

COURSE STRUCTURE

FOR

T. Y. B. Sc. (SEMESTER – VI) CHEMISTRY

SEMESTER – VI			
Principal Subject	Course Code	Paper Title	Credits
CHEMISTRY	US06CCHE01	ORGANIC CHEMISTRY	3
	US06CCHE02	ORGANIC CHEMISTRY	3
	US06CCHE03	INORGANIC CHEMISTRY	3
	US06CCHE04	INORGANIC CHEMISTRY	3
	US06CCHE05	PHYSICAL CHEMISTRY	3
	US06CCHE06	PHYSICAL CHEMISTRY	3
	US06CCHE07	PHYSICAL CHEMISTRY PRACTICAL	3
	US06CCHE08	ORGANIC CHEMISTRY PRACTICAL	3
	US06CCHE09	INORGANIC CHEMISTRY PRACTICAL	3

SARDAR PATEL UNIVERSITY

SYLLABUS OF CHEMISTRY

B. Sc. [Semester-VI]

US06CCHE01 (ORGANIC CHEMISTRY)

[03 Credits] [Total Unit IV]

Total Marks: 100 [Internal 30 + External 70]

Total 45 lecturers

[11 Hrs.]

UNIT: I

[A] CARBOHYDRATES-I

Introduction of monosaccharides, Definition and Classification, (+)-Glucose: an aldohexose,

(-)-Fructose: 2-ketohexose, Stereo isomers of (+)-glucose,

Oxidation Effect of alkali, Osazone formation Epimers, Kiliani-Fischer synthesis, Ruff degradation, Conversion of an aldose into its epimers, S The Fischer proof, Configuration of aldose, Optical families D and L-Tartaric acid, Families of aldose, Absolute configuration, Cyclic structure of D-(+)-glucose, Configuration about C-1, Methylation, Determination of ring size, Conformation.

[B] CARBOHYDRATE-II DISACCHARIDES AND POLYSACCHARIDES

Disaccharides, (+)-Maltose, (+)-Cellobiose, (+)-Lactose, (+)-Sucrose,

Cyclodextrine, Structure of cellulose, Reaction of cellulose,

Reference Book:

1. Organic Chemistry by Morrison and Boyd, 6th ed.

UNIT: II POLYNUCLEAR AROMATIC COMPOUNDS

[11 Hrs.]

Fused ring aromatic compounds, Nomenclature of naphthalene derivatives, Structure of naphthalene, Reactions of naphthalene, Oxidation of naphthalene, Reduction of naphthalene, Dehydrogenation of hydroaromatic compounds. Aromatization, Nitration and halogenation of naphthalene, Orientation of electrophilic substitution in naphthalene, Friedal-Craft acylation of naphthalene, Sulphonation of naphthalene, Naphthols, Orientation of electrophilic substitution in naphthalene derivatives, Synthesis of naphthalene derivatives by ring closure (Haworth method). Structure of Naphthalene, Nomenclature of anthracene and phenanthrene derivatives, Structure of anthracene and phenanthrene, Reactions of anthracene and phenanthrene, Preparation of anthracene derivative by ring closure. Anthraquinone, Preparation of phenanthrene derivative by ring closure, Carcinogenic hydrocarbon. Arene oxides,

UNIT: III ORBITAL SYMMETRY AND PERICYCLIC REACTIONS [11 Hrs.]

Introduction to pericyclic reaction, Characteristics of pericyclic reaction, Molecular orbitals, LCAO method, Bonding and anti-bonding orbitals, Electronic configuration of some molecules, Aromatic character. The Huckel (4n+2) rule, Orbital symmetry and the chemical reaction, Electrocyclic reaction, Cycloaddition reaction, Sigmatropic reaction, Cope rearrangement.

UNIT: IV DYES AND PIGMENT [12 Hrs.]

