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

Subject Code: US05CCHE21		**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 heterocyclic chemistry, reaction mechanism, Dienes And Macromolecules and Terpenoids. This study will helpful them in further studies and in industries.		
Unit	**Description in detail**	**Weightage (%)**
I	**Heterocyclic Compounds** Heterocyclic systems, Structure of Pyrole, furan and thiophene, Source of Pyrole, furan and thiophene, Electriphilic substitution in Pyrrole, furan and thiophene Reactivity and orientation, Saturated five – membered heterocycle, Structure of pyridine, Sources of pyridine compounds, Reactions of pyridine, Electrophilic substitution in pyridine, Nucleophilic substitution in pyridine, Basicity of pyridine, Reduction of pyridine, Quinoline. The skraup synthesis, Isoquinoline. The Bischler–Napieralski synthesis. Knorr pyrrole synthesis.	25%
II	**Reaction Mechanism** Baeyer Villiger oxidation, Hofmann rearrangement, Mannich reaction, Curtius–Schmidt rearrangement, Benzilic acid rearrangement, Sommlet rearrangement, Birch reduction, Favorskii rearrangement, Benzoin condensation, Beckmann rearrangement, Wittig reaction, Perkin reaction.	25%
III	**Dienes And Macromolecules** Dienes: Structure and properties, Stability of conjugated dienes, Resonance in conjugated dienes, Hyperconjugation, Ease of formation of conjugated dienes, Electrophilic addition to conjugated diene : 1,4- addition,1,2 Vs 1,4-addition, Rate Vs equilibrium, Free-radical polymerization of diene, Polymer and polymerization, Free radical vinyl polymerization, Co-polymerization, Ionic polymerization, Coordination, polymerization, Step reaction, polymerization, Structure and properties of macromolecules. Distinguishing features of addition and condensation polymerization Copolymer, classification of polymers, plastics and resins, Phase system for polymerization (like bulk, solution, emulsion and suspension polymerization).	25%
IV	**Terpenoids** General introduction including nomenclature, General properties of terpenoids, Isolation, Isoprene rule, Classification of terpenoids, General methods for the determination of structure of terpenoids. Introduction, isolation and constitution of Citral, α- terpineol, Camphor, B-carotene.	25%

Reference Books :-

1. Organic chemistry of natural products by Gurdeep Chatwal, Vol. II.
2. Organic Chemistry by Morrison and Boyd, 6th ed.
3. Synthetic organic chemistry by Gurdeep R. Chatwal
4. Reaction mechanism in Organic Chemistry by S. M. Mukherji.
5. Organic reaction mechanism by R.K. Bansal, 3rd ed.
6. Org. Chem., Vol II, by I.L. Finar.
7. Principles of Org. synthesis, by ROC Norman.
8. Reaction mechanism in Organic Chemistry S. M. Mukherji and S. P. Singh.
9. Heterocyclic chemistry vol. II by R. R. Gupta, M. Kumar and V. Gupta

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

Subject Code: US05CCHE22	**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 symmetry, crystal field theory, geometry of the molecule, stability of metal complexes and inorganic polymers. This study will helpful them in further studies and in industries.

Unit	Description in detail	Weightage (%)
I	**Symmetry** Introduction, Various types of symmetry elements, Point groups, Properties of point groups, To determine the point group of a molecule, Representations of groups, multiplication table for point groups C_{2V} and C_{3V}.	25%
II	**Crystal Field Theory** Importance of CFT, Grouping of 5d orbitals, CFT applied for octahedral complexes, Distribution of d^n electrons (strong field and weak field), Factor influencing magnitude of Δ_0, Spectrochemical series, Mean paring energy and calculations, Calculation based on CFSE, CFT for tetrahedral complexes, Distribution of d^n electrons, Limitation of CFT, Energy Level Diagram for $[CoF_6]^{3-}$ and $[Co(NH_3)_6]^{3+}$	25%
III	**(A) Thermodynamic and kinetic aspects of metal complexes stability of complexes in aqueous solution** Definition of stability, Stability of complex ions in solution, Stepwise formation constants and overall formation constants, Labile and inert octahedral complexes according to CFT, Factors affecting the stability of complexes, Experimental determination of stability constant and composition of a complex, Spectrophotometric method, Job's method of continuous variation. **(B) Ligand substitution reactions in octahedral complexes** Transition state or activated complex, Types of substitution reactions, Labile and inert complexes, Acid hydrolysis reactions of six-coordinated, Acid hydrolysis reactions of six-coordinated Co (III) ammine complexes, Base hydrolysis reactions of six-coordinated Co (III) ammine complexes.	25%
IV	**Inorganic Polymers** Introduction, Classification of inorganic polymers, General properties of inorganic polymers, Polymers containing boron: Preparation properties and structure of borazine and substituted borazines, boron nitrites **Polymers containing silicon:** Preparation properties and structure of silicones, silicone resins, silicon fluids or oils, silicon rubbers, silicon greases **Polymers containing phosphorous:** Preparation properties and structure of polyphosphonitrilic chlorides, Vitreous polyphosphates **Polymers containing sulfur:** Preparation properties and structure of nitrides of sulfur, thiazyl halides, imides of sulphur.	25%

