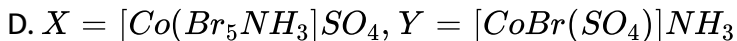
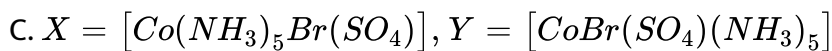
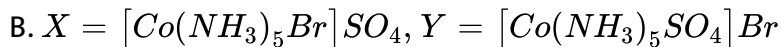
- A. two
- B. three
- C. five
- D. eleven .

**Answer: C**

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4. A coordination compound X gives pale yellow colour with  $AgNO_3$  solution while its isomer Y gives white precipitate with  $BaCl_2$  . Two compounds are isomers of  $CoBrSO_4 \cdot 5NH_3$  . What could be the possible formula of X and Y ?

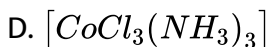
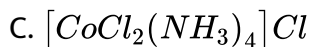
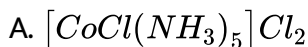
A.  $X = [Co(NH_3)_5SO_4]Br$ ,  $Y = [Co(NH_3)_5Br]SO_4$



**Answer: A**

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5. A solution containing 2.675 g of  $CoCl_3 \cdot 6NH_3$  (molar mass = 267.5 g  $mol^{-1}$ ) is passed through a cation exchanger. The chloride ions obtained in solution are treated with excess of  $AgNO_3$  to give 4.78 g of  $AgCl$  (molar mass = 143.5 g  $mol^{-1}$ ). The formula of the complex is (At.mass of  $Ag = 108$  u) .



**Answer: B**

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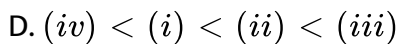
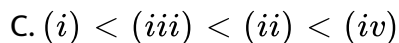
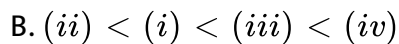
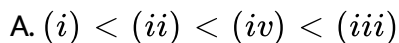
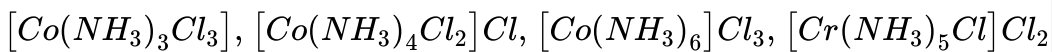
6. When each of the following complex salts is treated with excess of  $AgNO_3$  solution, which will give the maximum amount of  $AgCl$



**Answer: A**

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7. Arrange the following complexes in the increasing order of conductivity of their solution

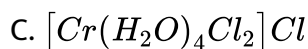
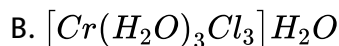
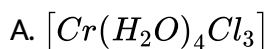


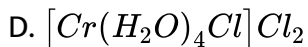
**Answer: A**



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8. A coordination compound  $CrCl_3 \cdot 4H_2O$  precipitates  $AgCl$  when treated with  $AgNO_3$ . The molar conductance of its solution corresponds to a total of two ions. Write the structural formula of the compound and name it.





**Answer: C**

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9. According to Werner's theory of coordination compounds ,

- A. primary valency is ionisable
- B. secondary valency is ionisable
- C. primary and secondary valencies are ionisable
- D. neither primary nor secondary valency is ionisable .

**Answer: A**

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10. According to Werner's coordination theory, there are two kinds of valence primary or \_\_\_\_\_ and secondary or \_\_\_\_\_. The former type of valency is \_\_\_\_\_ while the latter type is \_\_\_\_\_.

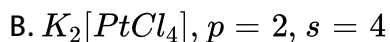
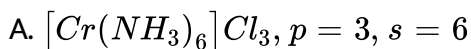
- A. three , negative , positive , cations
- B. different , negative , positive , anions
- C. two , primary , secondary , anions
- D. two , saturated , unsaturated , cations

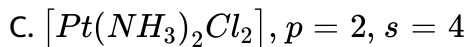
**Answer: C**



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11. Which of the following primary and secondary valencies are not correctly marked against the compound ?





**Answer: D**



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12. When aqueous solution of potassium fluoride is added to the blue coloured aqueous  $CuSO_4$  solution, a green precipitate is formed. This observation can be explained as follows.

A. On adding  $KF$ ,  $H_2O$  being weak field ligand is replaced by  $F^-$  ions forming  $[CuF_4]^{2-}$  which is green in colour.

B. Potassium is coordinated to  $[Cu(H_2O)_4]^{2+}$  ion present in  $CuSO_4$  and gives green colour.

C. On adding  $KF$ ,  $Cu^{2+}$  are replaced by  $K^+$  forming a green complex.

D. Blue colour of  $CuSO_4$  and yellow colour of KI form green colour on mixing .

**Answer: A**

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13. When excess of aqueous KCN solution is added to an aqueous solution of copper sulphate , the complex  $[Cu(CN)_4]^{2-}$  is formed . On passing  $H_2S$  gas through this solution no precipitate of CuS is formed because

A. sulphide ions cannot replace  $CN^-$  ions

B.  $[Cu(CN)_4]^{2-}$  does not give  $Cu^{2+}$  ion in the solution

C. sulphide ions from  $H_2S$  do not form complexes

D. sulphide ions cannot replace sulphate ions from copper sulphate solution .



Answer: B



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## Definition Of Some Important Terms Pertaining To Coordination Compounds

1. Ammonia acts as a very good ligand but ammonium ion does not form complexes because

A.  $NH_3$  is a gas while  $NH_4^+$  is in liquid form

B.  $NH_3$  undergoes  $sp^3$  hybridisation while  $NH_4^+$  undergoes  $sp^3$  d hybridisation

C.  $NH_4^+$  ion does not have any lone pair of electrons

D.  $NH_4^+$  ion has one unpaired electron while  $NH_3$  has two unpaired electrons .

Answer: C



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2. The denticity of the ligand  $N(CH_2CH_2NH_2)_3$  is

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

Answer: C



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3. Which of the following is a tridentate ligand?

- A.  $EDTA^{4-}$
- B.  $(COO)_2^{2-}$
- C. dien

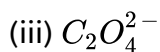
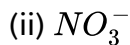


**Answer: C**



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4. Among the following which are ambidentate ligands?



A. (i) and (iii)

B. (i) and (iv)

C. (ii) and (iii)

D. (ii) and (iv)

**Answer: A**



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5. Which of the following ligand gives chelate complexes ?

- A. Acetate
- B. Oxalate
- C. Cyanide
- D. Ammonia

**Answer: B**

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6. Which of the following is not a neutral ligand ?

- A.  $H_2O$
- B.  $NH_3$
- C.  $ONO$

D.  $CO$

**Answer: C**



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7. Which of the following ligands will not show chelation ?

A. EDTA

B. DMG

C. Ethane-1, 2- diamine

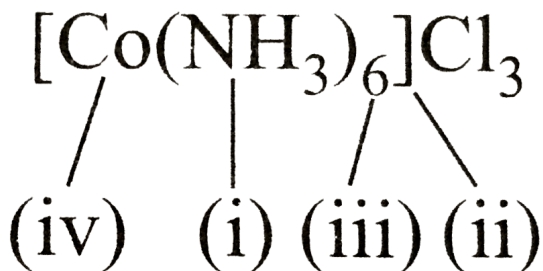
D.  $SCN^-$

**Answer: D**



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8. Mark the correct labelling of different terms used in coordination compounds :



A. (i) Central atom , (ii) Ionisation sphere , (iii) Coordination number ,  
(iv) Ligands

B. (i) Ligands , (ii) Coordination number , (iii) Valency , (iv) Ionisation  
sphere

C. (i) Ionisation sphere , (ii) Ligands , (iii) Coordination number , (iv)  
Central atom

D. (i) Ligands , (ii) Ionisation sphere , (iii) Coordination number , (iv)  
Central atom

**Answer: D**

9. Match the complexes given in column I with the oxidation states of central metal atoms given in column II and mark the appropriate choice .

