



B.Sc.
CHEMISTRY

SEMESTER - I

R.NO.	PAPER NO.	NAME OF THE PAPER	TOTAL MARKS EXT.+INT*= TOTAL	PASSING STANDARD EXT. + INT.*= TOTAL	TOTAL TEACHING HOURS	CREDITS
1	CHECC - 103	Fundamental and Applied Chemistry-I (Theory)	70+30=100	28+12=40	15 WEEKS X 4 HOURS =60	04
2	CHECC - 104	Practical [Based on paper CHECC -103]	100	40	15 WEEKS X 6 HOURS =90	06

*INTERNAL MARKS :	30
(1) Internal Test	15 marks (10marks LQ and 05 marks SQ)
(2) Assignment/Presentation	10 marks
(3) Seminar/Presence	05 marks
Total	30 marks



Paper No: CHECC -103

Title of the Paper: Fundamental and Applied Chemistry-I

Credits: 04

Total Teaching Hours: 60Hours

Marks: Semester Terminal Examination: 70 Marks

Continues Internal Evaluation: 30 Marks

Unit No.	Detailed Syllabus	Marks/Weight
1	Thermodynamics: Introduction and basic concepts of thermodynamics: system, surroundings, etc., types of system, intensive and extensive properties, state function, thermodynamic process, concept of heat and work, first law of thermodynamics: statement, definition of internal energy and enthalpy, Joule's law, calculation of W , q , ΔU and ΔH for the expansions of ideal gases under isothermal and adiabatic conditions for reversible process, limitations of the first law of thermodynamics, second law of thermodynamics, different statements of second law of thermodynamics, definition of entropy and free energy, significance of entropy in a reaction, Carnot theorem, Carnote cycle and its efficiency, thermodynamic scale of temperature, numerical based on first and second law of thermodynamics.	18
2	(A) Building materials: cement, constituting compound in cement, composition of Portland cement, manufacture of Portland cement. Glass: Glass and its general properties, manufacture of glass, variety & glasses and their application. Ceramics: Manufacture of ceramics, classification of ceramics like Acid, Base and Neutral. Chemical reactions involved in manufacture of cement, ceramic and glass. (B) Chemistry of water: Hard water and soft water, types of hardness of water, effect of hard water in boiler operation, scale and sludge formation and its prevention, priming and foaming and its prevention, caustic embrittlement and its prevention, softening of hard water, lime soda process, permutit process (zeolite process), Ion exchange process, reverse osmosis (R.O.) process, estimation of total hardness by EDTA method, example to calculate the hardness. (C) Wave mechanics: introduction, matter waves, the wave nature of the electron, wave equation, De-Broglie equation and uncertainty principle, fundamental postulates of wave mechanics, introduction of Schrodinger's wave equation and quantum numbers, numericals based on De-Broglie equation and uncertainty principle.	18
3	(A) Detection and estimation of elements present in organic compounds: detection of carbon and hydrogen, detection of nitrogen, sulphur and halogens (Lassaigne's test), detection of phosphorus, estimation of carbon and hydrogen by Liebig's combustion method with example, estimation of nitrogen by Kjeldahl's method, its limitation and examples, estimation of nitrogen by Dumas' method with examples,	17



	<p>estimation of halogen by Carrius method with examples, estimation of sulphur by Carrius method with examples, estimation of phosphorus by Carrius method with examples.</p> <p>(B) V. B. Theory: Valance bond theory of chemical bonding, explanation for formation of covalent bond by Lewis theory, limitations of Lewis theory, V.B. theory for formation of covalent bond, overlapping of s-s, s-p and p-p orbitals, explanation of H₂, N₂, O₂, NH₃, H₂O and HF molecules by V.B.T., limitations of V.B.T.</p>	
4	<p>(A) Fundamentals of stereochemistry: definition of isomerism, classification of isomerism, definition of optical isomerism, optical isomerism of compounds containing one and two asymmetric carbon atoms with proper illustrations, enantiomers, D-L and R-S nomenclatures, racemic mixtures, racemisation, definition of geometrical isomerism, geometrical isomerism of organic compounds with ethylenic double bond, importance of stereochemistry.</p> <p>(B) IUPAC nomenclature: IUPAC nomenclature of mono-functional aliphatic and aromatic organic compounds such as alkanes, alkenes, alkynes, alkylhalides, nitro, alcohols, aldehydes, ketones, carboxylic acids, esters, amines, nitriles, ethers and amides.</p> <p>(C) M. O. Theory: Formation of bonding and anti bonding molecular orbitals, bond order, order of energy for molecular orbitals, Molecular orbital diagram of homo nuclear diatomic molecules, Molecular orbital diagram of ions such as H₂, H₂⁺, He₂, He₂⁺ and C₂, N₂, O₂, F₂.</p>	17

: REFERENCE BOOKS :

