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| --- |
| **Karan Arora**  **R.L. Institute M: 9416974837**  **Class : XII**  **“CO-ORDINATION COMPOUNDS”** |

**Level – 1**

1. NO2 is a :

|  |  |  |  |
| --- | --- | --- | --- |
| a) Monodentate ligand | b) Tetradentate ligand | c) Hexadentate ligand | d) Ambidentate ligand |

1. 2,4-dinitro phenyl hydrazine is an example of :

|  |  |  |  |
| --- | --- | --- | --- |
| a) Tridentate ligand | b) Monodentate ligand | c) Polydentate ligand | d) Didentate ligand |

1. Which among the following is an example of double salt?

|  |  |
| --- | --- |
| a) Potassium ferrocyanide | b) Potassium ferricyanide |
| c) Ferrous ammonium sulphate | d) Dimethyl glyoxime |

1. The oxidation state of Fe in [Fe(CN)6] 3 – is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) + 3 | b) + 2 | c) + 4 | d) – 3 |

1. The IUPAC name of the complex K3 [Fe(CN)6] is :

|  |  |
| --- | --- |
| a) Potassium hexacyanoferrate (II) | b) Potassium hexacyanoferrate (III) |
| c) Potassium hexacyanoiron (II) | d) Tripotassium hexacyanoiron (II) |

1. A similarity between optical and geometrical isomerism is that:
2. Each gives equal number of isomers for given compound.
3. If in a compound, one is present then so is the other.
4. Both are included in stereoisomerism.
5. They have no similarity.
6. Which of the following shows optical isomerism?

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Co(NH3)3Cl] + | b) [Co (en) (NH3)2] 2+ | c) [Co(H2O)4(en)] 3+ | d) [Co (en)2 (NH3)2] 3+ |

1. The total number of geometrical isomers for the complex [RhCl (CO) (PPh3) (NH3)] is :

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

1. Which of the following complex ions has geometrical isomers?

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Co(en)3] 3+ | b) [Ni (NH3)5Br] + | c) [Co (en)2 (NH3)2] 3+ | d) [Cr (NH3)4(en)] 3+ |

1. The existence of two different colored complexes with the composition of [Co(NH3)4Cl2] + is due to :

|  |  |
| --- | --- |
| a) Ionization isomerism | b) Linkage isomerism |
| c) Geometrical isomerism | d) Coordination isomerism |

1. Square planar complexes of the type MABXL (where A, B, X and L are unidentates) show:

|  |  |
| --- | --- |
| a) 2 cis and 1 trans isomer | b) 1 cis and 2 trans isomer |
| c) 2 cis and 2 trans isomer | d) 1 cis and 1 trans isomer |

1. Valence bond theory of co-ordination compounds was given by :

|  |  |  |  |
| --- | --- | --- | --- |
| a) Werner | b) Pauling | c) John Rowling | d) Van leck and Bethe |

CO-ORDINATION COMPOUNDS Page No. 1

1. Predict the number of ions produced per formula unit in an aqueous solution of [Co(en)3]Cl3.

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

1. The most stable complex is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Fe(H2O)6]3 + | b) [Fe(NH3)6]3 + | c) [Fe(C2O4)3]3 + | d) [FeCl6]3 – |

1. Amongst the following ions, which has the highest paramagnetism?

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Cr(H2O)6]3 + | b) [Fe(H2O)6]2 + | c) [Cu(H2O)6]2 + | d) [Zn(H2O)6]2 + |

1. The magnetic moment (spin only) of [NiCl4]2 – is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) 1.82 B. M. | b) 5.46 B. M. | c) 2.82 B. M. | d) 1.41 B. M. |

1. Which of the following complex compound will exhibit highest magnetic behaviour?

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Zn(NH3)6]2 + | b) [Ti(NH3)6]3 + | c) [Cr(NH3)6]3 + | d) [Co(NH3)6]3 + |

1. Geometrical shape of the complex formed by the reaction of Ni2+ with Cl – and CN – respectively are :

|  |  |
| --- | --- |
| a) Octahedral , Tetrahedral | b) Square planar , Tetrahedral |
| c) Tetrahedral , Square planar | d) Octahedral , Square planar |