Column I (Complex)		Column II (Oxidation state of central atom)	
(A)	$K_3[Co(C_2O_4)_2Cl_2]$	(i)	0
(B)	$[Pt(C_2H_4)Cl_3]^-$	(ii)	+1
(C)	$[Fe(H_2O)_5NO]SO_4$	(iii)	+3
(D)	$[Ni(CO)_4]$	(iv)	+2

A. (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (i), (C)  $\rightarrow$  (iv), (D)  $\rightarrow$  (iii)

B. (A)  $\rightarrow$  (iv), (B)  $\rightarrow$  (ii), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (iii)

C. (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (iv), (C)  $\rightarrow$  (ii), (D)  $\rightarrow$  (i)

D. (A)  $\rightarrow$  (i), (B)  $\rightarrow$  (ii), (C)  $\rightarrow$  (iii), (D)  $\rightarrow$  (iv)

Answer: C

10. 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. 6 and 3

B. 6 and 2

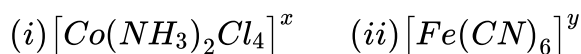
C. 4 and 2

D. 4 and 3

Answer: A

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11. The charges  $x$  and  $y$  on the following ions are



(Oxidation state of Co is +3 and Fe is + 2 in their respective complexes.)

A.  $x = + 1, y = - 1$



B.  $x = -1, y = +3$

C.  $x = -1, y = -4$

D.  $x = -2, y = -3$

**Answer: C**

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**12. Identify the statement which is not correct .**

A. Coordination compounds are mainly known for transition metals .

B. Coordination number and oxidation state of a metal are same

C. A ligand donates at least one electron pair to the metal atom to form a bond .

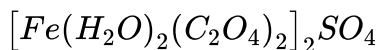
D.  $[Co(NH_3)_4Cl_2]^+$  is a heteroleptic complex .

**Answer: B**

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13. Which of the following is not correctly matched ?

A. Coordination compound containing cationic complex ion :



B. Coordination compound containing anionic complex ion :



C. Non-ionic coordination compound :  $[Co(NO_2)_3(NH_3)_3]$

D. Coordination compound containing cationic and anionic complex



**Answer: B**



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**Nomenclature Of Coordination Compounds**

1. Which of the following rules is not correct regarding IUPAC nomenclature of complex ions ?

A. Cation is named first and then anion .

B. In coordination sphere , the ligands are named alphabetically .

C. Positively charged ligands have suffix 'ate' .

D. More than one ligand of a particular type are indicated by using di, tri , tetra , etc.

**Answer: C**

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2. The correct IUPAC name of the coordination compound



A. potassium pentacyanonitrosylferrate (II)

B. potassium pentacyanonitroferrate(III)

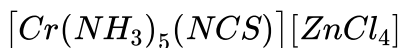
C. potassium nitritopentacyanoferrate(IV)

D. potassium nitritepentacyanoiron (II) .

**Answer: A**

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3. The correct IUPAC name of the following compound is



A. pentaammineisothiocyanatochromium(III) tetrachlorozincate(II)

B. pentammineisothiocyanatezinc chloridechromate(III)

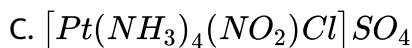
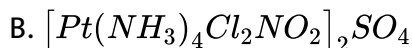
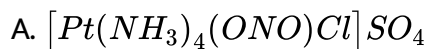
C. pentaamineisothiocyanatochromate(II)

D. isothiocyanatopentaamminechromium(II) zinc chloride (IV).

**Answer: A**

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4. Correct formula of tetraamminechloronitroplatinum (IV) sulphate can be written as

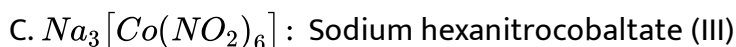
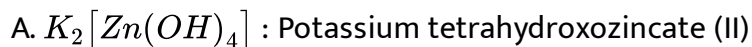


Answer: C



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5. Which of the following does not depict the correct , name of the compound ?

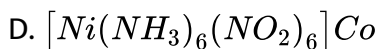
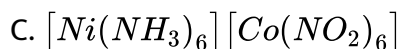
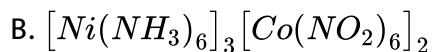
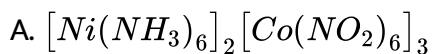


D.  $K_3[Cr(CN)_6]$ : Potassium hexacyanochromate(III)

Answer: B

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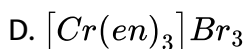
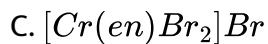
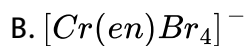
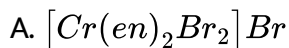
6. Hexaamminenickel(II) hexanitrocobaltate(III) can be written as



Answer: B

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7. Which among the following will be named as dibromidobis (ethylene diamine) chromium (III) bromide?

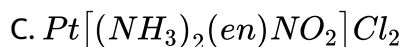
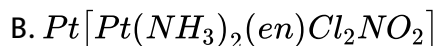
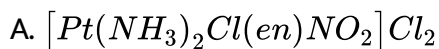


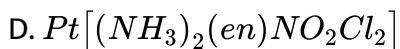
**Answer: A**



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8. The formula of the complex diamminechloro-(ethylenediamine) nitroplatinum (IV) chloride is





Answer: A

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9. The name of the compound  $[Co(NH_3)_5NO_2]Cl_2$  will be

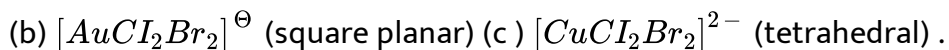
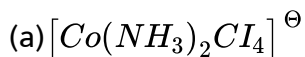
- A. pentaamminonitrocobalt (II) chloride
- B. pentamminenitrochloridecobalt(III) chloride
- C. pentanitrosoamminechlorocobaltate(III) .
- D. pentanitrosoamminechlorocobaltate(V) .

Answer: C

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1. How many geometrical isomers are there for



A. Two cis and trans, no geometrical isomers .

B. Two cis and trans , two cis and trans.

C. No geometrical isomers , two cis and trans .

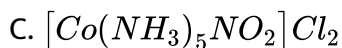
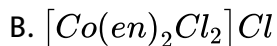
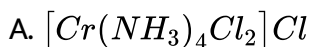
D. No geometrical isomers , no geometrical isomers .

**Answer: B**



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2. Which of the following will not show geometrical isomerism ?





**Answer: C**



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

A. one

B. two

C. three

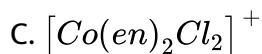
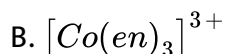
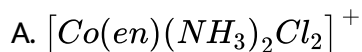
D. four

**Answer: C**



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4. Which of the following complex species is not expected to exhibit optical isomerism ?



