



Revision Chemistry

A complete Revision material for class XII as per new syllabus of NCERT



Revision Booket-3

1. - The p -Block Elements (8 marks)

[As per CBSE papers in The p -Block Elements chapter 4-5 Marks questions are based on Reasoning , 2 marks questions are Structure based & 2 marks Reactions based .]

2. d & f block Elements (5 marks)

[As per CBSE papers in The d & f block -Block Elements chapter 3 Marks questions are based on Reasoning , 2 marks Reactions based .]

3. COORDINATION COMPOUNDS (3 marks)

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Unit: 7- The p –Block Elements (8 marks)

I. Account for the following

1. Ammonia has higher boiling point than Phosphine.
2. Bi(V) is a strong oxidizing agent than Sb (V)
3. + 3 oxidation state becomes more and more stable from As to Bi in the group
4. The stability of +3 state increases down the group in group 15 of the periodic table.
5. The +5 oxidation state becomes less stable down the group 15 of the periodic table
6. Phosphorus shows greater tendency for catenation than Nitrogen.
7. Phosphorous, P_4 is much more reactive than Nitrogen N_2
8. All the bonds in the molecules of PCl_5 are not equal.
9. NH_3 is stronger base than PH_3 .
10. PH_3 is weaker base than NH_3
11. PH_3 forms bubbles when passed slowly in water but NH_3 dissolves.
12. Nitrogen does not form pentahalides.
13. Tendency to form pentahalides decreases down the group in group 15 of the periodic table
14. In solid state PCl_5 exists as Ionic compound.
15. PCl_4^+ is likely to exist but PCl_4^- is likely not to exist.
16. NH_3 act as ligand.(Lewis base)
17. Ammonia(NH_3) has greater affinity for protons than phosphine PH_3
18. In the structure of HNO_3 , the N-O bond (121pm) is shorter than N-OH bond(140pm)
19. The N – O bond in NO_2^- is shorter than the N – O bond in NO_3^-
20. NCl_3 is an endothermic compound while NF_3 is an exothermic one
21. Red phosphorous is less reactive than white Phosphorous
22. CN^- ion is known but CP^- ion is not known.
23. H_3PO_2 and H_3PO_3 act as as good reducing agents while H_3PO_4 does not.
24. NO_2 is coloured but N_2O_4 is colourless.
25. NO_2 dimerises to form N_2O_4
26. Nitric oxide becomes brown when released in air.
27. Nitric oxide is paramagnetic in gaseous state but the solid obtained on cooling it is diamagnetic
28. Bond angle in PH_4^+ is higher than that in PH_3
29. Pentahalides of group 15 are more Covalent than trihalides
30. The first ionization energy of nitrogen is greater than oxygen.
31. H_3PO_3 is diprotic acid.
32. Nitrogen exists as diatomic molecule and phosphorus as P_4 .
33. NH_3 is basic while BiH_3 is only feebly basic
34. PF_5 is known while NF_5 is not known.
35. Sulphur vapours exhibits paramagnetism.
36. In solution of sulphuric acid in water the $K_{a2} \ll K_{a1}$.
37. Sulphur shows greater tendency for catenation than selenium
38. Sulphur has greater tendency for catenation than oxygen.
39. H_2O is a liquid while H_2S is a gas
40. H_2S is less acidic than H_2Te .
41. The negative value of electron gain enthalpy of oxygen atom is less than that of sulphur
42. SF_6 is much less reactive than SF_4

