

**COURSE STRUCTURE
FOR
S. Y. B. Sc. (SEMESTER – 4) CHEMISTRY**

SEMESTER – IV			
Principal Subject	Course Code	Paper Title	Credits
CHEMISTRY	US04CCHE01	INORGANIC CHEMISTRY	03 Credits
	US04CCHE02	APPLIED CHEMISTRY	03 Credits
	US04CCHE03	PRACTICAL	03 Credits
	US04CPHY01	ELECTROMAGNETIC THEORY AND SPECTROSCOPY	03 Credits
	US04CPHY02	SOLID STATE PHYSICS	03 Credits
	US04CPHY03	PRACTICAL	03 Credits
	US04EICH02	INSTRUMENTAL METHODS OF ANALYSIS	02 Credits
	US04EMTH05	CACULUS & ALGEBRA-II	02 Credits
	US04FENG01	FUNCTIONAL ENGLISH	02 Credits

USO4CCHE01 (INORGANIC CHEMISTRY)
[03 Credits] [Total Unit IV]
Total Marks: 100 [Internal 30 + External 70]

Total 45 lecturers

UNIT: I CHEMISTRY OF d-BLOCK ELEMENTS

[11 Hrs.]

Introduction, Position of d-block elements in the periodic table, Electronic configurations and definition, Classifications of d-block elements in 3d, 4d, 5d and 6d series, Physicochemical properties: Atomic radii, Ionic radii, Metallic character and related properties, Atomic volumes and densities, Melting and boiling points, Ionization energies, Standard reduction potential values, Variable oxidation states, Colour of transition metal complex ions, Magnetic properties of transition metal ions and their complexes, Tendency of transition metals to form complex compounds, Formation of interstitial compounds, Catalytic activity, Alloy formation.

Reference Book: Advanced Inorganic Chemistry (Volume-II) by Satya Prakash, G. D. Tuli, S. K. Basu & R D Madan

UNIT: II COORDINATION CHEMISTRY AND ISOMERISM IN COORDINATION COMPOUNDS

[11 Hrs.]

Postulates of Werner's coordination theory, Explanation of the structure of Co(III) ammines and Pt(IV) complexes on the basis of Werner's coordination theory, Experimental evidences in favour of Werner's theory, Sidgwick's electronic concept of coordinate bond and its limitations, Sidgwick's effective atomic number rule, Structural isomerism: Conformation isomerism, Ionization isomerism, Hydrate isomerism, Coordination isomerism, Linkage isomerism, Coordination position isomerism, Ligand isomerism and Polymerization isomerism, Stereoisomerism: Geometrical isomerism, Geometrical isomerism in 4-coordinated complex compounds, Geometrical isomerism in 6 - coordinated complex compounds, To distinguish between cis and trans isomers, Optical isomerism: Definitions, Conditions for a molecule to show optical isomerism, Optical isomerism in 4-coordinated complex compounds, Optical isomerism in 6 -coordinated complex compounds.

Reference Book: Advanced Inorganic Chemistry (Volume-II) by Satya Prakash, G. D. Tuli, S. K. Basu & R D Madan

UNIT: III LANTHANIDES AND ACTINIDES

[11 Hrs.]

(A) LANTHANIDES: Definition, Position of lanthanides in periodic table, General properties- electronic configuration, oxidation state and oxidation potential, chemistry of +2, +3 and +4 state, chemistry of +2, +3 and +4 state, Atomic and ionic radii, lanthanide contraction, cause of lanthanide contraction, consequences of lanthanide contraction, Color and absorption spectra of Ln^{+3} ion, magnetic properties and complex formation, Extraction of lanthanides from monazite mineral, Separation of individual rare earth elements by modern methods- ion exchange method, solvent extraction method, uses of lanthanide compounds.

(B) ACTINIDES: Definition, Position of actinides in periodic table, General properties and their comparison with lanthanides like - electronic configuration, oxidation state and oxidation potential, chemistry of +2, +3, +4, +5, +6 and +7 oxidation state, Atomic and ionic radii, actinide contraction, color and absorption spectra, magnetic properties and complex formation, Separation of actinide elements by- ion exchange method and solvent extraction method.

Reference Book: Selected Topics in Inorganic Chemistry by Wahid U. Malik, G. D. Tuli and R. D. Madan

UNIT-IV CHEMISTRY OF METALLIC CARBONYLS AND NITROSYLS [12 Hrs.]