**Answer: D**



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5.  $[Co(NH_3)Cl(en)_2]^{2+}$  shows two geometrical isomers cis and trans .

Which of the following statement is correct ?

A. trans-isomer will show optical isomerism .

B. cis-isomer will show optical isomerism .

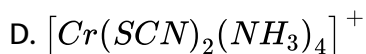
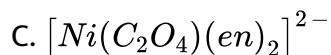
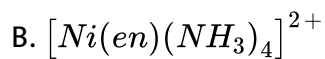
C. Both trans and cis-isomers will show optical isomerism .

D. Neither cis nor trans-isomer will show optical isomerism .

**Answer: B**

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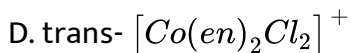
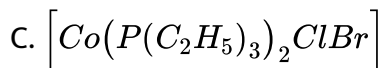
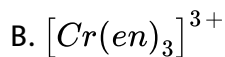
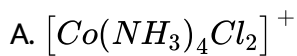
6. Which of the following gives the maximum number of isomers?



**Answer: D**

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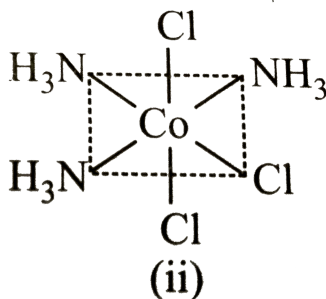
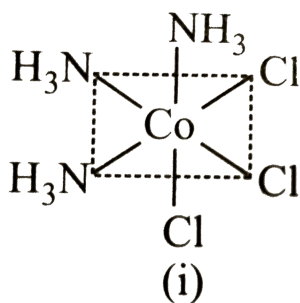
7. Which of the following pair of compounds is a pair of enantiomers



Answer: B

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8. Two isomers of a compound  $Co(NH_3)_3Cl_3$  ( $MA_3B_3$  type) are shown in the figures .



The isomers can be classified as

A. (i) fac-isomers (ii) mer-isomer

B. (i) optical - isomer (ii) trans-isomer

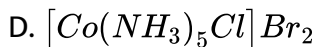
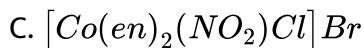
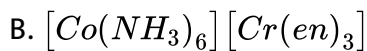
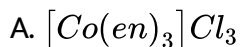
C. (i) mer-isomer (ii) fac-isomer

D. (i) trans-isomer (ii) cis-isomer.

**Answer: A**

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9. Which of the following compounds exhibits linkage isomerism?



**Answer: C**

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10.  $[Pt(NH_3)_4][CuCl_4]$  and  $[Cu(NH_3)_4][PtCl_4]$  are known as

- A. ionisation isomers
- B. coordination isomers
- C. linkage isomers
- D. polymerisation isomers.

**Answer: B**

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11. Which of the following complex will give white ppt. with  $BaCl_2$  solution ?

- A.  $[Co(NH_3)_5SO_4]Br$
- B.  $[Co(NH_3)_5Br]SO_4$
- C.  $[Co(NH_3)_4(SO_4)_2]Br$
- D.  $[Co(NH_3)_4Br(SO_4)]$

**Answer: B**

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

- A. (i) , (ii) and (iii) are hydrate isomers .
- B. (i) , (ii) and (iii) are coordination isomers
- C. (i) , (ii) and (iii) are ionisation isomers .
- D. (i) and (ii) are stereoisomers .

**Answer: A**

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13. Which of the following pairs of isomers is not correctly matched with its type of isomerism ?



- A.  $[Cr(NH_3)_6][Cr(CN)_6]$  and  $[Cr(NH_3)_4(CN)_2][Cr(NH_3)_2(CN)_4]$  - Coordination isomerism
- B.  $[Co(NH_3)_5NO_2]Cl_2$  and  $[Co(NH_3)_5ONO]Cl_2$  - Linkage isomerism
- C.  $[Co(py)_2(H_2O)_2Cl_2]Cl$  and  $[Co(py)_2(H_2O)Cl_3]H_2O$  - Coordination isomerism
- D.  $[Pt(NH_3)_4Br_2]Cl_2$  and  $[Pt(NH_3)_4Cl_2]Br_2$  - Ionisation isomerism

**Answer: C**

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14.  $CrCl_3 \cdot 6H_2O$  exists in different isomeric forms which show different colours like violet and green . This is due to

A. ionisation isomerism

B. coordination isomerism

C. optical isomerism

D. hydrate isomerism

**Answer: D**

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15. Match the column I and with column II and mark the appropriate choice .

Column I (Complex)		Column II (Isomerism)	
(A)	$[\text{Co}(\text{NH}_3)_6] [\text{Cr}(\text{CN})_6]$	(i)	Geometrical isomerism
(B)	$[\text{Co}(\text{en})_2(\text{NO}_2)\text{Cl}]\text{Br}$	(ii)	Optical isomerism
(C)	$[\text{Pt}(\text{en})_2\text{Cl}_2]$	(iii)	Coordination isomerism
(D)	$[\text{Cr}(\text{CN})_2(\text{NH}_3)_4]^{2+}$	(iv)	Linkage isomerism

A. (A)  $\rightarrow$  (iv), (B)  $\rightarrow$  (ii), (C)  $\rightarrow$  (iii), (D)  $\rightarrow$  (i)

B. (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (iv)

C. (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (iv), (C)  $\rightarrow$  (ii), (D)  $\rightarrow$  (i)

D. (A)  $\rightarrow$  (i), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (iv), (D)  $\rightarrow$  (ii)

**Answer: C**



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**16.** What type of isomerism exists in the following pairs of complexes ?

(i)  $[Co(NH_3)_5NO_3]SO_4$  and  $[Co(NH_3)_5SO_4]NO_3$

(ii)  $[Co(en)(H_2O)_2Cl_2]Cl$  and  $[Co(en)(H_2O)Cl_3]H_2O$

A. (i) Ionisation (ii) Hydrate

B. (i) Linkage (ii) Hydrate

C. (i) Ionisation (ii) Linkage

D. (i) Linkage (ii) Coordination

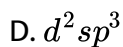
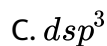
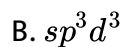
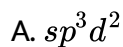
**Answer: A**



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## Bonding In Coordination Compounds

1. The anion  $[Co(C_2O_4)_3]^{3-}$  involves hybridization

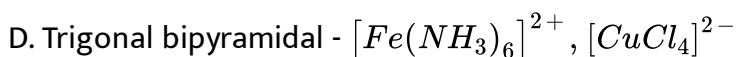
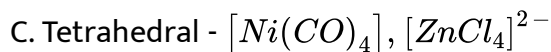


**Answer: D**



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2. Which of the following sets of examples and geometry of the compounds is not correct ?



**Answer: D**



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3. Match the examples given in column I with the shapes of the compounds given in column II and mark the appropriate choice .

