

BHAVNAGAR UNIVERSITY

BHAVNAGAR

(NACC Accreditation Grade “B”)

CREDIT AND SEMESTER SYSTEM

SYLLABUS

BACHELOR OF SCIENCE (B.Sc.)

CHEMISTRY

(In Force From Academic Year: 2011-2012)

तमसो मा ज्योतिर्गमय



B.Sc.
Credit and Semester System Syllabus

NAME OF THE SUBJECT: CHEMISTRY

SEMESTER: 3rd

SR. NO.	PAPER NO	NAME OF THE PAPER	TOTAL MARKS EXT+INT*=TOTAL	PASSING STANDARD EXT+INT=TOTAL	TOTAL TEACHING HOURS	EXAM. HOURS	CREDITS
1	C-301	Inorganic Chemistry	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45	03	03
2	C-302	Organic Chemistry	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45	03	03
3	C-303	Physical Chemistry	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45	03	03
4	C-304	Laboratory Course (Practicals)	90 + 00 = 90 (External Only)	36 + 00 + 36	15 Weeks x 09 Hours = 135	09	09

* <u>INTERNAL</u>	<u>MARKS</u>
ASSIGNMENT	10
SEMINAR	10
TEST	10



B.Sc.
Credit and Semester System Syllabus

NAME OF THE SUBJECT: CHEMISTRY

SEMESTER: 4th

SR. NO.	PAPER NO	NAME OF THE PAPER	TOTAL MARKS EXT+INT*=TOTAL	PASSING STANDARD EXT+INT=TOTAL	TOTAL TEACHING HOURS	EXAM. HOURS	CREDITS
5	C-401	Inorganic Chemistry	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45	03	03
6	C-402	Organic Chemistry	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45	03	03
7	C-403	Physical Chemistry	70 + 30 = 100	28 + 12 = 40	15 Weeks x 03 Hours = 45	03	03
8	C-404	Practicals	90 + 00 = 90 (External Only)	36 + 00 + 36	15 Weeks x 09 Hours = 135	09	09

* <u>INTERNAL</u>	<u>MARKS</u>
ASSIGNMENT	10
SEMINAR	10
TEST	10



B.Sc. (CHEMISTRY)
SEMESTER – III

PAPER NO.: C-301: Inorganic Chemistry:

Credit: 03

Total Marks: 100

Marks: Semester End Examination: 70

Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<p><u>Wave mechanics:</u></p> <ul style="list-style-type: none">❖ Brief introduction of Eigen function and Eigen value with examples, Meaning of Ψ and Ψ^2, explanation for normalized and orthogonal wave functions, problems on normalization and orthogonality, derivation of one and three dimensional Schrodinger's equation, co-relation between Cartesian and polar co-ordinates, Schrodinger's equation in polar co-ordinates, separation of variables with examples. <p><u>Uses of organic reagents in the analysis of Inorganic compounds:</u></p> <ul style="list-style-type: none">❖ DMG❖ EDTA❖ NTA❖ 8-hydroxyquinolin❖ α-nitroso❖ Cuprerron❖ Diphenyl❖ Diethyl❖ β-naphthol❖ Thiocarbazole❖ Dithiocarbamate	15	24 + 10 = 34
Unit – II	<p><u>Chemical bonding and Molecular Orbital Theory (MOT):</u></p> <ul style="list-style-type: none">❖ Condition for the formation of covalent bond, Hybridization concept, sp, sp^2, sp^3, sp^3d, dsp^2, sp^3d^2 and sp^3d^3 hybridization with appropriate examples.❖ Molecular Orbital Treatment, LCAO principle for sigma (σ) and pi (π) bonds, bonding, antibonding and non-bonding molecular orbitals, MO representation of homo-nuclear molecules such as H_2, He_2, Li_2 and O_2 and hetero-nuclear molecules such as CO, NO and HCl with explanation of bond order, stability, magnetic behavior and polarity.	15	23 + 10 = 33
Unit – III	<p><u>Chemistry of d-block elements of first, second and third transition series:</u></p> <ul style="list-style-type: none">❖ General characteristics of <i>d</i>-block elements, electronic configuration of elements, general characteristics of transition elements, comparison of elements of first transition series (<i>3d</i> series) with those of second (<i>4d</i> series) and third (<i>5d</i> series). <p><u>Fertilizers:</u></p> <ul style="list-style-type: none">❖ Plant nutrients, nutrient function, types of fertilizers, need of fertilizers, essential requirements, fertility of the soil, pH value of the soil, source of fertilizers, natural organic fertilizers, granulations, bulk blending, natural inorganic fertilizers, artificial fertilizers, nomenclature in fertilizer industry, nitrogenous fertilizers, urea: raw materials, manufacture, condition for a good yield, important points, action of urea as fertilizer.	15	23 + 10 = 33



Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

1. Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson & P. L. Gaus- 3rd Edition, John Wiley, New York, 1995.
2. Advanced Inorganic Chemistry, F. A. Cotton, G. Wilkinson, John Wiley & Sons, 1988.
3. Theoretical Inorganic Chemistry, M. C. Day Jr., J. Selbin, Van Nostrand Reinhold, 1962.
4. Introductory Quantum Chemistry, A. K. Chandra- 4th Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi
5. Quantum Chemistry, R. K. Prasad- 3rd Edition, New Age International Publishers
6. Concise Inorganic Chemistry – J. D. Lee - 3rd Edition, Von Nostrand
7. Principles of Inorganic Chemistry, Puri, Sharma & Kalia, New Age International Publishers
8. Advanced Inorganic Chemistry, Gurdeep Raj, Goel Publishing House, Meerut.
9. Selected Topics in Inorganic Chemistry, W. U. Malik, G. D. Tuli & R. D. Madan, S. Chand & Company Ltd., New Delhi.
10. Industrial Chemistry, B. K. Sharma-9th Edition, Krishna Prakashan
11. Textbook of Inorganic Chemistry, P. L. Soni, M. Katyal-20th Edition, 2000.



PAPER NO.: C-302: Organic Chemistry:

Credit: 03

Total Marks: 100

Marks: Semester End Examination: 70

Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<p><u>Purines and Ureides:</u></p> <ul style="list-style-type: none">♣ Introduction and classification of Purines and Ureides, General chemical behavior of urides♣ Determination of constitution of uric acid with synthesis, synthesis of adenine, caffeine, guanine, theobromine, theophyllin from uric acid <p><u>Estimation of organic functional groups:</u></p> <ul style="list-style-type: none">♣ Estimation of following organic functional groups with procedure, chemical reaction and necessary calculation:<ol style="list-style-type: none">1. Carboxylic Acid2. Ester3. Ketone and Aldehyde4. Methoxy5. Amide6. Phenol and Amine7. Nitro8. Azo	15	23 + 10 = 33
Unit – II	<p><u>Principle, mechanism and synthetic applications of the following reactions:</u></p> <ul style="list-style-type: none">♣ Aldol condensation♣ Diels-Alder♣ Michael addition & condensation reaction♣ Perkin♣ Reformatsky♣ Hofmann degradation♣ Claisen condensation <p><u>Synthesis and synthetic applications of following reagents:</u></p> <ul style="list-style-type: none">♣ Diazomethane♣ Lead tetra-acetate♣ Lithium aluminium hydride♣ Organoboranes♣ Manganese dioxide	15	23 + 10 = 33
Unit – III	<p><u>Heterocyclic Compounds:</u></p> <ul style="list-style-type: none">♣ Introduction, Synthesis and properties of<ol style="list-style-type: none">1. Benzpyrrole2. Benzfuran3. Benzthiophene4. Quinoline5. Isoquinoline. <p><u>Alkaloids</u></p> <ul style="list-style-type: none">♣ Introduction of alkaloids, constitution and synthesis of hygrine and coniine <p><u>Rearrangements:</u></p> <ul style="list-style-type: none">♣ Principle and applications of following re-arrangements:<ol style="list-style-type: none">1. Benzil-Benzilic acid2. Curtius3. Allylic4. Pinacol-Pinacolone5. Wolff	15	24 + 10 = 34



Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

1. Organic chemistry by Cram, Hammond & Hendrickson, 3rd ed. McGraw-hill series.
2. Organic chemistry by Morrison & Boyd, 6th ed. Prentice Hall of India. Ltd., 1996.
3. Fundamentals of Organic chemistry by Graham & Soloman, 3rd ed. New York, 1990.
4. Organic chemistry, Vol.1-3 by S. M. Mukheji & S. P. Singh.
5. University General Chemistry by CNR Rao.
6. A text book of organic chemistry by R. K. Bansal.
7. Vogel's Text book of Practical Organic Chemistry.
8. Advanced Organic Chemistry by Jerry March.
9. Organic Natural Products, Vol-II by O.P. Agarwal.
10. Organic Chemistry by I. L. Finar.
11. Synthetic Organic Chemistry by O.P. Agarwal.