43. All the bonds in the molecules of SF₄ are not equal
44. SF₆ is kinetically an inert substance.
45. H₂S is more acidic than H₂O.
46. OF₆ is not known.
47. SF₄ is easily hydrolysed, SF₆ is not easily hydrolysed
48. OF₂ should be called oxygen fluoride and not fluorine oxide
49. Dioxygen is a gas but Sulphur is a solid
50. Oxygen molecule has formula O₂ while Sulphur S₈
51. Oxygen generally exhibit oxidation state of -2 only whereas other members of the family exhibit +2, +4, +6 oxidation states also.
52. H₂S acts as only reducing agent but SO₂ acts as a reducing as well as an oxidizing agent.
53. In spite of similar electronegativity, oxygen forms hydrogen bonding while chlorine does not.
54. The increasing order of acidic strength of HX varies in the order H₂O < H₂S < H₂Se < H₂Te.
55. SCl₆ is not known but SF₆ is known.
56. Ozone (O₃) act as a powerful oxidising agent.
57. Ozone is thermodynamically less stable than oxygen.
58. Fluorine does not exhibit any positive oxidation state.
59. F₂ is most reactive of all the four common halogens
60. F₂ is a stronger oxidising agent than Cl₂
61. O₂ & F₂ both stabilize higher oxidation states of metals but O₂ exceeds F₂ in doing so.
62. When HCl reacts with finely powdered iron, it forms ferrous chloride and not ferric chloride.
63. HF has higher boiling point than HCl.
64. ICl is more reactive than Cl₂.
65. Bond dissociation energy of F₂ is less than Cl₂
66. HI in aqueous solution is strong acid than HF.
67. The negative value of electron gain enthalpy of fluorine is less than that of Chlorine.
68. Fluorine never acts as the central atom in the polyatomic interhalogen compounds
69. ClF₃ molecule has a T-shaped structure and not a trigonal planar one.
70. Fluorine forms the largest number of interhalogen compounds among halogens.
71. Halogens are coloured
72. F shows oxidation state of -1 only whereas other halogens exhibit +1, +3, +5, +7 Ox. states also.
73. ClF₃ exists but FCl₃ does not.
74. Halogens are strong oxidizing agent
75. Most of the reactions of fluorine are exothermic
76. Fluorine forms only one oxoacid, HOF.
77. The acidic strength of oxoacids of halogens varies in the order HOF > HOCl > HOBr > HOI.
78. The acidic strength of oxoacids of halogens varies in the order: HClO₄ > HClO₃ > HClO₂ > HClO
79. Chlorine is a powerful bleaching agent
80. Metal fluorides are more ionic than its chlorides.
81. Perchloric acid is stronger than sulphuric acid
82. The acidic strength decreases in the order HCl > H₂S > PH₃
83. Helium is used in diving apparatus
84. XeF₂ has a linear structure & not a bent angular structure
85. Of the noble gases only Xenon is known to form real chemical compounds

86. No Chemical compound of helium is known.

87. Xe does not forms compounds such as XeF_3 and XeF_5

88. Helium is used for inflating aeroplane tyres.

89. Noble gases are mostly chemically inert.

90. Structures of Xenon Flourides cannot be explained on the basis of valence bond approach.

Draw the Structure of following

- | | | |
|----------------------|------------------------------------|--------------------------------------|
| 1. XeF_2 | 17. PCl_5 (gaseous state) | 33. N_2O_5 . |
| 2. XeF_4 | 18. PCl_5 (solid state) | 34. HClO_4 , |
| 3. XeF_6 , | 19. PH_3 | 35. HClO_3 , |
| 4. XeOF_4 | 20. SF_6 | 36. HClO_2 , |
| 5. XeO_3 | 21. SF_4 | 37. HClO , |
| 6. ClF_3 | 22. H_2S | 38. H_3PO_4 , |
| 7. BrF_3 | 23. H_2O | 39. H_3PO_3 , |
| 8. IF_3 | 24. white phosphorus | 40. H_3PO_2 , |
| 9. ICl_3 | 25. Red phosphorus. | 41. $\text{H}_3\text{P}_2\text{O}_7$ |
| 10. ClF_5 | 26. S_6 | 42. $\text{H}_3\text{P}_2\text{O}_6$ |
| 11. BrF_5 | 27. S_8 | 43. $\text{H}_3\text{P}_2\text{O}_5$ |
| 12. IF_5 | 28. N_2O , | 44. $(\text{HPO}_3)_3$. |
| 13. IF_7 | 29. NO , | 45. H_2SO_4 |
| 14. O_3 , | 30. N_2O_3 , | 46. H_2SO_3 |
| 15. ClO_4^- | 31. NO_2 | 47. $\text{H}_2\text{S}_2\text{O}_7$ |
| 16. SO_2 | 32. N_2O_4 , | 48. $\text{H}_2\text{S}_2\text{O}_8$ |

Learn the Following Reactions of P-Block elements.