[A] METALLIC CARBONYLS: General methods of preparation, general properties, Structure and nature of M-CO bonding in carbonyls, Effective atomic number (EAN) rule as applied to metallic carbonyls, 18-electron rule as applied to metallic carbonyls, Some carbonyls

[B] METALLIC NITROSYLS: Some metallic nitrosyls, Effective atomic number (EAN) rule as applied to metallic nitrosyls.

Reference Book: Selected Topics in Inorganic Chemistry by Wahid U. Malik, G. D. Tuli and R. D. Madan

B. Sc. [Semester-IV]
US04CCHE02 (APPLIED CHEMISTRY)
[03 Credits] [Total Unit IV]
Total Marks: 100 [Internal 30 + External 70]

Total 45 lecturers

UNIT: I ELECTROMAGNETIC SPECTRUM: ABSORPTION SPECTRA [11 Hrs.]

Introduction of U. V. Absorption Spectroscopy

Visible and UV spectroscopy Presentation (Sketching) of UV spectra of Benzene, 2,5-dimethyl-2,4-hexadiene and aniline.

Woodward-Fischer rules and application for calculating absorption maxima for the following molecules:

1. Myrcene, 2. 1,3-pentadiene, 3. Carvone, 4. Vitamin- A₁ 5. Crotonaldehyde, 6. 2,4-hexadiene

I R Absorption spectroscopy

Molecular Vibration, Application of I R Spectroscopy, (Absorption of common functional groups) to Aniline, Benzoic acid, nitrobenzene, benzamide, acetamide, acetone, benzaldehyde, phenyl acetylene, cyanobenzene, acetone, styrene, phenol, ethanol, acetic acid and acrolein.

Reference Books:

1. Application of absorption spectroscopy of organic compounds by John R. Dyer.
2. Introduction to organic chemistry by Gurdeep R. Chatwal.

UNIT: II VITAMINS

[11 Hrs.]

Introduction, history and nomenclature, classification, synthesis of vitamins by intestinal bacteria, Fat and water soluble vitamins.

Vitamin-A and its chemistry, absorption, transport and metabolization, colour vision, other biological functions and deficiency of Vitamin-A.

Vitamin-D: chemistry and biochemical functions of Vitamin-D, Vitamin-D is a hormone and not a vitamin, dietary sources and deficiency symptoms.

Vitamin-E: chemistry and biochemical functions of Vitamin-E, dietary sources and deficiency symptoms.

Vitamin-C: chemistry and biochemical functions of Vitamin-C, dietary sources and deficiency symptoms, biomedical/clinical concepts.

Reference Books:

1. Biochemistry by U. Satyanarayan and U. Chakrapani
2. Fundamentals of biochemistry by Dr. A.C. Deb.

UNIT: III FERTILIZERS

[11 Hrs.]

Plant nutrients and their functions, Micronutrients, Types of Fertilizers, Need of Fertilizers, Essential, Requirements, Fertility of the Soil, pH Value of the Soil, Classification of Fertilizer, Direct and Mixed Fertilizers, Source of Fertilizers, Natural Organic Fertilizers, Granulations, Bulk Blending, Natural Inorganic Fertilizers, Artificial Fertilizers, Nomenclature in Fertilizer Industry, Nitrogenous Fertilizers, Ammonium Nitrate, Important Points, Ammonium Sulfate, Ammonium Sulfate from gypsum or anhydride, Action of Ammonium Sulfate as Fertilizer, Urea, Raw Materials, Manufacture, Condition for a Good Yield, Important Points, Action of Urea as Fertilizer, Calcium Cyanamide, Action of CaCN₂ as Fertilizer, Calcium Ammonium Nitrate, Sodium Nitrate, Ammonium Chloride, Organic Materials, Controlled Release Nitrogen Solution, Phosphate Fertilizer, Phosphate Rock, Normal Super Phosphate, Modification in Manufacturing Equipment, Properties, Triple Super Phosphate, Important Points, Ammonium Phosphate. Phosphates, Potassium Fertilizer, NPK Fertilizer, Important Fertilizers.

UNIT: IV CEMENT INDUSTRY**[12 Hrs.]**

Introduction and types of cement, High alumina cement, Slag cement, Acid resisting cement, Super sulphate cement, White and coloured cement, Sorel's cement, Roman cement, Pozzolan cement, Blended portland cement, Types of Portland cement, cementing materials, Raw materials, Cement rock beneficiation, Manufacture, Reactions in the kiln, Mixing of additives to the cement, Setting of cement, Function of compounds, Properties of cement, Indian standard institute specifications, Testing, Uses, Physicochemical processes occurring in thermal treatment of raw cement mixture, Heat requirement, Definitions, Rotary kilns for making cement clinker, Fuel burning devices, Clinker coolers, Factors affecting quality, economy in cement industry, Mortars and concrete, Curing and decay of concrete, Corrosion of concrete or cement stone, Gypsum, Plaster of Paris, Lime and its manufacture, Properties of lime, Setting and hardening of lime.