PAPER NO.: C-303: Physical Chemistry:

Credit: 03

Total Marks: 100

Marks: Semester End Examination: 70

Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<u>Chemical Thermodynamics:</u> ♣ Introduction 1. Concept of entropy and free energy 2. Entropy change in reversible and irreversible processes 3. Free energy and work function- Helmholtz free energy function & Gibbs free energy function 4. Variation of work function with temperature and volume 5. Variation of free energy with temperature and pressure 6. Criteria for feasibility / spontaneity of a process 7. Partial molal free energy, Gibbs Duhem equation, Gibbs-Helmholtz equation 8. Fugacity and activity concepts 9. Thermodynamic derivation of law of mass action 10. Clapeyron equation and its use, Clausius-Clapeyron equation 11. Numericals	15	23 + 10 = 33
Unit – II	<u>Physical properties of liquids:</u> ♣ The structure of liquids ♣ Vacancy theory of liquids, free volume in a liquid ♣ Physical properties of liquids: 1. Vapour pressure- molar heat of vaporization, Trouton's rule, entropy of vapourisation 2. Surface tension- Effect of surface tension, measurement of surface tension by stalagmometer and tensiometer method, relationship between Parachor and surface tension 3. Viscosity- Determination of viscosity by Ostwald viscosity method 4. Refraction- Refractive index, Measurement of refractive indices by Abbe refractometer ♣ Numericals	15	23 + 10 = 33
Unit – III	<u>Chemical kinetics:</u> ♣ Scope of chemical kinetics ♣ Concept of reaction rates, factors influencing the rate of reaction ♣ Molecularity and order of reaction, Differential rate law ♣ Concept and kinetics of zeroth, first, second, third and pseudo order reaction with derivation ♣ Trial or integration methods of determining order of reaction such as graphical, differential, half life period and isolation method ♣ Hydrolysis of Methyl acetate, Inversion of cane sugar ♣ Temperature dependence of rate constant, Arrhenius equation, Energy of Activation ♣ Collision theory and Transition State theory of reaction rate ♣ Numericals.	15	24 + 10 = 34



Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

1. Principles of Physical Chemistry, Fourth edition, P.W.Marron and C.F. Prutton.
2. Chemical Kinetics , K. J. Laidler, McGraw Hill
3. Chemistry for Engineers – Dr. B. K. Ambasta, Laxmi Publications (P) LTD., New Delhi.
4. Elements of Physical Chemistry, P.W.Atkins, Oxford
5. Elements of Physical Chemistry – Peter Atkins, Julio de Paula, 4th Edition, Oxford University Press.
6. A Textbook of Physical Chemistry – A. S. Negi & S. C. Anand, 2nd Edition, New Age International Publishers.
7. Comprehensive Physical Chemistry for B.Sc – B. K. Vermani, Vivek Pathania and S. Kiran Vermani, Laxmi Publications (P) LTD.,New Delhi.
8. A Textbook of Physical Chemistry- K. L. Kapoor, Volume 5, Macmillan.
9. Essentials of Physical Chemistry, Colour edition, B.S.Bahl, Arun Bahl and G.D.Tuli, S.Chand & Company.
10. Advanced Practical Physical Chemistry bt J. B. Yadav, Goel Publishing house, Krishna Prakashan Media (P) Ltd.
11. Experimental Physical Chemistry by V. D. Athawale & Parul Mathur, New Age International Publishers.
12. Practicals in Physical Chemistry: A Modern Approach by P. S. Sandhu, MACMILLAN.
13. Advanced Viva Voca in Physical Chemistry Experiments by Subhash-Satish & Dr. Kudesia, Pragati Prakashan, Meerut.



