

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, alkylidyne, low valent carbenes and carbynes synthesis, nature of bond, structural characteristics, Nucleophilic and electrophilic reactions on the ligands, Roles in organic synthesis. Fluxional organometallic compounds, Fluxionality and dynamic equilibria

Unit-II Transition metal π - complexes.

Transition metal π 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. hydro-carbonylation of olefins, (oxo reaction)], oxopalladation reactions, activation of C-H bond.

Unit-IV (A) Supramolecular Chemistry

Introduction, Non covalent interactions, self-assembly in supramolecular chemistry, Reactivity and catalysis design and synthesis, transport processes and carrier design, supermolecular devices.

(B) Photo chemistry of metal complexes.

Basis of photochemistry, properties of excited states, excited states of metal complexes and their comparison with organic compounds.

Photo- substitution, photo-oxidation and photo-reduction, Excited electron transfer, Reactions of 2, 2-bipyridines and 1, 10 phenanthroline complexes, metal complexes sensitizers, Application of photochemical reactions of co- ordinnance compounds.

Unit-V (A) Molecular rearrangement

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

(B) **Spectroscopic Application:** Application of Mossbauer and ESR spectroscopy in elucidation of structure of inorganic molecule.

Books Recommend:

1. Organometallic Chemistry- Ayodhya Singh and Ratnesh Singh
2. Organometallic Chemistry- R.C.Mehrotr 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- Hiclena- 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. Hulhey, 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-1b
Physical Chemistry Special

Full Marks-70

Credits-5

Unit-I (A) Hartree Fock Theory:

Born oppenheimer approximation. Salter-Condon rule, Hartree-Fock equation, Koopman theory.

(B) Semi Empirical Theories

HMO Theory of π systems. Bond order, Free valence and charge density, and its calculation. Extended Huckle theory.

Unit-II Catalysis and Oscillatory Behaviour

Kinetics of catalytic reaction, Arrhenius intermediates, vant-Half intermediates, Theory of acid-base catalyst, Bronsted catalysis law, Hammett 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.

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.

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Unit-V (A) Corrosion

Scope and economic of corrosion, causes and types of corrosion, electrochemical theories of corrosion, Method of protecting the corrosion

(B) Thermodynamics of solids

Specific heat of solids, Einstein heat capacity equation Debye theory of specific heat.

Books Suggested.

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|--|---|---------------------------|
| 1. Physical chemistry | : | P.W. Atkins |
| 2. Advance Physical chemistry | : | Gurdeep Raj |
| 3. Chemical Kinetics | : | Keith, J. Laidler. |
| 4. Introduction to chemical Thermodynamics | : | R.P.Rastogi & R.R. Mishra |

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Semester-IV
Elective Course-1c
Organic Chemistry Special

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Unit-I Terpenoids

Introduction, classification, isoprene rule and special isoprene rule. Structural determination, stereochemistry and synthesis of citral, α -Terpeniol, camphor, santonin

Unit-II Alkaloids

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

Unit-III Drug Design

- (a) Introduction, classification of drugs. Development of new drugs. Procedures followed in drug design. Structure activity relationship. Receptor. Theories of drug activity with emphasis on Drug-receptors interactions.
- (b) Application of Mass, IR, UV-Visible, NMR (^1H & ^{13}C) in elucidation of structure of organic molecules.

Unit-IV Drugs

- Antineoplastic Agents:** Introduction, Cancer chemotherapy, role of alkylating agents, antimetabolites, natural products and hormones in treatment of cancer. Synthesis of mechlorethamine, cyclophosphamide, uracil-mustards, 6- mercaptopurine, melphalan.
- Cardiovascular Drugs:** Cardiovascular disease, drug inhibition of peripheral sympathetic function, direct acting arteriolar dilators. Synthesis of amyl nitrate, hydrolaxine verapamil, diazoxide propanol, sorbitrate, quinidine, Methyldopa, atenolol and oxypropenolol.
- Anti-tubercular Drugs:** PAS, Isoniazid, Ethambutol Thiosemicarbozone, Rifampicin.

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Unit-V Heterocyclic Compounds

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

Books Recommend:

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 J.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 armaceutical Chemistry by Charles O. Wilson, Ole Gisvold & Robert F. Doerge.
9. Principle of Medicinal Chemistry by Wilam O. Foye, Thomas L. Lemice and David A. Williams.
10. Burgers Medicinal Chemistry and Drug Discovery by M.E. Wolf
11. Heterocyclic Chemistry by RR. Gupta, M. Kumar and V.Gupta.
12. Heterocyclic Chemistry by T.L. Gilchrist.
13. Organic Chemistry by I.L. Finar.

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Semester-IV
Elective Course (P) 2a
Practical (Inorganic Chemistry Special)
Duration of Exam 12 hrs.

Full Marks - 50

Credit - 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 15
(a) Dolomite (b) Brass (c) Solder (d) Bauxite

OR

Spectrophotometric determination of Fe, Ni, Mn^{2+} , Cr, V, Ti, F, NO_3^- and PO_4^{3-} etc. PO_4^{3-}

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)
Duration of Exam 12 hrs.

Full Marks - 50

Credits- 5

(Marks 30)

Two experiments have to be set.

Determination
of

1. Conductometric titration of strong acid and strong base (NaOH+HCl)
2. Potentiometrically pH of a given solution using hydrogen electrode or quinhydrone electrode.
3. Potentiometric Experiments Determination of Acid-base titration.
4. Determination of partition coefficient of Iodine between CCl_4 and water.
5. Determination of partition coefficient of $\text{KI} + \text{I}_2 = \text{KI}_3$ between CCl_4 and water.
6. Viva- voce -15
7. Note Book -5

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Semester - IV
Elective Course (P) 2C
Practical Organic chemistry (Special)
Duration of Exam 12 hrs.

Full Marks - 50

Credits - 5

Any two experiments have to be set (Marks 30)

1. Separation and identification of organic compounds using chemical methods from organic mixtures containing up to three components
2. Preparation of organic compounds involving several stages
3. Estimation of carbohydrates, protein, aminoacids, ascorbic acid, blood cholesterol and aspirin by UV - visible Spectrophotometric method.
4. Vivo Voce
5. Note Book

15 Marks

05 Marks

A.P.S. /
29/3/19

Semester - IV

DSE-1



A.R. Patil
29/2/19

Semester - IV
GE-1

SYLLABUS
FOR

M.Sc. Chemistry

Semester (Ist, IInd, IIIrd and IVth)

ARR's
29/12/19



Effective from 2019-20 Onwards

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