Column I		Column II	
(A)	$[\text{Ag}(\text{NH}_3)_2]^+$	(i)	$d^2sp^3$ , octahedral
(B)	$[\text{Ni}(\text{CN})_4]^{2-}$	(ii)	$dsp^2$ , square planar
(C)	$[\text{Ni}(\text{CO})_4]$	(iii)	$sp$ , linear
(D)	$[\text{Fe}(\text{CN})_6]^{3-}$	(iv)	$sp^3$ , tetrahedral

A. (A)  $\rightarrow$  (i), (B)  $\rightarrow$  (ii), (C)  $\rightarrow$  (iii), (D)  $\rightarrow$  (iv)

B. (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (ii), (C)  $\rightarrow$  (iv), (D)  $\rightarrow$  (i)

C. (A)  $\rightarrow$  (iv), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (ii), (D)  $\rightarrow$  (i)

D. (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (i), (C)  $\rightarrow$  (iii), (D)  $\rightarrow$  (iv)

**Answer: B**

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4. Which of the following is correct ?

A. Valence bond theory explains the colour of the coordination compounds .

B.  $[NiCl_4]^{2-}$  is diamagnetic in nature

C. Ambident ligands can show linkage isomerism .

D. A bidentate ligand can have four coordination sites .

**Answer: C**

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5. Mark the incorrect statement .

A. Inner orbital (low spin) complexes involve  $d^2 sp^3$  hybridisation .

B. Outer orbital (high spin) complexes involve  $sp^3 d^2$  hybridisation .

C. Tetrahedral complexes generally involve  $dsp^2$  hybridisation .

D. Stereoisomerism involves geometrical and optical isomerism .

**Answer: C**

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6. Which of the following facts about the complex  $[Cr(NH_3)_6]Cl_3$  is wrong ?

- A. The complex involves  $d^2sp^3$  hybridisation and is octahedral in shape .
- B. The complex is paramagnetic .
- C. The complex is an outer orbital complex .
- D. The complex gives white precipitate with silver nitrate solution .

**Answer: C**

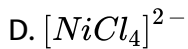


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7. Which of the following molecules has a regular tetrahedral shape?

- A.  $[PdCl_4]^{2-}$
- B.  $[Pd(CN)_4]^{2-}$
- C.  $[Ni(CN)_4]^{2-}$





**Answer: D**



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**8.** Mark the correct statements regarding the geometry of complex ions .

(i) The geometry of the complex ion depends upon the coordination number .

(ii) If coordination number is 6 , the complex is octahedral .

(iii) If coordination number is 4 , the geometry of the complex may be tetrahedral or square planar .

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

B. (i) and (ii) only

C. (i) and (iii) only

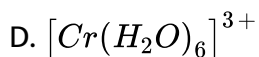
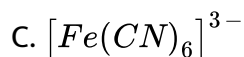
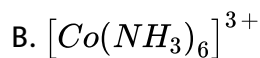
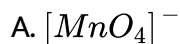
D. (ii) and (iii) only .

**Answer: A**



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9. Which of the following complex ion does not have 'd'-electrons in the central metal atom-



Answer: A



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10. Give reason for the statement  $[Ni(CN)_4]^{2-}$  is diamagnetic while  $[NiCl_4]^{2-}$  is paramagnetic in nature .

- A. In  $[NiCl_4]^{2-}$  no unpaired electrons are present while in  $[Ni(CN)_4]^{2-}$  two unpaired electrons are present
- B. In  $[Ni(CN)_4]^{2-}$ , no unpaired electrons are present while in  $[NiCl_4]^{2-}$  two unpaired electrons are present .
- C.  $[NiCl_4]^{2-}$  shows  $dsp^2$  hybridisation hence it is paramagnetic .
- D.  $[Ni(CN)_4]^{2-}$  shows  $sp^3$  hybridisation hence it is diamagnetic .

**Answer: B**

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**11. The lowest value of paramagnetism is shown by**

- A.  $[Co(CN)_6]^{3-}$
- B.  $[Fe(CN)_6]^{3-}$
- C.  $[Cr(CN)_6]^{3-}$
- D.  $[Mn(CN)_6]^{3-}$

**Answer: A**

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**12.** Explain the following:

(i) All the octahedral complexes of  $Ni^{2+}$  must be outer orbital complexes.

(ii)  $[CoF_6]^{3-}$  is paramagnetic but  $[Co(CN)_6]^{3-}$  is diamagnetic .

A. paramagnetic and undergoes  $sp^3d^2$  hybridisation

B. diamagnetic and undergoes  $d^2sp^3$  hybridisation

C. paramagnetic and undergoes  $sp^3d$  hybridisation

D. diamagnetic and undergoes  $sp^3$  hybridisation .

**Answer: A**

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13. Deduce the structures of  $[NiCl_4]^{2-}$  and  $[Ni(CN)_4]^{2-}$  considering the hybridisation of the metal ion. Calculate the magnetic moment (spin only) of the species.

A. 2.82 B.M.

B. 3.25 B.M.

C. 1.23 B.M.

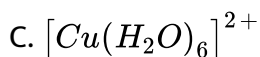
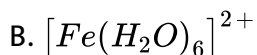
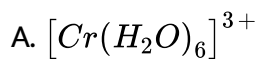
D. 5.64 B.M.

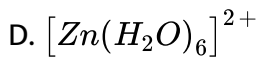
**Answer: A**



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14. Which of the following has largest paramagnetism ?





**Answer: B**

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15. Using valence bond theory , the complex  $[Cr(H_2O)_6]^{3+}$  can be described as

A.  $sp^3d^2$  , outer orbital complex , paramagnetic

B.  $dsp^2$  , inner orbital complex , diamagnetic

C.  $d^2sp^3$  , inner orbital complex , paramagnetic

D.  $d^2sp^3$  , outer orbital complex , diamagnetic .

**Answer: C**

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16. Which of the following descriptions about  $[FeCl_6]^{4-}$  is correct about the complex ion ?

- A.  $sp^3d$  , inner orbital complex , diamagnetic
- B.  $sp^3d^2$  , outer orbital complex , paramagnetic
- C.  $d^2sp^3$  , inner orbital complex , paramagnetic
- D.  $d^2sp^3$  , outer orbital complex , diamagnetic .

**Answer: B**



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

- A. tetrahedral and paramagnetic
- B. tetrahedral and diamagnetic
- C. square planar and diamagnetic

D. square planar and paramagnetic .

**Answer: D**

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18. Pick out the correct statement with respect to  $[Mn(CN)_6]^{3-}$  :

A.  $d^2 sp^3$  , inner orbital complex , paramagnetic , 2.87 B.M.

B.  $d^2 sp^3$  , inner orbital complex , diamagnetic , zero magnetic moment

C.  $d^2 sp^3$  , outer orbital complex , paramagnetic , 3.87 B.M.

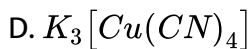
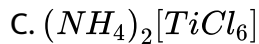
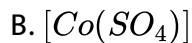
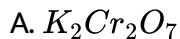
D.  $dsp^2$  , outer orbital complex , diamagnetic , zero magnetic moment

**Answer: A**

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19. Among the following the compound that is both paramagnetic and coloured is



**Answer: B**



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

A. 2.84 B.M

B. 4.90 B.M.

C. 5.92 B.M

D. 0 B.M.

**Answer: D**

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21. Which of the following complexes will show maximum paramagnetism ?



