Syllabus Of
Chemistry
B.Sc. (Hons.)
Course Code: ECH

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Course Structure for the Bachelor's Degree Programme (ECH) Chemistry

Course Code : ECH 01 : Course Title : General Chemistry

Block - I : Atoms, Molecules and Structure of Matter – I

Unit-1 : Electric Discharge through Gases, Fundamental Particles, Radioactivity, Rutherford's Atomic Model.

Unit-2 : Quantum Theory and Atomic Spectra, Bohr's Theory

Unit-3 : Wave Mechanics and its Application in Atomic structure

Unit-4 : Valency (I) - Chemical Bonds and Electronic Theory of Valency

Unit-5 : Valency(II)-Valence-Bond Theory and Molecular Orbital Theory.

Block-II : Structure of Matter–II

Unit-6 : Molar Refraction, Optical Activity

Unit-7 : Dipole Moment

Unit-8 : Absorption spectroscopy and Molecular Structure of Matter–Ultraviolet, Infrared and Electronic Spectroscopes.

Unit-9 : Raman Spectroscopy and Molecular Structure.

Unit-10 : Nuclear Chemistry.

Course Code : ECH 02 : Course Title : Inorganic Chemistry–I

Block-I : Periodic Table and Oxidation-reduction

Unit-1 : Periodic Table

Unit-2 : Periodicity

Unit-3 : Oxidation and Reduction

Block-II : Acids and Bases, Solvents, Structural nature (shape) of Inorganic Compounds, Radioactivity

Unit-4 : Acids and Bases

Unit-5 : Non-aqueous Solvents

Unit-6 : Structural Nature (Shape) of Inorganic Compounds

Unit-7 : Radioactivity

Unit-8 : Isotopes and Applications

Course Code : ECH 03 : Course Title : Inorganic Chemistry-II

Block-I : S-Block Elements

Unit-1 : Hydrogen

Unit-2 : Alkali Metals

Unit-3 : Alkaline Earth Metals

Block-II : P-Block Elements-I

Unit-4 : Elements of Group 13
Unit-5 : Elements of Group 14
Unit-6 : Elements of Group 15

Course Code : ECH 04 : Course Title : Practical Chemistry-I

Block-I Inorganic Chemistry : Quantitative analysis and preparations

Unit-1 : Experimental Methods and Apparatus
Unit-2 : Identification of Anions
Unit-3 : Identification of Cations.
Unit-4 : Preparations of Inorganic Compounds

Block-II Organic Chemistry : Quantitative analysis and Preparations

Unit-5 : Experimental Methods and Apparatus
Unit-6 : Identification of Special Elements of Organic Compounds
Unit-7 : Preparation of Organic Compounds.

Course Code : ECH 05 : Course Title : Inorganic Chemistry – III

Block I : P-Block Elements-II

Unit-1 : Elements of Group 16
Unit-2 : Elements of Group 17
Unit-3 : Elements of Group 18

Block-II : d-and f-Block Elements

Unit-4 : Transition Elements
Unit-5 : Inner – Transition Elements
Unit-6 : Coordination Compounds
Unit-7 : Isolation and Purification of Metals

Course Code : ECH 06 : Course Title : Physical Chemistry-I

Block-I : States of Matter

Unit-1 : The Gaseous State : Empirical Properties of Gases
Unit-2 : The Kinetic theory of Gases
Unit-3 : Real Gases and their Liquefaction
Unit-4 : Liquid state of Matter
Unit-5 : Solid state of Matter

Block - I : Chemical Thermodynamics

Unit-6 : The First Law of Thermodynamics
Unit-7 : Thermochemistry
Unit-8 : The Second Law of Thermodynamics

Unit-9 : Free Energy Functions
Unit-10 : Entropy and Probability : Statistical Concept

Course Code : ECH 07 : Course Title : Physical Chemistry–II

Block - I : Solutions and Phase Rule

Unit-1 : Solution–I
Unit-2 : Solution–II
Unit-3 : Colligative Properties of Dilute Solutions
Unit-4 : Phase Equilibria - I
Unit-5 : Phase Equilibria - II

Block-II : Reaction Equilibrium

Unit-6 : Chemical Equlibria
Unit-7 : The Response of Equilibria to Different Conditions
Unit-8 : Ionic Equilibria
Unit-9 : Buffers and Neutralization
Unit-10 : Redox-Indicators ; Adsorption Indicator

Course Code : ECH 08 : Course Title : Practical Chemistry-II

Block - I : Inorganic Chemistry–Quantitative Analysis

Unit-1 : Acidimetry and Alkalimetry
Unit-2 : Quantitative Analysis of Water
Unit-3 : Gravimetric and Volumetric Analysis of Metals

Block-II : Physical and Organic Chemistry–Quantitative Analysis (4, 5, 6)