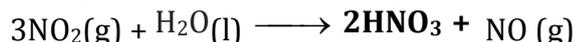
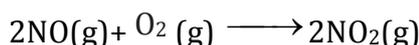
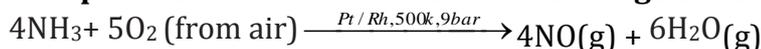
1. **Thermal decomposition of sodium or barium azide** $\text{Ba}(\text{N}_3)_2 \rightarrow \text{Ba} + 3\text{N}_2$

2. **Thermal decomposition of sodium azide** $2\text{NaN}_3 \rightarrow 2\text{Na} + 3\text{N}_2$

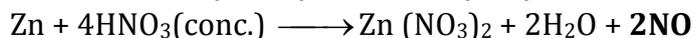
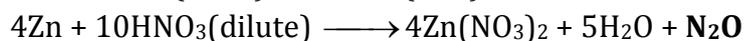
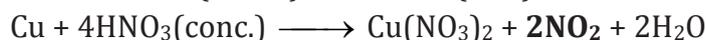
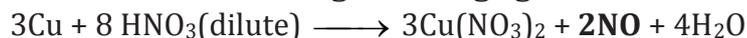
3. **Manufacture of ammonia** (Haber's Process)

$\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \xrightarrow{773\text{K}} 2\text{NH}_3(\text{g}); \Delta_r H^\ominus = -46.1 \text{ kJmol}^{-1}$, In accordance with Le Chatelier's principle, high pressure would favour the formation of ammonia. The optimum conditions for the production of ammonia are a pressure of $200 \times 10^5 \text{ Pa}$ (about 200 atm), a temperature of $\sim 700 \text{ K}$ and the use of a catalyst such as iron oxide with small amounts of K_2O and Al_2O_3 to increase the rate of attainment of equilibrium

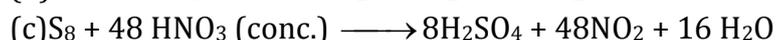
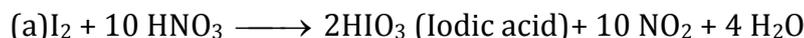
4. **Preparation of nitric acid obtained on large scale by Ostwald process**



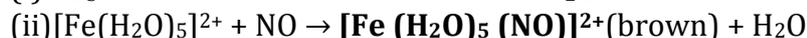
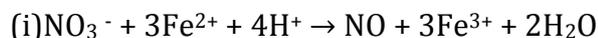
5. **Conc. HNO_3 is a strong oxidising agent and attacks most metals except metals like Au & Pt**



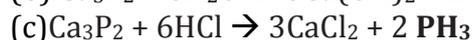
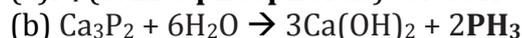
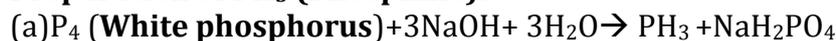
6. **Concentrated nitric acid oxidises non-metals and their compounds.**



7. **Brown Ring Test:**



8. Preparation of PH₃ (Phosphine):



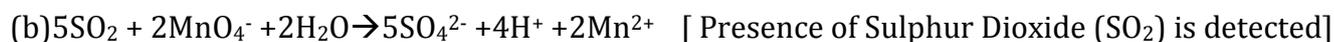
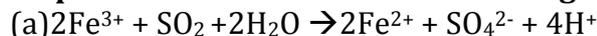
9. Reaction of PH₃ with mercuric chloride solution $3\text{HgCl}_2 + 2\text{PH}_3 \rightarrow \text{Hg}_3\text{P}_2 + 6\text{HCl}$

