AAM-4522-23-24-25-29 Seat No.

M. Sc. (Sem. IV) Examination

April / May - 2018

Chemistry

(1) CHN - 704 : Organo Metallic Chemistry
(Elective)

(2) CHN-704(B) : Organic Synthesis

(3) CHN - 704(C) Chemistry of Materials
(Core Elective)

(4) CHN-704(D) : Computational Chemistry
(Elective Paper)

(5) CHN - 704 (E) : Inorganic Chemistry
(Advanced Quantum Chemistry) (Elective)

Time : 2 Hours] [Total Marks : 50

(1) CHN - 704 : Organo Metallic Chemistry
(Elective)

1 (a) Attempt any two of the following : 10

(1) Discuss, the methods of preparation and synthetic applications of organo copper compounds.

(2) Discuss the preparation and bonding in transition metal alkyne complexes.

(3) Write the methods of preparation and bonding in Zeise's salt.

(4) Write a note on Schrock Carbene Complex.

(b) Attempt any two of the following : 6

(1) How do the π-acceptor ligands increase the stability of octahedral complexes ? Explain.

(2) Explain why the transition metal aryl compounds are more stable than the corresponding alkyl compounds ?

(3) Write down the synthesis and applications of Tebbe's reagent.

(4) Write note on : Correv House synthesis.

(c) Attempt any two of the following : 4

(1) Calculate the E.A.N. of $(n^5\text{–}C_5H_5)_2$ Mn and $(n^5\text{–}C_5H_5)_2V$.

(2) Explain Cabonilate anion.

(3) How will you distinguish between dihydrogen and dihydride complexes ?

(4) Explain the structure of $Co_2(CO)_8$.

(a) Attempt any two of the following : 10

(1) Give brief account of OMC of Li.

(2) What are the fluxional Organo metallic compounds ? Discuss the fluxionality in n^3–allyl complexes.

(3) Write down the mechanism of polymerization of propene catalyzed by Zeigler-Natta Catalyst.

(4) Discuss the structure and bonding in bis benzene Chromium compound.

(b) Attempt any two of the following : 6

(1) Discuss the structure of ferrocene.

(2) What is Zeolite Socony Mobil-5 ? How Methanol can be transformed in to gasoline using ZSM-5 as a catalyst.

(3) Write IUPAC Nomenclature of OMC with suitable example.

(4) What are the limitation of 18 electron rule ?

(c) Attempt any two of the following :

(1) Draw $Ir_4(CO)_{12}$ and $Co_4(CO)_{12}$ structure.

(2) Differentiate between singlet carbene and triplet carbene.

(3) Give an example of Cyclopentadienyl group where it act as a mono hepto and penta hepto.

(4) What is Homogeneous catalysis ?

3 Attempt any five of the following : 1

(1) Brief account on tetra carbonyl Nickel complex.

(2) How could the complex $Cr(CO)_3(NO)_3$ attain the 18 electron configuration ?

(3) Write down the structure of $Al_2(CH_3)_6$ and give the nature of bonding in it.

(4) Give the name of catalyst used by Monsato acetic acid synthesis.

(5) Draw the structure of iron enna carbonyl and iron dodeca carbolyl.

(6) If alkyl Lithium react with formaldehyde it produced Primary alcohol while react with any ketone it produced tertiary alcohol, prove it

(7) Define : Hydrogenation reaction with suitable example.

(2) CHN-704(B) : Organic Synthesis

1 (a) Answer any two of the followings :

(1) Write a short note on use of acetylenes (alkynes) in Organic synthesis.

(2) Discuss reversal of polarity with suitable examples.

(3) Discuss the importantce of the order of event in organic synthesis.

(4) Explain the regioselectivity in one group C-C-disconnection.

(b) Answer any two of the followings :

(1) Enlist various methods of alkene syntheses.

(2) Illustrate briefly the protection of carboxyl functional group.

(3) Discuss the two group C-X disconnections with suitable example.

(4) Give outline of the total synthesis of Reserpine?

(c) Answer any two of the followinge :

(1) Discuss Robinson annelation in brief.

(2) Write a short note on synthetic, route of oxiranes ?