1. For 1 molal solution of the following compounds, which will show the highest freezing point?

|  |  |
| --- | --- |
| a) [Co(H2O)6] Cl3 | b) [Co(H2O)5Cl] Cl2.H2O |
| c) [Co(H2O)4Cl2] Cl. 2H2O | d) [Co(H2O)3Cl3] .3H2O |

1. When 1 mol of CoCl3.5 NH3 was treated with excess of silver nitrate solution, 2 moles of AgCl was precipitated. The formula of the compound is :

|  |  |
| --- | --- |
| a) [Co(NH3)5Cl2] Cl | b) [Co(NH3)5Cl] Cl2 |
| c) [Co(NH3)4Cl2] (NH3) Cl | d) [Co(NH3)3Cl3] (NH3)2 |

1. The geometry and magnetic behaviour of complex [Ni(CO)4] are :

|  |  |
| --- | --- |
| a) Square planar geometry and paramagnetic | b) Tetrahedral geometry and diaramagnetic |
| c) Square planar geometry and diaramagnetic | d) Tetrahedral geometry and paramagnetic |

1. On treatment of 100 mL of 0.1 M solution of CoCl3. 6H2O with excess AgNO3, 1.2 x 1022 ions are precipitated. The complex is :

|  |  |
| --- | --- |
| a) [Co(H2O)6] Cl3 | b) [Co(H2O)5Cl] Cl2.H2O |
| c) [Co(H2O)4Cl2] Cl. 2H2O | d) [Co(H2O)3Cl3] .3H2O |

1. Among the following complexes (K-P): The diamagnetic complexes are :

**K** = K3 [Fe(CN)6] ; **L** = [Co(NH3)6] Cl3 ; **M** = Na3 [Co(ox)3] ; **N** = [Ni(H2O)6] Cl2 ; **O** = K2 [Pt(CN)4] ; **P** = [Zn(H2O)6] (NO3)2

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

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 ?

|  |  |
| --- | --- |
| a) CoCl3. 5 NH3 | b) CoCl3. 6 NH3 |
| c) CoCl3. 3 NH3 | d) CoCl3. 4 NH3 |

1. Both Co3+ and Pt4+ have a coordination number of six. Which of the following pair of complexes will show approximately the same electrical conductance for their 0.001 M aqueous solutions?

|  |  |
| --- | --- |
| a) CoCl3. 4 NH3 and PtCl4. 4 NH3 | b) CoCl3. 3 NH3 and PtCl4. 5 NH3 |
| c) CoCl3. 6 NH3 and PtCl4. 5 NH3 | d) CoCl3. 6 NH3 and PtCl4. 3 NH3 |

CO-ORDINATION COMPOUNDS Page No. 2

1. Amongst Ni(CO)4 ; [Ni (CN)4] 2 – and [NiCl4] 2 – :
2. Ni(CO)4 and [NiCl4] 2 – are diamagnetic and [Ni (CN)4] 2 – are paramagnetic.
3. [Ni (CN)4] 2 – and [NiCl4] 2 – are diamagnetic and Ni(CO)4 are paramagnetic.
4. Ni(CO)4 and [Ni (CN)4] 2 – are diamagnetic and [NiCl4] 2 – are paramagnetic.
5. [Ni (CN)4] 2 – and [NiCl4] 2 – are paramagnetic and Ni(CO)4 are diamagnetic
6. Which of the following is an outer orbital complex and exhibit paramagnetic behaviour?

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Ni(NH3)6]2 + | b) [Zn(NH3)6]2 + | c) [Cr(NH3)6]3 + | d) [Co(NH3)6]3 + |

1. The spin only magnetic moment value (in Bohr magneton units) of Cr(CO)6 is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) 0 | b) 2.84 | c) 4.90 | d) 5.92 |

1. Which of the following statements about [Co(CN)6] 3 – is true?
2. [Co(CN)6] 3 – has 4 unpaired electrons and will be in a high-spin configurations.
3. [Co(CN)6] 3 – has no unpaired electrons and will be in a high-spin configurations.
4. [Co(CN)6] 3 – has no unpaired electrons and will be in a low-spin configurations.
5. [Co(CN)6] 3 – has 4 unpaired electrons and will be in a low-spin configurations
6. Amongst the following the one which shares zero crystal field stabilization energy is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Co(H2O)6]3 + | b) [Mn(H2O)6]3 + | c) [Fe(H2O)6]3 + | d) [Co(H2O)6]2+ |