Unit-4 : Polarimeter, Colourimeter / PH Meter–Applications
Unit-5 : Surface Tension, Viscosity and Partition Co-efficient
Unit-6 : Estimation of Organic Compounds

Course Code : ECH 09 : Course Title : Physical Chemistry–III

Block I : Electrochemistry

Unit-1 : Electrolytic Conductance of Solutions
Unit-2 : Applications of Conductance Measurements
Unit-3 : Electrochemical Cells
Unit-4 : Applications of E.M.F. Measurements
Unit-5 : Polarisation : Overvoltage

Block II : Dynamics of Chemical Reactions and Macromolecules

Unit-6 : Chemical Kinetics–I : Empirical Laws and Mechanism

Unit-7 : Chemical Kinetics – II : Theoretical Aspects
Unit-8 : Photochemistry
Unit-9 : Colloids and Macromolecules
Unit-10 : Adsorption and Catalysis

Course Code : ECH 10 : Course Title : Organic Chemistry–I

Block-I : Fundamental concepts : Aliphatic Alicyclic and Aromatic Hydrocarbon (I)

Unit-1 : Fundamental concepts – Nature of Chemical Bonds in Organic Chemistry
Unit-2 : Atomic Orbitals, Molecular Orbitals and Hybridisation
Unit-3 : Saturated Hydrocarbons – Alkanes and Cycloalkanes
Unit-4 : Unsaturated Hydrocarbons (I) – Alkenes
Unit-5 : Unsaturated Hydrocarbons (II) – Alkynes
Unit-6 : Aromatic Hydrocarbons (I) – Benzene and Homologues

Block - II : Aromatic Hydrocarbons (II), Stereoisomerism, Nature of Organic Reactions

Unit-7 : Aromatic Hydrocarbons (II)–Polynuclear Hydrocarbon (1) : Biphenyl
Unit-8 : Polynuclear Hydrocarbon (2) : Anthracene.
Unit-9 : Stereoisomerism in Acyclic Compounds
Unit-10 : Stereoisomerism in Cyclic Compounds
Unit-11 : Nature of Organic Reactions (I) : Substitution Reactions
Unit-12 : Nature of Organic Reactions (II) : Additional Reactions and Elimination Reactions

Course Code : ECH 11 : Course Title : Organic Chemistry–II

Block - I : Substituted Aliphatic and Aromatic Compounds

Unit-1 : Halogen Compounds : Alcohols ; Phenols ; Ethers and Sulphides
Unit-2 : Carbonyl Compunds
Unit-3 : Organic Monocarbolyxic Acids ; Sulphonic Acids and Substituted Acids.
Unit-4 : Nitro & Amino Compounds
Unit-5 : Diazonium Compounds

Block-II : Dicarboxylic Acids ; Tautomerism ; Organic Compounds with Active Methylene Group ; Organic Compounds of Metals ; Heterocyclic Compounds

Unit-6 : Dicarboxylic Acids
Unit-7 : Tautomerism
Unit-8 : Cyanoacetic Ester : Malonic Ester : Acetoacetic Ester and Acetyl Acetone
Unit-9 : Organic Compounds of Metals

Unit-10 : Heterocyclic compounds – Furan ; Thiophene ; Pyrrole ; Pyridine ; Indole and Quinolene

Course Code : ECH 12 : Course Title : Practical Chemistry–III

Block - I : Biochemistry

Unit-1 : Structure of a Cell and its Functions.
Unit-2 : Amino Acid and Protein
Unit-3 : Enzyme, Coenzyme, Vitamins and Minerals
Unit-4 : Carbohydrate, Lipid and Nucleic Acid.

Block - II

Unit-5 : Study of Reaction–Kinetic 1. Hydrolysis of Ester, 2. Inversion of Cane Sugar
Unit-6 : Estimation of Available Chlorine in Bleaching Powder
Unit-7 : Estimation of Iron in Cement

Course Code : ECH 13 : Course Title : Organic Chemistry-III

Block-I : Reactive Intermediates ; Molecular Rearrangements, Pericyclic Reactions

Unit-1 : Reactive Intermediates in Organic Reactions–Carbenes, Nitrenes
Unit-2 : Benzynes
Unit-3 : Molecular Rearrangements–I
Unit-4 : Molecular Rearrangements–II
Unit-5 : Pericyclic Reactions.

