


Andhra Pradesh State Council of Higher Education  
B.Sc. Chemistry Syllabus under CBCS  
w.e.f. 2015-16 (revised in April 2016)

**Structure of Chemistry Syllabus Under CBCS**

| YEAR | SEMESTER                                          | PAPER      | TITLE                             | MARKS | CREDITS |
|------|---------------------------------------------------|------------|-----------------------------------|-------|---------|
|      | * Any one<br>Paper from<br>VII A, B<br>and C      | VII (A)*   | Elective                          | 100   | 03      |
|      |                                                   |            | Practical - VII A                 | 50    | 02      |
|      |                                                   | VII (B)*   | Elective                          | 100   | 03      |
|      |                                                   |            | Practical - VII B                 | 50    | 02      |
|      |                                                   | VII (C)*   | Elective                          | 100   | 03      |
|      |                                                   |            | Practical - VII C                 | 50    | 02      |
|      | ** Any one<br>cluster<br>from VIII,<br>A, B and C | VIII (A)** | <b>Cluster Electives - I :</b>    | 100   | 03      |
|      |                                                   |            | VIII-A-1                          | 100   | 03      |
|      |                                                   |            | VIII-A-2                          | 100   | 03      |
|      |                                                   |            | VIII-A-3                          | 50    | 02      |
|      |                                                   |            |                                   | 50    | 02      |
|      |                                                   |            |                                   | 50    | 02      |
|      |                                                   | VIII (B)** | <b>Cluster Electives - II ::</b>  | 100   | 03      |
|      |                                                   |            | VIII-B-1                          | 100   | 03      |
|      |                                                   |            | VIII- B-2                         | 100   | 03      |
|      |                                                   |            | VIII-B-3                          | 50    | 02      |
|      |                                                   |            |                                   | 50    | 02      |
|      |                                                   |            |                                   | 50    | 02      |
|      |                                                   | VIII (C)** | <b>Cluster Electives - III ::</b> | 100   | 03      |
|      |                                                   |            | VIII-C-1                          | 100   | 03      |
|      |                                                   |            | VIII-C-2                          | 100   | 03      |
|      |                                                   |            | VIII-C-3                          | 50    | 02      |
|      |                                                   |            |                                   | 50    | 02      |
|      |                                                   |            |                                   | 50    | 02      |

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**SEMESTER-VI**  
**ELECTIVE PAPER – VII-(B) : ENVIRONMENTAL CHEMISTRY**  
**45 hrs (3 h / w)**

**UNIT-I**

**Introduction**

**9h**

Concept of Environmental chemistry-Scope and importance of environment in now adays – Nomenclature of environmental chemistry – Segments of environment - Natural resources – Renewable Resources – Solar and biomass energy and Nonrenewable resources – Thermal power and atomic energy – Reactions of atmospheric oxygen and Hydological cycle.

**UNIT-II**

**Air Pollution**

**9h**

Definition – Sources of air pollution – Classification of air pollution – Acid rain – Photochemical smog – Green house effect – Formation and depletion of ozone – Bhopal gas disaster – Controlling methods of air pollution.

**UNIT-III**

**Water pollution**

**9h**

Unique physical and chemical properties of water – water quality and criteria for finding of water quality – Dissolved oxygen – BOD, COD, Suspended solids, total dissolved solids, alkalinity – Hardness of water – Methods to convert temporary hard water into soft water – Methods to convert permanent hard water into soft water – eutrophication and its effects – principal wastage treatment – Industrial waste water treatment.

**UNIT-IV**

**Chemical Toxicology**

**9h**

Toxic chemicals in the environment – effects of toxic chemicals – cyanide and its toxic effects – pesticides and its biochemical effects – toxicity of lead, mercury, arsenic and cadmium.

**UNIT-V**

**Ecosystem and biodiversity**

**9h**

**Ecosystem**

Concepts – structure – Functions and types of ecosystem – Abiotic and biotic components – Energy flow and Energy dynamics of ecosystem – Food chains – Food web – Tropic levels – Biogeochemical cycles (carbon, nitrogen and phosphorus)

  
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## **Biodiversity**

Definition – level and types of biodiversity – concept - significance – magnitude and distribution of biodiversity – trends - biogeographical classification of india – biodiversity at national, global and regional level.

