

SARDAR PATEL UNIVERSITY
Programme: B.Sc (Chemistry)
Semester: VI
Syllabus with effect from: 2020
(30 +70 Marks, 4 hrs per week)

Subject Code: US06CCHE21	Total Credit: 4
Title Of Subject: Organic Chemistry	
Learning outcomes of the paper: From the study of this paper, student will learnt about basic concept of Amino Acids And Proteins, Purine and Pyrimidines, alkaloids, Synthetic Dyes and Organic Photochemistry. This study will helpful them in further studies and in industries.	

Unit	Description in detail	Weighttage (%)
I	<p>(A) Amino Acids And Proteins Proteins, Structure of amino acids, Amino acids as dipolar ions, Isoelectric point of amino acids, Preparation of amino acids, Peptides. Geometry of the peptide linkage, Determination of structure of peptide. Terminal residue analysis. Synthesis of peptides, Structure of proteins, Peptide chain, Side chain. Isoelectric point. Electrophoresis, Secondary structure of protein.</p> <p>(B) Purine and Pyrimidines Purines – Synthesis of Purines, Adenine and Guanine. Pyrimidines – Synthesis of Pyrimidine, Uracil, Thymine and Cytosine.</p>	25%
II	<p>Alkaloids 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 Nicotine, Papaverine, Conine, Atropine</p>	25%
III	<p>(A) Synthetic Dyes:-Classification of Dyes- Anionic and Cationic dyes, Mordant and Vat dyes, Reactive and Dispersed dyes, Synthesis of Alizarin, Malachite green, Indigo, Congo red, Eosin.</p> <p>(B) Explosives:-Preparation of RDX, PETN, Nitroglycerine, Tetryl.</p> <p>(C) Pesticides:-Preparation of Aldrine, Malathion, Parathion, methoxychlor.</p>	25%
IV	<p>Organic Photochemistry 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.</p>	25%

Reference Books :-

- Org. Chem., Vol II, by I.L. Finar.
- Organic chemistry by A. Bahal & B. S. Bahal, 16th Ed..
- Organic Reaction Mechanism by S.M. Mukerji.
- Organic Reaction Mechanism by R.K. Bansal.
- Organic Chemistry by R.O.C. Norman.
- Organic chemistry of natural products by Gurdeep R. Chatwal, Vol. I.

SARDAR PATEL UNIVERSITY
Programme: B.Sc. (Chemistry) Semester: VI
Proposed Syllabus with effect from:2020
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Subject Code: US06CCHE22		Total Credit: 4
Title Of Subject: Inorganic Chemistry		
Learning outcomes of the paper: From the study of this paper, student will learnt about basic concept of wave mechanics, Organo metallic compounds, Cyclopentadienyl complexes Term symbol, Electronic spectra of metal complexes and principles of metallurgy. This study will helpful them in further studies and in industries.		
Unit	Description in detail	Weighting (%)
I	Wave Mechanics Wave equation, Interpretation of ψ and Heisenberg's uncertainty principle, Properties of ψ , Operators, Second postulate of quantum mechanics, Setting up operators for different observable, Third postulate of quantum mechanics, Fourth postulate of quantum mechanics, One dimensional box, Normalization and orthogonality, Characteristics of the wave functions	25%
II	(A) ORGANO METALLIC CHEMISTRY Introduction, General methods of preparations, General properties, Organo metallic compounds of alkali metals, Organo metallic compounds of beryllium, Organo metallic compounds of magnesium, Organo metallic compounds of aluminum, Metal olefin (alkene) complexes (B) Cyclopentadienyl complexes: Preparation of metallocenes and their derivatives, Some properties of ferrocene molecule, Structure and bonding in ferrocene molecule, Ionic cyclopentadienyl compounds.	25%
III	(A) Term symbol Russel Saunders coupling and determination of Term symbols of the ground state. Calculation of number of microstates. Pigeon hole diagram of p ² and d ² configurations. Hund's rule. Hole formulation. (B) Electronic spectra of metal complexes [07 Marks] Electronic spectra of transition metal complexes, Laporte orbital and spin selection rules. Orgel energy level diagram of d ⁵ and combined diagrams of d ¹ - d ⁹ , d ² – d ⁸ , d ³ – d ⁷ , d ⁴ – d ⁶ and their spectra. Jahn Teller distortion. Spectrochemical series.	25%
IV	PRINCIPLES OF METALLURGY AND CHEMISTRY OF Pb,Fe,Ni,Cu & Ag: Metals, Occurrence of metals, Mineral wealth of india, Metallurgy, Concentration and ore, Calcinations 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 & 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.	25%

Reference Book:

1. Introductory Quantum Chemistry- 3rd Edition, By A. K. Chandra
2. Textbook of Inorganic Chemistry -20th edition, Chapter-13 By P. L. Soni & Mohan Katyal
3. Advanced Inorganic Chemistry Volume II By Satya Prakash, G. D. Tuli, S. K. Basu, R. D. Madan
4. CONCISE INORGANIC CHEMISTRY : 5TH EDITION BY: J.D.LEE
- 5 Basic Inorganic Chemistry- 3rd Edition By F. Albert Cotton, Geoffrey Wilkinson & Paul L. Gaus

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Programme: B.Sc (Chemistry)
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Subject Code: US06CCHE23		Total Credit: 4
Title Of Subject: Physical Chemistry		
Learning outcomes of the paper: From the study of this paper, student will learnt about basic principles of thermodynamics and electrochemistry. Also will be able to understand basics of catalysis and phase equilibria. This study will helpful them in further studies and in industries.		
Unit	Description in detail	Weightage (%)
I	ENTROPY AND THIRD LAW OF THERMODYNAMICS 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, Numerical.	25%
II	ELECTROMOTIVE FORCE OF ELECTROCHEMICAL CELLS Electrodes, cell emf, emf and free energy, Standard electrode potentials, emf and activities, activity coefficients from emf's, equilibrium constant from emf's, electrode concentration cells, electrolyte concentration cells, thermodynamic properties from cell emf's	25%
III	PHASE EQUILLIBRIA Introduction to Phase rule, Phase component and degree of freedom, Phase reactions, condition for equilibrium between phase, derivation of phase rule, advantage and limitations of phase rule, one component system, water system, the sulfur system, experimental determination of transition point, two component system, types of two component system, simple eutectic system, lead silver system, KI-Water system, simple eutectic system having congruent melting point, zinc magnesium system, eutectic system with incongruent melting point ,Numericals.	25%
IV	COLLOIDAL STATE Types of Colloidal system, Classifications of Colloids, Lyophobic and Lyophilic Sols, Size range, Preparation and Properties of colloids solution, Dialysis, Electrodialysis, Ultrafiltration, Electrical Double Layer, Electrophoresis, Electrosmosis, Importance and Applications of Colloids, Numerical.	25%

Reference Book:

1. Advanced Physical Chemistry by Gurdeep Raj.
2. Text book of physical chemistry by Samuel Glasstone.
3. Principles of Physical Chemistry by Puri, Sharma and Pathania. 38thed.
4. Essential of physical chemistry by Bahl, Bahl and Tuli. 25th edition.
5. Physical Chemistry by G.M.Barrow, 5th ed.
6. Textbook of physical chemistry by P.L. Soni, O.P. Dharmarha, U. N. Dash
7. University chemistry by Bruce H Mahan
8. Principles of Physical chemistry, S H Marron, Karl F prutton
9. Physical Chemistry, Ira Levine/
10. Physical Chemistry, Atkins

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Subject Code: US06CCHE24		Total Credit: 4
Title Of Subject : Applied Chemistry		
Learning outcomes of the paper: From the study of this paper, student will learnt about basic concept of principles of NMR Spectroscopy, Drugs, Bioinorganic chemistry and Heavy chemicals . This study will helpful them in further studies and in industries.		
Unit	Description in detail	Weightage (%)
I	<p>Spectroscopy The nuclear magnetic resonance (NMR) spectrum. Number of signals, NMR positions of signals. Chemical shift, NMR peak area and proton counting, NMR Splitting of signals. Spin-spin coupling, NMR coupling constant, Carbon – 13 NMR (CMR) spectroscopy CMR Splitting, CMR Chemical shift, NMR and CMR spectra of hydrocarbons, NMR and CMR spectra of alkyl halides, NMR and CMR spectra of alcohols and ethers, Spectroscopic analysis of aldehydes and ketones, Spectroscopic analysis of Carboxylic acids, Spectroscopic analysis of amines and substituted amides, Spectroscopic analysis of Carboxylic acid derivatives. Problems based on above spectroscopic technique.</p>	25%
II	<p>Drug Introduction, Classification of drugs. Introduction and classification of following selected class of drugs. Hypnotics, sedative and anticonvulsants, Histamine and antihistaminic agents, Hematological agents, Antipyretic and analgesics, Mode of action of antipyretic drug. Anthelmintics Antimalarial, Antiseptic, Sulphanilamides, Mechanism of action of sulpha drug. Antitubercular and antileprosy drugs. Synthesis and uses of following drugs (i) Nirvanol (ii) Phenobarbitone (iii) Dimenhydrinate (iv) Novalgin (v) Phenylbutazone (vi) Hetrazan (vii) Atenelol(viii) Chloroquine (ix) Lidocaine, (x) Sulphamethazine, (xi) Sulphafurazole (xii) PAS (xiii) Acedapsone (xiv) Tolbutamide .</p>	25%
III	<p>BIOINORGANIC CHEMISTRY 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.</p>	25%
IV	<p>HEAVY CHEMICALS 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.</p>	25%