Reference Books:

1. Industrial Chemistry, (9th Edition), B.K.Sharma.
2. A Textbook of Engineering Chemistry by M. M. Uppal.

B. Sc. [Semester-IV]
US04CCHE03 (PRACTICAL CHEMISTRY)
[03 Credits]
Total Marks: 100 [Internal 30 + External 70]

1. BINARY ORGANIC MIXTURE: [Solid + Solid or Solid + liquid i.e. (acetone, methyl acetate, ethanol, benzene, CCl₄)].

2. VOLUMETRIC TITRATION (By self preparation of solution of titrant):

- (1) Determination of equivalent weight of carboxylic acid by alkali solution.
- (2) Determination of glucose.
- (3) Determination of formaldehyde by sodium hypiodide.

3. GRAVIMETRIC ANALYSIS

- (1) ZnCO₃
- (2) BaCl₂.2 H₂O

4. PREPARATION OF STANDARD SOLUTIONS

Reference Books:

1. Vogel's Testbook of Quantitative Chemical Analysis, 5th Edition By G.H.Jeffery, J.Basset, J.Mendham, R.C.Denney.
2. Vogel's Testbook Of Qualitative Inorganic Analysis By G.Svehla
3. Practical Chemistry By O.P.Pandey, D.N.Bajpai & S.Giri
4. An Advanced Course In Practical Chemistry By Ghoshal, Mahapatra & Nad

Subject: Physics
Course: US04CPHY01
Electromagnetic Theory and Spectroscopy
(Three Credit Course –3 Hours per week)
(Effective from June-2012)

UNIT - I Electrostatics

Electric field: Brief introduction to Gradient, Divergence, Curl and Coordinate Systems, Coulomb's Law, The Electric field, Continuous charge distribution, **Divergence and curl of Electrostatic fields:** Field lines, Flux and Gauss's law, The Divergence of E, Application's of Gauss's law, The Curl of E, **Electric Potential:** Introduction to potential, Comments on potential, Poisson's equation and Laplace's equation, The potential of a localized charge distribution, **Work and Energy in Electrostatics:** The work done to move a charge, The energy of a point charge distribution, The energy of a continuous charge distribution, Related Numericals

UNIT - II Magnetostatics

The Lorentz Force Law: Magnetic fields, Magnetic forces, Currents, **The Biot-Savart law:** Steady currents, The Magnetic field of a steady current, **The Divergence and Curl of B:** Straight-Line currents, The Divergence and Curl of B, Applications of Ampere's law, Comparison of Magnetostatics and Electrostatics, **Magnetic Vector Potential:** The Vector potential, Summary; Magnetostatic boundary conditions, Multipole expansion of the vector potential, Related Numericals

UNIT - III Atomic Spectra

Investigation of Spectra, Production of Spectra, Types of Spectra, Wave Number, The Spinning Electron, Space Quantization, Quantum Numbers and their Physical Interpretation, L-S Coupling, J-J Coupling, Experimental study of Zeeman Effect, Classical Interpretation of Normal Zeeman Effect, Anomalous Zeeman Effect, Stark Effect

UNIT - IV X-ray Spectra

Production of X-rays, X-rays, Light and Electromagnetic Spectrum, Diffraction of X-Radiations, Bragg's law, Continuous X-ray spectrum, Characteristic Emission Spectrum, Characteristic absorption Spectrum, A Close Survey of Emission Spectrum, Explanation of Emission and Absorption Spectra, Comparison of Optical and X-ray Spectra, Moseley's Law, The Fluorescence yield and Auger Effect

Books Recommended:

1. Introduction to Electrodynamics
David J Griffiths, Prentice-Hall of India Private Ltd.
2. Electricity and Magnetism
A S Mahajan and A A Rangwala
Tata McGraw Hill Publishing Company Ltd
3. Elements of Electromagnetics
Sadiku, Oxford University Press
4. Elements of Spectroscopy
S L Gupta, V Kumar, R C Sharma
Pragati Prakashan
5. Molecular structure and Spectroscopy
G Aruldas, Prentice-Hall of India Private Limited

Subject: Physics
Course: US04CPHY02
Solid State Physics
(Three Credit Course –3 Hours per week)
(Effective from June-2012)