1. The crystal field stabilization energy for high spin d4 octahedral complex is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) – 1.8 O | b) – 1.6 O + P | c) – 1.2 O | d) – 0.6 O |

1. The absorption maxima of several octahedral complex ions are as follows:

|  |  |  |
| --- | --- | --- |
| S. No. | Compound |  |
| (i) | [Co(NH3)6]3 + | 475 |
| (ii) | [Co(CN)6] 3 – | 310 |
| (iii) | [Co(H2O)6]3 + | 490 |

The crystal field splitting energy is maximum for :

|  |  |
| --- | --- |
| a) [Co(H2O)6]3 + | b) [Co(CN)6] 3 – |
| c) [Co(NH3)6]3 + | d) All the complexes have the same splitting energy |

1. Which of the following is diamagnetic in nature?
2. Co3+ octahedral complex with weak field ligands.
3. Co3+ octahedral complex with strong field ligands.
4. Co2+ in tetrahedral complex.
5. Co2+ in square planar complex.
6. In spectrochemical series, chlorine is above water i.e. Cl > H2O, this is due to :
7. Good -acceptor properties of Cl.
8. Strong -donor and Good -acceptor properties of Cl.
9. Good -donor properties of Cl.
10. Larger size of Cl than H2O.
11. Which of the following is high spin complex?

|  |  |  |  |
| --- | --- | --- | --- |
| a) [CoCl6] 3 – | b) [CoF6] 3 – | c) [Co(NH3)6]2 + | d) all fo these |

1. CuCl is insoluble in water but it dissolves in KCl solution. This is due to the formation of the complex:

|  |  |  |  |
| --- | --- | --- | --- |
| a) K2[CuCl3] | b) K3[CuCl4] | c) K [CuCl2] | d) all of these |

1. Iron carbonyl, [Fe(CO)5] is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) trinuclear | b) mononuclear | c) tetranuclear | d) dinuclear |

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**Answers**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1. d | 1. b | 1. c | 1. a | 1. b | 1. c | 1. d | 1. b |
| 1. c | 1. c | 1. a | 1. b | 1. a | 1. c | 1. b | 1. c |
| 1. c | 1. c | 1. d | 1. b | 1. b | 1. b | 1. c | 1. c |
| 1. c | 1. c | 1. a | 1. a | 1. c | 1. c | 1. d | 1. b |
| 1. b | 1. c | 1. d | 1. d | 1. b |  |  |  |

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| **Karan Arora**  **R.L. Institute M: 9416974837**  **Class : XII**  **“CO-ORDINATION COMPOUNDS”** |

**Level – 2**

1. The ligand N(CH2CH2NH2)3 is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) tridentate | b) pentadentate | c) tetradentate | d) bidentate |

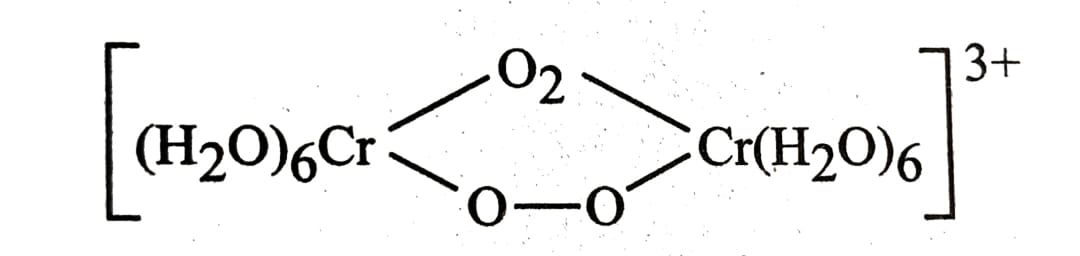
1. The correct structure of ethylenediamine tera acetic acid (EDTA) is :

|  |  |
| --- | --- |
| a) | b) |
| c) | d) |

1. Oxidation number and coordination number of silver in Tollen’s reagent respectively are :

|  |  |  |  |
| --- | --- | --- | --- |
| a) 1 , 1 | b) 2 , 1 | c) 2 , 2 | d) 1 , 2 |

