ALLIED CHEMISTRY 2024 -2025 BATCH

Class	Sem	Title	Instr. Hours	Credit
I B.Sc Biochemistry & Geology	I	AC I – Chemistry I	4	4
	I &II	AC II – Chemistry Practical I	2&2	3
	II	AC III – Chemistry III	4	4
II B.Sc Zoology & Physics	III	AC I – Chemistry I	4	4
	III &IV	AC II – Chemistry Practical I	2&2	3
	IV	AC III – Chemistry III	4	4

Semester-III / Allied Course-IV	Chemistry –I	Course Code: PBSQA4
Instruction Hours : 4	**Credits: 4**	**Exam Hours: 3**
Internal Marks: 25	**External Marks: 75**	**Total Marks: 100**

Cognitive Level	**K1 – Recalling** **K2 – Understanding** **K3 - Applying** **K4 – Analyzing** **K5 – Evaluating** **K6 – Creating**
Course Objectives	This course aims to provide knowledge on the • basics of atomic orbitals, chemical bonds, hybridization • concepts of thermodynamics and its applications. • concepts of nuclear chemistry • importance of chemical industries • Qualitative and analytical methods.

UNIT	CONTENT	HOURS
I	**Chemical Bonding and Nuclear Chemistry** Chemical Bonding**:** Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Nitrogen; discussion of bond order and magnetic properties. Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions - group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes – carbon dating, rock dating and medicinal applications.	**12**
II	**Industrial Chemistry** Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required). Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple superphosphate.	**12**
III	**Fundamental Concepts in Organic Chemistry** Hybridization: Orbital overlap, hybridization and geometry of CH_4, C_2H_4, and C_6H_6. Electronic effects: Inductive effect, electromeric, mesomeric, hyper conjugation and steric effect- examples. Reaction mechanisms: Types of reactions–aromaticity (Huckel's rule) – aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.	**12**
IV	**Thermodynamics and Phase Equilibria** Thermodynamics: Types of systems, reversible and irreversible processes, isothermal and adiabatic processes and spontaneous processes. Statements of first law and second law of thermodynamics.	**12**

	Carnot's cycle and efficiency of heat engine. Entropy and its significance. Free energy change and its importance (no derivation). Conditions for spontaneity in terms of entropy and Gibbs free energy.Relationship between Gibbs free energy and entropy. Phase Equilibria**:** Phase rule - definition of terms. Applications of phase rule to water system. One component system - Water and Sulphur System.	
V	**Analytical Chemistry** Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques – extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.	**12**

Text Books:

1. V.Veeraiyan, Text book of Ancillary Chemistry; High mount publishing house, Chennai, first edition,2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; PriyaPublications, Karur,2006.
3. S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand andCompany, NewDelhi, twenty third edition, 2012.
4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninthedition, 2007.

Reference Books:

1. P.L.Soni, Mohan Katyal, Textbook of Inorganic chemistry; Sultan Chan d and Company, New Delhi, twentieth edition, 2007.
2. B.R.Puri, L.R.Sharma, M.S.Pathania, Textbook Physical Chemistry;V ishal Publishing Co., New Delhi, forty seventh edition, 2018.
3. B.K,Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.

Course Outcomes:

On completion of the course the students should be able to

CO 1: gain in-depth knowledge about the theories of chemical bonding, nuclear reactions and its applications.

CO 2: evaluate the efficiencies and uses of various fuels and fertilizers

CO 3: explain the type of hybridization, electronic effect and mechanism involved in theorganic reactions.

CO 4: apply various thermodynamic principles, systems and phase rule.