01. Basic Inorganic chemistry, -F.A.Cotton, G.Wilkinson; John Wiley & Sons
02. Quantum chemistry, - Iran.N.Levine ; P H I Learning Private Ltd.
03. Modern Inorganic chemistry, -G.D.Parkes; Longmans, Green & Co. London.
04. Modern Inorganic Chemistry, - R.D.Madan; S.Chand & Company Ltd.
05. Organic Chemistry vol-I, - I.L.Finar ; Longman Scientific & Technical Publication.
06. Organic Chemistry vol-II, - I.L.Finar ; Longman Scientific & Technical publication.
07. Reaction Mechanism & Reagents in Organic Chem., - G.R.Chatwal ; Himalaya Pub. house.
08. Organic reaction mechanism by Ahluwalia parasar.: Narosa Publishing House.
09. Text book of Physical Chemistry, - Glasstone ; London Macmillan & Company Ltd.
10. Physical Chemistry, - A.J.Mee ; The English Language Book Society.
11. Physical Chemistry, - Barrow; McGraw Hill Book Co.
12. Principles of Physical Chemistry, - S. H. Maron, C. F. Pruton ; Oxford and IBH Pub. Co.
13. Physical Chemistry, - William F. Sheehan ; Prentice hall of India Pvt. Ltd.
14. Physical Chemistry, - Frank.H.Mac Dougall ; New York The Macmillan Company.
15. Shrev's Chemical Process Industries, -R. Norris Shreve, J.A.Brink, Jr.; McGraw-Hill Kogakusha.
16. Industrial Chemistry, -Dr B.K.Sharma; Goel Publication house.
17. Roger's Industrial Chemistry, -C.C.Furnas; D.Van Nostrand company, Inc.
18. Industrial Chemistry, -William Thornton ; John Wiley & Sons.



Paper No: CHECC -104

Title of the Paper: Practical [Based on paper CHECC-103]

Credits: 06

Marks: Semester Terminal Examination: 100 Marks

Detailed Curriculum for Practical

Students have to prepare their Practical journals of Chemistry for Laboratory work and they have to submit certified journals in the University practical exams. Students are not allowed in the laboratory without certified journals in the University practical examination.

Detailed Syllabus for Chemistry Practical	Teaching Hours
Organic Spotting; Identification of organic compounds having mono functional group, including Lassaigne's test and physical constant.	90
Volumetric analysis: I. To determine the molarity and gm/lit of NaOH and H ₂ SO ₄ by using 0.1 M HCl solution. II. To determine the molarity and gm/lit of Na ₂ CO ₃ and NaHCO ₃ solution in mixture by using 0.1 M HCl solution. III. To determine the molarity and gm/lit of NaOH and Na ₂ CO ₃ solution in mixture by using 0.05 M H ₂ SO ₄ solution. IV. To determine the amount of Cu ⁺² by 0.12 M Na ₂ S ₂ O ₃ solution by using starch as indicator.	

REFERENCE BOOKS :

1. Vogel's Textbook of practical organic chemistry, 5th Edition by B. S. Furniss et al.
2. Vogel qualitative Inorganic Analysis by G. Svehla.:universities press.
3. Organic qualitative analysis by Mann sunder.
4. Comprehensive practical organic chemistry, V. K. Ahuwalia.



B.Sc.
CHEMISTRY

SEMESTER - II

R.NO.	PAPER NO.	NAME OF THE PAPER	TOTAL MARKS EXT.+INT*= TOTAL	PASSING STANDARD EXT. + INT.*= TOTAL	TOTAL TEACHING HOURS	CREDITS
1	CHECC - 203	Fundamental and Applied Chemistry-II (Theory)	70+30=100	28+12=40	15 WEEKS X 4 HOURS =60	04
2	CHECC - 204	Practical [Based on paper CHECC-203]	100	40	15 WEEKS X 6 HOURS =90	06

*INTERNAL MARKS:	30
(1) Internal Test	15 marks (10marks LQ and 05 marks SQ)
(2) Assignment/Presentation	10 marks
(3) Seminar/Presence	05 marks
Total	30 marks