1. Oxidation number of Cr in the following complex is :



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

1. Which one of the following is a homoleptic complex?

|  |  |
| --- | --- |
| a) tris(ethane-1,2-diamine) cobalt (III) chloride | b) triamminetriaquachromium (III) chloride |
| c) diamminechloridonito-N-platinum (II) | d) pentaamminecarbonato cobalt (III) chloride |

1. The formula, dichlorobis(urea)copper (II) is :

|  |  |
| --- | --- |
| a) [Cu{O = C(NH2)}2] Cl2 | b) [CuCl2{O = C(NH2)}2] |
| c) [Cu{O = C(NH2)2}Cl] Cl | d) [CuCl2{O = C(NH2)2}2] |

1. Which of the following has largest number of isomers?

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Ru(NH3)4 Cl2]+ | b) [Co(en)2 Cl2]+ | c) [Ir(PR3)2 H(CO)]+ | d) [Co(NH3)5 Cl]2+ |

1. Which one of the following complexes is not expected to exhibit isomerism?

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Ni(NH3)4 (H2O)2]+ | b) [Pt(NH3)2 Cl2] | c) [Ni(NH3)2 Cl2] | d) [Ni(en)3]+2 |

1. For the given complex [CoCl2 (en) (NH3)2]+, the number of geometrical isomers, the number of optical isomers and total number of isomers of all type possible respectively are :

|  |  |  |  |
| --- | --- | --- | --- |
| a) 2 , 2 , 4 | b) 2 , 2 , 3 | c) 2 , 0 , 2 | d) 0 , 2 , 2 |

CO-ORDINATION COMPOUNDS Page No. 5

1. The number of geometrical isomers that can exist for square planar [Pt (Cl) (py) (NH3) (NH2OH)]+ is :

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

1. The total number of possible isomers for the complex compound [CuII (NH3)4] [PtIICl4]are :

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

1. Number of possible isomers for the complex Co (en)2 Cl2] Cl will be :

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

1. [Co(NH3)4 (NO2)2]Cl exhibits :
2. Ionization isomerism, geometrical isomerism and optical isomerism.
3. Linkage isomerism, geometrical isomerism and optical isomerism.
4. Linkage isomerism, ionization isomerism and optical isomerism.
5. Linkage isomerism, ionization isomerism and geometrical isomerism.
6. Fac-Mer isomerism is associated with which one of the following complexes?

|  |  |  |  |
| --- | --- | --- | --- |
| a) [M (AA)2] | b) [M A3B3] | c) [M (AA)3] | d) [M ABCD] |

1. Which of the following can exhibit geometrical isomerism?

|  |  |  |  |
| --- | --- | --- | --- |
| a) [MnBr4] – 2 | b) [Pt (NH3)3 Cl]+ | c) [Pt Cl2 P(C2H5)3]2 | d) [Fe (H2O)5 NO] 2+ |

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

|  |  |
| --- | --- |
| a) [Co(en) (NH3)2 Cl2]+ | b) [Co(en)3]+3 |
| c) [Co(en)2 Cl2]+ | d) [Co(NH3)3 Cl3] |

1. Which of the following complexes shows optical isomerism?

|  |  |
| --- | --- |
| a) [Co (NH3)3 Cl3] | b) [Co(en)2 Cl2]Cl |
| c) trans [Co(en)2 Cl2]Cl | d) [Co(NH3)4 Cl2] Cl |

1. Consider the following reaction and select the correct statements :

[Co(NH3)4 Br2]+ + Br –  [Co (NH3)3 Br3] + NH3

1. Two isomers are produced if the reactant complex ion is a cis-isomer.
2. Two isomers are produced if the reactant complex ion is a trans-isomer.
3. Only one isomer are produced if the reactant complex ion is a trans-isomer.
4. Only one isomer are produced if the reactant complex ion is a cis-isomer.

