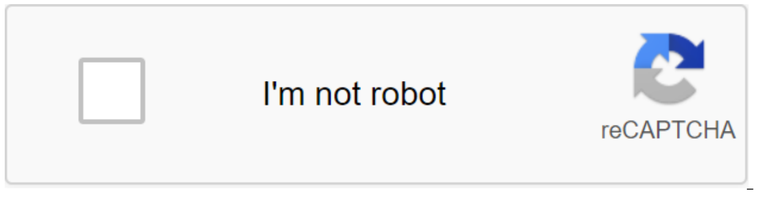

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Chemistry notes for class 12 chapter 9 pdf

Here we discussed Chapter 9 of the 12th Chemistry Class. To form a focal point, a molecule or ion binds to a metal atom. Such ion or molecule is called ligand. These ligands function as an electronic couple donor. Unidentified ligands are ligands that have one donor atom. Biden is a ligand that has two donor atoms. Trident ligands that have three donor atoms. Hexadenate ligands, which have six donor atoms. Class 12 is very important because grades are important. This is a factor that will help you decide your career. To score well, you need to prepare well for the exam. Download THE CBSE Class 12 Chemistry Chapter 9 Notes Also Read: Werner Theory Nomenclature Coordinating Connections NCERT Solutions for Class 12 Chemistry Chapter 9 Coordination Connections are presented here to help students learn about coordination of connections and understand the concepts associated with it. 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Negative ions satisfy primary valence, and secondary valences are filled with both neutral ions and negative ions. (b) Metal ion has a fixed amount of secondary valence of the central atom. These valences are also oriented in a certain direction in space, provided there is a certain geometry of the focal compound. (c) Secondary valence cannot be ionized, while primary valence can usually be ionized. No 2. The FeSO4 solution, mixed with solution (NH4)2SO4 in a ratio of 1:1 molyar, gives a test for Fe2 ion, but the CuSO4 solution, mixed with acquiescous ammonia in a ratio of 1:4 molyar, does not give a test for ion Cu2. Explain why? Ans : FeSO4 mixing solution with (NH4)2SO4in 1: 1 molar ratio produces double salt FeSO4 (NH4)2SO4-6H2O. This salt is responsible for providing Fe2. CuSO4, mixed with acvest ammonia at a ratio of 1:4, gives a complex salt. Complex salt is not ionized to give Cu2, therefore not a test. B3. Explain with two examples each of the following: facial coordination, ligand, focal number, polyhedroon coordination, homolept and heteroleeptic. Ans : (a) Ligands are neutral molecules or negative ions associated with the metal atom in a focal object. Example - Cl-, -OH (b) Coordination Organization is an electrically charged radical or species. They are a central ion or atom surrounded by neutral molecules or ion. Example - Ni(CO)4, COCL3(NH3)3 (c) Coordination number is the number of connections formed between ligands and the central atom/ion. Example : (i) In K2'PtCl6, 6 chloride ions are attached to Pt in the coordinate area. Thus, 6 is the focal number of Pt. (ii) in Ni(NH3)4Cl2, the focal number of the central metal ion (Ni) is 4. The focal multi-adre is the spatial positioning of ligands, which are directly related to the central atom in the field of coordination. Example - v) heteroleeptic: they are complexes with their metal ion associated with more than one type of donor group. Example is Co(NH3)4Cl2, Ni(CO)4 (vi) Homoleptic: they are metal ion complexes associated with only one type of donor. Example - - PtCl4-2- , Co (NH3)6 3 No 4. What is meant by unidentified, bidentate and ambidentate ligands? Here are two examples for each. Ans : (i) Unidentified ligands: these are ligands with a single donor site. Example Cl-, NH3 (ii) Ambidentate Ligand: these are ligands that attach to the central metal/atom ion through two different atoms. The example of NO-2or ONO-, CN- or NC-(iii) Bidentate is a ligand with two donor sites. Example - Ethan-1,2-diamine, oxalata ion (C2O42-) No.5. Include metal oxidation numbers in the following организациях: (i) «Co(H2O)(CN)(en)2»2 »(ii) (coBr2(en)2» (iii) (PtCl4)2» (iv) (iv) (v) Cr (NH3)3Cl3 Ans : (i) Co (H2O) (CN) (en)2 x x 0 (-1) 1 x 2 x 3 (ii) - Ko Br2 (en)2 x x 2 (-1) No 2 (0) iii) - PtCl4 - 3 2 - x 4 (-1) - -2x x 2 (iv) K3 (CN)6 - Fe (-1) - -3 x