



VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY
JNANASAGARA CAMPUS, BALLARI-583105

Department of Studies in Chemistry

SYLLABUS

Bachelor of Science
(I & II Semester)

With effect from 2024-25 and onwards

Department Name: CHEMISTRY**Semester - I**

| | |
|---|----------------------------------|
| Course Title: Chemistry-1 | Course Code:24MJCHEM1L |
| Total Contact Hours: 54 | No. of Credits: 04 |
| L:T:P | (4,0,0) |
| Internal Assessment Marks: Theory:20 | Duration of SEE: 3Hours |
| Semester End Exam Marks: 80 | Contact HrsWeek: 04 Hours |

Course Outcomes (CO's):

- 1) Basics of atomic periodic properties and bonding nature will taught
- 2) Fundamentals of organic reaction, mechanism and stereochemistry of organic compounds will be taught
- 3) Principles, properties and applications of gases, liquids and solids will be taught
- 4) Introductory analytical aspects like data analysis and treatment of analytical data will be taught

At the end of the course, students shall be able to:

- 1) Understanding the importance of properties of periodic elements and bonding in chemical compounds..
- 2) Understanding the basics and mechanism of organic compounds.
- 3) Explain the preliminary and importance of solid, liquids and gases.
- 4) Utilisation of analytical view of data and its treatment.

UNIT-I: INORGANIC CHEMISTRY-1**14 Hours****Atomic structure****04 hours**

Modern views on Atomic structure-Cloud model- Schrodinger wave equation (no derivation), Wave function, application of Schrodinger wave equation to H-atom & physical significance of ψ & ψ^2 . Normalised & Orthogonal wave functions, Eigen Functions & Eigen value, shapes of s, p & d orbitals. Pauli exclusion principle. Hund's rule of maximum multiplicity, Aufbau principle & (n+l) rule.

Periodic properties**05 hours**

Elementary ideas on types of periodical tables (helical,rectilinear,spiral) Atomic & ionic radii, Ionization Potential, electron affinity and electronegativity –definition&, determination (one method). Effective nuclear charge, Shielding/ Screening effect and Slater rules

Chemical bonding-1**05 hours**

Definition, types of chemical bonds, Ionic bond-formation, factors favoring the formation of ionic bond, Characteristics of ionic compounds. structure of ionic crystals: MX (ZnS & CsCl) & MX₂(TiO₂ & Calcium fluoride), lattice energy, Born-Haber's cycle, Born-Lande equation (no derivation), Polarizing power of ions, Fajan's rules.

UNIT-II:ORGANIC CHEMISTRY-1

14 Hours

Structure and bonding in organic molecules

04 hours

Covalent bonds, bond length, bond angle, bond energy and bond order. Concept of Hybridization: sp^3 , sp^2 , sp hybridizations by taking methane, ethylene and acetylene molecules respectively. Sigma and pi bonds, Bent bonds- geometry & angles.

Organic reactions and their mechanism

05 Hours

Types of organic reactions: Addition, Substitution, elimination, rearrangement, hydrolysis, oxidation, reduction, reactions – definition with examples. Homolytic & heterolytic bond cleavage – definition with examples.

Types of reagents: Electrophiles and nucleophiles – definition with examples.

Reactive intermediates: Carbonium ions, carbanions – definition, methods of formation, reactivity and stability. Free radicals and carbenes – definition with examples. Pericyclic reactions

Stereochemistry of organic reactions

05 Hours

Concept of isomerism and Classification. Optical isomerism, Optical activity, configuration, chiral carbon, and molecular dissymmetry. Optical isomerism in tartaric acid. Enantiomers, diastereomers, meso compound, racemic mixture – meaning & examples. Racemisation.

Geometrical isomerism: Explanation with examples (maleic & fumaric acids), stability of geometrical isomers E-Z System

Conformation isomers: Conformational analysis of ethane and 1,2 dichloro ethane.

UNIT-III: PHYSICAL CHEMISTRY-1

14 Hours

Gaseous state

07hours

Critical phenomenon:, Liquifaction of gases PV isotherms of carbon dioxide , relation between critical constants and Van der Waal's constants. Continuity of states, The law of corresponding states and reduced equation of states. Qualitative discussion of Maxwell and Boltzmann's distribution of molecular velocities, Molecular velocities; average, root mean square and most probable velocity. Collision properties: Collision diameter collision number and mean free path.