|  |  |  |  |
| --- | --- | --- | --- |
| a) (i) and (ii) | b) (i) and (iii) | c) (iii) and (iv) | d) (ii) and (iv) |

1. The type of isomerism shown by the complex [Co Cl2 (en)2] is :

|  |  |
| --- | --- |
| a) Ionization isomerism | b) Coordination isomerism |
| c) Geometrical isomerism | d) Linkage isomerism |

1. When 0.01 mole of a cobalt complex is treated with excess silver nitrate solution, 4.305 g of silver chloride is precipitated. The formula of the complex is :

|  |  |
| --- | --- |
| a) [Co (NH3)3 Cl3] | b) [Co (NH3)5 Cl] Cl2 |
| c) [Co (NH3)6 Cl3] | d) [Co (NH3)4 Cl2] NO3 |

1. An excess of AgNO3 is added to 100 mL of 0.01 M solution of dichlorotetraaquachromium (III) chloride. The number of moles of AgCl precipitated would be :

|  |  |  |  |
| --- | --- | --- | --- |
| a) 0.001 | b) 0.002 | c) 0.003 | d) 0.01 |

1. The correct order of the stoichiometries of AgCl formed when AgNO3 in excess is treated with the complexes : CoCl3. 6 NH3 ; CoCl3. 5 NH3 ; CoCl3. 4 NH3 , respectively are :

|  |  |
| --- | --- |
| a) 1 AgCl ; 3 AgCl ; 2 AgCl | b) 3 AgCl ; 1 AgCl ; 2 AgCl |
| c) 3 AgCl ; 2 AgCl ; 1 AgCl | d) 2 AgCl ; 3 AgCl ; 1 AgCl |

CO-ORDINATION COMPOUNDS Page No. 6

1. The correct statement with respect to the complexes Ni(CO)4 and [Ni (CN)4] – 2 is :
2. Nickel is in the same oxidation state in both.
3. Both have tetrahedral geometry.
4. Both have square planar geometry.
5. Have tetrahedral and square planar geometry respectively.
6. The complex which has the highest magnetic moment among the following is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Co F6] – 3 | b) [Co (NH3)6] 3 + | c) [Ni (NH3)4] 2 + | d) [Ni (CN)4] – 2 |

1. Among [Ni(CO)4] ; [Ni (CN)4] – 2 and Ni(CO)4 and [Ni Cl4] – 2 species, the hybridization states at the Ni atom are respectively:

|  |  |  |  |
| --- | --- | --- | --- |
| a) sp3 , dsp2 , dsp2 | b) sp3 , dsp2 , sp3 | c) sp3 , sp3 , dsp2 | d) dsp2 , sp3 , sp3 |

1. The Hybridisation involved in the complex [Ni (CN)4] – 2 is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) d2sp2 | b) d2sp3 | c) dsp2 | d) sp3 |

1. Which of the following complexes are not correctly matched with the Hybridisation of their central metal atom?

(i) Ni(CO)4 = sp3 (ii) [Ni (CN)4] – 2 = sp3 (iii) [Co F6] – 3 = d2sp3 (iv) [Fe (CN)6] – 3 = sp3d2

Select the correct options :

|  |  |  |  |
| --- | --- | --- | --- |
| a) (i) , (ii) | b) (i) , (iii) | c) (ii) , (iv) | d) (ii) , (iii) , (iv) |

1. Pick out the correct statement with respect to [Fe (CN)6] – 3 :
2. It is sp3d2 hybridized and octahedral.
3. It is sp3d2 hybridized and tetrahedral.
4. It is d2sp3 hybridized and octahedral.
5. It is dsp2 hybridized and square planar.
6. The pair having the same magnetic moment is :

|  |  |
| --- | --- |
| a) [Cr (H2O)6] 2+and [Co Cl4] 2 – | b) [Cr (H2O)6] 2+and [Fe (H2O)6] 2+ |
| c) [Mn (H2O)6] 2+and [Cr (H2O)6] 2+ | d) [Co Cl4] 2 – and [Fe (H2O)6] 2+ |

1. The pairs of metal ions that can give a spin only magnetic moment of 3.9 B.M. for the complex

[Mn (H2O)6]Cl2 is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) Cr2+ and Mn2+ | b) V2+  and Co2+ | c) V2+  and Fe2+ | d) Co2+  and Fe2+ |