Introduction, Textile fiber or type of fiber, Dyeing, Fastness properties, Bathochromic and hypsochromic effect, Colour and constitutions, Relation between colour and constitutions including (Witt's theory only), Modern theories of colour and constitution, Pigments, Fluorescent Brightening agents,

Non-textile use of Dyestuff, Detail consideration about food colorants and medicinal Dyes.

Synthesis and applications of following dyes from cheapest raw materials.

Direct Yellow 12, Auramine O, New Magenta, Disperse Orange 13, Disperse Blue 1, Mercurochrome, Safranine T, Astrazon Pink FG, Caledon Jade Green,

Tartrazine, Procion Brilliant M5B, Hansa Yellow, Ciba Blue 2B, Crystal Violet, C.I. Disperse Blue

Reference Books:

1. Reaction mechanism in Organic Chemistry by S. M. Mukherji.
2. Other topics from Organic reaction mechanism by R.K. Bansal, 3rd ed.

Books Recommended for Further Reading:

1. Hand book of synthetic Dyes and Pigments, Vol.I and II, Synthetic Dyes, By K. M. Shah).
2. A text book of organic chemistry by Arun Bahl and B. S. Bahl (16th ed.).
3. Reaction mechanism in organic chemistry by S.M.Mukherji and S.P.Singh
4. Organic chemistry by S.M.Mukherji, S.P.Singh and R.P.Kapoor., vol. II.

B. Sc. [Semester-VI]

US06CCHE02 (ORGANIC CHEMISTRY)

[03 Credits] [Total Unit IV]

Total Marks: 100 [Internal 30 + External 70]

**Total 45 lecturers
[11 Hrs.]**

UNIT: I AMINO ACIDS AND PROTEINS

Proteins, Structure of amino acids, Amino acids as dipolar ions, Isoelectric point of amino acids, Configuration of natural amino acids, Preparation of amino acids, Peptides. Geometry of the peptide linkage, Determination of structure of peptide. Terminal residue analysis. Partial hydrolysis. Synthesis of peptides, Proteins. Classification and function. Denaturation, Structure of proteins, Peptide chain, Side chain. Isoelectric point. Electrophoresis, Conjugated proteins. Prosthetic group. Enzyme (definition), Coenzymes, Secondary structure of protein, Mechanism of enzyme action. Chymotrypsin, Nucleoproteins and nucleic acids.

Reference Book: Organic chemistry, 6th Ed., By Morrison and Boyd.

UNIT: II PURINES AND NUCLEIC ACIDS

[11 Hrs.]

Introduction, Uric acid, Purine derivatives, Xanthine bases, Nucleic acids, Structure of nucleosides, structure of nucleotides, Ribonucleic acids, Deoxyribonucleic acids, Chemical and enzyme synthesis of the polynucleotides.

Reference Books: Org. Chem., Vol II, by I.L. Finar. Organic chemistry by A. Bahal & B. S. Bahal, 16th Ed.

UNIT: III ALKALOIDS

[11 Hrs.]

Introduction, function, classification, isolation and properties of alkaloids. General methods employed for determining the structure of alkaloids. Introduction, isolation, physiological action, properties, extraction, constitution and synthesis of Adrenaline, Nicotine, Papaverine.

Introduction, isolation and constitution of Quinine.

Reference Book: Organic chemistry of natural products by Gurdeep R. Chatwal, Vol. I.

UNIT: IV ORGANIC PHOTOCHEMISTRY

[12 Hrs.]

Principles of photochemistry. Photochemical energy. Electronic excitation, excited states, modes of dissipation of energy (Jablonski diagram). Energy transfer and photosensitization. Photochemistry of carbonyl compounds. Photoreduction. Norrish type -I and -II reactions. Photochemical reactions of cyclic ketones. Paterno-Buchi reaction. Photochemistry of α , β -unsaturated ketones. Photochemistry of olefins. Cis-trans isomerification. Dimerization reactions. Photo-Fries rearrangement. Barton reaction.