Paper CHECC: 203

Title of the Paper: Fundamental and Applied Chemistry-II

Credits: 04

Total Teaching Hours: **60Hours**

Marks: Semester Terminal Examination: 70 Marks

Continous Internal Evaluation: 30 Marks

Unit No.	Detailed Syllabus	Marks/Weight
1	<p>(A) Surface chemistry: Introduction of surface chemistry: concept of adsorption, difference between adsorption and absorption, physical adsorption and chemisorptions, Freundlich's adsorption isotherm and its limitations, Langmuir's adsorption isotherm, applications of adsorption.</p> <p>(B) Colloids: definition and classification of colloids, solids in liquids (sols), preparation and purification (lyophobic), general, optical and electrical properties, stability of colloids, liquid in liquid (emulsions), types of emulsions, emulsifiers, preparation and uses, liquid in solid (gels), preparation and uses of colloids.</p>	18
2	<p>(A) Metallurgy: introduction, occurrence, definition of metallurgy, principles of metallurgy, basic metallurgical operations and metallurgy process, general methods involved in extraction of metals, flow sheet diagram, extraction processes with chemical reactions, chemical properties and uses of Cr, Ni and Zn, important compounds of Cr, Ni and Zn.</p> <p>(B) Purification of water: treatment for drinking water: sedimentation, coagulation, filtration, sterilization, chlorination, Sewage water treatment: properties of sewage water and BOD, treatment of sewage water, industrial waste water treatment: properties of industrial waste water, treatment of industrial waste water by reverse osmosis and electro dialysis, impurities present in water due to different sources.</p>	18
3	<p>(A) Molecular weight determination of organic compounds: concept of molecular weight, molecular weight determination of volatile organic compound by Victor-Mayer's method including its apparatus, experimental procedure and related calculations and sums. Molecular weight determination of carboxylic acids by silver salt method including its procedure, calculations and sums. Molecular weight determination of an organic base by Chloroplatinate method with its procedure, calculations and sums.</p> <p>Introduction of empirical formula, molecular formula with numericals.</p> <p>(B) Photochemistry: introduction of photochemistry, difference between thermal and photochemical process, laws of photochemistry, Grothus Draper's law and Stark-Einstein's law of photochemical equivalence, quantum yield, photochemical reaction of hydrogen with chlorine and bromine, qualitative description of fluorescence and phosphorescence, photosensitized reactions, energy transfer process.(simple, complex)</p>	17



4	<p>(A) Reactions and mechanism: introduction of reactions and mechanism, nucleophilic reagent and electrophilic reagent, classification of organic reactions, study of substitution reaction, addition reaction, elimination reaction, mechanism of S_N^1 and S_N^2 reactions, mechanism of E_1 and E_2 reactions, Mechanism of electrophilic aromatic substitution reactions e.g., nitration, sulphonation, halogenation, alkylation.</p> <p>(B) Synthesis and uses of some important compounds: sulphanilamide, p-amino salicylic acid, adrenaline, 8-hydroxy quinoline, indigo, methyl orange, vanillin, paracetamol and aspirin.</p>	17
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: REFERENCE BOOKS:

1. Basic Inorganic chemistry, -*F.A.Cotton, G.Wilkinson*; John Wiley & Sons
2. Modern Inorganic chemistry, -*G.D.Parkes*; Longmans, Green & Co. London.
3. Modern Inorganic Chemistry, - *R.D.Madan*; S.Chand & Company Ltd.
4. Organic Chemistry vol-I, - *I.L.Finar* ; Longman Scientific & Technical Publication.
5. Organic Chemistry vol-II, - *I.L.Finar* ; Longman Scientific & Technical publication.
6. Reaction Mechanism & Reagents in Organic Chem., - *G.R.Chatwal* ; Himalaya Pub. house.
7. Organic reaction mechanism by Ahluwalia parasar.: Narosa Publishing House.
8. Text book of Physical Chemistry, - *Glasstone* ; London Macmillan & Company Ltd.
9. Physical Chemistry, - *William F. Sheehan* ; Prentice hall of India Pvt. Ltd.
10. Physical Chemistry, - *Frank.H.Mac Dougall* ; New York The Macmillan Company.



Paper No: CHECC - 204

Title of the Paper: Practical [Based on paper CHECC -203]

Marks: Semester Terminal Examination: 100Marks

Credits: 06

Detailed Curriculum for Practical

Students have to prepare their Practical journals of Chemistry for Laboratory work and they have to submit certified journals in the University practical exams. Students are not allowed in the laboratory without certified journals in the University practical examination.

Detailed Syllabus for Chemistry Practical	Teaching Hours
<p>Inorganic Qualitative analysis of compounds having two radicals.</p> <ul style="list-style-type: none">▪ Positive radicals: Pb^{+2}, Cu^{+2}, Sb^{+2}, Cd^{+2}, As^{+3}, Al^{+3}, Fe^{+3}, Fe^{+2}, Zn^{+2}, Mn^{+2}, Ni^{+2}, Co^{+2}, Ca^{+2}, Ba^{+2}, Sr^{+2}, Mg^{+2}, Na^{+}, K^{+}, NH_4^{+}▪ Negative radicals : CO_3^{-2}, O^{-2}, Cl^{-1}, Br^{-1}, I^{-1}, PO_4^{-3}, S^{-2}, SO_3^{-2}, NO_2^{-1}, NO_3^{-1}, CrO_4^{-2}, $Cr_2O_7^{-2}$, SO_4^{-2} <p>Redox titration</p> <ol style="list-style-type: none">1. To determine the molarity and gm/lit of $H_2C_2O_4 \cdot 2H_2O$ and NaOH by using 0.02 M $KMnO_4$ solution.2. To determine the molarity and gm/lit of each component in a mixture of $H_2C_2O_4 \cdot 2H_2O$ and H_2SO_4 by using 0.02 M $KMnO_4$ and 0.12 M NaOH solution.3. To determine the molarity and gm/lit of each component in a mixture of $H_2C_2O_4 \cdot 2H_2O$ and $K_2C_2O_4 \cdot H_2O$ by using 0.02 M $KMnO_4$ and 0.08 M NaOH solution.4. To determine the molarity and gm/lit of $FeSO_4(NH_4)_2 \cdot SO_4 \cdot 6H_2O$ and $K_2Cr_2O_7$ solutions using 0.02 M $KMnO_4$ solution by using diphenyl amine as an internal indicator.	90

: REFERENCE BOOKS :

1. Vogel's Textbook of practical organic chemistry, 5th Edition by B. S. Furniss et al.
2. Vogel qualitative Inorganic Analysis by G. Svehla.:universities press.
3. Organic qualitative analysis by Mann sunder.
4. Comprehensive practical organic chemistry, V. K. Ahuwalia.