Reference Books :-

- Organic Chemistry by Morrison and Boyd, 6th ed.
- Organic Spectroscopy by P.S.Kalsi
- Organic Spectroscopy by J R Dyer.
- Elementary Spectroscopy by Y R Sharma
- Synthetic Drugs 6th ed. by Gurdeep R. Chatwal.
- Medicinal chemistry 3rd ed. by Ashutosh Kar.
- Basic Inorganic Chemistry- 3rd Edition By F.Albert Cotton, Geoffery Wilkinson & Paul L. Gaus
- Textbook of Inorganic Chemistry- 20th by P. L. Soni & Mohan Katyal

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Syllabus with effect from: 2020

(45 +105 Marks, 12 hrs per week) (Total

Credit: 6)

Subject Code: <u>US06CCHE25</u>	
Learning outcomes of the paper: From the study of this paper student will learnt about performing chemical experiments under time constraint and appreciate the physical principles useful in chemical science. Separation and identification of two component Organic mixture. Volumetric analysis. This study will helpful them in further study and Industry.	
Title Of Subject : Paper –I : Physical Chemistry Practical	

	Description in detail
1	<ol style="list-style-type: none"> 1. Chemical kinetics of a reaction between $K_2S_2O_8$ and KI in an aqueous system. (a=b) 2. Chemical kinetics of a reaction between $K_2S_2O_8$ and KI in an aqueous system. (a ≠ b) 3. The study of Rate of Reaction between hydrogen peroxide and KI in an aqueous media. (a=b) 4. The study of Rate of Reaction between hydrogen peroxide and KI in an aqueous media. (a ≠ b) 5. To determine the Rate Constant for the reaction between $KBrO_3$ and KI in an aqueous media. (a=b) 6. To determine the Rate Constant for the reaction between $KBrO_3$ and KI in an aqueous media. (a ≠ b) 7. The Distribution coefficient of Benzoic acid distributed between water and kerosene. 8. To determine the Composition of a Binary liquid mixture by Refractrometry.
2	VIVA

Basic Text & Reference Books:-

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

Subject Code: <u>US06CCHE25</u>	
Title Of Subject : Paper –II : Organic Chemistry Practical	
	Description in detail
1	<p><i>SEPARATION AND IDENTIFICATION OF TWO COMPONENT ORGANIC MIXTURE USING CHEMICAL AND PHYSICAL METHODS (WATER SOLUBLE, INSOLUBLE & LIQUID + LIQUID)</i></p> <p>Solid Acid: Benzoic acid, salicylic acid, cinnamic acid, phthalic acid, o-,m- chloro benzoic acid, o-,m—nitro benzoic acid, succinic acid oxalic acid,</p> <p>Solid phenol:- α naphthol, β-naphthol, resorcinol,</p> <p>Solid neutrals:- p-dichlorobenzene, naphthalene, anthracene, benzamide, acetanilide, m-dinitrobenzene.</p> <p>Solid Base:- o-,m-& p-nitroaniline, p-toluidene,</p> <p>Liquid base:- aniline,</p> <p>Neutral liquid:- ethyl acetate, methyl acetate, acetone, methyl alcohol ethylalcohol, benzaldehyde, chlorbenzene, nitrobenzene, $CHCl_3$, nitrobenzene, acetohpenone</p> <p>(Derivative of any one out of two compounds)</p>
2	VIVA

Basic Text & Reference Books:-

- Comprehensive practical organic chemistry Preparation and qualitative analysis by V.K. Ahuwalia and Renu Aggarwal.

➤ Organic Preparation by Vogel

Subject Code: <u>US06CCHE25</u>	
Title Of Subject : Paper-III : Inorganic Chemistry Practical	

	Description in detail
1	(a) Volumetric <ul style="list-style-type: none"> • Estimation of Bi^{3+} by EDTA • Estimation of Ca^{2+} and Mg^{2+} in mixture by EDTA Hardness • Estimation of Chloride by silver nitrate (Mohr's Method) • Estimation of Fe^{3+} by EDTA(Back Titration) • Estimation of Cd^{2+} and Zn^{2+} in mixture by EDTA (b) Inorganic Preparation <ul style="list-style-type: none"> • sodium thiosulphate • sodium cobaltinitrate • hexa thio plumbs nitrate
2	VIVA