Reference Books:

1. Organic Reaction Mechanism by S.M. Mukerji.
2. Organic Reaction Mechanism by R.K. Bansal.
3. Organic Chemistry by R.O.C. Norman.

SARDAR PATEL UNIVERSITY

SYLLABUS OF CHEMISTRY

B. Sc. [Semester-VI]

US06CCHE03 (INORGANIC CHEMISTRY)

[03 Credits] [Total Unit IV]

Total Marks: 100 [Internal 30 + External 70]

Total 45 lecturers

[11 Hrs.]

UNIT: I ORGANO METALLIC CHEMISTRY

Introduction, General methods of preparations, General properties, Organo metallic compounds of alkali metals, Organo metallic compounds of beryllium, magnesium and aluminum, metal olefin complexes, Cyclopentadienyl complexes: metallocenes, Some properties of ferrocene, Structure and bonding in ferrocene molecule, Ionic cyclopentadienyl compounds.

Reference Book:

1. Advanced Inorganic Chemistry Volume II- 18th By Satya Prakash, G.D.Tuli, S.K.Basu, R.D.Madan

UNIT: II BIOINORGANIC CHEMISTRY

[11 Hrs.]

Introduction, The role of model systems, The alkali and alkaline earth metals, Metalloporphyrins, Iron-sulfur proteins, Hemerythrin, Oxygen supply and transport, The bioinorganic chemistry of cobalt: Vitamin B₁₂, Metalloenzymes, Nitrogen fixation.

Reference Book:

1. Basic Inorganic Chemistry- 3rd Edition By F.Albert Cotton, Geoffery Wilkinson & Paul L. Gaus

UNIT: III CATALYSIS

[11 Hrs.]

General Principles, the language of catalysis, homogeneous and heterogeneous catalysis, Homogeneous catalysis: hydrogenation of alkenes, hydroformylation, methanol carbonylation, Wacker oxidation of alkenes, alkene metathesis, Palladium catalysed C-C bond forming reactions, asymmetric oxidations.

Heterogeneous catalysis: the nature of heterogeneous catalysis, hydrogenation of alkenes, ammonia synthesis, sulfur dioxide oxidation, interconversion of aromatics by zeolites, Fisher and Tropsch synthesis, alkene polymerization, electrocatalysis.

Reference Book:

1. Inorganic Chemistry, 4th Edition By Shriver & Atkins

UNIT: IV PRINCIPLES OF METALLURGY AND CHEMISTRY OF Pb, Fe, Ni, Cu & Ag

[12 Hrs.]

Metals, Occurrence of metals, Mineral wealth of India, Metallurgy, Concentration of ore, Calcination and roasting, Standard electrode potentials and metallurgy, thermodynamics of metallurgy, Reducing behavior of carbon, Reduction of mineral to metal, Refining of metals, Physical methods of refining, Chemical methods of refining, Types of furnaces used.

Pb: Occurrence & extraction, Properties & uses of lead, White lead.

Fe: Occurrence and commercial forms of iron, Manufacture of cast iron, wrought iron, steel.

Ni: Occurrence & extraction, Properties and uses of nickel.

Cu: Occurrence & extraction, Electrolytic refining of copper, Properties and uses of copper.

Ag: Occurrence & extraction, Properties and uses of silver, Preparation, properties and uses of silver nitrate, Silvering of mirrors.

Reference Book:

1. Textbook of Inorganic Chemistry- 20th Edition By P.L.Soni & Mohan Katyal

SARDAR PATEL UNIVERSITY

SYLLABUS OF CHEMISTRY

B. Sc. [Semester-VI]

US06CCHE04 (INORGANIC CHEMISTRY)

[03 Credits] [Total Unit IV]

Total Marks: 100 [Internal 30 + External 70]

Total 45 lecturers

[11 Hrs.]