No3 (c) - Cr (NH3)3Cl3 - x 3 (0) - 3 (-1) - 0 x - 3 x 0 x 3 x 3 x 6. Using IUPAC rules, Write formulas for the following: (i) Tetrahydroxidozincate (II) (ii) Tetrachloridopaladat potassium (II) (iii) Diamminedichloropplatinum (II) (iv) Tetracianide potassiumonickelate (II) (v) Penta penta aminnithritito-O-cobalt (III) (vi) Hexaamminocobal (III) sulfate (vii) Three potassiums (oxalato)chromate (III) (viii) Hexaamminplatin (IV) (ix) Tetrabromido (II) (x) Pentaammininritito-N-cobalt (III) Ants : (i))2Cl2 (iv) K2'Ni (CN)4 (v) (CO (NO2) (NH3)5 (vi) - Co (NH3)6'2 (SO4)3 (vii) K3 - Cr (C2O4)3 (viii) - Pt (NH3)6 (ix) - Cu (Br)4 (x) (CO) (ONO) (NH3)5 2 7. Using IUPAC rules, write the systematically names: (i) Co(NH3)6Cl3 (ii) (Pt(NH3)2Cl (NH2CH3)Cl (iii) (Ti(H2O)6 (iv) Co (NH3)4Cl (NO2)Cl (v) Mn(H2O)6 2 (vi) (NiCl4)2- (vii) Ni(NH3)6Cl2 (viii) (Co(en)3 (ix) (Ni(CO)4 Ans : (i) Hexaamminecobalt (III) chloride (ii) Diamminechlorido (methylamine) platinum (II) chloride (iii) Hexaamminecobalt (III) ion (iv) Tetraamminichloridonitrito-N-Cobalt (III) chloride (v) Hexakuamanganese (II) ion (vi) Tetrachloroidonicate (II) Ion (vii) Hexaamminnikel (II) chloride (viii) Tris (ethan-1, 2-diammin) cobalt (III) ion (ix) Tetracarbonilnicel (0) No8. List the different types of isomerism possible for coordinating connections, giving an example of each. Ans : Different types of isomerism is present in the coordination of connections : (i) Geometric isomerism : (ii) Optical isomerism : (iii) Communication is isomerism: This is found in complexes that have ambidentate ligands. For example, : Co (NH3)5 (NO2) No2 and Co (NH3)5 (ONO) No Cl2 (iv) Coordination of sophistication : This kind of sophistication occurs when ligands are interchangeable between the anionic and cationsic entities of the various metal ions present in the complex. Example - Cr (NH3)6 (CO (v) Ionization of Isomerism : This is a kind of isomerism, where the counter ion takes the place of ligand within the focal sphere. (i) Cr(C2O4)3 3- (ii) Co(NH3)3Cl3 Ans : (ii) In Cr (C2O4)3 there are no geometric isomers present, because it is a bidentate ligand. (ii) In Co (NH3)3 Cl3 th two isomers are possible. No10. Draw the structures of optical isomers: (i) Cr(C2O4)3 (ii) PtCl2(en)2 «Cr(NH3)2Cl2(en)» Ans : (i) » Cr (C2O4)3 » (ii) » PtCl2 (en)2 » (3) » Cr (NH3)2 Cl2 (en) . Draw all isomers (geometric and optical) from: (i) CoCl2(en)2 (ii) Co(NH3)Cl (en)2 (iii) Co (NH3)2Cl2 (en) Ana: (i) - CoCl2 (en)2 (ii) - Co (NH3) Cl (en)2 (2) . . . . . Write all the geometric isomers Pt(NH3) (Br) (c)(py) and how many of them will be exhibited optical isomers? Ans: - Pt (NH3) (br)(cl) (py) - None of the above isomers will exhibit optical isomerism. No13. Copper sulfate solution (blue in color) gives: (i) green sediment with potassium aquiose fluoride and ii) a bright green solution with potassium aquius chloride. Explain these experimental results to Ans: Blue aqueous cuSO4 solution due to the presence of Cu ions (H2O)4 . (i) Therefore, when KF is added, H2O ligands are replaced by F-leagues that give a green color. (Cu(H2O)4'2'4F-CuF4, CuF_{4}2'4H2O ({4} H_{2}O) 4H_{2}O'Cu (H2 O)4 '2'4F'CuF4 No2'4H2 O (ii) So when KCL is added, H2O ligands are replaced by Cl-ligands that give bright green color. (Cu(H2O)4'2'4Cl'CuCl4,2'4H2O (H_{2}O {4}) Right (CuCl_{4}) 4H_{2}OCu (H2 O)4 24ClCuCl4 2 4H2 O 14. What is the coordinating essence formed when a glut of aqueous KCN is added to the aqueous solution of copper sulfate? Why does H2S (g) not produce copper sulfide precipitation? Ans: 2'CuSO4'(aq)-10KCN (aq)-2K2'Cu (CN)4 (aq)-2K2SO4 (aq)'(CN)22'CuSO_{4} 2K_{2} (aq) Ku (aq) {4} (aq) - 2K_{2}SO_{4} ({2} aq) coordinated by the organization, received in the aforementioned process, is K2'Cu (CN)4 . Since the aforementioned coordinating entity is highly stable, it is not ionized to give Cu2 ions. Thus, hydrogen sulfide bubbles do not produce precipitation through