Basic Text & Reference Books :-

1. Advanced Inorganic Chemistry Volume I- 18th By Satya Prakash,G.D.Tuli, S.K.Basu, R.D.Madan
2. Basic Inorganic Chemistry -3rd Edition By F. Albert Cotton, Geoffrey, Wilkinson & Paul L. Gaus
3. Advanced Inorganic Chemistry Volume: II (2007 Edition) By: Satyaprakash, Tuli, Basu and Madan
4. Selected Topic in Inorganic Chemistry, 8th-edition,By Wahid U. Malik, G. D. Tuli And R. D. Madan
5. Introductory Quantum Chemistry- 4th Edition By A K Chandra

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

Subject Code: US05CCHE23		**Total Credit: 4**
Learning outcomes of the paper: From the study of this paper, student will learnt about basic concept of entropy and chemical kinetics. Also will be able to understand basics of photo chemistry and surface chemistry. This study will helpful them in further studies and in industries.		
Title Of Subject: Physical Chemistry		
Unit	**Description in detail**	**Weightage (%)**
I	**ENTROPY AND SECOND LAW OF THERMODYNAMICS** Limitation of first law, spontaneous or irreversible process, cyclic process, Carnot cycle, Carnot theorem, entropy the new state function, the concept of entropy, entropy change in isothermal expansion of an ideal gas, entropy change in reversible and irreversible change, the entropy change accompanying phase change, calculation of entropy of an ideal gas with change in P, V and T, entropy of mixing of an ideal gas, physical significance of entropy, work and free energy function, variation of free energy change with T and P., Numerical.	25%
II	**CHEMICAL KINETICS** Third order reaction (a= b=c), 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, Activated Complex Theory (ACT) of Bimolecular reaction, Numerical	25%
III	**PHOTOCHEMISTRY** Introduction, Types of chemical reactions, Difference between Dark and Photochemical reaction, Absorption of light, Laws of photochemistry, Quantum yield (or) Quantum efficiency, Deviation in the law of photochemical, Equivalence, Reasons of high and low quantum yield, Factors affecting quantum yield, Luminescence, Fluroescence and Phosphorescence, Numerical.	25%

IV	**SURFACE CHEMISTRY** Sorption, Adsorption Of Gases, Influence Of Temperature And Pressure, Nature Of Adsorbent And Adsorbed Gas, Unimolecular Layers, Langmuir Adsorption Isotherm, Types Of Adsorption, Vander Waals Adsorption, Chemisorption, Persorption, Adsorption at Surfaces Of Solutions, Formation of Unimolecular Surface Film Of Spreading Oils(Unimolecular Insoluble films), Adsorption By Solids From Solutions.	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. 38th ed.
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

SARDAR PATEL UNIVERSITY
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(30 +70 Marks, 4 hrs per week)