### **List of Reference books**

1. Fundamentals of ecology by M.C.Dash
2. A Text book of Environmental chemistry by W. Moore and F.A. Moore
3. Environmental Chemistry by Samir k. Banerji

## **LABORATORY COURSE – VI**

**Practical Paper – Elective VII B (at the end of semester VI) 30 hrs (2 h / W)**

1. Determination of carbonate and bicarbonate in water samples (acidity and alkalinity)
2. Determination of hardness of water using EDTA
  - a) Permanent hardness
  - b) Temporary hardness
3. Determination of Acidity
4. Determination of Alkalinity
5. Determination of chlorides in water samples

### **Cluster Elective –III ORGANIC**

**PAPER – VIII-C-1 : ORGANIC SPECTROSCOPIC TECHNIQUES  
45 hrs (3 h / w)**

#### **UNIT-I**

**10h**

#### **NUCLEAR MAGNETIC RESONANCE SPECTROSCOPY**

Nuclear spin, Principles of NMR-Classical and Quantum Mechanical methods, Magnetic moment and Spin angular momentum. Larmour Frequency. Instrumentation. Relaxation-spin-spin & spin lattice relaxation. Shielding constants, Chemical shifts, Shielding and Deshielding

  
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mechanism-Factors influencing Chemical shift. Spin-Spin interactions-AX, AX<sub>2</sub> and AB types. Vicinal, Geminal and Long range coupling- Factors influencing coupling constants.

## UNIT – II

5h

Spin decoupling, Spin tickling, Deuterium exchange, Chemical shift reagents and Nuclear overhauser effect. Applications in Medical diagnostics, Reaction kinetics and Mechanically induced dynamic nuclear polarization. FT NMR and its Advantages.

## UNIT-III

10h

### UV & VISIBLE SPECTROSCOPY

Electronic spectra of diatomic molecules. The Born-oppenheimer approximation. Vibrational coarse structure: Bond association and Bond sequence. Intensity of Vibrational-electronic spectra: The Franck-Condon principle. Rotational fine structure of electronic vibration transitions. Electronic structure of diatomic molecules.

Types of transitions, Chromophores, Conjugated dienes, trienes and polyenes, unsaturated carbonyl compounds-Woodward – Fieser rules.

## UNIT-IV

5h

Electronic spectra of polyatomic molecules. Chemical analysis by Electronic Spectroscopy – Beer-Lambert's Law. Deviation from Beer's law. Quantitative determination of metal ions (Mn<sup>+2</sup>, Fe<sup>+2</sup>, NO<sub>2</sub><sup>-</sup>, Pb<sup>+2</sup>). Simultaneous determination of Chromium and Manganese in a mixture.

## UNIT-V

15h

### Electron Spin Resonance Spectroscopy

Basic Principles, Theory of ESR, Comparison of NMR & ESR. Instrumentation, Factors affecting the 'g' value, determination of 'g' value. Isotropic and Anisotropic constants. Splitting hyper fine splitting coupling constants. Line width, Zero field splitting and Kramer degeneracy. Crystal field splitting, Crystal field effects.

Applications:- Detection of free radicals; ESR spectra of (a) Methyl radical (CH<sub>3</sub>), (b) Benzene anion (C<sub>6</sub>H<sub>6</sub><sup>-</sup>) (c) Isoquinine (d) [Cu(H<sub>2</sub>O)<sub>6</sub>]<sup>+2</sup> (e) [Fe(CN)<sub>5</sub>NO]<sup>-3</sup> (f)



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## REFERENCE BOOKS:

1. Electron Spin Resonance Elementary Theory and Practical Applications- John E. Wertz and James R. Bolton, Chapman and Hall, 1986.
2. Spectroscopic Identification of organic compounds – Silverstein, Basseler and Morrill.
3. Organic Spectroscopy- William Kemp.
4. Fundamentals of Molecular Spectroscopy- C.N.Banwell and E.A. Mc cash 4<sup>th</sup> Edition, Tata Mc Graw Hill Publishing Co., Ltd. 1994.
5. Physical Methods in Inorganic Chemistry – R.S.Drago, Saunders Publications.
6. Application of Mössbauer Spectroscopy – Green Mood.
7. NMR, NQR, EPR and Mössbauer Spectroscopy in inorganic chemistry – R.V Parish, Ellis, Harwood.
8. Instrumental Methods of Chemical Analysis- H.Kaur, Pragathi Prakashan, 2003.
9. Instrumental Methods of Analysis, 7<sup>th</sup> Edition – Willard, Merritt, Dean, Settle, CBS Publications, 1986.
10. Molecular Structure and Spectroscopy – G. Aruldas, Prentice Hall of India Pvt.Ltd, New Delhi, 2001.
11. Mössbauer Spectroscopy – N.N. Green Wood and T.C. Gibb, Chapman, and Hall, Landon 1971.
12. Coordination Chemistry: Experimental Methods- K. Burger, London Butter Worths, 1973.
13. Analytical spectroscopy – Kamlesh Bansal, Campus books, 2008.
14. Structural Inorganic Chemistry Mössbauer Spectroscopy – Bhide.
15. Principle of Mössbauer Spectroscopy – T.C. Gibb, Chapman, and Hall, Landon 1976.

### Cluster Elective –III ORGANIC

#### PAPER – VIII-C-2 : ADVANCED ORGANIC REACTIONS 45 hrs (3 h / w)

### UNIT – I

### ORGANIC PHOTOCHEMISTRY



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Organic photochemistry : Molecular orbitals, carbonyl chromophore-triplet states, Jablonski diagram, inter-system crossing. Energy transfer. Energies properties and reaction of singlet and triplet states of and transitions.  
**Photochemical reactions** : (a) Photoreduction, mechanism, influence of temperature, solvent, nature of hydrogen donors, structure of substrates on the course of photo reduction,.

