

ACHARYA NAGARJUNA UNIVERSITY :: NAGARJUNANAGAR-522 510

B.Sc. CHEMISTRY COURSE STRUCTURE

Semester	Part	Subject	Hrs.	Credits	IA	ES	Total
FIRST YEAR							
Semester-I	Part-II	Inorganic & Organic Chemistry-I	4	4	25	75	100
		Laboratory Course-I	3	2	25	75	100
		Elective_ Medicinal Chemistry-VIII (or) Green Chemistry & Pesticides-VIII	4	4	25	75	100
		Laboratory Course-VI	3	2	25	75	100

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(CBCS UG Proposed syllabus)

Subject: CHEMISTRY

(w.e.f. 2015-2016)

Semester-I

Paper-I (Inorganic & Organic Chemistry)

60 hrs (4 h / w)

INORGANIC CHEMISTRY-I

UNIT - I

1. p-block elements:

15 h

General characteristics of elements of groups 13, 14, 15

Group-13 Synthesis and structure of diborane and higher boranes (B_4H_{10} and B_5H_9). boron-nitrogen compounds ($B_3N_3H_6$ and BN)

Group-14: Preparation and applications of silanes and silicone

Group-15: Preparation and reactions of hydrazine, hydroxylamine.

UNIT-II

I p-block elements:

8 h

General characteristics of elements of groups 16 and 17

Group-16: Classifications of oxides based on (i) Chemical behaviour and (ii) Oxygen content.

Group-17: Inter halogen compounds and pseudo halogens.

2. Organometallic Chemistry

Definition and classification of organometallic compounds, nomenclature, preparation, properties and applications of alkyls of Li and Mg elements

7 h

ORGANIC CHEMISTRY-I

30 hrs (2h /w)

UNIT-III

I. Structural theory in Organic Chemistry

10 h

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H_2O , NH_3 & $AlCl_3$).

Bond polarization: Factors influencing the polarization of covalent bonds, electro negativity - inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of Carboxylic acids. Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes. carbanions, carbenes and nitrenes.

Types of Organic reactions: Addition - electrophilic, nucleophilic and free radical, Substitution - electrophilic, nucleophilic and free radical. Elimination- Examples (mechanism not required).

UNIT-IV

I. Acyclic Hydrocarbons

6 h

Alkenes - Preparation of alkenes. Properties: Addition of hydrogen - heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H₂O, HOX, H₂SO₄ with mechanism and addition of HBr in the presence of peroxide (anti-Markonikov's addition). Dienes - Types of dienes, reactions of conjugated dienes - 1,2 and 1,4 addition of HBr to 1,3 - butadiene and Diel's Alder reaction.

Alkynes - Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides, Properties: Acidity of acetylenic hydrogen (formation of Metal acetylides). Preparation of higher acetylenes, Metal ammonia reductions Physical properties. Chemical reactivity electrophilic addition of X₂, HX, H₂O (Tautomerism), Oxidation with KMnO₄, OsO₄, reduction and Polymerisation reaction of acetylene.

2. Alicyclic hydrocarbons (Cycloalkanes)

4 h

Nomenclature, Preparation by Freund's methods, heating dicarboxylic metal salts. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes, Stability of cycloalkanes - Baeyer's strain theory, Sachse and Mohr predictions and Pitzer's strain theory Conformational structures of cyclobutane, cyclopentane, cyclohexane.

UNIT-V

I. Benzene and its reactivity

10 h

Concept or resonance, resonance energy. Heat of hydrogenation, heat of combustion of Benzene, mention of C-C bond lengths and orbital picture of Benzene.

Concept of aromaticity - aromaticity (definition), Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non-Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation)

Reactions - General mechanism of electrophilic substitution, mechanism of nitration. Friedel Craft's alkylation and acylation. Orientation of aromatic substitution - Definition of ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups Like NO₂ and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens (Explanation by taking minimum of one example from each type)

LABORATORY COURSE-60 hrs (3 h / w)

Practical-I (At the end of Semester-I)

Qualitative inorganic analysis

Qualitative Analysis and Inorganic preparations:

Analysis of simple salt containing the following one anion and cation

Analysis of Anions: Carbonate, sulphate, chloride, bromide, iodide, acetate, nitrate, borate, phosphate,

Analysis of cations: Lead, copper, cadmium, iron, aluminum, zinc, manganese, nickel, Calcium, strontium, barium, potassium and ammonium.