UNIT: I PASSIVITY & CORROSION

Introduction to passivity, Alternative definition of passivity, Theories of passivity, Is passivity universal phenomenon?, Applications of passivity, Electrochemical passivity, Mechanical passivity, Introduction to corrosion, Economic aspects of corrosion, Types of corrosion, Corrosion by gaseous environment, Immersed corrosion, Prevention from corrosion.

Reference Book:

1. Advanced Inorganic Chemistry Vol-1, 23rd By Gurdeep Raj

UNIT: II ALLOY AND INTER-METALLIC COMPOUNDS

[11 Hrs.]

Introduction, Effects of alloying, Properties of alloys, Preparation of alloys, Types of alloys: simple mixtures, solid solutions, substitutional alloys, intermetallic compounds, Super structures, electron compounds, Tamman's rule, Hume-Rothery rule, Succession of Hume-Rothery phases, Hume-Rothery's ratio rule, Rules for formation of alloys, Ferrous and non-ferrous alloys.

Reference Book:

1. Advanced Inorganic Chemistry Volume I- 18th By Gurudeep Raj

UNIT: III INTER HALOGEN COMPOUNDS

[11 Hrs.]

Inter halogen compounds, Introduction, Preparations, properties, structure, geometry and uses of Inter halogen compounds of type XY: iodine monochloride, chlorine monofluoride, iodine monobromide, Preparations, properties, structure and geometry of Inter halogen compounds of type XY₃: chlorine trifluoride, iodine trichloride, bromine trifluoride, Preparations, properties, structure and geometry of Inter halogen compounds of type XY₅: Chlorine pentafluoride, iodine pentafluoride, Preparations, properties, structure and geometry of Inter halogen compounds of type XY₇: Iodine heptafluoride, Structure of interhalogen compounds, Polyhalide ions and Polyhalides.

Reference Book:

1. Advanced Inorganic Chemistry Volume I- 18th By Satya Prakash, G.D.Tuli, S.K.Basu, R.D.Madan

UNIT: IV HEAVY CHEMICALS

[12 Hrs.]

Sodium hydroxide

Manufacture: Causticising process, electrolytic process (Nelson cell, Castner-Kellner cell, Kellner-Solvay cell), Properties and uses NaOH.

Nitric acid

Preparation of nitric acid in laboratory, Manufacture of nitric acid from nitre, from air (Birkland and Eyde process), from ammonia (Ostwald's process), Concentration of nitric acid, Properties and uses of nitric acid.

Sulphuric acid

Manufacture: Lead chamber process, principal impurities present in the chamber acid and their removal, Concentration of chamber acid, Cascade process, Gaillard tower, Contact process, Properties and uses of sulphuric acid.

Reference Book:

1. Textbook of Inorganic Chemistry- 20th by P. L. Soni & Mohan Katyal

B. Sc. [Semester-V]

US06CCHE05 (PHYSICAL CHEMISTRY)

[03 Credits] [Total Unit IV]

Total Marks: 100 [Internal 30 + External 70]

Total 45 lecturers

UNIT: I VIBRATIONAL AND ROTATIONAL SPECTROSCOPY [11 Hrs.]

Introduction, Molecular spectra, Origin of Infra red spectra, Rotational (or) Microwave spectrum, Classification of molecules, Rigid rotor model, Selection Rule, Effect of isotopic substitution on the transition frequencies, Refractive intensities of spectral line, Vibrational rotational Spectra, Harmonic oscillator model, Force constant, Normal modes of vibrations of atoms in polyatomic molecules, Vibrational Coupling, Numericals.

Reference Book: Instrumental Methods of chemical Analysis by B.K.Sharma. 26th Edition

UNIT: II PHYSICAL PROPERTIES AND CHEMICAL CONSTITUTION [11 Hrs.]