Subject Code: US05CCHE24		**Total Credit: 4**
Title Of Subject: Analytical Chemistry		
Learning outcomes of the paper: From the study of this paper, student will learnt about basic concept of instrumental techniques, chromatography and solvent extraction methods. This study will helpful them in further studies and in industries.		
Unit	**Description in detail**	**Weighting (%)**
I	**pHmetry-** Introduction, types of indicator electrodes and reference electrodes, types of titrations. **potentiometry-** Introduction, types of titrations, graphical method for end point determination. **Conductimetry-** Introduction, types of conductance, effect of dilution, conductivity cells, types of titration.	25%
II	**Chromatography-I** Introduction, classification, paper chromatography, thin layer chromatography, column chromatography, ion exchange chromatography- experimental details for all the techniques.	25%
III	**Chromatography-II** **Gas Chromatography** Introduction, Technique of Gas Liquid Chromatography, Apparatus of Gas Liquid Chromatography (Carrier Gas, Injection Port, Columns, The solid inert support, The stationary liquid phase), Detectors, Thermal Conductivity Detectors, Flame Ionization Detectors, Electron Capture Detectors. **High Performance Chromatography (Hplc)** 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.	25%
IV	**Solvent Extraction Methods** The Distribution Law, Extraction process, Liquid liquid extraction, Factor affecting Extraction, Technique for Solvent Extraction, Quantitative treatment of solvent Extraction eqillibria, 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.	25%

Reference Books :-

1. Instrumental methods of Chemical Analysis by B.K.Sharma
2. Instrumental methods of Chemical Analysis by Gurdeep R Chatwal
3. Quantitative Analysis by Skoog & West

SARDAR PATEL UNIVERSITY

Programme : B.Sc. (Chemistry) Semester: V

Syllabus with effect from June 2020

(45 +105 Marks, 12 hrs per week) (Total Credit: 06)

Subject Code: US05CCHE25		
Learning outcomes of the paper: After performing chemical kinetics exercise, students will learn hands on training of instruments like pH metry, Potentiometry , Conductometry. Separation and identification of six radicals inorganic mixture. Estimation and preparation of organic compounds. This study will helpful them in further study and Industry.		
Title Of Subject : Paper –I : Physical Chemistry Practical		
	Description in detail	
1	**Applications of pH metry** 1. To **determine Molarity** of strong acid by titrating against 0.1 M NaOH solution. 2. To determine molarity and d**issociation Constant** of weak monobasic acids like HAC by titrating against 0.1 M NaOH solution. 3. To **determine Molarity** of each acid present in a **Mixture** of strong acid and weak acid. **Applications of Potentiometry** 4. To **determine Molarity** of strong acid by titrating against 0.1 M NaOH solution. 5. To determine molarity and d**issociation Constant** of weak monobasic acids like HAC titrating against 0.1 M NaOH solution. 6. To **determine Molarity** of each acid present in a **Mixture** of strong acid and weak acid. **Applications of Conductometry** 7. To **determine Molarity** of strong acid by titrating against 0.1 M NaOH solution. 8. To **determine Molarity** of weak acid by titrating against 0.1 M NaOH solution. 9. To **determine Molarity** of each acid present in a **Mixture** of strong acid and weak acid. 10. To determine the Concentration of $KMnO_4$ / $K_2Cr_2O_7$ by Colourimetry.	
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: US05CCHE25		
Title Of Subject : Paper-II : Organic Chemistry Practical		
	Description in detail	
1	Organic Preparation (a) Preparation of P-Bromo Acetanilide from Acetanilide(Bromination) (b) Preparation of P-Nitro Acetanilide from Acetanilide (Nitration) (c) Preparation of m-dinitrobenzene from m-nitroaniline (Reduction) (d) Preparation of Benzaldehyde from Benzoic acid (Oxidation) (e) Preparation of Iodoform (f) Preparation of Di-benzyl acetone from Benzaldehyde (g) Preparation of Dyes- Modernt Yellow	

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: US05CCHE25		
Title Of Subject : Paper –III : Inorganic Chemistry Practical		
	Description in detail	
1	Inorganic Mixtures (Min 10 Mix.) **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^{+}, K^{+}, Cl^{-}, Br^{-}, I^{-}, NO^{-}, CO^{-2}, S^{-2}, PO^{-3}, BO^{-3}, SO^{-2}, CrO_4^{-2}, $Cr_2O_7^{-2}$ etc.	
2	**VIVA**	