UNIT-I Basic Elements of Crystallography

Introduction, Lattice points and space lattice, The basics and crystal structure, Unit Cell, Unit Cell versus Primitive Cell, Unit Cell and lattice parameters, Crystal types, Two dimensional crystal lattice, Seven crystal system, Symmetry Operations (Translational, Point, & Hybrid), Metallic crystal structures, Relation between the density of crystal materials and lattice constants, Directions planes and Miller Indices of crystal planes, Important features of Miller indices in a cubic crystal, Separation between lattice planes in cubic crystal

UNIT-II Atomic Cohesion, Crystal Binding, Atomic Size

Introduction, Force between atoms, Cohesion of atoms and cohesive energy, Calculation of cohesive energy, Calculation of lattice energy of ionic crystals, Calculation of Madelung constant of ionic crystals, The Born–Haber cycle, Bonding in solids, Primary Bonds (Covalent, Metallic, Ionic and Mixed), Secondary bonds (van der Waals and Hydrogen Bond), Properties of primary and secondary bonds, Wave mechanical concept of atom, Atomic size, Ionic radii, Empirical ionic radii, variation of ionic radii, Covalent radii, Metallic radii, van der Waals radii

UNIT- III Thermal & Dielectric Properties of Solids

Introduction, The specific heat of solid, The classical lattice heat capacity, The Einstein Model, The density of states, The Debye theory of heat capacity, Thermal conductivity of solids, Thermal conductivity due to electrons and phonons, Thermal resistance of solids, Dipole moment, Polarization, The electric field of a dipole, Local electric field at an atom, Dielectric constant and its measurement, Polarizability, The classical theory of electronic Polarizability, Dipolar Polarizability

UNIT-IV Structure of Polymers and its Applications

Introduction, Hydrocarbon molecules, Polymer molecules, The chemistry of polymer molecules, Molecular weight, Molecular shape, Molecular structure, Molecular Configurations, Thermoplastic and thermosetting polymers, Copolymers, Mechanical Behavior of polymers (Stress-Strain behavior, Macroscopic deformation, Viscoelastic deformation, Fracture of polymers, Miscellaneous mechanical characteristics), Mechanisms of deformation for strengthening of polymers (deformation of semi-crystalline polymers, factors that influence the mechanical properties of semi-crystalline polymers, deformation of elastomers), Polymer Types (Plastics, Elastomers, Fibers)

Books Recommended:

1. Solid State Physics
M A Wahab, Narosa Publishing House.
2. Solid State Physics
S O Pillai, , New Age International Publisher
3. Material Science and Engineering
W D Callister Jr. Wiley India (P) Ltd.
4. Introduction to Solid State Physics
C Kittel, (5th Edition) Wiley Eastern Ltd.
5. Elements of Solid State Physics
J P Srivastava, Prentice-Hall of India

Subject: Physics (Practical)
Course No. US04CPHY03
(Three Credit Course –6 Hours per week)
(Effective from June-2012)

List of Practicals:

1. Characteristics of FET
2. Miller Indices using X-Ray diffraction pattern.
3. De-Broglie Relation using electron diffraction pattern.
4. Wave length of a monochromatic light ' λ ' using Double Slit method.
5. Study of a Hartley Oscillator
6. Study of a Colpitts Oscillator
7. Thermal Conductivity (K) by Lee's method
8. Frequency Response of RC Coupled amplifier (with negative feedback).
9. Study of L-C-R Parallel Resonance
10. Wave length of a monochromatic light ' λ ' using Lloyd's mirror
11. Study of a Thermocouple
12. Cauchy's Constants
13. Find the Stefan's Index
14. Numerical Integration
15. Propagation of errors in observation.

Note: To provide flexibility up to the maximum of 20% of total experiments can be replaced/ added to the list by the board of studies.

Books Recommended:

1. Advanced Practical Physics for students
B L Wosnop and H T Flint
Methuen and Co. Ltd., London
2. B.Sc. Practical Physics
C L Arora
S.Chand & Co. Ltd., New Delhi
3. Advanced Practical Physics
M S Chauhan and S P Singh
Pragati Prakashan, Meerut
4. Advanced Practical Physics
S L Gupta and V Kumar
Pragati Prakashan, Meerut

INDUSTRIAL CHEMISTRY
SEMESTER-IV
COURSE NO.: US04EICH02 (2 CREDITS, 70 MARKS)
TITLE: INSTRUMENTAL METHODS OF CHEMICAL ANALYSIS

Unit-1:

pH metry: Introduction and determination of pH, applications. Potentiometric titrations: Introduction, Types of titrations, Advantages of potentiometric titrations. Conductometric measurements: Introduction, Some important laws, Definition and relations, Effect of dilution, Applications of conductance measurements, Types of titrations, Advantages and disadvantages.