PAPER NO.: C-304: Laboratory Course (Practicals):

Credit: 09

Total Marks: 90 (External Only)

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	♣ To analyze quantitatively inorganic mixture containing 4 radicals		
Unit – II	<u>Organic Estimation:</u> ♣ Quantitative analysis of organic functional groups such as: 1. Ester 2. Amine 3. Phenol 4. Amide 5. Aldehyde		
Unit – III	<u>Physico Chemical Exercises:</u> ♣ To determine the order of reaction of hydrolysis of Methyl Acetate ♣ To determine the relative strength of HCl and H ₂ SO ₄ acid ♣ To study the adsorption of an organic acid on animal charcoal		



B.Sc. (CHEMISTRY)
SEMESTER – IV

PAPER NO.: C-401: Inorganic Chemistry:

Credit: 03

Total Marks: 100

Marks: Semester End Examination: 70

Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<p>Coordination compounds:</p> <ul style="list-style-type: none">General concepts and brief explanation of coordination compounds, classification of ligands based on denticity, terminology in coordination compounds and IUPAC nomenclature, isomerism in coordination compounds:<ul style="list-style-type: none">structural isomerism- ionization, linkage and coordination isomerism, stereoisomerism-geometrical and optical isomerism, Warner's theory of coordination, electronic interpretation of coordination, EAN rule, Introduction of Valence bond theory (VBT), Valence bond theory in octahedral, tetrahedral and square planar complexes. <p>Crystal Field Theory (CFT):</p> <ul style="list-style-type: none">Introduction of CFT, shape of d-orbitals, Crystal Field effects:<ul style="list-style-type: none">Octahedral, tetrahedral and square planar complexes, spectrochemical series, Crystal Field Stabilization Energy (CFSE) calculations in octahedral and square planar- low spin and high spin complexes.	15	24 + 10 = 34
Unit – II	<p>Lanthanides (4f-block elements) or rare earth elements:</p> <ul style="list-style-type: none">General introduction of lanthanide series or Lanthanons, position of lanthanides in the periodic table, occurrence, extraction of lanthanides from monazite mineral, separation methods of lanthanides, general properties of lanthanides, atomic and ionic radii-lanthanide contraction, causes of lanthanide contraction, uses of lanthanides and their compounds, comparison between properties <i>d</i>- and <i>f</i>- block elements (particularly between <i>3d</i>- and <i>4f</i>- block elements). <p>Actinides (5f-block elements):</p> <ul style="list-style-type: none">Definition, position of actinides in the periodic table, separation methods of actinides, general properties of actinides and their comparison with lanthanides:<ul style="list-style-type: none">Electronic configuration and nature of bonding, oxidation states and oxidation potentials, Atomic and ionic radii-actinide contraction, colors and absorption spectra of actinides, magnetic properties.	15	23 + 10 = 33
Unit – III	<p>Hydrogen</p> <ul style="list-style-type: none">History, occurrence and preparation of hydrogen by<ol style="list-style-type: none">Bosch processLiquefaction processH from hydrocarbonElectronic processLane's process. Properties of H and position of H in Periodic Table, Nascent hydrogen, occluded hydrogen, atomic hydrogen, ortho and para hydrogen. Explanation for isotopes and isobars, isotopes of hydrogen such as deuterium and tritium, heavy water, physical and chemical properties of hydrogen, deuterium, H₂O & D₂O. Biological behavior, importance and compounds of D₂O. Ortho and para deuterium and Tritium. Preparation properties and structure of H₂O₂.	15	23 + 10 = 33



	Environmental Pollution: ♣ General introduction, Types of pollution 1. Air pollution: Carbon dioxide, sulphur oxide and Nitrogen oxide 2. Water pollution: Different types of water pollutant 3. Organic pollutant, inorganic pollutant, sediment pollutant, radioactive pollutant, thermal pollutant and trace elements 4. Definition of COD, BOD and Winkler method for Dissolve oxygen		
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Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

1. Basic Inorganic Chemistry, F. A. Cotton, G. Wilkinson & P. L. Gaus- 3rd Edition, John Wiley, New York, 1995.
2. Advanced Inorganic Chemistry, F. A. Cotton, G. Wilkinson, John Wiley & Sons, 1988.
3. Theoretical Inorganic Chemistry, M. C. Day Jr., J. Selbin, Van Nostrand Reinhold, 1962.
4. Introductory Quantum Chemistry , A. K. Chandra- 4th Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi
5. Quantum Chemistry, R. K. Prasad- 3rd Edition, New Age International Publishers
6. Concise Inorganic Chemistry, J. D. Lee - 3rd Edition, Von Nostrand
7. Principles of Inorganic Chemistry, Puri, Sharma & Kalia, New Age International Publishers
8. Advanced Inorganic Chemistry, Gurdeep Raj, Goel Publishing House, Meerut.
9. Selected Topics in Inorganic Chemistry, W. U. Malik, G. D. Tuli & R. D. Madan, S. Chand & Company Ltd., New Delhi.
10. Industrial Chemistry, B. K. Sharma-9th Edition, Krishna Prakashan
11. Textbook of Inorganic Chemistry, P. L. Soni, M. Katyal-20th Edition, 2000.