10. Disproportionation reaction of H₃PO₃: $4\text{H}_3\text{PO}_3 \xrightarrow{\text{Heat}} 3\text{H}_3\text{PO}_4 + \text{PH}_3$

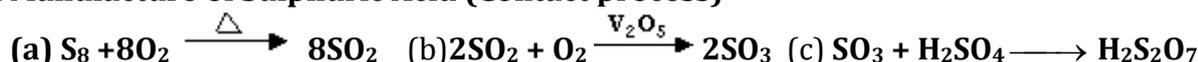
11. Ozone (O₃) act as a powerful oxidising agent. ($\text{O}_3 \rightarrow \text{O}_2 + \text{O}$)

12. Quantitative method for estimating O₃ gas: $\text{O}_3 + 2\text{I}^- + \text{H}_2\text{O} \rightarrow \text{O}_2 + \text{I}_2 (\text{Voilet vapours}) + 2\text{OH}^-$

13. Sulphur dioxide behaves as a reducing agent.

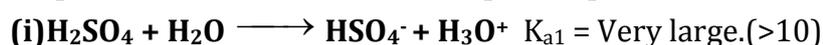


14. Manufacture of Sulphuric Acid (Contact process)



The key step in the manufacture of H₂SO₄ is the catalytic oxidation of SO₂ with O₂ to give SO₃ in the presence of V₂O₅ (catalyst). The reaction is exothermic, reversible and the forward reaction leads to a decrease in volume. Therefore, low temperature and high pressure are the favourable conditions for maximum yield. But the temperature should not be very low otherwise rate of reaction will become slow. In practice, the plant is operated at a pressure of 2 bar and a temperature of 720 K

15. Sulphuric acid ionises in two steps in aqueous solution



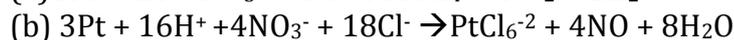
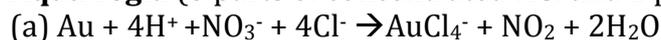
In solution of sulphuric acid in water the $K_{a2} \ll K_{a1}$. because sulphuric acid [H₂SO₄] is a dibasic acid, it ionizes in 2 steps. K_{a2} is less than K_{a1} because the negatively charged HSO₄⁻ ion has much less tendency to donate a proton to H₂O as compared to H₂SO₄

16. Concentrated H₂SO₄ is a strong dehydrating agent. $\text{C}_{12}\text{H}_{22}\text{O}_{11} \xrightarrow{\text{Conc. H}_2\text{SO}_4} 12\text{C}(\text{Black}) + 11\text{H}_2\text{O}$

17. Reaction with Cold and dilute NaOH alkalies: $2\text{NaOH}(\text{Cold and dilute}) + \text{Cl}_2 \rightarrow \text{NaCl} + \text{NaOCl} + \text{H}_2\text{O}$

18. Reaction with Hot & conc. NaOH alkalies: $6\text{NaOH}(\text{Hot \& conc}) + 3\text{Cl}_2 \rightarrow 5\text{NaCl} + \text{NaClO}_3 + 3\text{H}_2\text{O}$

19. Aqua regia (3 parts of concentrated HCl and 1 part of concentrated HNO₃ are mixed)



20. When HCl reacts with finely powdered iron, it forms ferrous chloride and not ferric

chloride. $\text{Fe} + 2\text{HCl} \rightarrow \text{FeCl}_2 + \text{H}_2$. Liberation of hydrogen prevents the formation of ferric chloride.

21. $\text{XeF}_6 + 3\text{H}_2\text{O}(\text{excess}) \rightarrow \text{XeO}_3 + 6\text{HF}$ (Complete hydrolysis)

22. $\text{XeF}_6 + 2\text{H}_2\text{O} \rightarrow \text{XeO}_2\text{F}_2 + 4\text{HF}$ (Partial hydrolysis)

23. $\text{XeF}_6 + \text{H}_2\text{O} \rightarrow \text{XeOF}_4 + 2\text{HF}$ (Partial hydrolysis)

24. $\text{XeF}_2 + 2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{Xe}(\text{g}) + 4\text{HF}(\text{aq}) + \text{O}_2(\text{g})$

