

Please check whether you have got the right question paper.

- 1) All questions are compulsory
- 2) Figures to the right indicate full marks.
- 3) Use of log table/non- programmable calculator is allowed

1. Answer **any three** of the following:-

- A) Discuss the crystal field splitting of d-orbitals in tetrahedral complexes. 05
- B) What do you mean by crystal field stabilization energy (CFSE)? Calculate CFSE for d^4 and d^6 configurations in weak field octahedral complexes. 05
- C) Give an account of 'Electron Spin Resonance Spectra' as an evidence for covalent bonding in coordination compounds. 05
- D) Discuss the effect of charge on metal ion and geometry of the complex on the value of $10 D_q$. 05
- E) Draw a molecular orbital diagram for an octahedral complex $[ML_6]$ considering only sigma bonding. 05
- F) Write a short note on 'construction of ligand group orbitals with reference to octahedral complexes.' 05

2. Answer **any three** of the following:-

- A) Explain Laporte orbital selection rule which governs electronic transitions. 05
- B) What is Russell-Saunders's coupling? Explain with suitable example. 05
- C) Deduce the ground state term for d^2 configuration. 05
- D) Mention the different characteristics of the coordinating ligand affecting the stability of metal complexes. Discuss any one. 05
- E) Discuss the possible mechanism involved in acid hydrolysis reactions of cobalt amines. 05
- F) Explain the following : 05
 - 1) Stepwise stability constant.
 - 2) Inert and Labile complexes

3. Answer **any three** of the following:-

- A) Discuss the following chemical reactions of organometallic compounds of main group elements 05
 - 1) Reactions with oxygen and halogens
 - 2) Complex formation.
- B) With reference to organometallics of elements of main groups, discuss the method of preparation involving 05
 - 1) methylation 2) metal-hydrogen exchange.
- C) Write note on structure and bonding of ferrocene. 05
- D) With reference to ferrocene discuss the following reactions 05
 - 1) alkylation 2) oxidation 3) Mannich reaction.
- E) Discuss the steps involved in the catalytic reaction of hydroformylation of alkenes and draw the catalytic cycle. 05
- F) Explain the following:
 - i) Organometallic compounds. 02
 - ii) Requirements of a good catalyst 03

TURN OVER

4. Answer **any three** of the following:-
- A) What is colloidal route method? Explain the synthesis of nanomaterials using this method. 05
 - B) With reference to nanomaterials, explain 05
 - 1) Electrical properties 2) Optical properties.
 - C) Explain characterization of nanomaterials using x-ray diffraction method. 05
 - D) Discuss the following radiopharmaceuticals 05
 - 1) cobalt-57 and cobalt-60 3) iron -59
 - E) Write note on Gold complexes in medicines. 05
 - F) a) Explain, why trans diammine dichloro platinum (II) is inactive as an anticancer drug ? 02
 - b) Define and explain the enzymes. 03

5. Answer the following:-
- A Select and write the most appropriate answer. 04
- a) The complex $[FeF_6]^{3-}$ isin nature.
 - i) slightly paramagnetic ii) highly paramagnetic iii) diamagnetic
 - b) The ligand having strong ability to expand d-electron cloud of metal is
 - i) H_2O ii) F^- iii) CN^-
 - c) Splitting of d-orbitals is maximum incomplexes
 - i) octahedral ii) square planar iii) tetrahedral
 - d) The term u (ungerade) corresponds to
 - i) symmetrical ii) unsymmetrical iii) none of the above

OR

- A State whether the following statements are **true or false**. 04
- p) In octahedral complexes t_{2g} orbitals experiences minimum repulsion from ligands.
 - q) Generally weak field ligands form low spin complexes.
 - r) The six ligands are directed along x, y and z axis in octahedral complexes.
 - s) In tetragonal complexes the d-orbitals of central metal splits into four levels.

- B Select and write the most appropriate answer. 04
- a) The total spin multiplicity is given by.....
 - i) $2S$ ii) $2S-1$ iii) $2S+1$
 - b) The number of microstates for p^2 configuration is
 - i) 15 ii) 45 iii) 60
 - c) Presence of bulky ligands in a chelate results inof metal ligand bond.
 - i) strengthening ii) shortening iii) weakening
 - d) In complexes involving S_N^1 mechanism the main feature is bond.....
 - i) making ii) breaking iii) stabilization

OR

- B State whether following statements are **true or false**. 04
- p) Orgel diagram for d^1 octahedral configuration is same as that of d^6 octahedral configuration.
 - q) For the resultant orbital angular momentum quantum number ' $L=3$ ' the state symbol is 'G'.
 - r) The stability of complexes decreases with decrease in size of metal ion.
 - s) Reactions which involve replacement of an anion by water molecule is called Anation reaction.

TURN OVER

- C Select and write the most appropriate answer. 04
- Al(CH₃)₃ isin benzene and also in the vapour state.
 - dimeric
 - monomeric
 - trimeric
 - In transmetallation reactions, displacing metal is higher in the..... than the displaced metal .
 - Periodic table
 - electrochemical series
 - oxidation state
 - The gaseous phase of ferrocene has.....configuration.
 - boat
 - staggered
 - eclipsed
 - In Heck reaction a C-C bond is formed under.....catalysis.
 - Pd
 - Fe
 - Mn

OR

- C State whether the following statements are **true or false**. 04
- Most of the organometallic compounds of non-transition elements are covalent compounds with some ionic character.
 - Ferrocene obeys effective atomic number rule and 18 electron rule.
 - Ferrocene is more reactive than benzene.
 - Oxidation of SO₂ to SO₃ using oxides of nitrogen is an example of homogeneous catalysis.

- D Select and write the most appropriate answer. 03
- Nanoparticles of are used to develop self cleaning glass.
 - TiO₂
 - ZnO
 - CdS
 - Nanosize.....is currently used in sunscreens.
 - aluminium oxide
 - zinc oxide
 - carbon dioxide
 -unit of radioactivity is used for biological application
 - electron volt
 - Isotope
 - curie

OR

- D State whether the following statements are **true or false**. 03
- Nanomaterials are tiny particles of materials that have size 1 to 100 nanometer
 - Nanofilms, layers and surface coating materials are one dimensional nanomaterial.
 - The enzymes are not protein molecules.