Introduction, Refractive Index, Optical Activity & Chemical constitution, Electrical properties elucidating the molecular structure, Dipole moments, Electrical polarization of molecules, Dipole moments and dielectric constant, Dielectric polarization and dielectric constant, Clausius-mosotti equation, Determination of dipolemoments, vapour-temperature method, Dilute solution method, Bond moments and molecular dipole moments, Dipole moments and structure of molecules, Numericals.

Reference Book: Text book of physical Chemistry by P.L.Soni, O.P.Dharmarha, U.N. Dash.

UNIT: III ENTROPY AND THIRD LAW OF THERMODYNAMICS [11 Hrs.]

Third law of thermodynamics, Molecular basis of Entropy, Translational Entropy, Rotational Entropy, Vibrational Entropy, Molecular basis of the third law, Trouton's Rule, Free-Energy, Standard free energy of formation, Free energy and Pressure, Free energy and the equilibrium constant, Free energy and Temperature, Free energy function, Equilibria and Distributions, Fugacity, Numericals.

Reference Book: Physical Chemistry by Gordan M. Barrow. 5th Edition.

UNIT: IV COLLOIDAL STATE [12 Hrs.]

Types of Colloidal system, Classifications of Colloids, Lyophobic and Lyophilic Sols, Size range, Preparation and Properties of colloids solution, Dialysis, Electrodialysis, Ultrafiltration, Ultramicroscope, Electrical Properties, Charge on colloidal particles, Zeta potential, Coagulation of Colloidal solution, Flocculation values, Electrophoresis, Electrosmosis, Importance and Applications of Colloids, Numericals.

Reference Book: Principles of physical chemistry by puri, sharma and pathania. 44th Edition.

B. Sc. [Semester-VI]

USO6CCHE06 (PHYSICAL CHEMISTRY)

[03 Credits] [Total Unit IV]

Total Marks: 100 [Internal 30 + External 70]

Total 45 lecturers

UNIT: I CHEMICAL KINETICS

[11 Hrs.]

Mechanism of Complex reaction, The equilibrium approximation, Steady state approximation, Collision and Encounters, Effect of temperature on reaction rate, Effect of Catalyst, The Arrhenius Equation, The theories of reaction rate, The Lindemann theory of unimolecular reaction, Kinetics of Complex reaction, Opposing or reversible reaction, Consecutive reactions, Chain reaction and Branch Chain reaction, Activated Complex Theory (ACT) of Bimolecular reaction

Reference Book: Principles of Physical Chemistry 44th Edition By Puri, Sharma, Pathania

UNIT: II ENERGY OF COLLECTION OF MOLECULES

[11 Hrs.]

Thermal Energy, Distribution over states, Boltzmann Distribution, Derivation of Boltzmann Distribution, Partition Function, One dimensional Translational media, Three dimensional Translational media, Rotational Motions, Vibrational Motions, Gas-Heat capacities, Crystal and Liquid Heat capacities, Heat capacity of metals, Numerical

Reference Book: Physical chemistry (5th edition) by G.M.Barrow

UNIT: III HIGH PERFORMANCE CHROMATOGRAPHY (HPLC)

[11 Hrs.]

Introduction, Principle and Apparatus of HPLC(Solvent delivery system, Pumps, Sample Injection System, Columns, Column Packing materials, Column packing), Choice of supporting materials for separation, Detectors, Characteristics of Detectors, Some Detectors used in HPLC, Method, Identification of Solvent peaks, Materials, Advantages of HPLC.

Reference Book: Instrumental methods of Chemical Analysis by B.K.Sharma

UNIT: IV SOLVENT EXTRACTION METHODS

[12 Hrs.]

The Distribution Law, Extraction process, Liquid liquid extraction, Factor affecting Extraction, Technique for Solvent Extraction, Quantitative treatment of solvent Extraction equilibria, Classification of Solvent Extraction system, Types of extraction system, Advantage of Solvent Extraction system, Application of Liquid extraction, Solvent extraction methods in Metallurgy, Solid-Liquid Extraction.