25. $6\text{XeF}_4 + 12\text{H}_2\text{O} \rightarrow 4\text{Xe} + 2\text{XeO}_3 + 24\text{HF} + 3\text{O}_2$

Unit: 8 :d & f block Elements 5 marks

Assign Reason for the following:-

1. Zn, Cd and Hg are not considered as transition elements.
2. Scandium is a transition element but Zinc is not.
3. Transition elements exhibit higher enthalpies of atomization.
4. Transition metals show paramagnetic behaviour. .
5. Transition metal ions form complex ions.
6. Transition metals form interstitial compounds.
7. Most of the transition metals form alloys
8. Transition element form generally coloured compounds
9. Transition element show variable oxidation state.
10. A transition metal exhibit higher oxidation state in oxides and fluorides
11. There occurs much more frequent metal –metal bonding in compounds of heavy transition elements(3rd series).
12. Most of the transition metals and their compounds possess catalytic properties.
13. Chromium group elements have highest melting points.
14. In general the atomic radii of transition elements decrease with atomic number in the given series.
15. Members of second (4d) and the third (5d) series in each group of transition elements have similar radii
16. Zr and Hf exhibit similar properties
17. There is in general increase in density of element from titanium to copper.
18. Mn^{2+} exhibits maximum paramagnetism
19. Zn^{2+} salts are white ,but Cu^{2+} are coloured.
20. Out of Ag_2SO_4 , CuF_2 , MgF_2 and $CuCl$ which compound will be coloured and why?
21. Which of the following ions will exhibit colour in aqueous solution: Ti^{3+} or Sc^{3+} & why
22. E^0 value for the Mn^{3+}/Mn^{2+} couple much more positive than that for Cr^{3+}/Cr^{2+}
23. Of the d^4 species, Cr^{2+} is strongly reducing while manganese(III) is strongly oxidising.
24. Cr^{2+} is a stronger reducing agent Fe^{2+} .
25. CrO_4^{2-} is a strong oxidizing agent while MnO_4^- is not.
26. Cu^+ ion is not stable in aqueous solutions
27. The greatest number of oxidation states are exhibited by the elements in the middle of transition series. .
28. The third ionization enthalpy of manganese (z=25) is exceptionally high.
29. Cu^+ ion has d^{10} configuration while Cu^{2+} has d^9 configuration, still Cu^{2+} is stable in aqueous solutions.
30. E^0 value for the Mn^{2+}/Mn much more than expected.
31. E^0 value for the Cu^{2+}/Cu is positive .
32. Although Co^{2+} ion appears to be stable ,it is easily oxidized to Co^{3+} ion in the presence of a strong ligand.
33. The increasing oxidising power of oxoanions are in the $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$
34. The lowest oxide of transition metal is basic, the highest is amphoteric/acidic.
35. MnO is basic while Mn_2O_7 is acidic in nature.
36. Unlike Cr^{3+} , Mn^{2+} , Fe^{3+} and the subsequent other M^{2+} ions of the 3d series of elements ,the 4d and the 5d series metals generally do not form stable cationic species.
37. Metal –metal bonding is more frequent for the 4d & 5d series of transition metals than that for the series.
38. Chromium is a typical hard metal while mercury is a liquid.
39. Cobalt (II) is stable in aqueous solution but in the presence of complexing reagents it is easily oxidized.[
40. $K_2[PtCl_6]$ is well known compound whereas the corresponding Ni compound is not known.

41. In the titration of FeSO_4 with KMnO_4 in acidic medium, why is dil H_2SO_4 used instead of dil HCl .
42. KMnO_4 is a Strong Oxidizing Agent in an acidic medium than in alkaline Solution.
43. Chemistry of all the lanthanoids are quite similar.
44. Size of trivalent lanthanoid cations decreases with increase in the atomic number.
45. It is difficult to separate lanthanoid elements in pure state.
46. Ce^{4+} in aqueous solution is a good oxidising agent.
47. Ce^{3+} can be easily oxidized to Ce^{4+} .
48. d-block elements exhibit more oxidation states than f block elements.
49. Actinoids contraction is greater from element to element than lanthanoid contraction.
50. The actinoids exhibit a larger number of oxidation states than the corresponding lanthanoids
51. La^{3+} and Lu^{3+} do not show any colour in solutions
52. The chemistry of the actinoid elements is not so smooth as that of the lanthanoids
53. There is a greater horizontal similarity in the properties of the transition elements than of the main group elements.