it. No15. Discuss the nature of bonding in the following coordinating entities based on the theory of valence: (i) Fe(CN)64(ii) (ii) (iii) (Co(C2O4)3 (iv) CoF63 Ans: (i) Fe (CN)4 In this focal complex, the state's oxide is 3. Fe 2 : Electronic configuration 3d6 Orbits ion Fe2 : Since CN ' is a strong field ligand, it causes unsparable 3D electrons in pairs: As there are six ligands around the central metal ion, the most practical hybridization of d2sp3, d2sp3 hybridized Fe2 orbits are: 6 electronic pairs from CN and ions take the place of six hybrid d2sp3. Then, thus, the geometry of the complex is an autoherral and is a diamagnetic complex (since all electrons are paired). ii) In this essence of the coordinates, the state of iron oxidation is 3. Orbitals Fe No.3 ion: There are 6 Ionov F. So it will pass through d2sp3 or sp3d2 hybridization. Since the FH is a weak field ligand, it does not cause electrons to mate on a 3D orbital. Thus, the most practical hybridization is sp3d2. sp3d 2 hybridized fe orbits are : Thus, the geometry of this essence coordinates octahedral. (iii) - Co (C2O4)3 In this complex, the state of cobalt oxidation is 3 euros. Orbital co 3 ion : Oxalate is a weak field ligand. Thus, this will not lead to the pairing of 3D orbital electrons. As there are 6 ligands, hybridization should be either sp3d 2 or d 2sp3 hybridization. sp3d2 hybridization Co 3 : 6 electronic pairs of 3 oxalate ions (oxalate anion bidentate ligand) occupy these sp3d 2 orbits : Thus, the complex shows octachedral geometry. (iv)) In this complex, Cobalt has an oxidation state no. 3. Orbits Ion Co3: Since fluoride ion is a weak field ligand, this will not result in a pair of 3D electrons. Thus, the Co3 ion will go through sp3d2 hybridization. sp3d2 hybridized orbital co3 ions are : Thus, the complex has a geometric configuration of octageerral and is paramagnetic. No16. Draw a shape to show the cleavage of d orbital in an octachegreal crystal field. Ans: 17 pounds. What is a spectrochemical series? Explain the difference between a weak field ligand and a strong field league. Ans: A series of common ligands in order of increasing their crystal-field fissile energy (CFSE) is called the spectrochemical series. Strong field ligands have larger CFSE values. Taking in time, weak field ligands have smaller CFSE values. No18. What is a crystalline energy cleavage field? How can the value of the Δ determine the actual configuration of the D of the orbiting stations in the focal point? Ans: Crystal-field splitting energy is the difference in energy between the two levels (i.e., t2g and, for example), which separated from the degenerate D orbital due to the presence of ligand. It is symbolized as Δo. As soon as the orbits disintegrate, the electrons begin to fill the free spaces. The electron each goes into three t2g orbits, the fourth electron, however, can enter any of the two orbits: (1) It can go to for example orbital (production t2g3eg 1 as an electronic configuration), or (2) it can move to t2g orbit (production t2g4eg 0 as an electronic configuration). This fourth electron filling is based on the energy level of Δo. If ligand has Δdo to less than the pairing of energy, then the fourth electron enters for example orbital. However, if the value of the Δo is greater than the value of the pairing of energy, the electron enters the t2gorbital. Q19. «Cr(NH3)6»3» paramagnetic, while Ni(CN)42 is diamagnetic. Explain why? Ans: In Ni (CN)4 and 2 , Ni has a state of oxidation oxidation So it has a d 8converted. Ni 2 ' : CN - Being a strong field ligand, causes electrons on 3D orbital stations to mate. This leads to Ni 2 hybridizing dsp2. Since all electrons are paired, it is diamagnetic. Cr has a condition of oxidation No. 3. Thus, it has a configuration of d 3. Since NH3 is not a strong field ligand, it does not cause electrons on a 3D orbital pair. Cr3 : It undergoes hybridization of d2sp3 and 