

**FURTHER DETAILS REGARDING MAIN TOPICS OF  
PROGRAMME NO. 08/2014 (Item No. 7)**

**LECTURER IN CHEMISTRY**

**COLLEGIATE EDUCATION**

**(CATEGORY NO. 586/2012)**

**Module –I**

Formulation of Quantum Mechanics - Approximation Methods - Hydrogen like Atoms -Multi Electron Systems - Angular Momentum - Applications

Chemical Bonding in Diatomic and Polyatomic Molecules-Electronic Spectroscopy of Atoms - Basic principles of Molecular Spectroscopy: Microwave, Infrared, Electronic, NMR, ESR, Raman and Mossbauer

Basic principles of Group Theory - Character Tables - Chemical .and Spectral Applications

Introduction to Computational Chemistry - Computational methods : *ab initio*, Semi Empirical methods - Molecular Mechanics

**Module –II**

Laws of Thermodynamics - Thermodynamics of Solutions - Thermodynamics of irreversible process - Phase Equilibria - Two and Three Component Systems

Statistical Mechanics - Fundamentals - Partition Function - Quantum Statistics - Heat capacities of Solids and Gases .

Electrodes and Electrochemical Cells - Nernst, Debye-Huckel, Omsager Equations - Electro kinetic Phenomena, Electrolytic Polarization.

Electro Analytical Methods : Potentiometry, Polarography , Coulometry, Conductometry, Voltametry and Amperometry.

Electronic Structure of Solids - Crystal Symmetry - Theories of Solids - Properties of Solids : Electrical, Magnetical and Optical - Crystal defects.

Structure and Theories of Liquids - Liquid Crystals and their applications.

Basic principles of Kinetics - Kinetics of Complex reactions - steady state approximation -Theories of Reaction Rates - Arrhenius equation - fast reactions.

Homogenous and Heterogeneous Catalysis - Enzyme Catalysis

Monolayer and multilayer adsorption - Adsorption Isotherms - Principles of SEM, TEM, ECSA and Augur Spectroscopy

Colloids - Zeta Potential - Electrokinetic Phenomena

## Module-III

Basic concepts of Organic reactions - Electron displacement effects - Aromaticity

Organic Reactions : Substitution, Addition, Elimination, Rearrangements - Mechanism

Concept of Molecular Chirality - Carbon and Nitrogen Compounds - Chiral reagents and Chiral Catalysts - Stereo chemistry of biphenyl and allenes . Topicity and prostereo isomerism -asymmetric synthesis.

Geometrical isomerism

Conformational analysis in acyclic and cyclic systems

Reactivity in substitution and elimination reactions.

Reaction intermediates - reactions related to substitution, addition, elimination and rearrangements - mechanism and application.

Esterification and ester hydrolysis reactions - structure and reactivity: Linear Free Energy relationship.

## Module-IV

Photoreactions of Carbonyl compounds - enes, dienes, arenes - applications

Pericyclic reactions: Electrocyclic, cycloaddition, Sigmatropic - Selection rules and stereochemistry - applications

Chromatographic techniques. Column, TLC, Paper, GC, HPLC and ion exchange

Applications of UV, IR, HNMR, CNMR and Mass Spectroscopy - D NMR techniques -Structural Analysis using Spectral Data

ORD and CD - theory and applications

Organic, Inorganic and organo metallic reagents in organic synthesis.

Protecting groups in peptide synthesis

Natural Products : Terpenes, steroids, alkaloids, carbohydrates, proteins, nucleic acids, vitamins, prostoglandins, hormones and enzymes.

Fundamentals of polymerization - structure - property relationship of polymers - biopolymers.

## Module –V

Accuracy & Precision - statistical treatment of data - Theories of titrations

Thermal methods of analysis

Structure and bonding in molecules - chemical periodicity

Theories of acids and bases - Non-aqueous solvents - Isopoly and heteropoly acids

Theories in co-ordination chemistry - stereochemistry of co-ordination compounds - stability of metal complexes - reactions of metal complexes

Electronic, Infrared, NMR, ESR and Mossbauer spectra of complexes - Co-ordination complexes of Lanthanides and actinides.

## **Module –VI**

Synthesis, structure, properties and bonding of organometallic compounds - metal carbonyls and cyanides - Catalysts by organo metallic compounds - hydrogenation, hydroformylation and polymerization.

Metal ions in biological systems - Role and effects - Coenzymes, Cytochromes, chlorophylls and hormones.

Nuclear reactions - structure and stability - radio active equilibria - neutron activation analysis - counting techniques.

Synthesis, reactions, structure and bonding in boranes - organoboranes and hydriborations -synthesis, structure and uses of phosphorous, nitrogen compounds, phosphorus - sulphur compounds, silicones and silicates.

## **Module -VII      Recent Developments in Chemistry**

Nanostructures - 1D, 2D and 3D structures - Synthesis and applications of nanomaterials.

Principles of Green chemistry - Green synthesis - Application of Phase Transfer Catalysts -Green Reactions.