Answer the following:-

1. Name the oxometal anions of the first series of the transition metals in which the metal exhibits the oxidation state equal to its group number.
2. What may be the possible oxidation states of transition metals with the following electronic configuration in the ground states in their atoms? (i) $3d^34s^2$ (ii) $3d^54s^2$ (iii) $3d^64s^2$
3. Describe How Potassium dichromate is made from Chromite ore. Give the equations for the Chemical reactions involve.
4. The chromates and dichromates are interconvertible in aqueous solution depending upon pH of the solution. Give reactions
5. Describe How Potassium permanganate is made from pyrolusite (MnO_2). Write the Chemical equations for the involved reactions.
6. What is meant by 'disproportionation' of an oxidation state? Give Two example.
7. Compare the chemistry of lanthanoids with that of the actinoids with reference to (i) electronic configuration (ii) Oxidation state (iii) atomic size and ionic size (iv) chemical reactivity
8. What is Lanthanoid contraction? Give its cause. What are its Consequences?
9. Name the members of the lanthanoid series which exhibit +4 oxidation states and those which exhibit +2 oxidation states.
10. Use Hund's rule to derive the electronic configuration of Ce^{3+} ion, and calculate its magnetic moment on the basis of 'spin-only' formula.
11. Name an important alloy which contains some of the lanthanoid metals. Mention its uses.

Complete the reaction:

- 1) $\text{Cu}^{+2} + \text{I}^- \rightarrow$
- 2) $\text{Cr}_2\text{O}_7^{2-} + \text{I}^- + \text{H}^+ \rightarrow$
- 3) $\text{Cr}_2\text{O}_7^{2-} + \text{H}_2\text{S} + \text{H}^+ \rightarrow$
- 4) $\text{Cr}_2\text{O}_7^{2-} + \text{Sn}^{2+} + \text{H}^+ \rightarrow$
- 5) $\text{Cr}_2\text{O}_7^{2-} + \text{Fe}^{2+} + \text{H}^+ \rightarrow$
- 6) $\text{Cr}_2\text{O}_7^{2-} + \text{H}^+ + \text{C}_2\text{O}_4^{2-} \rightarrow$
- 7) $\text{MnO}_4^- + \text{H}^+ + \text{C}_2\text{O}_4^{2-} \rightarrow$
- 8) $\text{MnO}_4^- + \text{H}^+ + \text{Fe}^{2+} \rightarrow$
- 9) $\text{MnO}_4^- + \text{H}^+ + \text{I}^- \rightarrow$
- 10) $\text{NO}_2^- + \text{MnO}_4^- + \text{H}^+ \rightarrow$
- 11) $\text{I}^- + \text{MnO}_4^- + \text{H}^+ \rightarrow$
- 12) $\text{H}_2\text{S} + \text{MnO}_4^- + \text{H}^+ \rightarrow$
- 13) $\text{SO}_3^{2-} + \text{MnO}_4^- + \text{H}^+ \rightarrow$
- 14) $\text{MnO}_4^- + \text{H}_2\text{O} + \text{I}^- \rightarrow$
- 15) $\text{MnO}_4^- + \text{S}_2\text{O}_3^{2-} + \text{H}_2\text{O} \rightarrow$

Unit: 9:- COORDINATION COMPOUNDS (3 marks)

