B.Sc. (CHEMISTRY)
UGCHE- 01
Atoms and Molecules

Block -01

Structure of Matter-I

Unit-01- Old Quantum Theory- Discovery of sub Atomic Particles, Earlier, Earlier Atom Models, Light as Electromagnetic Wave, Failures of Classical Physics, Plank Quantum Theory, Block Body Radiation, Heat Capacity Variation Einstein's Theory of Photoelectric Elect, Bohr Atom Model, Radius of Bohr's Theory, Critical Analysis of Bohr's Theory Refinements in the Atomic Spectra Spectra Theory.

Unit-02- Wave Mechanics- Nature of Radiation and Matter, Heisenberg Uncertainty Principle the Schrodinger Equation and its Application Hydrogen and Hydrogen- like Atom, Electron Configuration of Multi Electron Atoms.

Unit-03- Electronic Theory of Valence- Basic Theory- Electrovalent or lonic Bond, Covalent Bond- Bond Polarity, VSEPR Theory

Unit-04- Valence Bond Theory- Origin of Valence, Bond and Molecular Orbital Theories, principles of Valence Bond Theory, Valence Bond theory of Hydrogen Molecules, Resonance or Electron Delocalization, Valence Bond Description of Some more Molecules, Hybridization of Orbital, Valence Bond Description of Benzene.

Unit-05- Molecular Orbital Theory- LACO Theory, Homonuclear. Diatomic Molecules, Heteronuclear Diatomic Molecules, Comparison of Valence Bond and Molecular Orbital Theories.

Block-II

Structure of Matter-II

Unit-06- Molecular Properties- Polar and Non Polar Molecular, Dielictric

Constant, Dipole Moment, Magnetic Properties of matter

Unit-07- Molecular Spectroscopy-I

Unit-08- Molecular Spectroscopy-II

Unit-09- Nuclear Chemistry

UGCHE -03 (Inorganic Chemistry-I)

Block-I	**Periodicity and S-Block Elements**
Unit-01	Periodic Table
Unit-02	Periodicity
Unit-03	Hydrogen
Unit-04	Alkali Metals
Unit-05	Alkali Earth Metals
	Block-II- P Block Elements –I
Unit-06	Elements of Group- 13
Unit-07	Elements of Group- 14
Unit-08	Elements of Group- 15
	Inorganic Chemistry-II
Block-III	**P Block Elements –II**
Unit-09	Elements of Group- 16
Unit-10	Elements of Group- 17
Unit-11	Elements of Group- 18
Block-III	**d and f Block Elements**
Unit-12	Transition Elements
Unit-13	Inner Transition Elements
Unit-14	Coordination Group
Unit -15	Isolation and participation of Metals

UGCHE -04 (Physical Chemistry-I)

Block-I	**Chemical Equilbria and Electro Chemistry**
Unit-1	Chemical Equilibria
Unit-2	Ionic Equilibria
Unit-3	Electrolytic Conductance of Solutions
Unit-4	Electro Chemical Cells
Block-II	**Dynamics and Macro Molecules**
Unit-5	Chemical Kinetics
Unit-6	Photo Chemistry
Unit-7	Colloids and Macro Molecules
Unit-8	Surface Chemistry and Catalysis
	Physical Chemistry-II
Block-IV	**Chemical Equilibria and Electro Chemistry**
Unit-9	Chemical Equilibria
Unit-10	Ionic Equilibria
Unit-11	Electrolytic Conductance of Solutions
Unit-12	Electro Chemical Cells
Block-V	**Dynamics and Macro Molecules**
Unit-13	Chemical Kinetics
Unit-14	Photo Chemistry
Unit-15	Colloids and Macro Molecules
Unit-16	Surface Chemistry and Catalysis

UGCHE -05

Organic Chemistry-I

Block-I Fundamental Concept

Unit-1 Bonding, Functional Group Classification and Nomenclature

Unit-2 Stereochemistry-I- Isomerism, Geometrical & Optical Isomerism

Unit-3 Stereochemistry-II Configuration and Fischer Projection Formulas, Asymmetric Synthesis, Walden Inversion, Conformational Isomers, Ethane, Butane, and Cyclic Systems