Unit-2:

Chromatography: Introduction, Classification and application

Paper chromatography: Experimental details for qualitative analysis, Experimental details for quantitative analysis. Thin layer chromatography: Superiority of TLC over the other techniques, Experimental techniques, Limitations, Scope.

Column chromatography: Introduction, Experimental details, Theory of development, factors affecting column efficiency.

Unit-3:

HPLC and GC: Introduction, Instruments involved, Sampling methods, Experimental details and applications.

Unit-4:

Visible spectrophotometry and Colorimetry: Introduction, Theory of spectrophotometry and colorimetry, Deviation from Beer's Law, Instrumentation, Applications. Ultra Violet Spectroscopy: Introduction, Origin and theory of ultraviolet spectra, Choice of solvent, instrumentation, Applications.

REFERENCE BOOKS

1. Instrumental methods of chemical analysis by Chatwal – Anand, Himalaya Publishing House.
2. Instrumental methods of chemical analysis by B.K. Sharma, Krishna Publication Media (P) Ltd., Meerut.
3. Organic spectroscopy by William Kemp, Macmillan Press Ltd., London.
4. Analytical chemistry by Gray D. Christian, 4th edition, Wiley & Sons, Inc.
5. Instrumental methods of analysis by Willard Merritt, Dean Settle, CBS Publishers & Distributors, New Delhi.
6. Principles of instrumental analysis by Skoog, Holler, Nieman, Thomson Asia Pvt. Ltd., Singapore.
7. Basic concept of analytical chemistry by S.M. Khopkar, New Age International Publishers.
8. Instrumental methods of chemical analysis by Galen W. Ewing, McGraw – Hill Book Company.

SARDAR PATEL UNIVERSITY, VALLABH VIDYANAGAR
B.Sc.(MATHEMATICS) SEMESTER - IV
US04EMTH05 (Calculus and Algebra - 2)
TWO HOURS PER WEEK (2 CREDIT)
(For the students who were in Biology group in semester I and II)
Effective from June 2011
Marks:-100(30 internal+70 external)

UNIT-1.

Maxima and Minima for a function of two variables and its Examples and property.

UNIT-2.

Definitions of vector and scalar functions; Differentiation of scalar and vector fields ;
Gradient of scalar field; Directional derivative of scalar field; Tangent and normal plane to a surface.

UNIT-3.

Divergence and Curl of vectors fields; Their Properties, relations and examples.

UNIT-4 . Dentition of Boolean algebra; Simplification of Boolean function; Application of Boolean algebra to switching circuits.

Recommended Texts :

- (1) D. J. Karia, N. Y. Patel, B. P. Patel, M. L. Patel, Introduction to calculus and differential equations.
- (2) M.S.Spiegel , Vector Analysis, Schaum's series .
- (3) Shanti narayan , Deferential Calculus, Ninth edition, S. chand and Co. Ltd.1991
- (4) J.E.Whitesitt , Boolean Algebra .
- (5) B.S.Grewal, Higher Engineering Mathematics.

Syllabus of B.Sc. (Fourth Semester)
Foundation Course in English
Subject: Functional English
Course Code: (US04FENG01)
2 credits (Practical)
Hours per week (2 hours/batch)
Internal 30 marks + External 70 marks

Total: 100 Marks

Unit 1 Listening for Specific Purposes

Marks

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|----------|---|-----------|
| 1 | Listening for information (Fill in the blanks) (46 to 60) | 10 |
| 2 | Listening for Gist of the audio/video. Writing the gist | 03 |
| 3 | Identify the language functions | 02 |

Total= 15

Unit 2 Writing Skills

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| 1 | Letters for social occasions (Condolence, Invitations, encouragement and best wishes) | 07 |
| 2 | Words used in Newspaper Headlines
(Match the meaning with words given in the headlines) | 04 |
| 3 | Notice Writing | 05 |
| 4 | Collocations | 04 |

Total= 20

Unit 3 Oral Skills

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| 1 | Mock Interviews(Introduction, talking about their field, interest and body language) | 15 |
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Total= 15

15+05 journal= 20

Unit 4 Grammar and Vocabulary

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| 1 | Prepositions of place, time and direction
(fill in the blank) | 04 |
| 2 | Punctuation (In a paragraph) | 04 |
| 3 | Question tags (fill in the blank) | 03 |
| 4 | Articles and plural forms
(fill in the blank) | 04 |

Total= 15