1. What is meant by denticity, Chelating and ambidentate ligands Give two examples for each.? [2008,2009,2011]
2. Using IUPAC norms write the formulae for the following:
 - a. potassiumtri(oxalato) chromate (III)
 - b. pentaamminenitrito-O-cobalt (III)
 - c. iron(III) hexacyanoferrate(II)
 - d. tetraammineaquachloridocobalt (III) chloride
 - e. tris(ethane-1,2-diamine) chromium(III) chloride
 - f. amminebromidochloridonitrito-N-platinate(II)
 - g. dichloridobis(ethane-1,2-diamine)platinum(IV) nitrate
3. Write the IUPAC names, Specify the coordination number of the central Atom of the following:
 - a. $[\text{Fe}(\text{en})_2\text{Cl}_2]\text{Cl}$ [2009]
 - b. $[\text{CoCl}_4]^{2-}$ [2010]
 - c. $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ [2008]
 - d. $[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]^-$ [2010]
 - e. $\text{K}_2[\text{PdCl}_4]$ [2008]
 - f. $[\text{Ni}(\text{CN})_4]^{2-}$ [2010]
4. Explain giving examples (i) Linkage Isomerism. [2009 (ii) Ionization isomerism (iii) Coordination isomerism. (iv) Solvate (Hydrate) isomerism
5. Give IUPAC name of an ionization isomer of $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$. & Linkage isomer of $[\text{Co}(\text{NH}_3)_5\text{NO}_2]^+$.
6. Name the type of isomerism exhibited by the following isomers. $[\text{Pt}(\text{NH}_3)_4]$ $[\text{PtCl}_6]$ & $[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]$ $[\text{PtCl}_4]$
7. Give evidence that $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Cl}$ are ionization isomers.
8. Why is geometrical isomerism not possible in tetrahedral complexes
9. Draw structures of geometrical isomers of $[\text{Fe}(\text{NH}_3)_2(\text{CN})_4]^-$ [2011]
10. Indicate the types of isomerism exhibited by the following complexes and draw the structures for these isomers: (i) $\text{K}[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]$ (ii) $[\text{Co}(\text{en})_3]\text{Cl}_3$ [2011] (iii) $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)](\text{NO}_3)_2$ (iv) $[\text{Pt}(\text{NH}_3)(\text{H}_2\text{O})\text{Cl}_2]$
11. How many geometrical isomers are possible in the following coordination entities? (i) $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$ (ii) $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$ [2008] (iii) $[\text{Pt}(\text{NH}_3)(\text{Br})(\text{Cl})(\text{py})]$
12. Draw the structures of optical isomers of: (i) $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$ (ii) $[\text{PtCl}_2(\text{en})_2]^{2+}$ (iii) $[\text{Cr}(\text{NH}_3)_2\text{Cl}_2(\text{en})]^+$
13. Draw all the isomers (geometrical and optical) of: (i) $[\text{CoCl}_2(\text{en})_2]^+$ [2008] (ii) $[\text{Co}(\text{NH}_3)\text{Cl}(\text{en})_2]^{2+}$ (iii) $[\text{Co}(\text{NH}_3)_2\text{Cl}_2(\text{en})]^+$
14. Write the name & Using VBT Predict the Magnetic behaviour, Hybridization, Shape of following. Also predict whether it is inner or outer orbital complex in case of octahedral complexes.: $[\text{Ag}(\text{NH}_3)_2]^+$, $[\text{CoF}_6]^{3-}$, $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Cr}(\text{NH}_3)_6]^{3+}$ [2009] $[\text{FeF}_6]^{3-}$, $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ [2007] $[\text{Fe}(\text{CN})_6]^{3-}$, $[\text{Fe}(\text{CN})_6]^{4-}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$ [2007,2008,2009] $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$, $[\text{NiCl}_4]^{2-}$ [2007,2009] $[\text{Ni}(\text{CN})_4]^{2-}$ [2009,2010] $[\text{Ni}(\text{CO})_4]$ [2009] $[\text{CoF}_4]^{2-}$, $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$, $[\text{Cr}(\text{H}_2\text{O})_2(\text{C}_2\text{O}_4)_2]^-$ [2010] $[\text{CuCl}_4]^{2-}$, $[\text{Fe}(\text{en})_2\text{Cl}_2]$, $[\text{Zn}(\text{H}_2\text{O})_6]^{2+}$, $[\text{CoF}_6]^{3-}$ [2009], $[\text{CoCl}_4]^{2-}$ [2010] $[\text{Cr}(\text{CO})_6]$ [CBSE SAMPLE PAPER]
15. Account for the Following:
 - (a) $[\text{Ni}(\text{CN})_4]^{2-}$ ion with square planar structure is diamagnetic and the $[\text{NiCl}_4]^{2-}$ ion with tetrahedral structure is paramagnetic.
 - (b) $[\text{NiCl}_4]^{2-}$ is paramagnetic while $[\text{Ni}(\text{CO})_4]$ is diamagnetic though both are tetrahedral.
 - (c) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ is strongly paramagnetic while $[\text{Fe}(\text{CN})_6]^{3-}$ is weakly paramagnetic.
 - (d) $[\text{Co}(\text{NH}_3)_6]^{3+}$ is an inner orbital complex whereas $[\text{Ni}(\text{NH}_3)_6]^{2+}$ is an outer complex.
 - (e) $[\text{Cr}(\text{NH}_3)_6]^{3+}$ is paramagnetic while $[\text{Ni}(\text{CN})_4]^{2-}$ is diamagnetic.