**Answer: B**

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22. Match the column I with column II and mark the appropriate choice .

Column I		Column II	
(A)	$[\text{Fe}(\text{CN})_6]^{3-}$	(i)	Zero
(B)	$[\text{CoF}_6]^{3-}$	(ii)	5.92 B.M.
(C)	$[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$	(iii)	4.89 B.M.
(D)	$[\text{Co}(\text{NH}_3)_6]^{3+}$	(iv)	1.732 B.M.

A. (A)  $\rightarrow$  (ii), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (iv), (D)  $\rightarrow$  (i)

B. (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (ii), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (iv)

C. (A)  $\rightarrow$  (i), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (iv), (D)  $\rightarrow$  (ii)

D. (A)  $\rightarrow$  (iv), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (ii), (D)  $\rightarrow$  (i)

Answer: D

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23. Electronic configuration of  $[\text{Cu}(\text{NH}_3)_6]^{2+}$  on the basis of crystal field splitting theory is

A.  $t_{2g}^4 e_g^5$

B.  $t_{2g}^6 e_g^3$

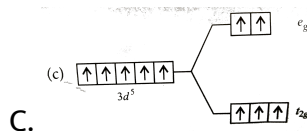
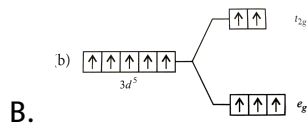
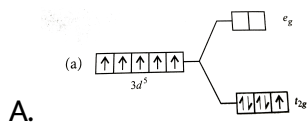
C.  $t_{2g}^9 e_g^0$

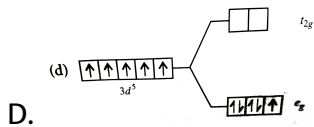
D.  $t_{2g}^5 e_g^4$

Answer: B

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24. Which of the following energy level diagram for  $[FeF_6]^{3-}$  is correct on the basis of crystal field theory ?

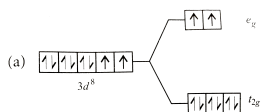




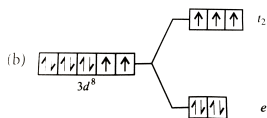
Answer: C

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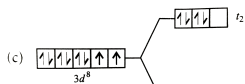
25. In  $[NiCl_4]^{2-}$ , the number of unpaired electron is



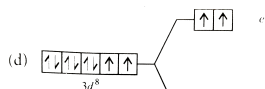
A.



B.



C.



D.

Answer: B



26. Which of the following shell from an octahedral complex

- A.  $d^4$  (low spin)
- B.  $d^8$  (high spin)
- C.  $d^6$  (low spin)
- D. None of these .

**Answer: C**

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27. The value of 'spin only' magnetic moment for one of the following configuration is  $2.84B.M$ . The correct one is:

- A.  $d^4$  (in strong ligand field )
- B.  $d^4$  (in weak ligand field )

C.  $d^3$  (in weak as well as in strong fields)

D.  $d^5$  (in strong ligand field )

**Answer: A**



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**28.** Which of the following statements is/are correct ?

(i) In octahedral complexes ,  $t_{2g}$  orbitals possess low energy as compared to  $e_g$  orbitals .

(ii) In tetrahedral complexes ,  $t_2$  orbitals possess high energy as compared to e orbitals .

(iii) In octahedral complexes ,  $e_g$  orbitals possess low energy as compared to  $t_{2g}$  orbitals .

A. (ii) only

B. (iii) only

C. (i) and (ii)

D. (i) and (iii)

**Answer: C**

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29.  $[FeF_6]^{3-}$  is paramagnetic due to presence of unpaired electrons in the complex . The five electrons remain unpaired because

A. fluorine is the most electronegative element

B.  $F^-$  is a weak field ligand hence does not cause pairing of electrons

C.  $F^-$  is a strong field ligand hence does not cause pairing of electron

D. pairing does not take place in iron complexes .

**Answer: B**

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30.  $[Co(Cr_2O_4)_3]^{3-}$  is a

- A.  $C_2O_4^{2-}$  is strong field ligand hence causes pairing of electrons
- B.  $C_2O_4^{2-}$  is a bidentate ligand hence causes pairing of electrons
- C.  $Co^{3+}$  is a strong central atom hence in all complexes of  $Co^{3+}$  electrons are paired
- D.  $C_2O_4^{2-}$  is a strong field ligand hence causes splitting of d-orbitals .

Answer: C



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31. What are the correct oxidation state , coordination number , configuration , magnetic character and magnetic moment of  $K_4[Mn(CN)_6]$  ?

A.

O. S.	C. N	Configuration	Magnetic Character	Magnetic Moment
+6	6	$t_{2g}^5$	Diamagnetic	0

B.

O. S.	C. N	Configuration	Magnetic Character	Magnetic Moment
+4	6	$t_{2g}^4 e_g^1$	Paramagnetic	$1.732B. M$

C.

O. S.	C. N	Configuration	Magnetic Character	Magnetic Moment
+2	6	$t_{2g}^5$	Paramagnetic	$1.732B. M$

D.

O. S.	C. N	Configuration	Magnetic Character	Magnetic Moment
+4	6	$t_{2g}^3 e_g^2$	Diamagnetic	0

**Answer: C**



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32. Which of the following statements is correct about  $[Co(H_2O)_6]^{2+}$  complex ?

A. Electronic configuration =  $3d^7 \rightarrow t_{2g}^5 e_g^2$ ,

no. of unpaired electrons = 3,  $\mu = 3.87B. M$

B. Electronic configuration =  $3d^6 \rightarrow t_{2g}^4 e_g^2$ .

no. of unpaired electrons = 2,  $\mu = 2.87B.M$

C. Electronic configuration =  $3d^7 \rightarrow t_{2g}^6 e_g^1$ .

no. of unpaired electrons = 1,  $\mu = 2.87B.M$

D. Electronic configuration =  $3d^7 \rightarrow t_{2g}^3 e_g^4$ .

no. of unpaired electrons = 3,  $\mu = 3.87B.M$

**Answer: A**

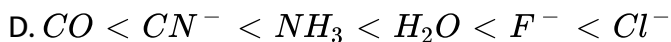
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**33.** The increasing order of the crystal field splitting power of some common ligands is

A.  $NH_3 < Cl^- < CN^- < F^- < CO < H_2O$

B.  $F^- < Cl^- < NH_3 < CN^- < H_2O < CO$

C.  $Cl^- < F^- < H_2O < NH_3 < CN^- < CO$



Answer: C

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34. What is crystal field splitting energy? How does the magnitude of  $\Delta_0$  decide the actual configuration of d orbitals in a coordination entity?

A. if  $\Delta_0 < P$ , the configuration is  $t_{2g}^3 e_g^1$  = weak field ligand and high spin complex

B. If  $\Delta_0 > P$ , the configuration is  $t_{2g}^3 e_g^1$  = strong field ligand and low spin complex

C. if  $\Delta_0 > P$ , the configuration is  $t_{2g}^4 e_g^0$  = strong field ligand and high spin complex

D. if  $\Delta_0 = P$ , the configuration is  $t_{2g}^4 e_g^0$  = strong field ligand and high spin complex .

**Answer: A**

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**35.** Why are low spin tetrahedral complexes not formed ?