Physical properties of liquids

04 Hours

Surface tension and its determination by using stalagmometer. Viscosity and its determination by using Ostwald's viscometer. Effect of temperature on viscosity and surface tension. Refractive index, specific & molar refractivities. Physical properties & molecular structure: Additive and constitutive properties. Application of parachor in elucidating the structure of benzene and quinone.

Solid state

03 Hours

Difference between crystalline and amorphous solids. Laws of crystallography (definition and explanation). Crystal lattice and unit cell, Bravais lattice, Miller indices. Derivation of Bragg's equation. X ray diffraction: Principles and techniques.

UNIT-IV: ANALYTICAL CHEMISTRY-1

14 Hours

Treatment of Analytical Data, Definitions of analysis, determination, measurement, techniques and

methods. Classification of analytical techniques. Selection of an analytical method - accuracy, precision, sensitivity, selectivity, method validation. Figures of merit of analytical methods and limit of detection (LOD), Limit of quantification (LOQ), linear dynamic range (working range). Errors and treatment of analytical data: Limitations of analytical methods

Errors in Analysis: Determinate and indeterminate, Types of errors: errors, absolute error, relative error, minimization of errors. Statistical treatment of finite samples -mean, median, range, standard deviation and variance. Quality control: Importance, role, functions. Numerical problems

Semester - I

| | |
|--|-----------------------------------|
| Course Title: Chemistry Laboratory Course-I | Course Code: 24MJCHEM1P |
| Total Contact Hours: 54 | No. of Credits: 02 |
| L:T:P | (0,0,4) |
| Internal Assessment Marks: Theory:10 | Duration of SEE: 3Hours |
| Semester End Exam Marks: 40 | Contact Hrs Week: 04 Hours |

Course Outcomes (CO's):

1. To prepare and estimate some inorganic compounds.
2. To prepare some organic compounds.
3. To impart skills related to preparation of stock and working solutions and handling of instrumental methods
4. To know the principle of viscometer and determination of viscosity by viscometer
5. To know the principle of stegnometer and determination of surface tension by stelegnometer

At the end of the course, students will be able to:

1. Understand the importance of instrumental methods for quantitative applications.
2. Learn the importance of preparation methods and also determination of inorganic compounds.
3. Understand the mechanism of organic synthesis

LABORATORY COURSE-1

54 Hours

Titrimetric estimations

Minimum 12 experiments are to be given for estimation.

The following estimations are to be given.

1. Preparation of standard sodium carbonate solution, standardization of HCl and estimation of sodium hydroxide solution.
2. Estimation of sodium hydroxide and sodium carbonate in a mixture of the two.
3. Estimation of oxalic acid and sulphuric acid in a mixture of the two using standard potassium permanganate and standard sodium hydroxide solution.
4. Preparation of standard oxalic solution, standardization of potassium permanganate and estimation of Fe in Mohr's salt.
5. Estimation of calcium content in lime stone as calcium oxalate by standardized potassium permanganate solution.
6. Estimation of ferrous & ferric iron in a mixture of the two by dichromate method.
7. Preparation of standard potassium dichromate solution, standardization of sodium thiosulphate solution and estimation of copper in copper sulphate.
8. Preparation of standard ferrous ammonium sulphate, standardization of potassium dichromate solution and estimation of Fe in FeCl_3 .
11. Estimation of phenol/aniline by bromination method.
13. Estimation of vitamin C by titrimetry method.
14. Estimation of amino acid.
15. Estimation of amines by acetylation methods.

Spectrophotometric estimations

16. Determination of surface tension of two liquids by using stegnometer

17. Determination of density and surface tension of a liquid by using stegnometer
18. Determination of viscosity of two liquids by using Ostwald's Viscometer
19. Determination of density and surface tension of a liquid by using Ostwald's Viscometer

SECOND SEMESTER

| | |
|---|------------------------------------|
| Course Title: Chemistry-II | Course Code:24MJCHEM2L |
| Total Contact Hours: 54 | No. of Credits: 04 |
| L:T:P | (4,0,0) |
| Internal Assessment Marks: Theory:20 | Duration of SEE: 3Hours |
| Semester End Exam Marks: 80 | Contact Hrs /Week: 04 Hours |

Course Outcomes (CO's):

- 1) Periodic properties of s and p block elements with bonding nature will be taught
- 2) Elementary aspects of organic compounds like alkane , alkene, alkyne and aromaticity will be taught
- 3) Importance of liquid crystal and mechanism of kinetics of some reactions will be taught
- 4) Principles and basics of qualitative, quantitative and gravimetric analysis will be taught

At the end of the course, students shall be able to:

- 1) Understanding the properties of s and p block elements.
- 2) Understanding the preliminary aspects of organic compounds.
- 3) Explain importance of liquid crystals and chemical kinetics.
- 4) Utilisation of qualitative and quantitative analysis with gravimetric analysis.