Unit-4 Effect of Molecular Architecture on Physical Properties- General Ideas about the Spectroscopy, Ultraviolet Spectroscopy, Nuclear Magnetic Resonance Spectroscopy Mass Spectrometry

Unit-5 Structure Reactivity Relationships

Block-II Basic Skeleton: Hydrocarbons and Heterocyclics

Unit-6 Alkanes

Unit-7 Alkenes

Unit-8 Alkynes

Unit-9 Aromatic Hydrocarbons and Polynuclar Aromatics

Unit-10 Heterocyclic Compounds

Organic Chemistry-II

Block-III Derivatives of Hydrocarbons-I

Unit-11 Halogen Derivatives

Unit-12 Alcohols and Phenols

Unit-13 Ethers and Sulphur Analogues of Alcohols and Ethers

Unit-14 Aldehydes and Ketones

Block-IV Derivatives of Hydrocarbons-II

Unit-15 Monocarboxylic and Sulphonic Acids

Unit-16 Substituted Carboxylic Acids

Unit-17 Functional Derivatives of Monocarboxylic Acids

Unit-18 Nitro Compounds

Unit-19 Amino Compounds and Diazonium Salts

Unit-20 Natural Products

UGCHE -09

Biochemistry

Block-I

Unit-01 Biomolecules-I
Unit-02 Cell Structure and Function
Unit-03 Carbohydrates
Unit-04 Lipids
Unit-05 Nucleic Acids

Block-II

Unit- 01 Biomolecules-II
Unit-02 Proteins
Unit-03 Enzymes
Unit-04 Vitamins Coenzymes and Minerals

Block-III

Unit-01 Bioenergetics and Metabolism
Unit-02 Bioenergetics
Unit-03 Metabolism Regulation
Unit-04 Photosynthesis

Block-IV

Unit-01 Gene Expression
Unit-02 Replication and Transcription
Unit-03 Protein Biosynthesis
Unit-04 Biotechnology
Unit-05 Immunology

UGCHE -10

Spectroscopy

Block-I **Basic Concept and Rotational Spectra**
Unit-01 Spectra of Atoms
Unit-02 Symmetry of Molecules
Unit-03 Rotational Spectra
Block-II **IR and Raman Spectra**
Unit-04 Vibratinal Spectra of Diatomic Molecules
Unit-05 Infrared Spectra of Polyatomic Molecules
Unit-06 Raman Spectroscopy
Block-III **Electronic Spectra and Instrumentation**
Unit-07 Electronic Spectra-I born- Oppenheimer Appoximation, Electronic States of Diatomic Molecules, Franck- Condor, Principal, Electronic Spectra, Polyatomic Molecules, Carbonyl Chromophore
Unit-08 Electronic Spectra-II Models for Metal, ligand and Interactions, Crystal field theory, Deexcitation Processes in electronic Spectroscopy
Unit-09 Optical Spectroscopy: Instrumentation and Sampling
Block-IV **Resonance Spectroscopy and Mass Spectrometry**
Unit-10 Nuclear Magnetic Resonance Spectroscopy
U nit-11 Electron Spin Resonance Spectroscopy
Unit-12 Mass Spectrometry
Unit-13 Exercises in Problem Solving using IR, UV, NMR and Mass Spectral Techniques

UGCHE-11
Mathematical Methods

Block-I	**Algebra and Geometry**
Unit-01	Sets and Functions
Unit-02	Graphs and Functions
Unit-03	Elementary Algebra
Unit-04	Coordinate Geometry
Unit-05	Vectors
Block-II	**Calculus**
Unit-06	Differential Calculus
Unit-07	Applications of Differential Calculus
Unit-08	The Integral
Unit-09	Integration of Elementary Functions
Unit-10	Differential Equations
Block-III	**Probability Distributions**
Unit-11	Statistics
Unit-12	Probability
Unit-13	Discrete Probability Distributions
Unit-14	Continuous Probability Distributions
Block-IV	**Statistical Inference**
Unit-15	Sampling (Statistical data Sampling)
Unit-16	Hypothesis Tests
Unit-17	Correlation and Regression