- A. for tetrahedral complexes , the CFSE is lower than pairing energy
- B. for tetrahedral complexes , the CFSE is higher than pairing energy
- C. electrons do not go to  $e_g$  in case of tetrahedral complexes
- D. tetrahedral complexes are formed by weak field ligands only .

**Answer: A**

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**36.** A substance appears coloured because

- A. it absorbs light at specific wavelength in the visible part and reflects rest of the wavelengths
- B. ligands absorb different wavelengths of light which give colour to the complex
- C. it absorbs white light and shows different colours at different wavelength
- D. it is diamagnetic in nature .

**Answer: A**



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**37.** Match the complex ions given in column I with their colour given in column II and mark the appropriate choice .

Column I (Complex ion)		Column II (Colour)	
(A)	$[\text{CoF}_6]^{3-}$	(i)	Blue-green
(B)	$[\text{Co}(\text{NH}_3)_6]^{3+}$	(ii)	Pale yellow
(C)	$[\text{Co}(\text{H}_2\text{O})_6]^{3+}$	(iii)	Green
(D)	$[\text{Co}(\text{CN})_6]^{3-}$	(iv)	Yellow-orange

A. (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (iv), (C)  $\rightarrow$  (i), (D)  $\rightarrow$  (ii)

B. (A)  $\rightarrow$  (iii), (B)  $\rightarrow$  (iv), (C)  $\rightarrow$  (ii), (D)  $\rightarrow$  (i)

C. (A)  $\rightarrow$  (i), (B)  $\rightarrow$  (iii), (C)  $\rightarrow$  (iv), (D)  $\rightarrow$  (ii)

D. (A)  $\rightarrow$  (iv), (B)  $\rightarrow$  (i), (C)  $\rightarrow$  (iii), (D)  $\rightarrow$  (ii)

**Answer: B**



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**38.**  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  is blue in colour while  $\text{CuSO}_4$  is colourless. Why ?

A. presence of strong field ligand in  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

B. absence of water (ligand) ,  $d - d$  transitions are not possible in



C. anhydrous  $CuSO_4$  undergoes d-d transitions due to crystal field splitting

D. colour is lost due to loss of unpaired electrons .

**Answer: A**

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

A.  $CN^-$  is a strong field ligand and  $H_2O$  is a weak field ligand hence magnitude of CFSE is different

B. both  $CN^-$  and  $H_2O$  absorb same wavelength of energy

C. complexes of weak field ligands are generally colourless



D. the sizes of  $CN^-$  and  $H_2O$  are different hence their colours are also different .

**Answer: B**

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**40.** Explain why hexacyano complexes of metals in their +2 oxidation state are usually yellow , but the corresponding hexa aqua compounds are often blue or green .

A. hexacyano complexes absorb orange or red light thus appear yellow while hexaqua complexes absorb indigo thus appear yellow

B. hexacyano complexes absorb indigo thus appearing yellow while hexaqua complexes absorb orange or red light thus appear blue or green

C. hexacyano complexes absorb yellow light while hexaqua complexes absorb blue light

D.  $CN^-$  ions are yellow in colour while aqua ions are blue or green in colour .

**Answer: D**

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## Bonding In Metal Carbonyls

1. The number of bridging CO ligand(s) and Co-Co bond(s) in  $Co_2(CO)_8$ , respectively

- A. 0,2
- B. 6,1
- C. 5,2
- D. 6,2

**Answer: A**



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2.  $Ni(CO)_4$  is

- A. tetrahedral
- B. square planar
- C. linear
- D. octahedral .

**Answer: C**

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3. The oxidation state of chromium in  $Cr(CO)_6$  is

- A. covalent bonding
- B. coordinate bonding
- C. synergic bonding

D. ionic bonding

**Answer: D**

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4. The correct structure of  $Fe(CO)_5$  is ?

A. octahedral

B. tetrahedral

C. square pyramidal

D. trigonal bipyramidal .

**Answer: D**

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5. Select the true statement from the following for metal carbonyls ?

- A.  $\pi$  back bonding strengthens M - C bond order as well as CO bond order .
- B.  $\pi$  back bonding weakens M - C bond order as well as CO bond order
- C.  $\pi$  back bonding weakens M - C bond order but strengthens CO bond order
- D.  $\pi$  back bonding strengthens M - C bond order and weakens CO bond order .

**Answer: D**

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## Application Of Coordination Compounds

1. Mark the incorrect match .

A. Insulin - Zinc

B. Haemoglobin - Iron

C. Vitamin  $B_{12}$  - Cobalt

D. Chlorophyll - Chromium

**Answer: A**



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2. Which of the following statements is incorrect regarding the importance of coordination compounds in biological systems ?

A. Vitamin  $B_{12}$  used to prevent anaemia is a complex compound of zinc .

B. Haemoglobin is the red pigment of blood and contains iron .

C. Chlorophyll is the green pigments of plants and contains magnesium .

D. All are correct .

**Answer: A**

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### Higher Order Thinking Skills

1. If excess of  $AgNO_3$  solution is added to 100mL of a 0.024 M solution of dichlorobis (ethylenediamine) cobalt (III) chloride . How many mole of AgCl be precipitated ?

- A. 0.0012
- B. 0.0016
- C. 0.0024
- D. 0.0048

**Answer: C**

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2. 0.02 mole of  $[Co(NH_3)_5Br]Cl_2$  and 0.02 mole of  $[Co(NH_3)_5Cl]SO_4$  are present in 200 cc of a solution X . The number of moles of the precipitates Y and Z that are formed when the solution X is treated with excess silver nitrate and excess barium chloride are respectively

A. 0.02 , 0.02

B. 0.01 , 0.02

C. 0.02 , 0.04

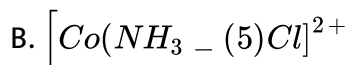
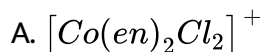
D. 0.04 , 0.02

**Answer: D**

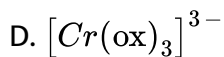


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3. Both geometrical and optical isomerism are shown by



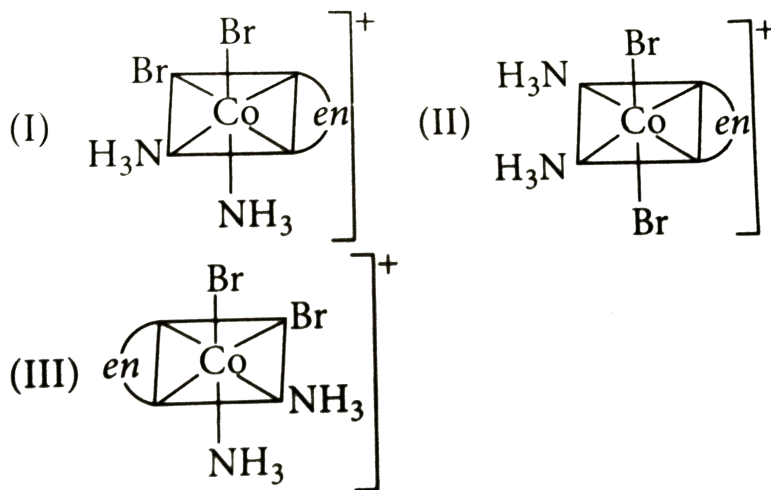




Answer: A

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4. Three arrangement are shown for the complex ,  $[Co(en)(NH_3)_2Br_2]^+$  . Which one is the wrong statement ?