Molecular recognition : Synthetic Receptors, Cyclodextrin, Calixiranes, Cyclophanes, Crown Ethers.

Drug design and Drug action.

## **Module VIII      Research Methodology/Teaching Aptitude**

### **I. TEACHING APTITUDE**

- Teaching: Nature, objectives, characteristics and basic requirements;
- Learner's characteristics;
- Factors affecting teaching;
- Methods of teaching;
- Teaching aids;
- Evaluation systems.

### **II. RESEARCH APTITUDE**

- Research: Meaning, Characteristics and types;
- Steps of research;
- Methods of research;

- Research Ethics;
- Paper, article, workshop, seminar, conference and symposium;
- Thesis writing: its characteristics and format.

## **Module IX(a) Salient Features of Indian Constitution**

Salient features of the Constitution - Preamble- Its significance and its place in the interpretation of the Constitution.

Fundamental Rights - Directive Principles of State Policy - Relation between Fundamental Rights and Directive Principles - Fundamental Duties.

Executive - Legislature - Judiciary - Both at Union and State Level. - Other Constitutional Authorities.

Centre-State Relations - Legislative - Administrative and Financial.

Services under the Union and the States.

Emergency Provisions.

Amendment Provisions of the Constitution.

## **Module IX (b) Social Welfare Legislations and Programmes**

Social Service Legislations like Right to Information Act, Prevention of atrocities against Women & Children, Food Security Act, Environmental Acts etc. and Social Welfare Programmes like Employment Guarantee Programme, Organ and Blood Donation etc.

## **Module X (a) Renaissance in Kerala**

### **TOWARDS A NEW SOCIETY**

Introduction to English education - various missionary organisations and their functioning- founding of educational institutions, factories, printing press etc.

### **EFFORTS TO REFORM THE SOCIETY**

#### **(A) Socio-Religious reform Movements**

SNDP Yogam, Nair Service Society, Yogakshema Sabha, Sadhu Jana Paripalana Sangham, Vaala Samudaya Parishkarani Sabha, Samathwa Samajam, Islam Dharma Paripalana Sangham, Prathyaksha Raksha Daiva Sabha, Sahodara Prasthanam etc.

#### **(B) Struggles and Social Revolts**

Upper cloth revolts. Channar agitation, Vaikom Sathyagraha, Guruvayoor Sathyagraha, Paliyam Sathyagraha. Kuttamkulam Sathyagraha, Temple Entry Proclamation, Temple Entry Act .Malyalee Memorial, Ezhava Memorial etc.

Malabar riots, Civil Disobedience Movement, Abstention movement etc.

## **ROLE OF PRESS IN RENAISSANCE**

Malayalee, Swadeshabhimani, Vivekodayam, Mithavadi, Swaraj, Malayala Manorama, Bhashaposhini, Mathnubhoomi, Kerala Kaumudi, Samadarsi, Kesari, AI-Ameen, Prabhatham, Yukthivadi, etc

## **AWAKENING THROUGH LITERATURE**

Novel, Drama, Poetry, *Purogamana Sahithya Prasthanam*, *Nataka Prashtanam*, Library movement etc

## **WOMEN AND SOCIAL CHANGE**

Parvathi Nenmenimangalam, Arya Pallam, A V Kuttimalu Amma, Lalitha Prabhu. Akkamma Cheriyan, Anna Chandi, Lalithambika Antharjanam and others

## **LEADERS OF RENAISSANCE**

Thycaud Ayya Vaikundar, Sree Narayana Guru, Ayyan Kali. Chattampi Swamikal, Brahmananda Sivayogi, Vagbhadananda, Poikayil Yohannan (Kumara Guru) Dr Palpu, Palakkunnath Abraham Malpan, Mampuram Thangal, Sahodaran Ayyappan, Pandit K P Karuppan, Pampadi John Joseph, Mannathu Padmanabhan, V T Bhattathirippad, Vakkom Abdul Khadar Maulavi, Makthi Thangal, Blessed Elias Kuriakose Chaavra, Barrister G P Pillai, TK Madhavan, Moorkoth Kumaran, C. Krishnan, K P Kesava Menon, Dr. Ayyathan Gopalan, C V Kunjuraman, Kuroor Neelakantan Namboothiripad, Velukkutty Arayan, K P Vellon, P K Chathan Master, K Kelappan, P. Krishna Pillai, A K Gopalan, T R Krishnaswami Iyer, C Kesavan. Swami Ananda Theerthan, M C Joseph, Kuttippuzha Krishnapillai and others

## **LITERARY FIGURES**

Kodungallur Kunhikkuttan Thampuran, KeralaVarma Valiyakoyi Thampuran, Kandathil Varghese Mappila. Kumaran Asan, Vallathol Narayana Menon, Ulloor S Parameswara Iyer, G Sankara Kurup, Changampuzha Krishna Pillai, Chandu Menon, Vaikom Muhammad Basheer. Kesav Dev, Thakazhi Sivasankara Pillai, Ponkunnam Varky, S K Pottakkad and others

## **Module X (b) General Knowledge and Current Affairs**

General Knowledge and Current Affairs

***NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.***