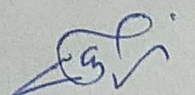
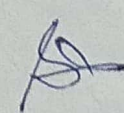


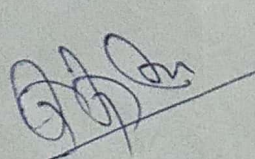
REVISED (DRAFT) SYLLABUS

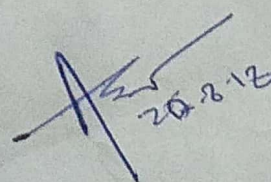
FOR

M.Sc. Chemistry

(CBCS- Based)



  
20.8.18



## CBCS-based syllabus for M.Sc. Chemistry (2 years) Programme

### General Informations:

- (1) It is two years Master Degree Programme
- (2) There shall be four semester to complete programme, i.e. 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> semester
- (3) Each semester shall consist of 15 weeks of academic work equivalent to 90 actual teaching days.
- (4) This programme will have three types of courses, i.e. Core course and Elective course.

**Core course-** The core courses are those courses whose knowledge is deemed essential for the students registered for a particular Master's degree programme.

**Elective course-** The elective course can be chosen from a pool of papers in II<sup>nd</sup> and IV<sup>th</sup> semester.

(5) Each course will have 100 marks in full and divided into 70 marks for end-semester exam and 30 marks for internal assessment work except AEC, AECC-1, AECC-2 and practical papers. Internal assessment will be in two internal exams of 10 marks each, 5 marks for seminar/internal project and 5 marks for attendance/discipline.

(6) In practical papers the distribution of marks in CIA will be same as prescribed for term end semester practical papers.

(7) A student in fourth semester can choose a generic paper or CC-5 paper of any other subject of the faculty as DSE.

**Credits-** A unit by which the course work is measured. It determines the number of hours of instruction required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work/ field work per week.



**Semester- IV**  
**Elective Course-1a**  
**Inorganic Chemistry Special**

Full Marks – 70

Credits- 5

**Unit- I (A) Alkyls and aryls transition metals.**

Types, routes of synthesis, stability and decomposition pathways, Organocopper in organic synthesis.

**(B) Compounds of transition metal-carbon multiple bonds.**

Alkylidenes, alkylidynes, low valent carbenes and carbynes synthesis, nature of bond, structural characteristics, Nucleophilic and electrophilic reactions on the ligands, Roles in organic synthesis.

**Unit- II Transition metal  $\pi$ - complexes.**

Transition metal  $\pi$  complexes with unsaturated organic molecules alkenes, alkynes, allyl, diene, dienyl, arene, trienyl complexes, their structural features and important nucleophilic and electrophilic reactions.

**Unit – III Homogeneous Catalysis.**

Stoichiometric reactions for catalysis, homogeneous catalytic hydrogenation. Zeigler Natta polymerization of olefins, catalytic reactions involving CO, [e.g. hydrocarbonylation of olefins, (oxo reaction)], oxopalladation reactions, activation of C-H bond.

**Unit- IV (A) Application of Group Theory to CFT**

d-orbitals as basis of representation in octahedral field point derivation of Sine formula, point use of Sine formula for splitting, transformation of s,p,d,f,g,h orbitals in octahedral environment .

**(B) Application of Group Theory to**

Formation of Hybrid orbitals in tetrahedral, squareplaner, octahedral, square pyramid and TBP geometrics.



## Unit- V

### (A) Molecular rearrangement

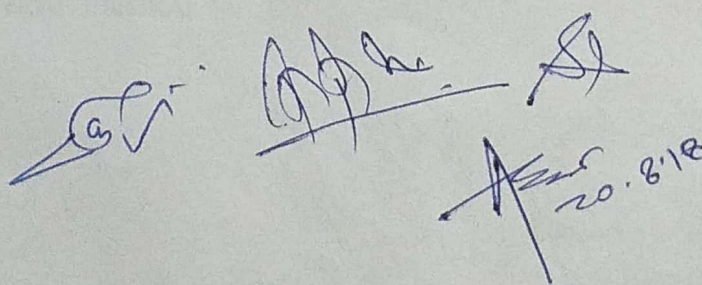
D and A process, reactions of geometrical and optical isomers, optical inversions, isomerisation and recemisation of octahedral complexes, intermolecular rearrangement.

### (B) Fluxional organometallic compounds

Fluxionality and dynamic equilibria.