Basic Text & Reference Books:-

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

Subject Code: <u>US06CCHE25</u>	
Title Of Subject : Paper-IV : Analytical Chemistry Practical	

	Description in detail
1	Gravimetric Analysis (Mixture with interfering radicals like removal of Cu) 1. Ba as BaSO_4 2. Fe as Fe_2O_3 3. Al as Al_2O_3 4. Ni as $\text{Ni}(\text{DMG})_2$ 5. Mn as $\text{Mn}_2\text{P}_2\text{O}_7$
2	VIVA

Basic Text & Reference Books:-

- Vogel's Textbook Of Qualitative Organic Analysis
- Practical Chemistry By O.P.Pandey, D.N.Bajpai & S.Giri
- An Advanced Course In Practical Chemistry By Ghoshal, Mahapatra & Nad

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Subject Code: US06DCHE26: SELECTED TOPICS IN CHEMISTRY-1		Total Credit: 2
Learning outcomes of the paper: From the study of this paper student will learnt about basic principles of Visible Spectroscopy, Atomic Spectroscopy and Vitamins. This study will helpful them in further studies and in industry.		
Unit	Description in detail	Weightage (%)
I	Visible Spectroscopy Introduction, Beer -Lambert's law, instrumentation (light source, optical system, wavelength selector, light sensitive device), Accuracy and error of Spectrophotometry.	25%
II	Atomic Spectroscopy Introduction, Principle, Flame Emission Spectroscopy (FES) and Atomic adsorption Spectroscopy (AAS), Principal, comparison and applications, Burners (Total consumption burner and Premix burners).	25%
III	<u>Vitamins</u> Structure and Biochemistry of Vitamin-A (A1) (Retinol), Vitamin-B6 (Pyridoxine), Vitamin- C.	25%
IV	<u>Solid state chemistry</u> Laws of crystallography-elements of symmetry lattice planes, unit cell, Weiss and Millar indices, characterizes of simple cubic, Face centered and body centered cubic system Interplanar distance in cubic crystals.	25%

Reference books:-

- (i) Industrial chemistry 9th by B K Sharma
- (ii) Physical chemistry by G. M. Barrow 5th edition, Mc. Grow Hill.
- (iii) Biochemistry by U. Satyanarayan and U Chakrapani Fundamental of biochemistry by Dr A C Deb
- (iv) Principles of polymers Science by P. Bahadur and N. V. Sastry. (Second Edition)
- (v) Polymer Science by V. R. Gowariker, N. V. Vashwanathan and Jaydev Shreedhar.

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June, 2020
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Subject Code: US06DCHE27		Total Credit: 2
Title Of Subject: SELECTED TOPICS IN CHEMISTRY-2		
Learning outcomes of the paper: From the study of this paper student will learnt about basic principles of Titration Techniques, Chemistry of α , β -dicarbonyl compounds and Chemical Aspect of Fertilizers. This study will helpful them in further studies and in industry.		
Unit	Description in detail	Weightage (%)
I	<u>Titration Technique-I</u> Titration curves, Feasibility, Indicators, Mohr, Volhard and Fajans' Methods, Factors affecting solubility	25%
II	<u>Titration Technique-II</u> Introduction, Precipitation, Digestion, Filtration, Washing of the precipitate, Drying and/or incineration of the precipitate, Weighing, Specific and selective precipitation, Organic precipitants, Masking or sequestering agent, Problems involved in precipitation gravimetry.	25%
III	<u>Chemistry of α, β -dicarbonyl compounds</u> Introduction, synthesis of Ethyl acetoacetate (EAA) and Diethylmalonate Acidic and ketonic hydrolysis of α , β -dicarbonyl compounds, Synthetic applications of α , β -dicarbonyl compounds. (i) Crotonic acid from EAA (ii) Valeric Acid from diethyl malonate.	25%
IV	<u>Chemical Aspect of Fertilizers</u> Fertilizers-manufacturing : Industries in India, manufacture of ammonical fertilizers, ammonium salts, urea, nitrates, phosphates and super phosphates, mixed fertilizers, micro-nutrients and their role in fertilizers.	25%

Reference books:-

1. Gary D. Christian, "Analytical Chemistry", John Wiley & Sons, INC, New York, 1994. (Fifth edition)
2. Douglas A. Skoog, Donald M. West, F. James Holler, "Analytical Chemistry An Introduction", Saunders College Publishing, Harcourt Brace College Publishers, Philadelphia, 1994. (Sixth edition)
3. Industrial chemistry 9th by B K Sharma
4. Y.Anjaneyulu, K.Chandrasekhar, Valli Manickam, "A Textbook of Analytical Chemistry",Pharma Book Syndicate, Hyderabad, India, 2006.
5. Reference books:-Organic chemistry by I L FINAR