(f) A solution of $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ is green but a solution of $[\text{Ni}(\text{CN})_4]^{2-}$ is colourless.

(g) $[\text{Fe}(\text{CN})_6]^{3-}$ and $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ are of different colours in dilute solutions.

(h) Nickel does not form low spin octahedral complexes. **[2009] [Ans: because Ni has E.C. $3d^8 4s^2$, in which two inner d-orbitals are not available which are required to form d^2sp^3 hybridisation]**

(i) The π -complexes are known for the transition metal only. [2009] [Ans: because Transition metals have d orbitals in their atoms or ions in to which the electron pair donated can be donated by ligands containing π electrons]

(j) Co^{+2} is easily oxidised to Co^{+3} in the presence of a strong ligand. [Ans: because in the presence of strong ligand, the 3d electrons pair up leaving two orbitals empty to be involved in d^2sp^3 hybridisation]

(k) CO is a stronger ligand than NH_3 for many metals. [2009] [Ans: because in case of CO back bonding takes place in which central atom uses its filled d orbital with empty π^* molecular orbital of CO]

16. Draw diagram to show splitting of d-orbital in octahedral crystal field. Explain the two patterns of filling d^4 in octahedral crystal field.

17. What is crystal field splitting energy? What are the various factors affecting CFSE. How does the magnitude of Δ_0 decide the actual configuration of d-orbital in a coordination entity? **[2009]**

18. Explain why $[\text{Ti}(\text{H}_2\text{O})_6]_3\text{Cl}_3$ is coloured. What happens to the colour of $[\text{Ti}(\text{H}_2\text{O})_6]_3\text{Cl}_3$ when heated gradually? **[CBSE SAMPLE PAPER]**

19. What is spectrochemical series? Explain the difference between a weak field ligand and a strong field ligand. **[2008]**

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

21. What do you understand by stepwise stability constants & overall stability constant of a coordination compound. How are stepwise and overall stability constant related. **[2011C]**

22. Discuss the nature of Bonding in metal carbonyls.

23. Discuss the role of coordination chemistry in (a) Biological systems (b) Analytical Chemistry (c) Medicinal Chemistry (d) metallurgy / Extraction of metals **[CBSE SAMPLE PAPER]**

If you think you can - you can! If you think you cannot - you cannot! And either way.....you are right !"

अगर आप सोचते हैं कि आप कर सकते हैं-तो आप कर सकते हैं !अगर आप सोचते हैं कि आप नहीं कर सकते हैं- तो आप नहीं कर सकते हैं !और किसी भी तरह से ...आप सही हैं.!

To succeed in your mission, you must have single-minded devotion to your goal.

अपने मिशन में कामयाब होने के लिए , आपको अपने लक्ष्य के प्रति एकचित्त निष्ठावान होना पड़ेगा.