Basic Text & Reference Books:-

- Vogel's Text book 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: US05CCHE25		
Title Of Subject : Paper –IV : Analytical Chemistry Practical		
	Description in detail	
1	Estimation of Functional Group (1) Estimation of Carboxylic Acid (2) Estimation of Ketone (3) Estimation of Ester (4) Estimation of Saponification of Oil (5) Estimation of amide (6) Estimation of aspirin	
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

SARDAR PATEL UNIVERSITY

Programme : B.Sc. (Chemistry) Semester : V

Proposed Syllabus with effect from June 2020

(50 Marks, 2 hrs per week)

Subject Code: US05DCHE26	**Total Credit: 2**
Title of Subject: ORGANIC SPECTROSCOPY	

Learning outcomes of the paper: From the study of this paper student will learnt about basic principal and application of spectroscopy specially Ultraviolet Spectroscopy**,** Infrared Spectroscopy**.** This study will helpful them in further studies and Industry.

Unit	Description in detail	Weightage (%)
I	**Ultraviolet Spectroscopy** Origin of UV Spectra, Principle, Electronic transition (σ-σ*, n-σ*, π-π* and n-π*), relative positions of λ_{max} considering conjugative effect, steric effect, solvent effect, red shift (bathochromic shift), blue shift (hypsochromic shift), hyperchromic effect, hypochromic effect (typical examples). Aromatic and Polynuclear aromatic hydrocarbons.	25%
II	**Ultraviolet Spectroscopy (Problems)** Problems of Dienes and enones using Woodward-Fieser rules. Problems of aromatic ketones, aldehydes and esters using empirical rules.	25%
III	**Infrared Spectroscopy** Introduction, principle of IR spectroscopy, instrumentation, sampling technique, selection rules, types of bonds, absorption of common functional groups. Factors affecting frequencies,	25%
IV	**Infrared Spectroscopy (Problems)** Differentiate two compounds by the IR frequencies. Problems pertaining to the structure elucidation of organic compounds using IR.	25%

Reference Books

(1) Introduction to Spectroscopy**:** Donald L. Pavia, Gary M. Lampman, George S. Kriz Cengage Learning; 4th Edition.

(2) Spectrometric Identification of Organic Compounds**:** Robert M. Silverstein, Francis X. Webster, David Kiemle Wiley; 7th Edition.

(3) Infrared spectra of Complex molecules**:** J. Bellamy, John Wiley & Sons, Inc., 3rd Edition.

(4) Spectroscopic Method in Organic Chemistry**:** Dudley Williams, Ian Fleming McGraw-Hill Education; 6th Edition.

(5) Applications of spectroscopic techniques in Organic Chemistry**:** P.S. Kalsi, New Age International; 6th Edition.

SARDAR PATEL UNIVERSITY
Programme: B.Sc. (Chemistry) Semester: V
Proposed Syllabus with effect from June 2020
(50 Marks, 2 hrs per week)

Subject Code: US05DCHE27		**Total Credit: 2**
Title Of Subject: SOIL CHEMISTRY AND ANALYSIS		
Learning outcomes of the paper: From the study of this paper student will learnt about basic properties of Soil and its characterization. This study will helpful them in further studies and for soil analysis.		
Unit	Description in detail	Weightage (%)
I	Introduction to Soil Chemistry Importance of soil, soil formation, composition of soil, the soil profile, types of soil, micro and macro plant nutrients.	25%
II	Analysis of Primary Nutrients Soil fertility and productivity, techniques for the analysis of soil, soil reaction, determination of total nitrogen in soil, determination of phosphorus in soil, determination of potassium in soil by flame photometry.	25%
III	Analysis of Secondary Nutrients Determination of total sulphur in soil, determination of calcium in soil determination of magnesium in soil, determination of lime and liming material in soil. Mechanical analysis of soil.	25%
IV	Analysis of Micro Nutrients Determination of total manganese in soil, determination of Fe (II) and Fe (III) in soil, determination of silica in soil, determination of soluble salts in soil, determination of sodium in soil by flame photometry.	25%

Reference Books

(1) Environmental Chemistry**:** H. Kaur, Pragati Prakashan, 2nd Edition.

(2) Soils in our Environment**:** Raymond W. Miller, Duane T. Gardiner, Prentice Hall, 8th Edition.