UNIT-I: INORGANIC CHEMISTRY-2

14 Hours

S-block elements

04 hours

Comparative study of alkali & alkaline earth metals with respect to Physical properties: density, melting points & boiling points, flame coloration. Solubility of ionic compounds in relation to lattice energy and hydration energy. complexation tendencies of alkali metals.

P-block elements

04 Hours

Halides of boron, relative strength of BF_3 , BCl_3 & BBr_3 as Lewis acids, diborane-preparation, structure & bonding. Halogens: Size of atoms & ions, ionization energy, electronegativity, oxidation states and oxidizing power. Types of interhalogen compounds-preparation and structure of ICl_3 , IF_5 & IF_7 .

Noble gases: structure & bonding in XeF_6 and XeO_3 , Clathrates.

Chemical bonding -2

06 Hours

Valence bond theory: postulates, Concept of resonance, hybridization involving s, p & d atomic orbitals, Limitations of valence bond theory. Molecular orbital theory (LCAO method), bonding and antibonding molecular orbitals, sigma & pi bonds. s-s, s-p, p-p, combination of orbitals, order of molecular orbital energy level configuration, bond order, molecular orbital energy level diagram for homonuclear H_2 , He_2 , N_2 & O_2 molecules.

UNIT-II: ORGANIC CHEMISTRY-2

14 Hours

Alkanes and cycloalkanes

05 hours

Alkanes – Introduction, chain isomerism in alkanes up to C₅. General methods of synthesis of alkanes by Wurtz reaction, Kolbe reaction. Free radical mechanism of halogenations, (chlorination of methane).

Cycloalkanes – Definition, Methods of synthesis (any two methods). Chemical properties. Bayer's strain theory – Salient features, angle of strain and its calculations, Limitations. Sachse-Mohr theory of strainless rings.

Alkenes, Dienes and Alkynes

05 hours

Alkenes: Synthesis by dehydration of alcohols, dehydrohalogenation of alkyl halides and dehydrogenation of vicinal dihalides. Chemical reactions – Addition of hydrogen, halogens, and hydrogen halides. Markovnikov's rule and peroxide effect with mechanism.

Dienes: definition, Types, Diels- Alder reaction.

Alkynes: Synthesis of alkynes by dehydro halogenation of vicinal dihalides. Acidity of alkynes and formation of metal acetylides.

Arenes and aromaticity

04 hours

Arenes: Modern concept of structure of benzene, Resonance energy. Aromatic electrophilic substitution reactions of benzene-Chlorination, nitration, sulphonation. Friedel Craft's alkylation and acylation reactions. Directive orientation effect of substituents in monosubstituted benzene. Types of groups with examples . Ortho-para orientation (phenol) and meta orientation (nitrobenzene).

Aromaticity – Definition and criteria. Huckel's rule with examples.

UNIT-III: PHYSICAL CHEMISTRY-2

14 Hours

Liquid state

05 hours

Inter molecular forces, Structure of liquids (a qualitative description)

Liquid crystals: definition and classification with examples. Properties of nematic and cholestric phases. Theory of liquid crystals Applications of liquid crystals.

Chemical kinetics

06 hours

Second order reaction with examples. Derivation of specific rate constant of a second order reaction when $a = b$. Methods of determination of order of a reaction – differential and half life period method.

Theory of reaction rates – qualitative treatment of collision theory of bimolecular reactions. Theory of unimolecular reactions. Lindemann's hypothesis and steady state principle. An elementary account of transition state theory, activated complex its relation with thermodynamic functions (ΔG^* , ΔH^* and ΔS^*). Derivation of rate constant of a bimolecular reaction based on transition state theory. Parallel reactions and consecutive reactions with examples.

Colloids

03 hours

Origin of charge on colloidal particle – electrical double layer and zeta potential. Electrophoresis & Electro osmosis. Emulsions and Gels.