A. I and II are geometrical isomers

B. II and III are optical isomers

C. I and III are optical isomers

D. II and III are geometrical isomers .

**Answer: B**

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5. Among the following complexes

$(K - P) : K_3[Fe(CN)_6] - K, [Co(NH_3)_6]Cl_3 - L, Na_3[Co(oxalate)_3]$

the diamagnetic complexes are

A. K, L, M, N

B. K, M, O, P

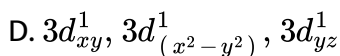
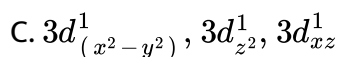
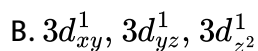
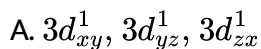
C. L, M, O, P

D. L, M, N, O

**Answer: A**

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

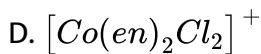
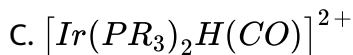


**Answer: A**

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7. Which one of the following has largest number of isomers?





**Answer: D**

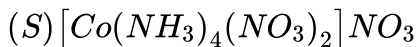
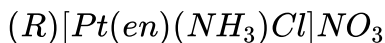
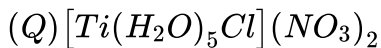


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**8.** Match each coordination compound in List-I with an appropriate pair of characteristics from List - II and select the correct answer using the code given below the lists .

[en =  $H_2NCH_2CH_2NH_2$  , At Nos : Ti = 22 , Cr = 24 , Co = 27 , Pt = 78]

List- I



List- II

1. Paramagnetic and exhibits ionisation isomerism

2. Diamagnetic and exhibits cis- trans isomerism

3. Paramagnetic and exhibits cis - trans isomerism

4. Diamagnetic and exhibits ionisation isomerism

A. 

<i>P</i>	<i>Q</i>	<i>R</i>	<i>S</i>
4	2	3	1

B. 

<i>P</i>	<i>Q</i>	<i>R</i>	<i>S</i>
3	1	4	2

C. 

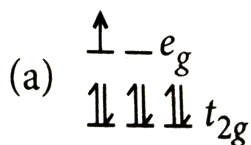
<i>P</i>	<i>Q</i>	<i>R</i>	<i>S</i>
2	1	3	4

D.  $\begin{matrix} P & Q & R & S \\ 1 & 3 & 4 & 2 \end{matrix}$

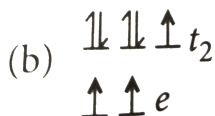
Answer: B

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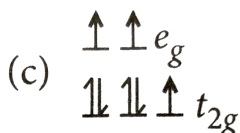
9. Which of the following energy diagrams shows the electron distribution according to the crystal field model of the 3d-electrons in  $[CoCl_4]^{2-}$  ?



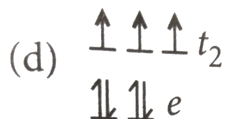
A.



B.



C.



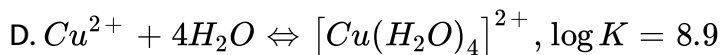
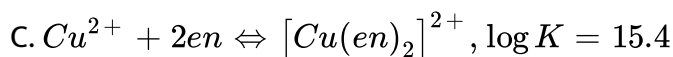
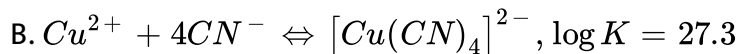
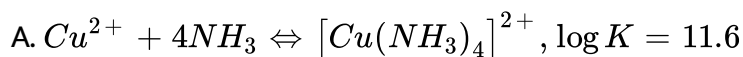
D.

**Answer: D**

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## Ncert Exemplar

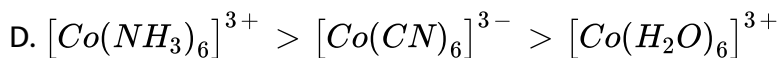
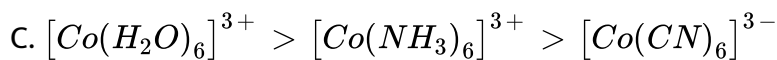
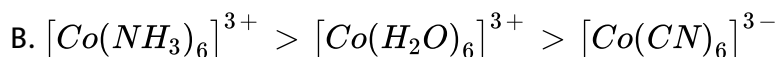
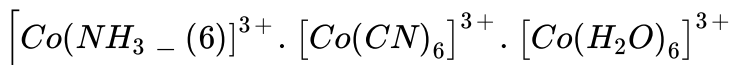
1. Which of the following complexes formed by  $Cu^{2+}$  ions is most stable ?



**Answer: B**

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2. The colour of the coordination compounds depends on the crystal field splitting. What will be the correct order of absorption of wavelength of light of the visible region, for the complexes,



**Answer:**



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3. When 0.1 mol  $CoCl_3(NH_3)_5$  is treated with excess of  $AgNO_3$ , 0.2 mole of  $AgCl$  are obtained. The conductivity of solution will correspond to

A. 1:3 electrolyte

B. 1: 2 electrolyte

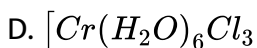
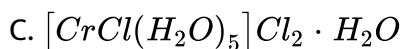
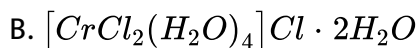
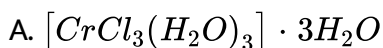
C. 1: 1 electrolyte

D. 3: 1 electrolyte

**Answer: B**

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4. When 1 mol  $CrCl_3 \cdot 6H_2O$  is treated with excess of  $AgNO_3$ , 3 mol of  $AgCl$  are obtained. The formula of the complex is



**Answer: D**

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

- A. diamminedichloridoplatinum (II)
- B. diamminedichloridoplatinum (IV)
- C. diamminedichloridoplatinum(0)
- D. dichloriododiammineplatinum (IV)

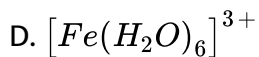
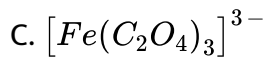
**Answer: A**



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6. The stabilization of coordination compound due to chelation is called the chelate effect. Which of the following is the most stable complex species?

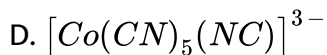
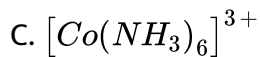
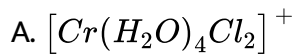
- A.  $[Fe(CO)_5]$
- B.  $[Fe(CN)_6]^{3-}$



**Answer: C**

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7. Indicate the complex ion which shows geometrical isomerism.