CO 5: explain various methods to identify an appropriate method for the separation ofchemical components

CO/PO	1	2	3	4	5	1	2	3	4	5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Semester-IV / Allied Course-VI	Chemistry-III	Course Code:PBSQA6
Instruction Hours : 4	**Credits: 4**	**Exam Hours: 3**
Internal Marks: 25	**External Marks: 75**	**Total Marks: 100**

Cognitive Level	**K1 – Recalling** **K2 – Understanding** **K3 - Applying** **K4 – Analyzing** **K5 – Evaluating** **K6 – Creating**
Course Objectives	This course aims at providing knowledge on the • Co-ordination Chemistry and Water Technology • Carbohydrates and Amino acids • basics and applications of electrochemistry • basics and applications of kinetics and catalysis • Various photochemical phenomenon

UNIT	CONTENT	HOURS
I	**Co-ordination Chemistry and Water Technology** Co-ordination Chemistry: Definition of terms-IUPAC Nomenclature - Werner'stheory - EAN rule - Pauling's theory – Postulates - Applications to $[Ni(CO)_4]$, $[Co(CN)_6]^{3-}$ Chelation - Biological role of Haemoglobin and Chlorophyll (Structure only) – Applications in qualitative and quantitative analysis. Water Technology: Hardness of water, determination of hardness of water using EDTA method, zeolite method-Purification techniques-Reverse Osmosis, BOD, COD (Definition only).	**12**
II	**Carbohydrates and Amino acids** Carbohydrates: Classification, preparation and properties of glucose, fructose and sucrose. Discussion of open chain ring structures of glucose and fructose. Glucose –fructose interconversion. Properties of starch and cellulose. Amino acids: Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method. RNA and DNA (elementary idea only).	**12**
III	**Electrochemistry** Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications - electroplating - Nickel and chrome plating – Types of cells -fuel cells-corrosion and its prevention.	**12**

IV	**Kinetics and Catalysis** Order and molecularity. Integrated rate expression for I and II (2A □ Products) order reactions. Pseudo first order reaction, methods of determining order of a reaction – Half-life period – Catalysis - homogeneous and heterogeneous, catalyst used in Contact and Haber's processes. Concept of energy of activation and Arrhenius equation.	**12**
V	**Photochemistry** Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen-chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples). Comparison with thermal reactions.	**12**

Text Books:

1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; PriyaPublications, Karur,2006.
3. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand andCompany, New Delhi, twenty third edition, 2012.
4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; SultanChand & sons, New Delhi, twenty ninth edition, 2007.

Reference Books:

1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; SultanChand and Company, New Delhi, twentieth edition, 2007.
2. R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventh edition, 2018.
3. B.K,Sharma, Industrial Chemistry;Meerut, sixteenth edition, 2014.GOEL publishing house.

Course Outcomes:

On completion of the course the students should be able to

CO 1: write the IUPAC name for complex, different theories to explain the bonding incoordination compounds and water technology

CO 2: explain the preparation and property of carbohydrate, amino acids and nucleic acids.

CO 3: apply/demonstrate the electrochemistry principles in corrosion, electroplating and fuelcells.

CO 4: identify the reaction rate, order for chemical reaction and explain the purpose of acatalyst.

CO 5: outline the various type of photochemical process.

CO/PO	1	2	3	4	5	1	2	3	4	5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Semester – I & III / Allied Course – I &IV	Chemistry –I	Course Code: BSQA1 /BSQA4
Instruction Hours : 4	Credits: 4	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 – Recalling** **K2 – Understanding** **K3 - Applying** **K4 – Analyzing** **K5 – Evaluating** **K6 – Creating**
Course Objectives	This course aims at providing knowledge on • basics of atomic orbitals, chemical bonds, hybridization andfundamentals of organic chemistry • nuclear chemistry and industrial chemistry • importance of speciality drugs • Separation and purification techniques.

UNIT	CONTENT	HOURS
I	**Chemical Bonding and Nuclear Chemistry** Chemical Bonding: Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals. M. O diagrams for Hydrogen, Nitrogen; discussion of bond order and magnetic properties. Nuclear Chemistry: Fundamental particles - Isotopes, Isobars, Isotones and Isomers-Differences between chemical reactions and nuclear reactions- group displacement law. Nuclear binding energy - mass defect - calculations. Nuclear fission and nuclear fusion - differences – Stellar energy. Applications of radioisotopes - carbon dating, rock dating and medicinal applications.	12
II	**Industrial Chemistry** Fuels: Fuel gases: Natural gas, water gas, semi water gas, carbureted water gas, producer gas, CNG, LPG and oil gas (manufacturing details not required). Fertilizers: Urea, ammonium sulphate, potassium nitrate NPK fertilizer, superphosphate, triple superphosphate.	12
III	**Fundamental Concepts in Organic Chemistry** Hybridization: Orbital overlap hybridization and geometry of CH_4, C_2H_4 and C_6H_6. Polar effects: Inductive effect and consequences on Ka and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric-examples and explanation. Reaction mechanisms: Types of reactions- aromaticity-aromatic electrophilic substitution; nitration, halogenation, Friedel-Craft's alkylation and acylation. Heterocyclic compounds: Preparation, properties of pyrrole and pyridine.	12