**DETAILED CURRICULUM B. Sc. Semester – 3- CORE COURSE – CHEMISTRY**

SR. NO.	PAPER NO.	NAME OF THE PAPER	TOTAL MARKS EXT.+INT*= TOTAL	PASSING STANDARD EXT. + INT.* = TOTAL	TOTAL TEACHING HOURS	CREDITS
1	CHECC-303	Inorganic & physical chemistry - 1	70+30=100	28+12=40	15 WEEKS X 4 HOURS =60	04
2	CHECC-304	Organic & analytical chemistry - 1	70+30=100	28+12=40	15 WEEKS X 4 HOURS =60	04
2	CHECC-305	Practical [Based on paper CHECC-303& 304]	100	40	15 WEEKS X 9HOURS =135	09

*INTERNAL MARKS: 30	(1) Internal Test	15 marks (10marks LQ and 05 marks SQ)
	(2) Assignment/Presentation	10 marks
	(3) Seminar/Presence	05 marks
	Total	30 marks

Time duration of theory examination will be 02.30 hours

Time duration of practical examination will be 06.00 hours (2 sessions of three hours)



Paper No: CHECC -303

Title of the Paper: Inorganic & physical chemistry - 1

Credits: 04

Total Teaching Hours: 60 Hours

Marks: Semester End Examination: 70Marks

Continues Internal Evaluation: 30 Marks

Unit	Detailed Syllabus	Marks/ Weight
1	<p>(A) Wave mechanics Explanation of Eigen function and Eigen value with examples and meaning of Ψ^1 and Ψ^2, explanation for normalized and orthogonal wave functions. Problems on normalization and orthogonality, Schrodinger's equation in polar co-ordinates, separation of variables with examples.</p> <p>(B) The concepts coordination compounds Explanation of complex compound, the concepts of primary and secondary valences. Werner's theory (1893). Stability of complex compounds, Sidgwick's co-ordinate bond theory of complex compounds, Drawbacks of Sidgwick's theory, Stereoisomerism such as geometrical and optical isomerism of ML_4 and ML_6 types of complex compounds.</p>	18
2	<p>(A)Hydrogen History, occurrence and preparation of hydrogen by (i) Bosch process (ii) Liquefaction process (iii) Hydrogen from hydrocarbon (iv) Electronic process (v) Lane's process. Properties of Hydrogen and position of Hydrogen in periodic table, Nascent 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 and H_2O & D_2O, Biological behavior, importance compounds of D_2O. Ortho and para deuterium and Tritium. Preparation properties and structure of hydrogen peroxide.</p> <p>(B) Bonding in metal complexes(Valance bond theory) Valance bond theory of ML_4 and ML_6 complex compounds, explanations of the outer and inner orbital complexes, Numbers of unpaired electrons and magnetic moment with formula.</p>	17
3	<p>(A)Additive, colligative and constitutive properties of liquieds. (Physical properties of liquids) Additive, colligative and constitutive properties. Various methods of determining physical properties, such as surface tension, viscosity, refractive index, dipole moment. Molecular-weight determination of macro molecules by osmotic pressure method, Numericals based on surface tension, refractive index, dipole moment and osmotic pressure.</p> <p>(B) Crystal field theory Shape of s, p, d orbitals, splitting of d orbitals in octahedral, tetrahedral and square planner arrangements. Explanation for high spin and low spin</p>	18



	complexes. Explanation for high energy and low energy complexes. Simple calculation of crystal field stabilization energy for different number of 'd' electrons for first transition elements, explanation for magnetic properties.	
4	Thermodynamics Brief introduction of thermodynamics Concept of entropy and free energy, criteria for spontaneous change, entropy change in reversible and irreversible processes, free energy and work functions, equilibrium conditions in terms of entropy and free energy change, Gibbs-Helmholtz equation. Outlines of extensive and intensive properties, Types of systems, partial molar free energy - chemical potential, Gibbs - Duhan equation, fugacity and activity concepts, thermodynamic derivation of law of mass action, effect of temperature and pressure on equilibrium constant and numerical.	17

: REFERENCE BOOKS:

1. Basic Inorganic chemistry, - *F.A.Cotton, G.Wilkinson*; John Wiley & Sons
2. Quantum chemistry, - *Iran.N.Levine* ; P H I Learning Private Ltd.
3. Modern Inorganic chemistry, - *G.D.Parkes*; Longmans, Green & Co. London.
4. Modern Inorganic Chemistry, - *R.D.Madan*; S.Chand & Company Ltd.
5. Organic Chemistry vol-I , - *I.L.Finar* ; Longman Scientific & Technical Publication.
6. Organic Chemistry vol-II , - *I.L.Finar* ; Longman Scientific & Technical publication.
7. Reaction Mechanisam & Reagents in Organic Chem.. , - *G.R.Chatwal* ; Himalaya Pub. house.
8. Organic reaction mechanism by Ahluwalia parasar.: Narosa Publishing House.
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10. Physical Chemistry, - *A.J.Mee* ; The English Language Book Society.
11. Physical Chemistry , - *Barrow*; McGraw Hill Book Co.
12. Principles of physical chemistry, - *Samuel H. Maron, Carl F. Pruton* ; Oxford and IBH Publishing Co.
13. Physical Chemistry , - *William F. Sheehan* ; Prentice hall of India Pvt. Ltd.
14. Physical Chemistry , - *Frank.H.Mac Dougall* ; New York The Macmillan Company.
15. Shrev's Chamical Process Industries, - *R. Norris Shreve, J.A.Brink, Jr.*; McGraw-Hill Kgakusha.
16. Industrial Chemistry, - *Dr B.K.Sharma*; Goel Publication house.
17. Roger's industrial chemistry, - *C.C, Furnas*; D.Van Nostrand compony, Inc.
18. Industrial Chemistry, - *William Thornton* ; John Wiley & Sons.
19. Physical chemistry, - *Atkin's* , Oxford and IBH Publishing Co.



Paper No: CHECC-304

Title of the Paper: Organic and analytical chemistry - 1

Credits: 04

Total Teaching Hours: 60 Hours

Marks: Semester end Examination: 70Marks

Continues Internal Evaluation: 30 Marks

Unit	Detailed Syllabus	Marks/ Weight
1	<p>(A) Purines and Ureides Brief introduction of purines and ureides, Determination of constitution of uric acid and synthesis of uric acid. Synthesis of Adenine, Guanine, Caffeine, Theobromine, Theophylline from uric acid.</p> <p>(B) Amino acids, Polypeptides and Proteins. Brief 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.</p>	18
2	<p>(A) Reagents Preparation and applications of following reagents in organic synthesis</p> <ol style="list-style-type: none">1. Diazomethane2. Lead tetra acetate3. Lithium aluminum hydride4. Raney nickel5. Sodamide. <p>(B) Problems based on organic reactions 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> <p>(B) Role of organic reagents in quantitative analysis</p> <ol style="list-style-type: none">1. Dimethylglyoxime (DMG),2. Ethylenediamine tetraacetic acid (EDTA),3. 8-hydroxyquinoline ,4. α-nitroso β-naphthol ,5. Cupferron ,6. Diphenyl thiocarbazon ,7. Diethyl dithiocarbamate.	17



3	<p>(A) Compounds having reactive methylene group Introduction, reactivity of methylene group, synthesis of malonic ester and acetoacetic ester. Applications of malonic ester (minimum 15). Applications of acetoacetic ester (minimum 15). A brief account on keto-enol tautomerism with respect to acetoacetic ester. Factors affecting equilibrium in keto-enol tautomerism.</p> <p>(B) Macromolecules: Importance of polymers. Basic concepts: monomers, repeat units, degree of polymerization. Linear, branched and crosslink polymers, classification of polymers, chain growth (free radical, ionic and coordination) and step growth polymerization and copolymerizations, polydispersion-average molecular weight concept, number, weight and viscosity average molecular weights. The practical significance of molecular weight, molecular weight determination using viscosity method, osmometry, cryoscopy, ebullioscopy (qualitative description) polymer degradation and environmental concerns and numerics based on theory.</p> <p>(C) Catalysis : Catalyst, inhibitor, autocatalysis. catalytic activity, selectivity and stability, homogeneous and heterogeneous catalysis, general characteristics of catalytic reactions, theories of catalysis (chemical theory and adsorption theory), active sites. applications of catalysts in industries, role of active sites in catalysis. turn over number, characterization of catalysts, acid - base catalysis. Solid acid catalysts, importance of selectivity, enzyme catalysis, catalysis in atmospheric pollution control, concept of auto , positive and negative catalysis, applications of catalysts in chemical industries.</p>	18
4	<p>(A) Conventional / classical method of analysis Brief introduction of volumetric and gravimetric analysis. Gravimetric analysis: Introduction, steps involved in gravimetric analysis, like precipitation, digestion, filtration, washing, drying or ignition (incineration). Post precipitation and co- precipitation, masking and de- masking agents, problem involved in precipitation such as Iron, Nickel, Barium and Alluminium.</p> <p>(B) Estimation of organic functional groups. Estimation of following organic functional groups with procedure, chemical reactions and necessary calculations :</p> <ol style="list-style-type: none">1. Aldehyde and Ketone2. Carboxylic acid3. Ester4. Amide5. Methoxy6. Phenol and amine	17



: REFERENCE BOOKS:

1. Basic Inorganic chemistry, -*F.A.Cotton, G.Wilkinson*; John Wiley & Sons
2. Quantum chemistry, - *Iran.N.Levine* ; P H I Learning Private Ltd.
3. Modern Inorganic chemistry, -*G.D.Parkes*; Longmans, Green & Co. London.
4. Modern Inorganic Chemistry, - *R.D.Madan*; S.Chand & Company Ltd.
5. Organic Chemistry vol-I , - *I.L.Finar* ; Longman Scientific & Technical Publication.
6. Organic Chemistry vol-II , - *I.L.Finar* ; Longman Scientific & Technical publication.
7. Reaction Mechanisam & Reagents in Organic Chem.. , - *G.R.Chatwal* ; Himalaya Pub.
8. Organic reaction mechanism by Ahluwalia parasar.: Narosa Publishing House.
9. Text book of Physical Chemistry , - *Glasstone* ; London Macmillan & Company Ltd.
10. Physical Chemistry, - *A.J.Mee* ; The English Language Book Society.
11. Physical Chemistry , - *Barrow*; McGraw Hill Book Co.
12. Principles of physical chemistry, - *Samuel H. Maron, Carl F. Pruton* ; Oxford and IBH Publishing Co.
13. Physical Chemistry , - *William F. Sheehan* ; Prentice hall of India Pvt. Ltd.
14. Physical Chemistry , - *Frank.H.Mac Dougall* ; New York The Macmillan Company.
15. Shrev's Chamical Process Industries, -*R. Norris Shreve, J.A.Brink, Jr.*; McGraw-Hill Kgakusha.
16. Industrial Chemistry, -*Dr B.K.Sharma*; Goel Publication house.
17. Roger's industrial chemistry, -*C.C,Furnas*; D.Van Nostrand compony, Inc.
18. Industrial Chemistry, -*William Thornton* ; John Wiley & Sons.



Paper: CHECC -305

Title of the Paper: Practical [Based on paper CHECC – 303 & 304]

Credits: 06

Marks: Semester End Examination: 100 Marks

DETAILED CURRICULUM FOR PRACTICAL

Students have to prepare their practical journal of chemistry for laboratory work and they have to submit certified journals in the University practical examination. Students are not allowed in the laboratory without certified journals in the University practical examination. Time duration of practical examination will be 06.00 Hours (2 Sessions of three hours).

Detailed Syllabus for Chemistry Practical	Teaching Hours
<p>To analyze quantitatively inorganic mixture containing 4 radicals Positive radicals: (Minimum 12 Mixture) (Without phosphate, arsenite, arsenate, borate, chromate and dichromate radicals) Pb²⁺, Cu²⁺, Sb²⁺, Cd²⁺, Bi³⁺, Sn²⁺, Al³⁺, Cr³⁺, Fe³⁺, Fe²⁺, Zn²⁺, Mn²⁺, Ni²⁺, Co²⁺, Ca²⁺, Ba²⁺, Sr²⁺, Mg²⁺, Na⁺, K⁺ and NH₄⁺ Negative radicals : Cl⁻, Br⁻, I⁻, NO₂⁻, NO₃⁻, CO₃²⁻, S²⁻, SO₃²⁻ and SO₄²⁻</p>	90
<p>To estimate volumetrically: 1) Ammonium chloride 2) Ferric chloride 3) Nitrite 4) Calcium by ethylenediamine tetraacetic acid 5) Magnesium by ethylenediamine tetraacetic acid 6) Zinc by ethylenediamine tetraacetic acid OR Physico chemical Exercises 1. To determine the order of reaction of hydrolysis of methyl acetate. 2. To determine the relative strength of hydrochloric acid and Sulfuric acid by catalytic method. 3. To study the adsorption of an organic acid on activated charcoal.</p>	

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1. Vogel's Textbook of practical organic chemistry, 5th Edition by B. S. Furniss et al.
2. Vogel qualitative Inorganic Analysis by G. Svehla.:universities press.
3. Organic qualitative analysis by Mann sunder
4. Comprehensive practical organic chemistry, V. K. Ahuwalia.



DETAILED CURRICULUM B. Sc. Semester – 4 – CORE COURSE – CHEMISTRY

PAPER NO.	NAME OF THE PAPER	TOTAL MARKS EXT.+INT*=TOTAL	PASSING STANDARAD EXT.+INT= TOTAL	TOTAL TEACHING HOURS	CREDITS
CHECC-403	Inorganic & physical chemistry - 2	70+30=100	28+12=40	15 WEEKS X 4 HOURS =60	04
CHECC-404	Organic & analytical chemistry - 2	70+30=100	28+12=40	15 WEEKS X 4 HOURS =60	04
CHECC-405	Practical [Based on paper CHECC-403 & 404]	100	40	15 WEEKS X 9HOURS =135	09

*INTERNAL MARKS :	30
(1) Internal Test	15 marks (10marks LQ and 05 marks SQ)
(2) Assignment/Presentation	10 marks
(3) Seminar/Presence	05 marks
Total	30 marks