**Answer: A**

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8. The CFSE for octahedral  $[CoCl_6]^{4-}$  is  $18,000\text{cm}^{-1}$ . The CFSE for tetrahedral  $[CoCl_4]^{2-}$  will be

A.  $18,000\text{cm}^{-1}$

B.  $16,000\text{cm}^{-1}$

C.  $8,000\text{cm}^{-1}$

D.  $20,000\text{cm}^{-1}$

**Answer: C**



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9. Due to the presence of ambidentate ligands coordination compounds show isomerism. Palladium complexes of the type  $[Pd(C_6H_5)_2(SCN)_2]$  &  $[Pd(C_6H_5)_2(NCS)_2]$  are

A. linkage isomers

B. coordination isomers

C. ionisation isomers

D. geometrical isomers

**Answer: A**

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10. The two compounds  $[Co(SO_4)(NH_3)_5]Br$  and  $[Co(SO_4)(NH_3)_5]Cl$  represent:

A. linkage isomersim

B. ionisation isomerism

C. coordination isomerism

D. no isomerism .

**Answer: D**

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11. A chelating agent has two or more than two donor atoms to bind to a single metal ion. Which of the following is not a chelating agent?

- A. Thiosulphato
- B. Oxalato
- C. Glycinato
- D. Ethane-1, 2- diamine

**Answer: A**



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12. Which of the following species is not expected to be a ligand?

- A.  $NO$
- B.  $NH_4^+$
- C.  $NH_2CH_2CH_2NH_2$
- D.  $CO$

**Answer: B**

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13. What kind of isomerism exists between  $[Cr(H_2O)_6]Cl_3$  (violet) and  $[Cr(H_2O)_5Cl] \cdot H_2O$  (greyish-green)?

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

**Answer: B**

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14. IUPAC name of  $[Pt(NH_3)_2Cl(NO_2)]$  is

- A. platinum diaminechloronitrite
- B. chloronitrito-N-ammineplatinum (II)
- C. diamminechloridonitrito-N-platinum (II)
- D. diamminechloronitrito-N-platinate (II)

**Answer: C**

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### Assertion And Reason

1. Assertion : Aqueous solution of the compound  $CoCl_3 \cdot 4NH_3$  when treated with excess of  $AgNO_3$ , 1 mole of  $AgCl$  is precipitated .

Reason : The compound  $CoCl_3 \cdot 4NH_3$  has six primary valencies and one secondary valency .

A. If both Assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false

D. if both assertion and reason are false

**Answer: C**

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2. Assertion : The complex  $K_3[Cr(C_2O_4)_3]$  when present in aqueous solution, will give test for  $K^+$ ,  $Cr^{3+}$  and oxalate ions.

Reason : The complex  $K_3[Cr(C_2O_4)_3]$  will dissociate completely in solution.

A. If both Assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion



C. If assertion is true but reason is false

D. if both assertion and reason are false

**Answer: D**



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**3. Assertion :**  $N(CH_2CH_2NH_2)_3$  and EDTA are examples of polydentate ligands .

**Reason :** Ligands which can ligate through two different atoms is called polydentate ligand .

A. If both Assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false

D. if both assertion and reason are false

**Answer: C**

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4. Assertion : Coordination number of Fe and Co in  $[Fe(C_2O_4)_3]^{3-}$  and  $[Co(en)_3]^{3+}$  respectively is 6 .

Reason :  $C_2O_4^{2-}$  and en (ethane-1, 2 - diamine) are didentate ligands.

- A. If both Assertion and reason are true and reason is the correct explanation of assertion
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false
- D. if both assertion and reason are false

**Answer: A**

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5. Assertion :  $[Co(NH_3)_5Br]SO_4$  gives white precipitate with barium chloride .

Reason : The complex  $[Co(NH_3)_5Br]SO_4$  dissociates in the solution to give  $Br^-$  and  $SO_4^{2-}$  .

- A. If both Assertion and reason are true and reason is the correct explanation of assertion
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false
- D. if both assertion and reason are false

**Answer: C**



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6. Assertion : Tetrahedral complexes having two different types of unidentate ligands coordinated with central metal ion will show geometrical isomerism .

Reason : Geometrical isomerism arises in homoleptic complexes due to different possible geometric arrangement of the ligands .

- A. If both Assertion and reason are true and reason is the correct explanation of assertion
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false
- D. if both assertion and reason are false

**Answer: D**



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7. Assertion : In a coordination entity  $[PtCl_2(en)_2]^{2+}$  only the cis-isomer shows optical activity .

Reason : Optical isomerism is common in octahedral complexes involving didentate ligands .

- A. If both Assertion and reason are true and reason is the correct explanation of assertion
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false
- D. if both assertion and reason are false

**Answer: B**



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8. Assertion : Inner orbital complexes are low spin complexes .

Reason : In low spin complexes , inner d-orbital (3d) is used in hybridisation .

A. If both Assertion and reason are true and reason is the correct explanation of assertion

B. If both assertion and reason are true but reason is not the correct explanation of assertion

C. If assertion is true but reason is false

D. if both assertion and reason are false

**Answer: A**



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9. Assertion :  $[Fe(H_2O)_6]^{2+}$  is  $sp^3d^2$  hybridised and paramagnetic complex ion .

Reason :  $[Fe(H_2O)_6]^{2+}$  has four unpaired electrons as  $H_2O$  is a weak field ligand .

- A. If both Assertion and reason are true and reason is the correct explanation of assertion
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false
- D. if both assertion and reason are false

**Answer: A**

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**10.** Assertion : In tetrahedral complexes low spin configuration are rarely observed .

Reason :  $\Delta_t = \left(\frac{4}{9}\right)\Delta_0$

- A. If both Assertion and reason are true and reason is the correct explanation of assertion
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false
- D. if both assertion and reason are false

**Answer: A**



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11. Assertion :  $[Ti(H_2O)_6]Cl_3$  on heating becomes colourless .

Reason : Water is removed on heating  $[Ti(H_2O)_6]Cl_3$  .

- A. If both Assertion and reason are true and reason is the correct explanation of assertion



- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false
- D. if both assertion and reason are false

**Answer: A**

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**12.** Assertion : According to crystal field theory , during complex formation , the d-orbitals split and form two sets of orbitals  $t_{2g}$  and  $e_g$  .

Reason : Splitting of d-orbitals occurs only in case of strong field ligands .

- A. If both Assertion and reason are true and reason is the correct explanation of assertion
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false

D. if both assertion and reason are false

**Answer: C**

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13.  $[Fe(H_2O)_6]^{3+}$  is strongly paramagnetic whereas  $[Fe(CN)_6]^{3-}$  is weakly paramagnetic. Explain.

- A. If both Assertion and reason are true and reason is the correct explanation of assertion
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false
- D. if both assertion and reason are false

**Answer: A**

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14. Assertion :  $K_2[Ni(EDTA)]$  is more stable than  $K_3[Al(C_2O_4)_3]$ .

Reason : Ni is a transition element while Al is a non-transition element .

- A. If both Assertion and reason are true and reason is the correct explanation of assertion
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false
- D. if both assertion and reason are false

**Answer: B**



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15. Assertion : Geometrical isomerism is also called cis-trans isomerism .

Reason : Tetrahedral complexes show geometrical isomerism .

- A. If both Assertion and reason are true and reason is the correct explanation of assertion
- B. If both assertion and reason are true but reason is not the correct explanation of assertion
- C. If assertion is true but reason is false
- D. if both assertion and reason are false

**Answer: C**



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