### Books Recommended :

1. Organometallic Chemistry- Ayodhya Singh and Ratnesh Singh
2. Organometallic Chemistry- R.C. Mehrotra and A. Singh
3. The Organometallic Chemistry of transition metals- Robert H. Crabtree
4. Organometallic Compounds- Indrajeet Kumar.
5. Supramolecular chemistry- concept and perspective- J.M. Lehn
6. Introduction to Supramolecular chemistry- Helena- Dodziuk
7. Supramolecular chemistry – Norendra N. Ghosh.
8. Photochemistry- Carle E. Wayne and Richard P. Wayne
9. Inorganic chemistry- Gary Walfsberg
10. Inorganic chemistry- J. E. Huhey, A. Keiler, L. Keiler, D.K. Medhi
11. Inorganic Chemistry - G.L. Miessler and D.A. Tarr
12. Advanced Inorganic chemistry – Cotton and Wilkinson T.

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**Semester- IV**  
**Elective Course- Ib**  
**Physical Chemistry Special**

**Full Marks- 70**

**Credits- 5**

**Unit- I**

**(A) Hartree Fock Theory :**

Born oppenheimer approximation. <sup>Slater</sup> Salter-Condon rule, Hartree-Fock equation, Koopman theory.

**(B) Semi Empirical Theories**

HMO Theory of Conjugated dienes, D.E., Bond order, Free valence and charge density, and its calculation. Extended Huckel theory.

**Unit- II**

**Catalysis and Oscillatory Behaviour**

Kinetics of catalytic reaction, Arrhenius intermediates, vant-Half intermediates, Theory of acid-base catalyst, Bronsted catalysis law, Hammet equation, Oscillatory reactions.

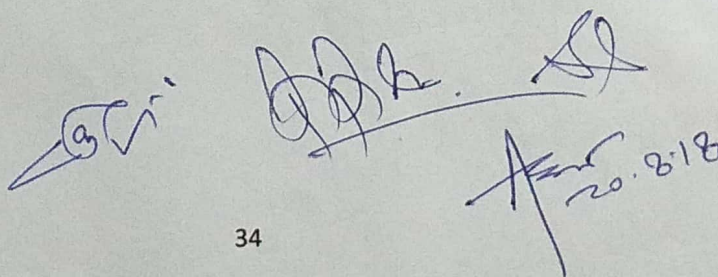
**Unit- III**

**(A) Kinetics of condensed phase Reaction.**

Factors determining reaction rate in solution, Transition state theory in solution, kinetics of ionic reaction. Dependence of rate constant on ionic strength and dielectric constant of the medium. Bronsted Bjerrum equation.

**(B) Study of Fast reactions.**

Flash Photolysis, relaxation techniques, Molecular beam and shock Tube kinetics, stop flow method.

  
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**Unit- IV Kinetics of Electrode reactions.**

Faradic and non-faradic current rate law in faradic process, current density, factors affecting electrode-reaction, Effect of double layer structure on electrode reaction rates.

**Unit- V (A) Corrosion**

Scope and economic of corrosion, causes and types of corrosion, electrochemical theories of corrosion.

**(B) Thermodynamics of solids**

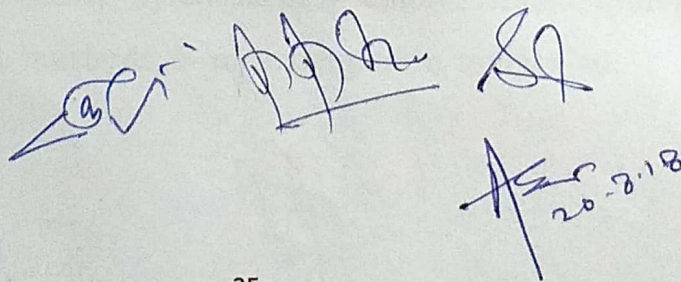
Specific heat of solids, Einstein and Debye theory of specific heat.

**(C)Molecular Statistics**

Thermodynamic probability, M.B., B.E. and F.D. statistics, comparison

**Books Suggested :**

1. Physical Chemistry : P.W. Atkins
2. Advance Physical Chemistry : Gurdeep Raj
3. Chemical Kinetics : Keith, J. Laidler.
4. An Introduction to chemical thermodynamics : R.P. Rastogi & R.R. Mishra

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**Semester- IV**  
**Elective Course- 1c**  
**Organic Chemistry Special**

**Full Marks – 70**

**Credits- 5**

**Unit- I      Terpenoids**

Introduction, classification, isoprene rule and special isoprene rule. Structural determination, stereochemistry and synthesis of citral,  $\alpha$ -Terpeniol, camphor, santonin and abietic acid.

**Unit- II      Alkaloids**

Introduction, classification, general method of structure determination. Structure and synthesis of the following compounds- Papaverine, Nicotine, Atropine, Quinine and Morphine.

**Unit- III      Drug Design**

Introduction, classification, SAR factors affecting bio activity. Theories of drug activity, Assay of drugs.