Block-II : Macromolecules ; Spectroscopy–Practical applications in Organic compounds ; Colour Constitution of Organic Compounds

Unit-6 : Carbohydrates
Unit-7 : Amino Acids and Proteins
Unit-8 : Spectroscopy–UV : IR and NMR–Applications in Organic Compounds
Unit-9 : Practical applications of Organic Compounds
Unit-10 : Dyes, Colour and Constitution of Organic Compounds

Course Code : ECH 14 : Course Title : Biochemistry

Block-I : Biomolecules – I and Biomolecules–II

Unit-1 : Cell Structure and Function
Unit-2 : Carbohydrates and Lipids
Unit-3 : Nucleic Acids and Proteins
Unit-4 : Enzymes, Co-enzymes, Vitamines and Minerals

Block-II : Biogenetics and Metabolism

Unit-5 : Bioenergetics : Definition and Source
Unit-6 : Metabolism – Carbohydrate Catabolism
Unit-7 : Metabolism – Amino Acid Catabolism
Unit-8 : Catabolism of Lipids
Unit-9 : Citric Acid Cycle
Unit-10 : Special Oxidation Unit.

Reference Books :

A. Physical Chemistry

1. Physical Chemistry–G. W. Casteltan, Narosa Pub.
2. Physical Chemistry – P. W. Atkins
3. Physical Chemistry – I. N. Levine, Mc Graw Hill
4. Text Book of Physical Chemistry–S. Glasstone
5. Physical Chemistry–Maron & Pruton/Maron & Lando
6. Principles of Physical Chemistry – B. R. Puri & L. R. Sharma
7. Text Book of Physical Chemistry (Vol. 1–4) – K. L. Kapoor
8. Physical Chemistry – W. J. Moore
9. Physical Chemistry – P.C. Rakshit
10. Concise Thermodynamics – R. P. Rastogi
11. Thermodynamics – P. C. Rakshit
12. Chemical Kinetics – K. J. Laidler
13. çìøùèçç+U ‘ëìäÖøã¬t¬?ô ø»Þó’_ÌíÐìô vÙì»
14. University General Chemistry – C. N. R. Rao
15. Elements of Physical Chemistry–Glasstone & Lewis

B. Inorganic Chemistry

16. University Chemistry – R. H. Mahan
17. Inorganic Chemistry–D. F. Shriver, R. W. Atkins and C. H. Langford
18. New Concise Inorganic Chemistry – J. D. Lee
19. Theoretical Inorganic Chemistry–M. C. Day, Jr. & J. Selbin
20. General & Inorganic Chemistry–P. K. Dutt
21. Inorganic Chemistry–R. L. Dutta
22. Inorganic Chemistry–A. G. Sharpe
23. General and Inorganic Chemistry (Vols 1, 2)—R. P. Sarkar
24. Fundamental Concepts of Inorganic Chemistry–Gilreath
25. Advanced Inorganic Chemistry–F. A. Cotton and G. Wilkinson
26. Chemistry of the Elemento : N. N. Green wood & Earnshaw

27. Advanced Inorganic Chemistry–S. Satya Prakash, G. D. Tuli, S. K. Basu and N. D. Madan

C. Organic Chemistry

28. Organic Chemistry (Vol. 1 and 2) – I. L. Finar
29. Organic Chemistry–R. T. Morrison and R. N. Boyd
30. Advanced Organic Chemistry–J. March
31. Organic Chemistry – Soloman
32. Advanced Organic Chemistry–B. S. Bhal & A. Bhal
33. Basic Stereo Chemistry of Organic Molecules – S. Sengupta
34. Stereo Chemistry of Carbon Compounds – D. Nasipuri
35. Biochemistry – A. Lehninger
36. Biochemistry–Debojyoti Das

D. Practical (Course 4, 8 & 12)

1. Vogel's Text Book of Quantitative Inorganic Analysis Including Elementary Instrumental Analysis (4th Edn.). ELBS & Longman 11978. J. Bassetl, R. C. Denney, G. H. Jeffery & J. Mendham.
2. Quantitative Chemical Analysis – I. M. Kolthoff, E. B. Sandell, E. J. Meehan and S. Bruckensfein (4th Edn.), Macmillan, London, 1969
3. Practical Physical Chemistry – A. M. James & F. E. Prichard
4. Findlays Practical Physical Chemistry– B. P. Levitt
5. Experimental Organic Chemistry, Principles & Practice—Hardwoods Moody Backwele Scientific Publisher
6. Selected Experiments in Physical Chemistry. N. G. Mukherjee
7. B. Sc. Practical General : S. Datta
8. University Hand Book of Undergraduate Chemistry Experiments on Quantitative Chemical Analyses : Organic Reactions : Chromatographic Seperations and Physicochemical Experiments for Three Year B. Sc. General & Honours Courses—Edited by Prof. G. N. Mukherjee

Examination system (Subject to Change)

1st Semester - FBG, FEG, E-1 & E - 4*
2nd Semester - FHS, E - 2, E - 3 & E - 5
3rd Semester - FST, E - 6 & E - 8*
4th Semester - E - 7, E - 9, E - 10 & S - 1
5th Semester - E - 11, E - 12* & S - 2
6th Semester - E - (13 & 14), S - 3, AOC & ENVS

*** Practical Courses**