**Answers**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1. c | 1. c | 1. d | 1. b | 1. a | 1. d | 1. b | 1. c |
| 1. b | 1. d | 1. d | 1. a | 1. d | 1. b | 1. c | 1. d |
| 1. b | 1. b | 1. c | 1. b | 1. a | 1. c | 1. d | 1. a |
| 1. b | 1. c | 1. d | 1. c | 1. b | 1. b |  |  |

CO-ORDINATION COMPOUNDS Page No. 7

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| **Karan Arora**  **R.L. Institute M: 9416974837**  **Class : XII**  **“CO-ORDINATION COMPOUNDS”** |

**Level – 3**

1. The magnetic moment of an octahedral homoleptic Mn(II) complex is 5.9 B.M. The suitable ligand for this complex is :

|  |  |
| --- | --- |
| a) CN – | b) NCS – |
| c) CO | d) ethylenediamine |

1. Among [Ni(CO)4] ; [Ni Cl4] – 2 ; Na3 [Co F6] ; Na2O2 and CSO2 the total number of paramagnetic compound is :

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

1. Hybridization, shape and magnetic moment of K3 [Co(CO3)­3] is:

|  |  |
| --- | --- |
| a) d2sp3 , octahedral , 4.9 B.M. | b) sp3d2 , octahedral , 4.9 B.M. |
| c) dsp2 , square planar , 4.9 B.M. | d) sp3 , tetrahedral , 4.9 B.M. |

1. Consider the following complex ions : P = [Fe F6] – 3 ; Q = [V (H­2O)6] 2+ ; R = [Fe (H­2O)6] 2+

The correct order of the complex ions, according to their spin magnetic moment is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) R < Q < P | b) Q < R < P | c) R < P < Q | d) Q < P < R |

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

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Cu (NH3)4] 2+ | b) [Ni (CN)4] – 2 | c) TiCl4 | d) [CoCl6] – 4 |

1. Which of the following is wrongly matched?

|  |  |
| --- | --- |
| a) [Cu (NH3)4] 2+ = square planar | b) [Ni (CO)4] = neutral ligand |
| c) [Fe (CN)6] – 3 = sp3d2 | d) [Co (en)3]3+ = follows EAN rule |

1. Geometrical shapes of the complexes formed by the reaction of Ni2+ with Cl – , CN – and H2O , respectively:
2. Octahedral , Tetrahedral and square planar.
3. Tetrahedral , square planar and octahedral.
4. Square planar , Tetrahedral and octahedral.
5. Octahedral , square planar and tetrahedral.
6. Which of the following facts about the [Cr(NH3)6] Cl3 is wrong?
7. The complex is paramagnetic.
8. The complex is an outer orbital complex.
9. The complex gives white precipitate with silver nitrate solution.
10. The complex involves d2sp3 hybridization and is octahedral in shape.

CO-ORDINATION COMPOUNDS Page No. 8

1. Complete removal of both of the axial ligands (along the z-axis) from an octahedral complex leads to which of the following splitting patterns?

|  |  |  |  |
| --- | --- | --- | --- |
| a) | b) | c) | d) |

1. Which of the following complex has minimum magnitude of O ?

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Cr (CN)6] 3 – | b) [Co (NH3)6] 3+ | c) [Co Cl6] 3 – | d) [Cr (H2O)6] 3+ |

1. What is the correct electronic configuration of the central atom in K4 [Fe (CN)6] based on crystal field theory?

|  |  |  |  |
| --- | --- | --- | --- |
| a) | b) | c) | d) |

1. Crystal field stabilizing energy for high spin d4 octahedral complex is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) – 0.6 O | b) – 1.8 O | c) – 1.8 O + P | d) – 1.2 O |

1. Low spin complex of d6 cation in an octahedral field will have the following energy:

|  |  |  |  |
| --- | --- | --- | --- |
| a) – O + 2 P | b) – O + P | c) – O + P | d) – O + 3 P |