Inorganic preparations: Any one of the following inorganic preparations:

- 1) Ferrous ammonium sulphate
- 2) Tetrammine copper (II) sulphate

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GENERAL CHEMISTRY **30 hrs (2h / w)**

UNIT-IV

1. Surface chemistry **8 h**

Definition of colloids. Solids in liquids (sols), preparation, purification, properties kinetic, optical, electrical. Stability of colloids, Hardy-Schulze law, protective colloid.

Liquids in liquids (emulsions) preparation, properties, uses. Liquids in solids (gels) preparation uses.

Adsorption: Physical adsorption, chemisorption. Freundlich. Langmuir adsorption isotherms. Applications of adsorption

2. Chemical Bonding **7 h**

Valence bond theory, hybridization, VB theory as applied to ClF_3 , $\text{Ni}(\text{CO})_4$, Dipole moment - orientation of dipoles in an electric field, dipole moment, induced dipole moment. dipole moment and structure of molecules. Molecular orbital theory - LCAO method. construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N_2 , O_2 , CO and NO).

UNIT- V

I. Stereochemistry of carbon compounds **15 h**

Molecular representations - Wedge, Fischer, Newman and Saw-Horse formulae. Stereoisomerism, Stereoisomers: enantiomers, diastereomers - definition and examples. Conformational and configurational isomerism - definition. Conformational isomerism of ethane and n-butane.

Enantiomers: Optical activity wave nature of light, plane polarised light, interaction with molecules, optical rotation and specific rotation. Chiral molecules - definition and criteria- absence of plane, center, and Sn axis of symmetry - asymmetric and disymmetric molecules. Examples of asymmetric molecules (Glyceraldehyde, Lactic acid, Alanine) and disymmetric molecules (trans-1,2-dichloro cyclopropane).

Chiral centers: definition- molecules with similar chiral carbon (Tartaric acid), definition of mesomers - molecules with dissimilar chiral carbons (2,3-dibromopentane). Number of enantiomers and mesomers- calculation.

D,L and R,S configuration for asymmetric and disymmetric molecules. Cahn-Ingold-Prelog rules. Racemic mixture - racemisation and resolution techniques.

Diastereomers: definition - geometrical isomerism with reference to alkenes- cis. trans and E,Z-configuration.

LABORATORY COURSE - 60 hrs (3 h / w)

Practical-II (At the end of Semester-II)

Qualitative inorganic analysis

Qualitative inorganic analysis and Inorganic preparations:

Analysis of mixture salt containing two anions mixtures containing two anions and two cations (From two different groups) from the following:

Anions: Carbonate, sulphate, chloride, bromide, iodide, acetate, nitrate, borate, phosphate Cations: Lead, copper, iron, aluminum, zinc, manganese, calcium, strontium, barium, potassium and ammonium.

Inorganic preparations: Any one of the following:

1) potash alum

2) Hexamine cobalt (III) chloride.

3)potassium trisoxalato chromate

Recommended Text Books and Reference Books

Inorganic Chemistry

1. Concise Inorganic Chemistry by J.D.Lee
2. Basic Inorganic Chemistry by Cotton and Wilkinson
3. Advanced Inorganic Chemistry Vol.1 by Satyaprakash, Tuli, Basu and Madan
4. Inorganic Chemistry by R R Heslop and P.L. Robinson
- 5 Text book of Inorganic chemistry by R. Gopalan
6. A textbook of qualitative inorganic analysis by A.I. Vogel
7. Inorganic Chemistry by J.E. Huheey
8. Inorganic Chemistry by Chopra and Kapoor
9. Coordination Chemistry by Basalo and Johnson
10. Organometallic Chemistry - An introduction by R.C. Mehrotra and A. Singh
11. Inorganic Chemistry by D.F. Shriver, P.W. Atkins and C.H. Langford
12. Advanced Inorganic Chemistry By Gurudeep Raj
13. Analytical Chemistry by G.L.David Krupadanam, *et al*, Univ. Press
14. Selected topics in inorganic chemistry by W.D. Malik, G.D.Tuli, R.D.Madan
15. Concepts and models of Inorganic Chemistry by Bodie Douglas, D.MeDaniel and J.Alexander
16. Concise coordination chemistry by Gopalan and Ramalingam
-] 7. Satyaprakash's modern inorganic chemistry by R.D.Madan.