UNIT-IV: ANALYTICAL CHEMISTRY-2

14 Hours

Quantitative Chemical Analysis:

Introduction, Importance & classification of quantitative analysis, Differences between qualitative and

quantitative analysis

Volumetric Analysis: Definition, Methods of expressing concentrations, Primary and secondary standard solutions,
Volumetric Estimations: Introduction, Types of volumetric estimations Calculation of results is volumetric determinations Advantages of volumetry

Acids-Base titrations: Redox, Precipitation and complexometric titrations

Gravimetric Analysis: Introduction, elementary principles of gravimetry Steps involved in gravimetry, precipitation, purity of precipitate, Super saturation, co-precipitation & post precipitation, washing of precipitate, drying & ignition of precipitate, Weighing, requirement of weighing form, report of results

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|---|-----------------------------------|
| Course Title: Chemistry Laboratory Course-II | Course Code: 24MJCHEM1P |
| Total Contact Hours: 54 | No. of Credits: 02 |
| L:T:P | (4,0,0) |
| Internal Assessment Marks: Theory:10 | Duration of SEE: 3Hours |
| Semester End Exam Marks: 80 | Contact Hrs Week: 04 Hours |

Course Outcomes (CO's):

- 1) Impart skills on organic analysis of the given compound.
- 2) To impart skills related to preparation of stock and working solutions.
- 3) To know the principle of qualitative analysis of organic compounds
- 4) Techniques to separate the organic mixture.
- 5) To understand the chemistry involved in qualitative reactions
- 6) Kinetics of acid base titrations at room temperature

At the end of the course, students will be able to:

- 1) Understand the importance of organic mixture analysis
- 2) Learn the importance of qualitative organic reactions.
- 3) Learning the volumetric methods for kinetics of chemical reactions.

Part-I: Organic Chemistry Experiments

Minimum 10 compounds are to be given for analysis

Organic qualitative analysis of single compound with preparation of derivative.

Note

* In the beginning two practical durations may be used for instructions & demonstration of single compound analysis with preparation of derivative.

* Instructions should include explanation of basis of scheme of analysis and each test with its use. For elements test and functional groups test chemical equations are to be given.

* At least three compounds should be given from each group.

The following compounds may be given for analysis

Acids: Benzoic, Salicylic, Succinic, Cinnamic & Phthalic acid.

Phenols: α -naphthol, β -naphthol, p-cresol and o-cresol, Resorcinol.

Bases: Aniline, p-Toluidine, o-Nitroaniline

Neutrals: Urea, Thiourea, Nitrobenzene, m-Dinitrobenzene, naphthalene, Chlorobenzene, Bromobenzene, Benzaldehyde, Acetone, Acetophenone & Biphenyl.

Part-II: Physical Chemistry Experiments

- 1) Determine the specific rate constant of hydrolysis of methyl acetate by HCl at room temperature
- 2) Determine the strength of HCl and H₂SO₄ in the hydrolysis of ethyl acetate (K of acid is given)
- 3) Determine the rate constant of a second order reaction between potassium persulphate and potassium iodide when a = b
- 4) Determine heat of neutralisation of strong acid and strong base.

References

INORGANIC CHEMISTRY

| S.No. | Title & edition | Author/s | Year of publicn. | Publisher |
|-------|---|-----------------------------------|------------------|---|
| 1 | Concise Inorganic Chemistry Fifth edition | J.D.Lee | 1998 | ELBS with Chapman & Hall |
| 2 | Basic Inorganic Chemistry Fourth edition | F.A.Cotton, G.Wilkinson | | Wiley Eastern |
| 3 | Inorganic Chemistry Fourth edition | Shriver, Atkins & C.H.Longford | | Oxford University press |
| 4 | Principles of Inorganic Chemistry As per UGC curriculum | Puri. Sharma.Kalia | 2010-11 | Milestone publishers & Distributors, Delhi. |
| 5 | Theoretical principles of Inorganic Chemistry | G.S.Manku | 1990 | TATA McGraw Hill Publishing company Ltd. New Delhi. |
| 6 | Chemistry for Degree students. For First year | Dr.R.L.Madan | 2011 | S.Chand & company P.Ltd. New Delhi. |
| 7 | Chemistry for Degree students. For Second year | Dr.R.L.Madan | 2011 | S.Chand & company P.Ltd. New Delhi. |
| 8 | Chemistry for Degree students. For Third year | Dr.R.L.Madan | 2011 | S.Chand & company P.Ltd. New Delhi. |
| 9 | Comprehensive Inorganic Chemistry for B.Sc.I year | Dr.Sulekh Chandra | 2004 | New Age International (P) Ltd. |
| 10 | Advanced Inorganic Chemistry. Vol-I, 23 rd Edition | Gurdep Raj | 1997-98 | Goel Publishing House, Meerut. |
| 11 | Text book of Inorganic Chemistry, second revised edition | K.N.Upadhyaya | 1990 | Vikas Publishing House Pvt. Ltd. |
| 12 | Analytical chemistry | Alka Gupta | | |
| 13 | Quantitative Inorganic Analysis | A.I.Vogel | | |
| 14 | Callister's Material Science & Engineering | Adapted by R.Balasubramanian | | Wiley India (P) Ltd. |
| 15 | Industrial Chemistry | B.K.Sharma | | |
| 16 | Environmental chemistry | Asim K.Das | | |
| | Other useful Inorganic chemistry books | | | |
| 15 | Inorganic Chemistry | G.L.Miessler and D.A.Tarr | | Prentice Hall |
| 16 | Inorganic chemistry | A.G.Sharpe | | ELBS |
| 17 | Concepts and Models of Inorganic Chemistry, second editoin | Douglas, McDaniel & Alexander | 1983 | Vikas Publishing House Pvt. Ltd. |