1. Two complexes: A = [Cr (H2O)6 Cl3] ; B = [Cr (NH3)6]Cl3 are violet and yellow colored respectively. The incorrect statement regarding them is :
2. O value of A is less than that of B.
3. O values of A and B are calculated from the energies of violet and yellow light.
4. Both absorb energies corresponding to their complementary colours.
5. Both are paramagnetic with three unpaired electrons.
6. The metal d-orbitals that are directly facing the ligands in K3 [Co (CN)6] are :

|  |  |  |  |
| --- | --- | --- | --- |
| a) dxz , dyz and dz2 | b) dxy , dxz and dyz | c) dxy and dx2-y2 | d) dx2-y2 and dz2 |

1. The magnitude of crystal field stabilizing energy in tetrahedral complexes is considerably less than in the octahedral field because:
2. There are only 4 ligands instead of 6 so the ligand field is only 2/3 the size hence the t is only 2/3 the size.
3. The direction of the orbitals does not coincide with the direction of the ligands. This reduces the crystal field stabilization energy (t) by further 2/3.
4. Both points (a) and (b) are correct.
5. Both points (a) and (b) are wrong.
6. Which of the following complex ions is expected to absorb visible light?

|  |  |
| --- | --- |
| a) [Ti (en)2 (NH3)2]4+ | b) [Cr (NH3)6] 3+ |
| c) [Zn (NH3)6] 2+ | d) [Sc (H2O)3 (NH3)3]3+ |

1. Which of the following ligand is capable of forming a low spin as well as a high spin complex?

|  |  |  |  |
| --- | --- | --- | --- |
| a) CO | b) F – | c) NH3 | d) CN – |

1. Which of the following shall form an octahedral complex?

|  |  |  |  |
| --- | --- | --- | --- |
| a) d4 (low spin) | b) d8 (high spin) | c) d6 (low spin) | d) all of these |

CO-ORDINATION COMPOUNDS Page No. 9

1. Coordination number of Cr is six. A complex ion of Cr with , en and superoxide ion has the formula [Cr(C2O4)x (en)y (O2)z] – . The ratio x : y : z will be :

|  |  |  |  |
| --- | --- | --- | --- |
| a) 1 : 1 : 1 | b) 1 : 1 : 2 | c) 1 : 2 : 2 | d) 2 : 1 : 1 |

1. [Cr (H2O)6] Cl3 has a magnetic moment of 3.83 B.M. The correct distribution of 3d electrons in the chromium of the complex is :

|  |  |
| --- | --- |
| a) , , | b) , , |
| c) , , | d) , , |

1. The correct complex of a metal ion M3+ with four monodentate ligands L1 , L2 , L3 and L4 absorbs wavelength in the region of red, green , yellow and blue respectively. The increasing order of ligand strength of the four ligands is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) L1 < L2 L­3­ < L4 | b) L4 < L3 L­2­ < L1 | c) L1 < L3 L­2­ < L4 | d) L3 < L2 L­4­ < L1 |

1. Among the following complexes, the one which shows zero crystal field stabilizing energy (CFSE) is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) [Mn (H2O)6] 3+ | b) [Fe (H2O)6] 3+ | c) [Co (H2O)6] 2+ | d) [Co (H2O)6] 3+ |

1. The geometry an diamagnetic behavior of the complex [Ni(CO)4] are :
2. Square planar geometry and paramagnetic.
3. Tetrahedral geometry and diamagnetic.
4. Square planar geometry and diamagnetic.
5. Tetrahedral geometry and paramagnetic
6. The denticity of an organic ligand , biuret is :

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

1. Indicate the complex/complex ions which do not show any geometrical isomerism:

|  |  |
| --- | --- |
| a) [Co Cl2 (en)2] | b) [Co (CN)5 (NC)] – 3 |
| c) [Co (NH3)3 (NO2)3] | d) [Co (NH3)4 Cl2]+ |

1. Which of the following metal complex is most stable?

|  |  |
| --- | --- |
| a) [Co (en) (NH3)4 ]Cl2 | b) [Co (en)3]Cl3 |
| c) [Co (en)2 (NH3)2 ]Cl2 | d) [Co (NH3)6 ]Cl2] |