**Unit- IV      Drugs**

1. **Antineoplastic Agents:** Introduction, Cancer chemotherapy, role of alkylating agents, antimetabolites, natural products and hormones in treatment of cancer. Synthesis of mechlorethamine, cyclophosphamide, Fluoro-uracil, mustards, 6- mercaptopurine, melphalan.

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2. **Cardiovascular Drugs:** Cardiovascular disease, direct acting arteriolar dilators. Synthesis of amyl nitrate, sorbitrate, quinidine, Methyldopa, atenolol and oxyprenolol.
3. **Anti-tubercular Drugs:** PAS, Isoniazid, Ethambutol Thiosemicarbozone, Rifampicin.

## Unit- V

### Heterocyclic Compunds

1. **Benzofused five membered heterocyclic compounds:** Classification, nomenclature synthesis and reaction of benzopyrole, benzofuran and benzothiophenes.
2. **Five and Six membered Heterocycles with two or more heteroatoms:** Synthesis and reaction of oxazole, isooxazole, pyrazole, Imidazole, thiazole, diazine.
3. **Seven and large membered Heterocycles with two or more heteroatoms:** Synthesis and reaction of azepines, oxepines, diazepines. azocines and thiapines.

### Books Recommended :

1. Natural Products-Chemistry and Biological Significance by J. Mann, R.S. Davidson, J.B. Hobbs, D.V. Banthrope and J.B. Harborne.
- 2 Organic Chemistry by I.L. Finar.
- 3 Rodds Chemistry of Carbon Compounds by S. Coffey.
- 4 Natural Products Chemistry by Jagdamba Singh and Jaya singh.
- 5 The Chemistry of Natural Products by P.S. Kalsi.
- 6 Chemistry of Natural Products by Nakamshi.
- 7 An Introduction to Medicinal Chemistry by Graham L. Patrick.
- 8 Textbook of Organic Medicinal and Pharmaceutical Chemistry by Charles O. Wilson, Ole Gisvold & Robert F. Doerge.

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- 9 Principles of Medicinal Chemistry by William O. Foye, Thomas L. Lemice and David A. Williams.
- 10 Burgers Medicinal Chemistry and Drug Discovery by M.E. Wolff.
- 11 Heterocyclic Chemistry by R.R. Gupta, M. Kumar and V. Gupta.
- 12 Heterocyclic Chemistry by T.L. Gilchrist.
- 13 Organic Chemistry by I.L. Finar.

**Semester- IV**  
**Elective Course (P) 2 a**  
**Practical (Inorganic Chemistry Special)**

Full Marks – 50

Credits- 5

- |   |    |
|---|----|
| 1. Qualitative analysis of Inorganic mixture containing six radicals including Mo, V, W, Ce                             | 15 |
| 2. Analysis of atleast two metal ions in alloys and minerals<br>(a) Dolomite (b) Brass (c) Solder (d) Steel (e) Bouxite | 15 |

OR

Spectrophotometric determination of Fe, Ni, Mn, Cr, V, Ti, F, NO<sub>3</sub><sup>-</sup> and PO<sub>4</sub><sup>3-</sup> etc.

- |                |    |
|----------------|----|
| 3. Viva- Voce  | 15 |
| 4. Record File | 5  |

**Books Recommended:**

1. Qualitative analysis- A.I. Vogel
2. Quantitative Analysis – A. I. Vogel

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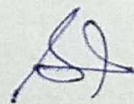
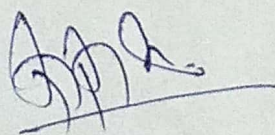
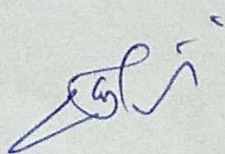
**Semester- IV**  
**Elective course (P) 2b**  
**Practical (Physical Chemistry Special)**

**Full Marks- 50**

**Credits- 5**

**Any one experiments (Marks 30)**

1. Conductometric measurement;
  - (i) Dissociation constant of Acetic acid
  - (ii) Titration of Strong acid and strong base (NaOH+HCl)
  - (iii) solubility and Solubility Product of Sparingly soluble salts (PbSo<sub>4</sub>)
2. Potentiometric Experiments
  - Determination of (i) E.M.F. of Concentration Cell.
  - (ii) pH of a given solution using hydrogen electrode or quinhydrone electrode.
  - (iii) Acid-base titration.
3. Partition coefficients
  - (i) Determine the Partition coefficient of Acetic acid between Benzene and water.
  - (ii) Determine the partition coefficient of Iodine between CCl<sub>4</sub> and water.
4. Viva-voce -15
5. Note Book -5



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