ORGANIC CHEMISTRY

| | | | | |
|----|--|----------------------------|--|-------------------------|
| 1 | A Text book of organic chemistry | Arun Bahl and B.S.Bahl | | |
| 2 | Advance organic chemistry | Arun Bahl and B.S.Bahl | | |
| 3 | A Text book of organic chemistry | K.S.Tewari and N.K.Vishnoi | | |
| 4 | Reaction Mechanism and Reagents in organic chemistry | Gurdeep R.Chatwal | | |
| 5 | Organic chemistry by | Morrison and Boyd | | |
| 6 | Organic chemistry | L.G.Wade | | |
| 7 | Organic chemistry Vol I, II, & III | Mukherji, Singh & Kapoor | | |
| 8 | Organic chemistry | I.L.Finar | | |
| 9 | Analytical chemistry | B.K.Sharma | | |
| 10 | Organic chemistry | P.S.Kalsi | | |
| 11 | Organic chemistry | Clayden | | Oxford University press |
| 12 | A guide book to mechanism in organic chemistry | Peter sykes | | |
| 13 | Environmental chemistry with green chemistry | Asim. K.Das | | |
| 14 | Organic spectroscopy | William Kemp | | |
| 15 | Stereochemistry | P.S.Kalasi | | |
| 16 | Stereochemistry | Elil | | |
| 17 | Environmental chemistry | A.K.De | | |
| 18 | Organic chemistry | Bruice | | |
| 19 | Organic reaction mechanisms | Nasipuri | | |
| 20 | Organic reaction mechanisms | P.S.Kalasi | | |

PHYSICAL CHEMISTRY

| | | | | |
|----|---|---|------|------------------------------------|
| 1 | Physical chemistry 7 th edition | P.W.Atkins & Julio dePaula | 2002 | Oxford University press |
| 2 | Elements of physical chemistry 3 rd edition | Peter Atkins | 2000 | Oxford University press |
| 3 | Physical chemistry-A molecular approach | Donald A, Macquarie & John D.Simon | 2001 | Viva Low priced student edition |
| 4 | Introduction to physical chemistry 3 rd edition | Mark Ladd | 1999 | Cambridge Low Priced edition |
| 5 | Text book of physical chemistry | S.Glasstone | 1982 | Mcmilan India Ltd. |
| 6 | Principles of physical chemistry | B.R. Puri, L.R.Sharma & M.S.Pathania | 1987 | S.L.N.Chand & Co. |
| 7 | Text Book of Physical Chemistry | P.L.Soni | 1993 | S.Chand & Co. |
| 8 | Physical chemistry | Alberty R.A. & Silbey | 1992 | R.J.John Wiley & Sons |
| 9 | Physical chemistry | G.M.Barrow | 1986 | McGraw Hills |
| 10 | Physical chemistry 3 rd edition | Gilbert W.Castilian | 1985 | Narosa Publishing House |
| 11 | Text book of polymer Science | BilMeyer. Jr | 1984 | John Wiley & Sons |
| 12 | Basic Physical Chemistry | Walter J.Moore | 1972 | Prentice Hall |
| 13 | Physical chemistry | Gurdeep raj | | Goel Publications |