PAPER NO.: C-402: Organic Chemistry:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<p><u>Compounds having Reactive Methylene group:</u></p> <ul style="list-style-type: none">♣ Introduction1. Reactivity of methylene group,2. Synthesis of malonic ester3. Synthesis of acetoacetic ester4. Applications of malonic ester (minimum-13)5. Applications of acetoacetic ester (minimum-13)6. A brief account of keto-enol tautomerism with respect to acetoacetic ester, Factors affecting equilibrium in keto-enol tautomerism7. Give evidence of keto and enol form possessing in AAE	15	24 + 10 = 34
Unit – II	<p><u>Preparation and uses of some important compounds:</u></p> <ul style="list-style-type: none">♣ Antipyrine♣ Acetophenetidine (phenacetin)♣ Sulphadiazine♣ Sulphathiazole♣ Vitamin-C (Ascorbic acid)♣ Congo red♣ Eriochrome Black-T♣ Malachite green♣ Metanil Yellow♣ Methyl Red <p><u>Problems based on organic reactions:</u></p> <ul style="list-style-type: none">♣ Involving the following unit processes: Alkylation, nitration, halogenation, sulphonation, acylation, amination, hydroxylation, reduction, oxidation, hydration, dehydration, hydrolysis, decarboxylation, esterification, condensation, etc. (Minimum 15 problems and each problem contains minimum four steps) <p><u>Terpinoids:</u></p> <ul style="list-style-type: none">♣ Introduction of terpinoids, isoprene rule, classification of terpinoids, constitution and synthesis of citral and methol.	15	23 + 10 = 33
Unit – III	<p><u>Polyuclear hydrocarbons:</u></p> <ul style="list-style-type: none">♣ Introduction♣ Classification♣ Methods of preparation and chemical characteristics of Naphthalene, Anthracene, Phenanthrene, Diphenyl methane and Triphenylmethane. <p>♣ Amino acids, Polypeptides and Proteins</p> <ul style="list-style-type: none">♣ Introduction of amino acids♣ classification of α-amino acids with proper illustrations♣ Properties of amino acids♣ General methods for the synthesis of α-amino acids (any five)♣ Introduction of polypeptides and proteins♣ Comparison of polypeptide and protein.	15	23 + 10 = 33



Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

1. Organic Chemistry by Morrison & Boyd, 6th ed. Prentice Hall of India. Ltd., 1996.
2. A Text Book of Organic Chemistry by P. L. Soni & H. M. Chavla.
3. Organic Chemistry, Vol.1-2, I L Finar.
4. Organic Chemistry by Stanley H. Pine.
5. University Chemistry by B. H. Mahan.
6. Chemistry of Organic Natural Products, Vol. 1&2, O. P. Agrawal
7. A text book of organic chemistry by R. K. Bansal.
8. Vogel's Text book of Practical Organic Chemistry.
9. Advanced Organic Chemistry by Jerry March.
10. Synthetic Organic Chemistry by O.P.Agarwal.



PAPER NO.: C-403: Physical Chemistry:

Credit: 03

Total Marks: 100
Marks: Semester End Examination: 70
Continues Internal Evaluation: 30