## UNIT – II

### ORGANIC PHOTOCHEMISTRY

Norrish cleavages, type I : Mechanism, acyclic cyclicdiones, influence of sensitizer, photo Fries rearrangement. Norrish type II cleavage : Mechanism and stereochemistry, type II reactions of esters : 1: 2 diketones, photo decarboxylation., Di -  $\pi$  methane rearrangement, Photochemistry – of conjugated dienes, Decomposition of nitrites – Barton reaction.

## UNIT – III

### PROTECTING GROUPS AND ORGANIC REACTIONS

Principles of (1) Protection of alcohols – ether formation including silyl ethers – ester formation, (2) Protection of diols – acetal, ketal and carbonate formation, (3) Protection of carboxylic acids – ester formation, benzyl and t-butyl esters, (4) Protection of amines – acetylation, benzoylation, benzyloxy carbonyl, triphenyl methyl groups and fmoc, (5) Protection of carbonyl groups – acetal, ketal, 1,2-glycols and 1,2-dithioglycols formation.

## UNIT – IV

Synthetic reactions : Mannich reaction – Mannich bases – Robinson annulations. The Shapiro reaction, Stork-enamine reaction. Use of dithioacetals – Umpolung, phase transfer catalysis – mechanisms and use of benzyl trialkyl ammonium halides. Wittig reaction.

## UNIT – V : NEW SYNTHETIC REACTIONS

Baylis-Hillman reaction, RCM olefin metathesis, Grubb catalyst, Mukayama aldol reaction, Mitsunobu reaction, McMurrey reaction, Julia-Lythgoe olefination, and Peterson's stereoselective olefination, Heck reaction, Suzuki coupling, Stille coupling and Sonogishira coupling, Buchwald-Hartwig coupling. Ugi reaction, Click reaction.

### Recommended Books

1. Molecular reactions and Photochemistry by Charles Dupey and O.L. Chapman.
2. Molecular Photochemistry by Turru.
3. Importance of antibonding orbitals by Jaffe and Orchin.
4. Text Book of Organic Chemistry by Cram, Hammand and Henrickson.
5. Some modern methods of organic synthesis by W. Carruthers.



Pharmaceutical chemistry Terminology: Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics (ADME, Receptors - brief treatment) Metabolites and Anti metabolites.

## UNIT-II

8h

### Drugs:

Nomenclature: Chemical name, Generic name and trade names with examples Classification: Classification based on structures and therapeutic activity with one example each, Administration of drugs

## UNIT-III

12h

### Synthesis and therapeutic activity of the compounds:

#### a. Chemotherapeutic Drugs

1. Sulphadugs (Sulphamethoxazole) 2. Antibiotics -  $\beta$ -Lactam Antibiotics, Macrolide Antibiotics, 3. Anti malarial Drugs (chloroquine)

#### b. Psycho therapeutic Drugs:

1. Anti pyretics (Paracetamol) 2. Hypnotics, 3. Tranquilizers (Diazepam) 4. Levodopa

## UNIT-IV

8h

### Pharmacodynamic Drugs:

1. Antiasthma Drugs (Solbutamol) 3. Antianginals (Glycerol Trinitrate)  
4. Diuretics (Frusemide)

## UNIT-V

9h

### HIV-AIDS:

Immunity - CD-4 cells, CD-8 cells, Retro virus, Replication in human body, Investigation available, prevention of AIDS, Drugs available - examples with structures: PIS: Indinavir (crixivan), Nelfinavir (Viracept).

### List of Reference Books:

1. Medicinal Chemistry by Dr. B.V. Ramana
2. Synthetic Drugs by O.D. Tyagi & M. Yadav
3. Medicinal Chemistry by Ashutoshkar
4. Medicinal Chemistry by P. Parimoo
5. Pharmacology & Pharmacotherapeutics R.S. Satoshkar & S.D. Bhandenkar
6. Medicinal Chemistry by Kadametal P-I & P-II
7. European Pharmacopoeia

  
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6. Guide Book to Organic Synthesis by R.K. Meckie, D.M. Smith and R.A. Atken.
7. Organic Synthesis by O.House.
8. Organic synthesis by Michael B. Smith.
9. Organic Chemistry Claydon and others 2005.
10. Name Reactions by Jie Jack Li
11. Reagents in Organic synthesis by B.P. Mundy and others.
12. Tandem Organic Reactions by Tse-Lok Ho.

**Cluster Elective –III**  
**ORGANIC**

**PAPER – VIII-C-3 : PHARMACEUTICAL AND MEDICINAL CHEMISTRY**  
**45 hrs (3 h / w)**

**UNIT-I**

**8h**

  
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