For Laboratory Experiments

| | | | | |
|----|--|--|------|------------------------|
| 1 | Vogel's Text book of qualitative chemical analysis | J.Basset, R.C.Denney, G.H.Jaffrey and J. Mendham | 1986 | ELBS |
| 2 | Inorganic semi micro qualitative analysis | v.v.Ramanujam | 1974 | National pub.Co. |
| 3 | Practical Inorganic chemistry | G.Marr, B.W.Rackett, Von Nostrand, Reinhold | 1972 | |
| 4 | Laboratory manual of Organic Chemistry | Day, Sitaraman and Govindachari | 1998 | |
| 5 | Text book of practical organic chemistry | A.I.Vogel | 1996 | |
| 6 | A Hand book of organic Analysis | Calrke and Hayes | 1964 | |
| 7 | Findlay's Practical physical chemistry | Levitt, | 1968 | Longman's London |
| 8 | Experiments in physical chemistry | Shoe maker & Garland | 1986 | McGraw Hill Int. edn. |
| 9 | An Introductioin to Practical Biochemistry | David Plummer | 1992 | McGraw Hill Pub. Co. |
| 10 | Introduction to practical Biochemistry | S.K.Sawlmey & Ranadhir Singh | 2000 | Narosa Pub. House |
| 11 | Advanceed Practical Chemistry | Jagadamba Singh, R.K.P.Singh etc. | 2008 | Pragathi Pub. Meerut |
| 12 | Advanced Experimental chemistry I, II, III | J.N.Gurtu & R.Kapoor | 1986 | S.Chand & Company Ltd. |

Evaluation Process:**A. Continuous Assessment Scheme (Major Courses): Internal**

| Sl. No. | Component | Maximum Marks |
|--------------|---|---------------|
| 01 | Two Session Tests with proper record for assessment (5+5 = 10) | 10 |
| 02 | Assessment of Skill development activities/Seminars/Group Discussion etc., with proper record | 05 |
| 03 | Assignment with proper record | 05 |
| TOTAL | | 20 |

B. Elective / SEC Courses: Internal

| Sl. No. | Component | Maximum Marks |
|--------------|---|---------------|
| 01 | Two Session Tests with proper record for assessment | 05 |
| 02 | Assessment of Skill development activities/Seminars/Group Discussion etc., with proper record | 05 |
| TOTAL | | 10 |

C. Internal Assessment for Practical: Internal

| | | |
|--------------|--|-----------|
| 1 | Test with proper record for assessment | 05 |
| 2 | Record / Journal | 05 |
| Total | | 10 |

D. Practical Semester End Examination External (Duration: 3Hrs)

| No | Component | Maximum Marks |
|--------------------|--|---------------|
| 1 | Circuit Diagram/Ray diagram/Tabular Column with proper labeling and units. | 10 |
| 2 | Experimental Skill (proper readings) | 12 |
| 3 | Graph/calculations/Result with Accuracy | 08 |
| 4 | Viva | 10 |
| Total Marks | | 40 |

E. Project Work Assessment during VI semester: Internal

| | | |
|--------------|-------------------------------------|-----------------|
| 1 | Regular project progress assessment | 05 Marks |
| 2 | Presentation | 05 Marks |
| Total | | 10 Marks |

F. Semester End examination assessment for Project

| | | |
|---|--------------------|----------|
| 1 | Project Report | 20 Marks |
| 2 | Final Presentation | 10 Marks |
| 3 | Viva Voice | 10 Marks |
| | Total | 40 Marks |

QUESTION PAPER PATTERN: B.Sc. First/ Second Semester Degree examination
Subject: CHEMISTRY

Time: 3 Hours

Max. Marks: 80

| Q.No | Explanation | Unit | Marks |
|------|---|------|----------------|
| 1 | Answer any ten questions of the following | | 2x10=20 |
| a | 2 Marks question | I | |
| b | | | |
| c | | | |
| d | 2 Marks question | II | |
| e | | | |
| f | | | |
| g | 2 Marks question | III | |
| h | | | |
| i | | | |
| j | 2 Marks question | IV | |
| l | | | |
| m | | | |

Section B

Answer all the questions

15x4= 60

| Q. No | Explanation | Unit | Marks |
|-------|-----------------------------------|------|---------------|
| 2 | Answer any three of the following | | 5x3=15 |
| a | Each question 5 Marks | I | |
| b | | | |
| c | | | |
| d | | | |
| e | | | |
| 3 | Answer any three of the following | | 5x3=15 |
| a | Each question 5 Marks | II | |
| b | | | |
| c | | | |
| d | | | |
| e | | | |
| 4 | Answer any three of the following | | 5x3=15 |
| a | Each question 5 Marks | III | |
| b | | | |
| c | | | |
| d | | | |
| e | | | |
| 5 | Answer any three of the following | | 5x3=15 |
| a | Each question 5 Marks | IV | |
| b | | | |
| c | | | |
| d | | | |