Organic Chemistry

1. Organic Chemistry By R T Morrison and R.N. Boyd
2. Organic Chemistry by G. Mare loudan, Purdue Univ
3. Text book of Organic Chemistry by Ferguson
4. Problems and their solutions in organic Chemistry by I.L. Finar
5. Reaction mechanisms in Organic Chemistry by S.M. Mukhelji and S.P. Singh
6. A guide book to mechanisms in Organic Chemistry by Peter Sykes
7. Organic spectroscopy by J.R. Dyer
8. Organic Spectroscopy by William Kemp
9. Comprehensive practical organic qualitative analysis by V.K. Ahluwalia & Sumta Dhingra
10. Text book of Organic Chemistry by K.S. Mukherjee
11. Organic Chemistry by L.G. Wade Jr, Maya Shankar Singh
12. Elementary organic spectroscopy by Y.R. Sharma
13. Chemistry & Industry by Gurdeep R. Chatwal
14. Drugs by David Krupadanam
15. Pharmacodynamics by R.C.Srivastava, Subit Ghosh
16. Analytical Chemistry by David Krupadanam
17. Green Chemistry - V.K. Ahluwalia
18. Organic Synthesis by V.K. Ahluwalia and R. Agarwal
19. New trends in Green Chemistry - by V.K. Ahluwalia & M. Kidwai
20. Industrial Chemistry by B.K.Sharmai
21. Industrial Chemistry by M.G. Arora
22. Synthetic Drugs by O.D. Tyagi & M. Yadav
23. Medicinal Chemistry by Ashutoshkar

24. Medicinal Chemistry by P. Parimoo
25. Pharmacology & Pharmacotherapeutics by R.S. Satoshkar & S.D. Bhandenkar
26. Medicinal Chemistry by Kadametal P-I & P-II.
27. Vogel's Qualitative organic analysis.
28. Laboratory manual of Organic Chemistry by Raj K Bansal

Physical Chemistry books:

1. Principles of Physical Chemistry by Prutton and Marron
2. Physical chemistry by Peter Atkins, Julio D. Paula
3. Elements of Physical Chemistry by Peter Atkins, Julio D. Paula
4. Text book of Physical Chemistry by P.L.Soni, O.P. Dharmarha and Q.N.Dash
5. Solid State Chemistry and its applications by Anthony R. West
6. Text book of Physical Chemistry by K L Kapoor
7. Text book of Physical Chemistry by M.V. Sangaranarayanan
8. Thermodynamics by J Jayaram and J C Kuriakose
9. Introductory Quantum Chemistry by A K Chandra
10. Physical Chemistry by J W Moore
11. Kinetics and mechanism by J.W.Moore and R G Pearson
12. Fundamentals of photochemistry by K K Rohtagi Mukharjee
13. Chemical thermodynamics by R P Rastogi and S S Misra
14. Advanced Physical Chemistry by Gurudeep Raj
15. Text book of physical chemistry by S Glasstone
16. Fundamentals of Molecular spectroscopy by C.N. Banwell and E.M. McCash
17. Nanochemistry by Geoffrey Ozin and Andre Arsenault
18. Catalysis: Concepts and green applications by Gadi Rotherberg
19. Green Chemistry: Theory and practice by P.T. Anastas and J.C. Warner
20. Polymer Science by Gowriker, Viswanathan and Jayadev Sridhar
21. Polymer Chemistry by Bilmayere.