UGCHE-12
Organic Reaction Mechanism

Block -1

Unit 1: Reaction Mechanism: Introduction
Unit 2: Kinetics and Reaction Mechanism of Reaction
Unit 3: Aliphatic Nucleophilic Substitution
Unit 4: Aromatic Electrophilic Substitution

Block-2

Unit 5: Addition to Carbon- Carbon Multiple Bond System
Unit 6: Nucleophic Addition to Carbonyl Compounds
Unit 7: Elimination Reaction
Unit 8: Oxidation and Reduction

Block-3

Unit 9: Cabenes, Nitrenes and Benzynes
Unit 10: Free Radicals
Unit 11: Molecular Rearrangement
Unit 12 : Pericyclic Reaction

Block -4

Unit 13: Organic photochemistry
Unit 14: Strategies of Organic Synthesis
Unit 15: Case study of Some Chemicals of Daily Use-I
Unit 16: Case study of Some Chemicals of Daily Use-II

UGCHE-13/ UGSTAT-01

Statistical Methods

BLOCK – I . Data Collection and Its Representation

Unit-I- Data Collection and Tabulation :

Meanings, Definitions and Applications of Statistics, Measurements and Scale, Measurements of qualitative data, Methods of data collection, Types of data.

Unit-II- Representation of Data- I (Diagrammatical representation):

Frequency distribution, Tabulation of data, Diagrammatical Representation of data, Bar diagram, Multiple bar diagram, Divided bar diagram, Percentage bar diagram, Pie chart, Pictogram, leaf chart,

Unit-II- Representation of Data- I (Graphical representation):

Graphical representation of frequency distribution, Histogram, Frequency polygon, Frequency curve, Ogive.

BLOCK – II . Measures of Central Tendency and Dispersion

Unit-I- Measures of Central Tendency :

Types of measures of central tendency, Arithmetic mean, Fundamental Theorems on

Arithmetic mean, Geometric mean, Harmonic mean, Median, Mode, Percentiles, Deciles, and Quartiles.

Unit-II- Measures of Dispersion :

Types of measures of Dispersion, Range, Mean Deviation, Variance and Standard deviation, Effect of change of origin and scale, Relationship between measures of central tendency and measures of dispersion, Coefficient of variation.

BLOCK – III . Moments, Skewness and Kurtosis

Unit-I- Moments, Raw Moments and Central Moments :

Definition of moments, raw moments for ungrouped data, raw moments for grouped data, Central moments, Factorial moments, Interrelationship between various moments, effect of change of origin and scale on moments, Charlier's checks, Sheppard"s correction for moments.

Unit-II- Skewness and Kurtosis :

Definition of skewness, Measures of skewness, Pearson's coefficient, Bowley's coefficients, Kurtosis, Measures of Kurtosis, effect of change of origin and scale.

UGCHE-14 / UGBCH -03
(BIO ANALYTICAL TECHNIQUES)

Block-I
Chromatography

Unit-01 Principals of partition chromatography; exchange, gel filtration chromatography, chromatography (HPCL) oaper, thin layer. Ion High pressure liquid.

Block II
Spectroscopy

Unit-01 Concepts of Spectroscopy , Beer-Lambert's law, Visible and UV Spectroscopy, Applications of colorimetry.

Block-III
Electrophoresis

Unit-01 Principles of Electrophoresis, Separation of proteins by PAGE and SDS-PAGE, Agarose gel Electrophoresis of separation of nucleic acids.

Block-IV
Centrifugation

Unit-01 Principles of Centrifugation, Differential Centrifugation, Applications of Centrifugation and Density Gradient.

UGCHE-15 / UGBCH -04
(NUTRITIONAL BIOCHEMISTRY)

Block-I
Elements of Nutrition

Unit-01 Dietary requirements of carbohydrates, lipids and proteins. Essential amino acids, essential fatty acids and their physiological functions. Malnutrition.