Time duration of theory examination will be 02.30 hours

Time duration of practical examination will be 06.00 hours (2 sessions of three hours)



Paper CHECC: 403

Title of the Paper: **Inorganic & physical chemistry - 2**

Credits: 04

Total Teaching Hours: **60 Hours**

Marks: Semester End Examination: **70Marks**

Continous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Marks/ Weight
1	<p>(A) Transition elements Brief account on transition elements and real transition elements. Position of transition elements in periodic table, electronic configuration of first transition series (Sc to Zn), explanation for physical properties such as density, atomic radii, melting point and boiling point, conductance of heat and electronic configuration, explanation based on chemical and physical properties such as :</p> <ol style="list-style-type: none">1. Decrease in basicity and increase in acidity2. Ionization potential3. Valency and variable valency4. Catalytic property5. Complex formation6. Interstitial compounds7. Stoichiometric and non-stoichiometric compounds8. Color <p>Magnetic properties based on their electronic configuration. Explanation of alloy formation and Hume-Rothery rule. Zero complex compound among transition elements.</p> <p>(B) Valence bond theory (V.B Theory) and molecular orbital theory (M. O. Theory) Basic concepts valence bond and molecular orbital theory in detail, comparison of valence bond and molecular orbital theory. molecular orbital energy level diagram of AB type heteronuclear diatomic molecules such as LiH, HF, BN, BeO, CO, NO, HCl.</p>	18
2	<p>(A) Chemical bonding Explanation of following chemical bonds such as</p> <ol style="list-style-type: none">1. Ionic bond,2. Covalent bond,3. Co-ordinate covalent bond,4. Metallic bond and5. Hydrogen bond <p>(B) Hybridization Brief Introduction of hybridization, explanation of sp, sp^2, sp^3, sp^3d, sp^3d^2 and sp^3d^3 hybridization with the help of BeH_2, BH_3, CH_4, PCl_5, SF_6 and IF_7</p>	17



	(C) Phase rule Explanation of terms: phase, component and degree of freedom in phase rule, phase equilibrium in one component systems such as water and sulphur systems. Phase diagrams of two component systems giving explanations components completely miscible with one another and not forming any compound such as lead – silver (Ag-Pb) system, potassium iodide - water (KI- water) system. Two components forming a solid compound with incongruent and congruent melting point such as zinc - magnesium (Zn-Mg) system and ferricchloride - water (FeCl ₃ - water) system.	
3	Chemical kinetics Brief Introduction of chemical kinetics, scope of chemical kinetics, concept of rate of reaction, factors influencing the rate of reaction, molecularity and order of reaction, differential rate law, concept and kinetics of zero, 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, Numericals.	18
4	Electromotiveforce (EMF) Brief classification of various type electrode, type of reversible electrodes like indicator electrodes and reference electrodes viz. glass electrode, calomel electrode, platinum electrode, quinhydrone electrode. Electro chemical and concentration cells. electromotiveforce of concentration cells with and without transference. Liquid junction potential, deduction of general equation for liquid junction potential, oxidation-reduction potentials and standard oxidation-reduction potentials, solubility product determinations and numericals.	17

: REFERENCE BOOKS :

1. Basic Inorganic chemistry - *F.A.Cotton, G.Wilkinson*; John Wiley & Sons
2. Modern Inorganic chemistry -*G.D.Parkes*; Longmans, Green & Co. London.
3. Modern Inorganic Chemistry, - *R.D.Madan*; S.Chand & Company Ltd.
4. Organic Chemistry vol-I, - *I.L.Finar* ; Longman Scientific & Technical Publication.
5. Organic Chemistry vol-II, - *I.L.Finar* ; Longman Scientific & Technical publication.
6. Reaction Mechanism & Reagents in Organic Chem., - *G.R.Chatwal* ; Himalaya Pub. house.
7. Organic reaction mechanism by Ahluwalia parasar.: Narosa Publishing House.
8. Text book of Physical Chemistry, - *Glasstone* ; London Macmillan & Company Ltd.
9. Physical Chemistry, - *William F. Sheehan* ; Prentice hall of India Pvt. Ltd.
10. Physical Chemistry, - *Frank.H.Mac Dougall* ; New York The Macmillan Company.
11. Physical chemistry, - *Atkin's* , Oxford and IBH Publishing Co.