IV	**Drugs and Speciality Chemicals** Definition, structure and uses: Antibiotics viz., Penicillin, Chloramphenicol and Streptomycin; Anaesthetics viz., Chloroform and ether; Antipyretics viz., aspirin, paracetamol and ibuprofen; Organic Halogen compounds viz., Freon, Teflon.	**12**
V	**Analytical Chemistry** Introduction qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques: extraction, distillation and crystallization. Chromatography: principle and application of column, paper and thin layer chromatography.	**12**

Text Books:

1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition,2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; PriyaPublications, Karur,2006.
3. ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition,2012.
4. P.L.Soni, H.M.Chawla, Text Book of Inorganic Chemistry;Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.

Reference Books:

1. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007.
2. B.K,Sharma, Industrial Chemistry; GOEL publishing house,Meerut, sixteenth edition, 2014.
3. Jayashree gosh, Fundamental Concepts of Applied Chemistry; Sultan & Chand, Edition 2006.

Course Outcomes:

On completion of the course the students should be able to

CO1: state the theories of chemical bonding, nuclear reactions and its applications.

CO2: evaluate the efficiencies and uses of various fuels and fertilizers.

CO3: explain the type of hybridization, electronic effect and mechanism involved in theorganic reactions.

CO4: demonstrate the structure and uses of antibiotics, anaesthetics, antipyretics andartificial sugars.

CO5: analyse various methods to identify an appropriate method for the separation of chemical components.

CO/PO	1	2	3	4	5	1	2	3	4	5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Semester-II & IV / Allied Course-III & VI	Chemistry-III	Course Code:BSQA3 / BSQA6
Instruction Hours : 4	Credits: 4	Exam Hours: 3
Internal Marks: 25	External Marks: 75	Total Marks: 100

Cognitive Level	**K1 – Recalling** **K2 – Understanding** **K3 - Applying** **K4 – Analyzing** **K5 – Evaluating** **K6 – Creating**
Course Objectives	This course aims to provide knowledge on • nomenclature of coordination compounds and carbohydrates. • Amino Acids and Essential elements of biosystem • understand the concepts of kinetics and catalysis • provide fundamentals of electrochemistry and photochemistry

UNIT	CONTENT	HOURS
I	**Co-ordination Chemistry and Water Technology** Co-ordination Chemistry**:** Definition of terms - IUPAC Nomenclature - Werner'stheory - EAN rule - Pauling's theory – Postulates - Applications to $[Ni(CO)_4]$,$[Co(CN)_6]^{3-}$ Chelation - Biological role of Hemoglobin and Chlorophyll (structure only) - Applications in qualitative and quantitative analysis. Water Technology: Hardness of water, determination of hardness of water using EDTA method -Purification techniques – Reverse osmosis method -BOD and COD (Definition only.	**12**
II	**Carbohydrates** Classification, preparation and properties of glucose and fructose. Discussion of open chain ring structures of glucose and fructose. Glucose-fructose interconversion. Preparation and properties of sucrose, starch and cellulose.	**12**
III	**Amino Acids and Essential elements of biosystem** Classification - preparation and properties of alanine, preparation of dipeptides using Bergmann method - Proteins- classification – structure - Colour reactions – Biological functions – nucleosides -nucleotides – RNA and DNA – structure. Essentials of trace metals in biological system-Na, Cu, K, Zn, Fe, Mg.	**12**

