



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

NETAJI SUBHAS OPEN UNIVERSITY

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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 Equilibria

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 Compounds

Unit-3 : Organic Monocarboxylic 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. Castellan, 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»'ó' _líðìô 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 Elements : N. N. Greenwood & 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. Bassett, 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. F. 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 Separations 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**