Paper CHECC-404

Title of the Paper: **Organic and analytical chemistry**

Credits: 04

Total Teaching Hours: **60 Hours**

Marks: Semester End Examination: **70Marks**

Continous Internal Evaluation: **30 Marks**

Unit	Detailed Syllabus	Marks/ Weight
1	<p>(A) Heterocyclic compounds Brief classification and nomenclature of heterocyclic compounds, classification of heterocyclic compounds, synthesis and properties of pyrrole, furan, thiophene, pyridine, quinoline and isoquinoline.</p> <p>(B) Polynuclear Hydrocarbons Brief Introduction and classification of polynuclear hydrocarbons, methods of preparation and chemical characteristics of naphthalene, anthracene, phenanthrene, diphenylmethane and triphenylmethane.</p> <p>(C) Organic re-arrangements Principle and applications of following organic re-arrangements: 1. Benzil-Benzilic acid 2. Curtius 3. Fries 4. Pinacol-Pinacolone</p>	18
2	<p>(A) Organic reactions Principle, mechanism and synthetic applications of the following : 1. Aldol condensation 2. Diels-Alder reaction 3. Michael reaction 4. Perkin reaction</p> <p>(B) Preparations and uses of important organic compounds. 1. Antipyrine 2. Acetophenetidine (phenacetin) 3. Sulphadiazine 4. Sulphathiazole 5. Vitamin-C (Ascorbic acid) 6. Congo red 7. Eriochrome Black-T 8. Malachite green 9. Metanil Yellow 10. Methyl Red 11. 11.Phenolphthelline 12. Aspirin</p>	17



3	<p>(A) Cycloalkane/Alicyclic compounds Brief Introduction of cycloalkane/alicyclic compounds, general methods for the preparation of cycloalkane compounds, physical and chemical properties of cycloalkane compounds, stability of cycloalkane compounds, baeyer's strain theory and stainless ring theory.</p> <p>(B) Fertilizers Brief account on fertilizers, plant nutrients, types of fertilizers, need of fertilizers, essential requirements element, fertility of 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.</p> <p>(C) Industrial Manufacturing of urea: Raw materials, manufacture, condition for a good yield, important points and usefulness of urea as fertilizer.</p>	18
5•4 4	<p>(A) Concept of volumetric analysis Classification of volumetric analysis:</p> <ol style="list-style-type: none">1. Neutralization titration,<ol style="list-style-type: none">1. Strong acid v/s strong base2. Strong acid v/s weak base3. Weak acid v/s strong Base4. Weak acid v/s weak base2. Precipitation titration:<ol style="list-style-type: none">1. AgNO₃ v/s NaCl2. BaCl₂ v/s H₂SO₄3. Complex formation titration:<ol style="list-style-type: none">1. Ca²⁺ v/s E.D.T.A2. Mg²⁺ V/S E.D.T.A4. Radox titration : Fe²⁺ V/S Cr⁶⁺ and Mn⁷⁺5. Matalochromic Indicator, Acid base Indicator6. Fajan's Rules for volumetric titration. <p>(B) Quantitative analysis : Brief introduction of quantitative analysis, separation of interfearence redical</p> <ol style="list-style-type: none">1. Cl⁻, Br⁻, I⁻2. NO₂⁻, NO₃⁻3. S²⁻, SO₃²⁻, SO₄²⁻4. AsO₃³⁻, AsO₄³⁻, PO₄³⁻	17



: REFERENCE BOOKS:

1. Basic Inorganic chemistry, -*F.A.Cotton, G.Wilkinson*; John Wiley & Sons
2. Modern Inorganic chemistry, -*G.D.Parkes*; Longmans, Green & Co. London.
3. Modern Inorganic Chemistry, - *R.D.Madan*; S.Chand & Company Ltd.
4. Organic Chemistry vol-I, - *I.L.Finar* ; Longman Scientific & Technical Publication.
5. Organic Chemistry vol-II, - *I.L.Finar* ; Longman Scientific & Technical publication.
6. Reaction Mechanism & Reagents in Organic Chem., - *G.R.Chatwal* ; Himalaya Pub. house.
7. Organic reaction mechanism by Ahluwalia parasar.: Narosa Publishing House.
8. Text book of Physical Chemistry, - *Glasstone* ; London Macmillan & Company Ltd.
9. Physical Chemistry, - *William F. Sheehan* ; Prentice hall of India Pvt. Ltd.
10. Physical Chemistry, - *Frank.H.Mac Dougall* ; New York The Macmillan Company.



Paper No: CHECC-405

Title of the Paper: Practical [Based on paper CHECC -403 & 404]

Credits: 06

Marks: Semester End Examination: **100 Marks**

DETAILED CURRICULUM FOR PRACTICAL

Students have to prepare their practical journal of chemistry for laboratory work and they have to submit certified journals in the University practical examination. Students are not allowed in the laboratory without certified journals in the University practical examination. Time duration of practical examination will be 06.00 Hours (2 Sessions of three hours).

Detailed Syllabus for Chemistry	Teaching Hours
Organic Spotting : single compound (Minimum 16 compounds) Spotting of organic compounds having mono and bifunctional groups with conformation and derivatives of above groups.	90
Quantitative analysis of following metal by gravimetrically 1. Aluminum as aluminum oxide 2. Ferric as ferric oxide 3. Barium as barium sulphate 4. Nickel as nickel-dimethyl glyoxime	

: REFERENCE BOOKS :

1. Vogel's Textbook of practical organic chemistry, 5th Edition by B. S. Furniss et al.
2. Vogel qualitative Inorganic Analysis by G. Svehla.:universities press.
3. Organic qualitative analysis by Mann sunder.
4. Comprehensive practical organic chemistry, V. K. Ahuwalia.