IV	**Electrochemistry** Galvanic cells - Standard hydrogen electrode - calomel electrode - standard electrode potentials -electrochemical series. Strong and weak electrolytes - ionic product of water -pH, pKa, pKb. Conductometric titrations - pH determination by colorimetric method – buffer solutions and its biological applications – Types of cells -fuel cells-corrosion and its prevention.	**12**
V	**Photochemistry** Grothus - Drapper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield - Hydrogen -chloride reaction. Phosphorescence, fluorescence, chemiluminescence and photosensitization and photosynthesis (definition with examples), Comparison with thermal reactions.	**12**

Text Books:

1. V.Veeraiyan, Textbook of Ancillary Chemistry; High mountpublishing house, Chennai, first edition, 2009.
2. S.Vaithyanathan, Text book of Ancillary Chemistry; PriyaPublications, Karur, 2006.
3. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012.
4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, NewDelhi, twenty ninth edition, 2007.

Reference Books:

1. Arun Bahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, New Delhi, twenty third edition, 2012.
2. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
3. P.L.Soni, Mohan Katyal, Text book of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition,2007.
4. B.R.Puri, L.R.Sharma, M.S.Pathania, Text book Physical Chemistry; Vishal Publishing Co., New Delhi, forty seventhedition, 2018.
5. B.K,Sharma, Industrial Chemistry; GOEL publishing house,Meerut, sixteenth edition, 2014.

Course Outcomes:On completion of the course the students should be able to

CO 1: write the IUPAC name for complex, different theories to explain the bonding incoordination compounds and water technology.

CO 2: explain the preparation and property of carbohydrate.

CO 3: enlighten the biological role of transition metals, amino acids and nucleic acids.

CO 4: apply/demonstrate the electrochemistry principles in corrosion, electroplating andfuel cells.

CO 5: outline the various type of photochemical process.

CO/PO	1	2	3	4	5	1	2	3	4	5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

Semester-II & IV / Allied Course-III	Chemistry-II (Practical)	Course Code: BSQA2Y/ PBSQA5Y/ BSQA5Y
Instruction Hours : 2	**Credits: 3**	**Exam Hours: 3**
Internal Marks: 40	**External Marks: 60**	**Total Marks: 100**

Cognitive Level	**K1 – Recalling** **K2 – Understanding** **K3 - Applying** **K4 – Analyzing** **K5 – Evaluating** **K6 – Creating**
Course Objectives	This course aims to provide knowledge on the • basics of preparation of solutions. • principles and practical experience of volumetric analysis • identification of organic functional groups • different types of organic compounds with respect to theirproperties. determination of elements in organic compounds

CONTENT

VOLUMETRIC ANALYSIS

1. Estimation of sodium hydroxide using standard sodiumcarbonate.
2. Estimation of hydrochloric acid using standard oxalic acid.
3. Estimation of ferrous sulphate using standard Mohr's salt.
4. Estimation of oxalic acid using standard ferrous sulphate.
5. Estimation of potassium permanganate using standard sodium thiosulphate
6. Estimation of magnesium using EDTA.

SYSTEMATIC ANALYSIS OF ORGANIC COMPOUNDS

The analysis must be carried out as follows:

(a) Functional group tests [phenol, acids (mono & di) aromatic primary amine, amides (mono & di), aldehydeand glucose].
(b) Detection of elements (N, S, Halogens).
(c) To distinguish between aliphatic and aromaticcompounds.
To distinguish – Saturated and unsaturated compounds.

Reference Books	V.Venkateswaran, R.Veerasamy, A.R.Kulandaivelu, Basic Principles ofPractical Chemistry; Sultan Chand & sons, Second edition, 1997.

Course Learning Outcomes (for Mapping with POs and PSOs)On completion of the course the students should be able to

CO 1: gain an understanding of the use of standard flask and volumetric pipettes, burette.
CO 2: design, carry out, record and interpret the results of volumetric titration.
CO 3: apply their skill in the analysis of water/hardness.
CO4: analyze the chemical constituents in allied chemical products

CO/PO	1	2	3	4	5	1	2	3	4	5
CO1	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S