Reference Book: Instrumental methods of Chemical Analysis by B.K.Sharma

B. Sc. [Semester-VI]

US06CCHE07

(PHYSICAL CHEMISTRY PRACTICAL)

[03 Credits]

Total Marks: 100 [Internal 30 + External 70]

1. **Chemical kinetics** of a reaction between $K_2S_2O_8$ and KI in an aqueous system.
2. The **study of Decomposition Rate** of hydrogen peroxide in presence of catalyst and catalyst with promoter.
3. The **study of Rate of Reaction** between hydrogen peroxide and KI in an aqueous media.
4. To **determine the Rate Constant** for the reaction between $KBrO_3$ and KI in an aqueous media.
5. The **Distribution coefficient** of Benzoic acid distributed between water and kerosene.
6. To study the **Adsorption** of acid on Activated charcoal.
7. To **determine Molecular weight** of polymer by using **Ubbelohde Viscometer**.
8. To **determine the Composition** of Binary liquid mixture through the viscosity measurement.
9. To **determine the Molar and Specific Refraction** of pure liquids through the measurement of refractive index.
10. To **determine the Composition of a Binary liquid mixture** by Refractometry.
11. To **determine the Concentration** of $KMnO_4$ / $K_2Cr_2O_7$ by Colourimetry.
12. To study the effect of addition of NaCl and Succinic acid on **Critical Solution Temperature (CST)** of phenol –Water system.

VIVA VOCE

Reference Books:

1. Experimental Physical Chemistry by R.C.Das & B.Behera
2. Advanced Physical Chemistry by J.B.Yadav

B. Sc. [Semester-VI]

US06CCHE08

(ORGANIC CHEMISTRY PRACTICAL)

[03 Credits]

Total Marks: 100 [Internal 30 + External 70]

PREPARATIONS

1. Preparation of iodoform from acetone
2. Preparation of p-nitroacetanilide
3. Preparation of p-bromoacetanilide
4. Preparation of 2,4,6-tribromoaniline
5. Preparation of Methyl Orange
6. Preparation of Mordant yellow
7. Preparation of Lake red
8. Preparation of Benzoic acid
9. Preparation of m-nitroaniline from m-dinitrobenzene
10. Preparation of dibenzalacetone from benzaldehyde
11. Preparation of m-nitrophenol from m-nitroaniline

ESTIMATION

1. Estimation of - COOH group
2. Estimation of Aspirin
3. Estimation of Amine
4. Estimation of amide
5. Estimation of ketone
6. To determine the amount of unsaturation

VIVA VOCE

Reference books:

1. Comprehensive practical organic chemistry
Preparation and qualitative analysis by V.K.Ahuwalia and Renu Aggarwal.
2. Qualitative Analysis by Vogel
3. Preparation and quantitative analysis by V.K.Ahuwalia and Renu Aggarwal.

B. Sc. [Semester-VI]

US06CCHE09

(INORGANIC CHEMISTRY PRACTICAL)

[03 Credits]

Total Marks: 100 [Internal 30 + External 70]

Semi-micro Inorganic Qualitative Analysis Of Mixture Containing Three Positive & Three Negative Radicals.

Cd^{+2} , Cu^{+2} , Bi^{+3} , Sb^{+3} , Pb^{+2} , Fe^{+2} , Fe^{+3} , Zn^{+2} , Al^{+3} , Co^{+2} , Ni^{+2} , Mn^{+2} , Ba^{+2} , Sr^{+2} , Ca^{+2} , Mg^{+2} , NH_4^+ , K^+ , Cl^- , Br^- , I^- , NO_3^- , CO_3^{-2} , S^{-2} , PO_4^{-3} , BO_3^{-3} , SO_4^{-2} , CrO_4^{-2} , $\text{Cr}_2\text{O}_7^{-2}$ etc.

ALLOY ANALYSIS

1. Brass Alloy
2. Bronze Alloy

VIVA VOCE

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