**US02CCHE21 GENERAL CHEMISTRY**

**UNIT-3 Coordination Chemistry**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Q.1** | **Write correct answer for the following multiple choice question**. | | | | | | | | | | | | | | | | | | | | | | | | |
| **1** | Which one of following is an example of bidentate ligand ? | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | Edta | | | | *(b)* | *Ethylene diamine* | | | | | | | (c) acetate | | | | | (d) pyridine | | | | | |
| 2 | Identify the monodentate ligand from the following | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | CO3-2 | | | | (b) | en | | | | (c) | | | | edta | | | | | *(d)* | | *H2O* | | |
| **3** | The dentate character of ligand “trien” is…………. | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | Bidentate | | | | (b) | Tridentate | | | | *(c)* | | | *tetradentate* | | | | | | | (d) | | None | |
| **4** | The oxidation state of “Co” in [Co(NH**3**)**6**]Cl**3** is…….. | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | +2 | | | | *(b)* | *+ 3* | | | | (c) | | | | + 4 | | | | | | (d) | | + 5 | |
| 5 | Coordination number of Cr in NH4[Cr(H2O)2Cl4] complex is: | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | 1 | | | | (b) | 3 | | | | (c) | | | | 4 | | | | | | *(d)* | | *6* | |
| **6** | Which is the simple salt ? | | | | | | | | | | | | | | | | | | | | | | | | |
|  | *(a)* | | *NaCl* | | | | (b) | Potash alum | | | | (c) | | | | EDTA | | | | | (d) Mohr’s salt | | | | |
| 7 | [ EDTA ] -4 is a | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | Monodentate ligand | | | | (b) | Bidentate ligand | | | | (c) | | | | Quadrident-ate ligand | | | | | | *(d)* | *Hexadentate ligand* | | |
| 8 | From the given compounds, which one is the lattice compound? | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | NaCl | | (b) | | Na2SO4 | | (c) | | K4 [Fe(CN)6 ] | | | | | *(d)* | | | *FeSO4(NH4)2 SO4 6H2O* | | | | | | |
| 9 | Which one of the following geometries are possible with coordination number 4 : | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | Tetrahedral | | | | (b) | Square planar | | | | (c) | | Octahedral | | | | | | *(d)* | | | *Both (a) and (b)* | | |
| 10 | Ethylene diamine is a ------- ligand. | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | Monodentate | | | | (b) | Polydentate | | | | | (c) | | | Tridentate | | | | *(d)* | | | *Bidentate* | | |
| **11** | Valency of “NO” ligands is …………. | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | 1 | | | | (b) | + 1 | | | | (c) | | | | - 1 | | *(d)* | | | | | *0* | | |
| **12** | In a co-ordination compound primary valency of a central metal ion is satisfied by : | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | Ligand | | | | (b) | Anion | | | | (c) | | | | Radical | | | | (d) | | | Cation | | |
| 13 | In a co-ordination compound secondry valencies of a central metal ion is satisfied by : | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) *Cation* | | | (b) | | Anion | | (c) | | Radical | | | | | | *(d)* | *Ligand* | | | | | | | | |
| **14** | Which of the following represents chelating ligand? | | | | | | | | | | | | | | | | | | | | | | | | |
|  | (a) | | Cl**--** | | | | (b) | OH-- | | | | (c) | | | | H2O | | | | *(d)* | | | *DMG* | | |
| **15** | During complex formation, metal ion acts as \_\_\_\_\_\_ and ligand acts as\_\_\_\_\_.  (a)Lewis acid and Lewis Base (b) Arrhenius acid and base (c)small and big molecule  (d) none of these | | | | | | | | | | | | | | | | | | | | | | | | |
| **16** | Complex containing two or more central metal ions are called \_\_\_\_\_\_\_\_\_\_\_\_.  (a)polynuclear complex (b)chelate (c)positive complex (d)negative complex | | | | | | | | | | | | | | | | | | | | | | | | |
| **17** | Coordination number (secondary valency) of Cr in the complex K3[Cr(C2O4)3] is \_\_\_\_.  (a)6 (b)3 (c)4 (d)2 | | | | | | | | | | | | | | | | | | | | | | | | |
| **18** | What is the charge on [CrIII(CO)2(CN)4] complex?  (a)-1 (b)2 (c)1 (d)-2 | | | | | | | | | | | | | | | | | | | | | | | | |
|  | *There is no short cut, except hard work with understanding to excel in examination.*  Dr. H. R. MARADIYA B.Sc. Chem. Sem. II – Chem. Dept./V. P. Sci. College | | | | | | | | | | | | | | | | | | | | | | | | |
| **2** | **Answer the following in short. (2 marks)** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | **Write IUPAC name for the following.**  [ Pt**II**(en)2 ][ PtCl6]  [Cr**III**(H2O)4 Cl**2**]**+**  [CoCl (H2O)2 (NH3)3] + 2  [Ni(CN)4 ] **--** 4  (NH3)5 Cr OH Cr (NH3)5]Cl5  [CoBr6(H2O)(en)2]+ 2  [BrF4]-  NH4[Cr(NH3)2(NCS)4]  [(NH3)4Co-NH2-OH-Co(NH3)4] | | | | | | | | | | | | | | | | | | | | | | | |
| **2 2** | **Give the systematic formula for the following.** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Tetra cyano nicklate (II) ion. | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Tris(ethylene diamine)manganese(III)chloride | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Tetra iodo mercurate(II) ion | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Dichloro argentate(I) ion | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Name the following polydentate ligand , draw the structure and write its dentate character.  (ox) **–** 2  , (gly) **--- ,**(oxin) **---,**(dmg)**--,**(NTA)**—3,**(acac)**-- ,** EDTA**—4, terpy, o-phen.** | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Show that sulphate is a flexidentate ligand. | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Give definitions of:  Coordination compound, coordination number, coordinating atom. | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Differentiate between: Coordination compound and double salt (Lattice compound). | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Show how following compound dissociates in water with the equation.  Mohr’s salt, Potash alum, potassium hexachloroplatinate(IV), sodium tetra cyano nickelate(0). | | | | | | | | | | | | | | | | | | | | | | | | |
| Q-3 | Long question. (4-5 marks) | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **In the co-ordination compound [Cr(en)3][Ni(CN)6]** | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | The oxidation state of chromium ion and nickel ion are ------------- | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | The co-ordination number of chromium ion and nickel ion are ---------------- | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | The dentate character of different ligands are ----------- | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Ionic charge on complex cation and complex anion are------------- | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | IUPAC name of the compound is\_\_\_\_\_. | | | | | | | | | | | | | | | | | | | | | | | | |
|  | **Similarly for [Co(H2O)6][Co(CN)6] and Na[SbCl5(C6H5)]co-ordination compounds.** | | | | | | | | | | | | | | | | | | | | | | | | |
| Q-4 | **Very long question. (10 marks)** | | | | | | | | | | | | | | | | | | | | | | | | |
|  |  | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Explain ligand, ambidentate ligand and flexidentate ligand. Give complete classification of ligands. | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Define chelate. Give the classification and uses of chelates. | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Discuss Werner’s theory. Describe the geometry of the complexes with coordination numbers 2 to 6 with suitable structure. | | | | | | | | | | | | | | | | | | | | | | | |

*There is no short cut, except hard work with understanding to excel in examination.*

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