(3) What are saturated heterocyclic compounds? Explain with two suitable examples.

(4) Give two examples of applications of aliphatic nitro compounds in organic synthesis.

2 (a) Answer any two of the followings. 10

(1) Give an account on synthons and synthetic equivalents.

(2) Describe the protection of amines.

(3) Explain' the disconnection approach to $\alpha-\beta$ unsaturated carbonyl compounds.

(4) Give the retrosynthesis of Juvabione.

(b) Answer any two of the followings : 6

(1) Write a short note on Micheal Reaction.

(2) Explain the retrosynthesis of vitamin D_2.

(3) Give a brief account on disconnection approach to Diels-Alder reaction.

(4) Explain retrosynthesis of Cortisone.

(c) Answer any two of the followings : 4

(1) Explain Chemo selectivity in brief.

(2) Draw only structure of Longifolene.

(3) Explain hydroxyl group protection with one example.

(4) What is functional group interconversion? Give one example of the same.

3 Answer the following : (any five) 10

(1) Explain any one synthesis of six membered heterocycles?

(2) What is Umpolung ?

(3) What is the Protecting group?

(4) Give only structure of Fredericamycin A ?

(5) Give two synthetic equivalents for R^+.

(6) What are the most common hetero atoms ?

(7) Give two examples of synthetic equivalents for R^-.

8) Give only structure of Camphore.

9) Give two examples with structure of aromatic heterocyclic compounds.

10) Draw only structure of Aphidicolin.

(3) CHN - 704(C) Chemistry of Materials (Core Elective)

20

Answer any three :

(a) Write an account on steels : properties and applications.

(b) Give an account on mechanical properties of ceramics. What are rectifiers ?

(c) Explain different types of polymers and mention their applications.

(d) Illustrate the uses of liquid crystals.

20

Answer any three :

(a) How will you characterize clay products ?

(b) Write a detailed account of transistors and capacitors.

(c) Illustrate ionic conductors.

(d) Give an account on perovskites.

10

Answer any five in brief :

(a) What is sputtering ?

(b) Explain the words : configuration and crystallinity.

(c) LB film : What is it ? Where is it used ?

(d) Distinguish nematic and smectic mesophases.

(e) Define and give example of doping.

(f) What are 2-1-4 materials ?

(g) Define dielectric susceptibility.

(h) Where are high T_c materials used ?

CHN-704(D) : Computational Chemistry
(Elective Paper)

nstruction : Attempt all questions.

1 Answer any four of the following : 5×4=20

(i) Explain the Romberg integration.

(ii) Solve linear simultaneous with Guassian Elimination method using at least two examples.

(iii) Taking examples, calculate differentials on basis of Taylors series.

(iv) Describe central differenced formulae method for interpolation.

(v) Explain regular falsi method in solving polynomial equations.

(vi) Discuss Jacobi method for solving eigen values and matrix diagonalization.

(vii) Write a note on errors integration formulae.

2 Write notes on any two of the following : 10×2=20

(i) Simulation packages

(ii) Quantum chemical packages

(iii) Drug design packages

(iv) Graphical design packages

3 *Attempt two from the following as short questions :*

(i) Quanta

(ii) Pivotal strategy

(iii) QSAR

(iv) Auto dock.

2×5=

(5) CHN - 704 (E) : Inorganic Chemistry

(Advanced Quantum Chemistry) (Elective)

1 Answer any **three** questions from the following 20

(a) Discuss Slater-Condon rules.

(b) Discuss Multi-Configurational Self-Consistent Field method for one electron Hamiltonian.

(c) Give the treatment for PPP in Huckel theory.

(d) Explain Born-Oppenheimer approximation.

2 Answer any **two** questions from the following : 20

(a) Discuss detailed treatment of CNDO theory.

(b) Explain the derivation of Hohenberg Kohn theorem.

(c) Discuss Configuration Interaction theories which are size - consistent.

3 Answer any **one** questions from the following : 10

(a) Discuss the experiments which uses AMBER modelling software packages on computers in quantum chemistry.

(b) Discuss the experiments which uses GAUSSIAN software packages on computers in quantum chemistry.