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	<u>Electrochemical Cells:</u> <ul style="list-style-type: none">♣ Introduction, Reversible and irreversible cells♣ Measurements of EMF of cells, Free energy and EMF of a cell reaction, Measurement of entropy and enthalpy from EMF data♣ Thermodynamics of electrode and cell potential – Nernst equation, Standard electrode potential and its measurements♣ Types of electrodes – Metal-Metal Ion, Metal-Metal Insoluble salt, Metal-Amalgam, Gas-ion, Oxidation-reduction♣ Other reference electrodes – Calomel, Silver-Silver chloride♣ Classification of Electrochemical cells:<ul style="list-style-type: none">○ Chemical cells with and without Transference.○ Concentration cells with and without Transference♣ Application of EMF measurements♣ Liquid Junction Potential♣ Determination of pH by Hydrogen electrode, Quinhydrone electrode, Glass electrode♣ Potentiometric titration – Acid-Base Neutralization, Oxidation-Reduction, Precipitation♣ Numericals	15	24 + 10 = 34
Unit – II	<u>Phase Equilibria – The Phase Rule:</u> <ul style="list-style-type: none">♣ Introduction, Definition of various terms♣ Derivation of the Phase Rule♣ Stability of Phases, Phase Diagram♣ One-component system, The water system, Carbon dioxide system, Sulphur system♣ Two-component systems♣ Three-component systems♣ The Nernst Distribution law, Thermodynamic derivation of the Distribution law♣ Application and limitation of the Distribution law♣ Numericals	15	23 + 10 = 33
Unit – III	<u>Catalysis:</u> <ul style="list-style-type: none">♣ Introduction♣ Characteristics of catalysts♣ Types of catalysis: Homogeneous and Heterogeneous♣ Enzyme catalysis: Mechanism and characteristics♣ Theory of catalysis: Intermediate compound formation theory and Adsorption theory♣ Inhibitors, poisons and promoters♣ Autocatalysis and negative catalysis <u>Macromolecules:</u> <ul style="list-style-type: none">♣ Introduction: Definition, difference between macromolecules and polymers with examples♣ Classification of Polymers♣ Molar masses of polymer and its determination	15	23 + 10 = 33



Break up of Continuous Internal Evaluation:

1. Assignments	10 Marks
2. Seminar	10 Marks
3. Test	<u>10 Marks</u>
Total Marks	30 Marks

Reference/Text book/ Additional Reading:

1. Essentials of Physical Chemistry, Colour edition, B.S.Bahl, Arun Bahl and G.D.Tuli, S.Chand & Company
2. A Textbook of Physical Chemistry – A. S. Negi & S. C. Anand, 2nd Edition, New Age International Publishers.
3. Principles of Physical Chemistry, Fourth edition, P.W.Marron and C.F. Prutton.
4. Chemistry for Engineers – Dr. B. K. Ambasta, Laxmi Publications (P) LTD., New Delhi.
5. Elements of Physical Chemistry, P.W.Atkins, Oxford
6. Elements of Physical Chemistry – Peter Atkins, Julio de Paula, 4th Edition, Oxford University Press.
7. Comprehensive Physical Chemistry for B.Sc – B. K. Vermani, Vivek Pathania and S. Kiran Vermani, Laxmi Publications (P) LTD.,New Delhi.
8. A Textbook of Physical Chemistry- K. L. Kapoor, Volume 5, Macmillan.
9. Polymer Science, V. R. Gowariker, N. V. Vishwanathan and J. Shreedhar, Willey Eastern Ltd., New Delhi.
10. Principles of Polymer Science : P. Bahadur & N. V. Sastry, Narosa
11. Advanced Practical Physical Chemistry bt J. B. Yadav, Goel Publishing house, Krishna Prakashan Media (P) Ltd.
12. Experimental Physical Chemistry by V. D. Athawale & Parul Mathur, New Age International Publishers.
13. Practicals in Physical Chemistry: A Modern Approach by P. S. Sandhu, MACMILLAN.
14. Advanced Viva Voca in Physical Chemistry Experiments by Subhash-Satish & Dr. Kudesia, Pragati Prakashan, Meerut.
15. Experiments in Polymer Science by D. G. Hundiwale, V. D. Athawale, U. R. Kapadi & V. V. Gite, New Age International Publishers.
16. A Laboratory Manual of Polymers by S. M. Ashraf, Sharif Ahmad & Ufana Riaz, I. K. International.



PAPER NO.: C-404: Practicals:

Credit: 09

Total Marks: 90 (External Only)

UNIT	DETAILED SYLLABUS	TEACHING HOURS	MARKS / WEIGHT
Unit – I	Spotting of organic compounds having mono and bifunctional groups with conformation by preparation of derivatives		
Unit – II	<u>To estimate volumetrically:</u> <ul style="list-style-type: none">♣ Ammonium chloride♣ Ferric chloride♣ Nitrite♣ Calcium by E.D.T.A♣ Magnesium by E.D.T.A♣ Zinc by E.D.T.A		
Unit – III	<u>Physico chemical exercises:</u> <ul style="list-style-type: none">♣ To determine the energy of activation♣ To study the rate of reaction : $\text{KBrO}_3 - \text{KI}$♣ To study the rate of reaction : $\text{K}_2\text{S}_2\text{O}_8 - \text{KI}$		