3D orbital electrons remain unsparable. Thus, Ni (CN)4 and 2 is paramagnetic by nature. No20. The Ni(H2O)6 2 solution is green, but ni(CN)4 2 is colorless. Explain Ans: Ni (H2O)6 and 2 consists of a ni-2 ion with an electronic 3d8 configuration. In this configuration, there are two unpaired electrons that cannot mate because H2O is a weak ligand. Thus, the transition d- d absorbs the incoming light and emits a green light. So, giving the solution a green color. Ni (CN)4' 2- consists of Ni-2 ion with 3d8 electronic configuration. But, CN - present here, which is a strong ligand and in its presence, the unpaired electrons steam up. So, there is no d-d transition, so there is no color. R2R. Fe(CN)6'4 and Fe(H2O)62 have different colors in diluted solutions. Why? Ans: Fe (H2O)6 and Fe (CN)6 and 4 have two different ligands H2O and CN -. CN - Being a strong ligand field has a higher cfSE value (crystalline energy cleavage field) than water. As a result, d-d transitions absorb and return different wavelengths of light. So they have different colors in the solution. No22. Discuss the nature of bonding in metal carbonyls. Ans: In metallic carbonyls, metallic carbon bonds contain both communication symbols and communication symbols. A bond is formed when a lone pair of electrons is donated to an empty metal orbit with carbon dioxide. A bond is formed when a pair of electrons is donated to an empty anti-banding orbit filled with d orbital metal. This completely stabilizes and strengthens the metal bonds. The above two types of bonding are presented as : 23 euros. Give the state of oxidation, d orbital occupation and the focal number of the central metal ion in the following complexes: (i) K3'Co (C2O4)3 (iii) (NH4)2 (CoF4) (ii) cis-'CrCl2 (en)2'Cl (iv) (Mn,H2O)6'SO4 Ans: (i)K3' Co (C24)3. Coordination number 6. We know that the state of oxidation: x 6 and No. 3 x 3 D orbital occupation : t2g6eg 0. (ii) cis - - Cr (en)2 Cl2 Cl Central ion metal : Cr. Coordinating number 6. We know that the state of oxidation: x No 2 (0) No 2 (-1) - 1 x -2 - -1 x 3 D orbital occupation : t2g3. (iii) (NH4)2 CoF4 Central Metal Ion: Co Coordinating Number 4. We know that the state of oxidation: x - 4 - -2 x and 2 d orbital occupation : eg4t2g3. (iv) Mn (H2O)6 th SO4Central metal metal : Mn. Coordination number 6. We know that the state of oxidation: x 0 x 2 x 2 d orbital occupation : t2g3 eg4. No24. Write down the name IUPAC for each of the following complexes and specify the state of oxidation, electronic configuration and coordination number. Also given stereomimi and magnetic moment complex: (i) KKC (H2O)2 (C2O4)2'.3H2O (ii) Co (NH3)5Cl-'Cl2 (iii) Cl3 (py)3 (iv) Cs'FeCl4 (v) K4'Mn (CN)6 Ans: (i) title IUPAC - potassium diaquadioxalochromat (III) trihydrat. Coordinating number No. 6 Chromium Oxidation State : x No 0 (-2) - -1 x 3 Electronic configuration: 3D 3 and t2g3 Form : Octahedral Stereochemy : Magnetic Moment, N (n-2) srt'n (n No2) n (n'2) 3 (3)3 (3)2)15'sqrt{15}15 ≈ 4BM (ii) name IUPAC - Pentaamminechloridocobalt (III) Chlorine Coordinating Number 6 Oxidative State Co. : x No 0 - 1 - 2 x 3 Electronic Configuration: 3D 6 and t2g6 Form : Octahedalral Thus, Magnetic moment = 0 (iii) IUPAC name = Trichloridotripyridinechromium (III) Coordination number = 6 Oxidation state of Cr : x – 3 + 0 = 0 x = 3 Electronic configuration: 3d3 = t2g3 Shape : Octahedral Stereochemistry : n = 3 Magnetic moment, μ = n(n+2)\sqrt{n(n +2)}n(n+2) = 3(3+2)\sqrt{3(3 +2)}3(3+2) = 15\sqrt{15}15 ≈ 4BM (iv) IUPAC name = Caesiumtetrachloroferrate (III) Coordination number = 4 Oxidation state of Fe : x – 4 = -1 x = 3 Electronic configuration: d6 = eg2 t2g3 Shape : Tetrahedral Stereochemistry :- optically inactive n = 5 Magnetic moment, μ = n(n+2)\sqrt{n(n +2)}n(n+2) = 5(5+2)\sqrt{5(5 +2)}5(5+2) = 35\sqrt{35}35 ≈ 6 BM (v) IUPAC name = Potassium hexacyanomanganate(II) Coordination number = 6 Oxidation state of Mn : x - 