Block-II
Basal Metabolic Rate (BMR)

Unit-01 Concept of BMR, Factors affecting BMR, Measurement of fuel value of foods.

Block-III
Minerals

Unit-01 Nutrition importance of dietary calcium, phosphorus, magnesium, iron, iodine, zinc and copper.

Block-IV
Vitamins

Unit-01 Biochemical functions, requirements and deficiency diseases associated with vitamin B Complex, C and A,D,E, and K Vitamins.

UGCHE (L)-6

/[UGCHE(L)-1 and / UGCHE(L)-2]

Chemistry Lab-I/ UGCHE(L)-1

Block-I	**Quantitative Analysis-I**
Unit-1	Laboratory Lechniques and Procedures
Unit-02	Acid Base Titrations-I
Unit-03	Acid Base Titrations-II
Block-II	**Quantitative Analysis-II**
Unit-01	Estimation of Iron
Unit-02	Estimation of Copper
Unit-03	Analysis of Water

Chemistry Lab-II/ UGCHE(L)-2

Block-I	**Inorganic Preparations and Gravimetry**
Unit-01	Apparatus and Experimental Gravimetry
Unit-02	Inorganic Preparations
Unit-03	Gravimetric Analysis
Block-II	**Qualitative Inorganic**
Unit-01	Detection of the Anions
Unit-02	Detection of the Cations-I
Unit-03	Detection of the Cations-II

UGCHE(L)-3

Block-1	**Preparation Organic Chemistry**
Unit-01	Techniques and Apparatus
Unit-02	Organic Preparations
Block-2	Qualitative Organic Analysis
Unit-03	Preliminary Qualitative Analysis
Unit-04	Qualitative Classification Test and Preparation of Derivatives-I
Unit-05	Qualitative Classification Test and Preparation of Derivatives-II

UGCHE(L)-4

Block-1	**Laboratory Skills and Techniques**
Unit-01	Basic Laboratory Skills
Unit-02	Handling of Data
Unit-03	Low-Cast Instruments
Block-2	**Properties of Liquids and Thermo-chemistry**
Unit-04	Surface Tension
Unit-05	Viscosity of Liquids
Unit-06	Thermo-chemistry
Unit-07	Determination of Enthalpy of Neutralization and Ionisation
Block-3	**Applications of Thermodynamics**
Unit-08	Depression of Freezing Point
Unit-09	Applications of Emf Measurements
Unit-10	Adsorption
Unit-11	Phase Equilibria-I
Unit-12	Phase Equilibtia-II
Block-4	**Chemical Kinetics**
Unit-13	Basic Concepts
Unit-14	Initial Rate Method
Unit-15	Integrated Rate Equation Method

UGCHE(L)-5

List of Experiments

1. Separation of a Mixture of Benzole Acid,-Naphtol and 1,4-Dimethoxyvezene by Solvent Extraction and Identification of their functional groups.
2. Separation of a Mixture of p-Toluidine and Naphthalene by Solvent Extraction and Identification of their functional groups.
3. Extraction of Caffeine from Tea- Leaves
4. Paper Chromatographic Separation and Identification of Metal Ions.
5. Paper Chromatographic Separation and Identification of Sugar.
6. Thin Layer Chromatographic Separation and Identification of Amino Acids.
7. Column Chromatographic Separation of Pigments from Green Leaves.
8. Column Chromatographic Separation and Estimation of Inorganic Substances.
9. Estimation of Amino Groups
10. Estimation of Phenols
11. Estimation of Sugars
12. Estimation of Amino Acids
13. Estimation of formaldehyde
14. Analysis of Oils and Fats
15. Estimation of Magnesium and Calcium in Mixture by Complexometry
16. Estimation of Copper and Zinc in a Mixture by Gravimetry
17. Estimation of Copper and Nickel in a Mixture by Gravimetry
18. Preparation of Aspirin and Analysis of a Commercial Sample of Aspirin
19. Preparation and Use of Methyl Orange – an Azo Dye
20. Preparation of Nylon 66-a Condensation Polymer
21. Preparation of Face Cream.