1. Consider the complex ion , trans-[Co (en)2 Cl2]+ (A) and cis-[Co (en)2 Cl2]+ (B). The correct statement regarding them is :
2. Both A and B cannot be optically active.
3. A can be optically active but B cannot be optically active.
4. Both A and B can be optically active.
5. A cannot be optically active but B can be optically active.
6. The complex that shows optically activity is:

|  |  |
| --- | --- |
| a) trans-[Cr (Cl2) (ox)2] – 3 | b) trans-[Fe (NH3)2 (CN)4] – |
| c) cis-[Fe (NH3)2 (CN)4] – | d) cis-[Cr (Cl2) (ox)2] – 3 |

1. Complex A has composition of H12O6Cl3Cr. If the complex on treatment with conc. H2SO4 loses 13.5 % of its original mass, the correct molecular formula of A is :

|  |  |
| --- | --- |
| a) [Cr (H2O)6] Cl3 | b) [Cr (H2O)3 Cl3]. 3H2O |
| c) [Cr (H2O)5 Cl] Cl2 . H2O | d) [Cr (H2O)4 Cl2] Cl. 2H2O |

1. The ion that is not expected to show isomerism is :

|  |  |
| --- | --- |
| a) [Ni (NH3)4 (H2O)2]+ | b) [Ni (en)2]2+ |
| c) [Ni (NH3)2 Cl2] | d) [Pt (NH3)2 Cl2] |

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1. The isomers of [Co (NH3)4 Cl2] that has/have a Cl-Co-Cl angle of 90 is/are :

|  |  |
| --- | --- |
| a) meridional and trans | b) cis and trans |
| c) trans only | d) cis only |

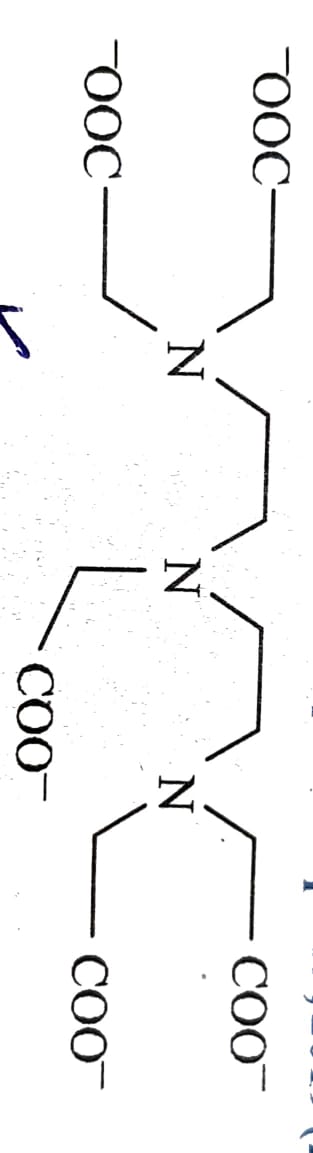
1. The complex that can show fac- and mer- isomers is :

|  |  |
| --- | --- |
| a) [Co (NH3)4 Cl2]+ | b) [Pt (NH3)2 Cl2] |
| c) [Co Cl2 (en)2] | d) [Co (NH3)3 (NO2)3] |

1. The total number of possible isomers for square planar [Pt (Cl) (NO2) (NO3) (SCN)] – 2 is :

|  |  |  |  |
| --- | --- | --- | --- |
| a) 16 | b) 12 | c) 8 | d) 24 |

1. The maximum possible denticities of a ligand given below towards a common transition and inner-transition metal ions, respectively are :



|  |  |  |  |
| --- | --- | --- | --- |
| a) 8 and 6 | b) 6 and 8 | c) 6 and 6 | d) 8 and 8 |

**Answers**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1. b | 1. b | 1. b | 1. b | 1. a | 1. c | 1. b | 1. b |
| 1. a | 1. c | 1. c | 1. a | 1. d | 1. b | 1. d | 1. c |
| 1. b | 1. c | 1. c | 1. b | 1. a | 1. c | 1. b | 1. b |
| 1. a | 1. b | 1. b | 1. d | 1. d | 1. d | 1. c | 1. d |
| 1. d | 1. b | 1. b |  |  |  |  |  |

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