6 - -4 x y 2 Electronic configuration: 3d5 and t2g5 Form : Octahedral stereochememia :- optically inactive n No 1 Magnetic moment, N (n'2)-sqrt'n (n No2) n (n-2) - 1 (1'2) - sqrt'1 (1 No2) - 1 (1'2) - 3 sq.m{3}3 and 1,732 BM No25. Explain the purple color of the Ti(H2O)63 complex based on the theory of the ans crystal field: The stability of the coordination compound in the solution is the degree/level of association between species involved in the state of equilibrium. Stability can also be written quantitatively in terms of permanent or permanent stability. M- 3L ML3 Stability is a constant {3} ML_{3}, Factors responsible for the stability of the complex: (1) Charge on the central metal ion - more charge, more stable is the complex. (2) The nature of the ligand - the chelating ligand produces a more stable complex. (3) The main strength of the ligand is the more basic ligand, more stable it No26. What does helat mean? Here's an example. Ans: When a poly dentent or ligand bidentate anchors itself with a metal ion so that it takes the shape of a ring, the metal ligand bond becomes more stable. These rings are called chelate rings. From this we can conclude that the complexes with chelat rings are more stable than complexes without rings. This phenomenon is called the Chelat effect. Ni2 (aq) - 6NH3 - Ni (NH3)6 (aq) magazine 7.99 Ni2 (aq) - 3en (aq) - Ni (en)3 (aq) magazine No 18.1 (more stable) No27. Briefly discuss the role of coordinating compounds in each case as a focal (iii) analytical chemistry (ii) of drug chemistry and (iv) metal extraction/metallurgy. Ans: (i) Role in biological systems: In animals, there are several very important focal compounds, such as hemoglobin is the focal compound of iron. In plants, chlorophyll pigment is a focal compound of magnesium. (ii) Role in drug chemistry: So many coordinate compounds are used to treat targets. For example, a coordinating compound of platinum, cis platinum, is used to check tumor growth. Role in analytical chemistry: determining water hardness. Role in metallurgy or mining: When metal is extracted from the ores, complexes are formed. For example, gold is combined with cyanide ions in an aquirat solution. The gold is then extracted from this complex using zinc. No28. How many ions are produced from the Co (NH3)6Cl2 complex in the solution? i) 6 (ii) 4 (iii) 3 (iv) 2Ans: (iii) 3 Given complex - Co (NH3)6 Cl2 ionizes to give three ions, viz one - Co (NH3)6 and two Cl - ions. No29. Among the following ions, which one has the highest magnetic moment? (i) Cr(H2O)6 (ii) Fe(H2O)6 2 (iii) n(H2O6'2 Ans: (i) Cr (H2O)6 3 number of unsparable electrons, n No 3 Magnetic moment, 3 (3 x2) Kvrt 3 (3 x 2) 3 (3 x2) 3 (3 x2) 3 (3 x2) 3 (3'2) - 15 sq{15}15 ≈ 4BM (ii) - Fe (H2O)6 2 number of non-paired electrons, n No 4 Magnetic Moment, No 4 (4'2 ≈{24})) No30. What is the amount of cobalt oxidation in THE CCO (CO) ? Ans: CCCO (CO) - KCCO (CO) - We know x x 0 - 1 - Where x is the number of oxidation. Among the following, the most stable complex (i) Fe(H2O)6 3 (ii) (ii) (Fe(NH3)6'3 (iii) Fe(C2O4)3 (iv) FeCl63-Ans: In all cases, Fe has oxidation state No.3. (C2O4)3is bidentate chelating ligand and forms chelating rings. Thus, iii) is the most stable complex. No32. What will be the correct order for absorption wavelengths in the visible area for the following: Ni(NO2)64, Ni(NH3)62, Ni(H2O)62? Ans: All complexes have the same metal ion, so energy absorption depends on the cfse ligand values. According to the Spectrochemical Series, the values of CFSE ligands are in the order of H2O (NH3) NO2, since E 'HC/E ∝ 1/ ' So the values of the absorbed wavelength in the ascendant order will be: BYJU'S NCERT was prepared with a focus on enhancing the student's ability to learn, and it was designed in such a way that they offer several benefits to those who refer to these learning materials. 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