

ALLIED CHEMISTRY

SYLLABUS

**FROM THE ACADEMIC YEAR
2023-2024**

GENERIC ELECTIVE

Paper No.	Generic Elective I					
Category	Generic Elective	Year	I	Credits	3	Course Code
		Semester	I			
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total	
	4	-			4	
Prerequisites	Higher secondary chemistry					
Objectives of the course	<p>This course aims to provide knowledge on the</p> <ul style="list-style-type: none"> • 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. 					
Course Outline	<p>UNIT I Chemical Bonding and Nuclear Chemistry Chemical Bonding: Molecular Orbital Theory-bonding, antibonding</p>					

	<p>and non-bonding orbitals. Molecular orbital diagrams for Hydrogen, Helium, Nitrogen; discussion of bond order and magnetic properties.</p> <p>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.</p>
	<p>Unit 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). Silicones: Synthesis, properties and uses of silicones. Fertilizers: Urea, ammonium sulphate, potassium nitrate, NPK fertilizer, superphosphate, triple superphosphate.</p>

	<p>UNIT III Fundamental Concepts in Organic Chemistry Hybridization: Orbital overlap, hybridization and geometry of CH₄, C₂H₄, C₂H₂ and C₆H₆. Electronic effects: Inductive effect and consequences on K_a and K_b of organic acids and bases, electromeric, mesomeric, hyper conjugation and steric- examples.</p> <p>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.</p>
	<p>UNIT 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. Carnot's cycle and efficiency of heat engine. Entropy and its</p>
	<p>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.</p> <p>Phase Equilibria: Phase rule - definition of terms in it. Applications of phase rule to water system. Two component system - Reduced phase rule and its application to a simple eutectic system (Pb-Ag).</p> <p>UNIT V Analytical Chemistry Introduction to qualitative and quantitative analysis. Principles of volumetric analysis. Separation and purification techniques – extraction, distillation and crystallization.</p> <p>Chromatography: principle and application of column, paper and thin layer chromatography.</p>
Extended Professional	Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved

Component (is a part of internal component only, Not to be included in the external examination question paper)	(To be discussed during the Tutorial hours)
Skills acquired from this course	Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills.
Recommended Text	<ol style="list-style-type: none"> 1. V.Veeraiyan, Text book of Ancillary Chemistry; High mount publishing house, Chennai, first edition,2009. 2. S.Vaithyanathan, Text book of Ancillary Chemistry; Priya Publications, Karur,2006. 3. S.ArunBahl, B.S.Bahl, Advanced Organic Chemistry; S.Chand and Company, NewDelhi, twenty third edition, 2012. 4. P.L.Soni, H.M.Chawla, Text Book of Organic Chemistry; Sultan Chand & sons, New Delhi, twenty ninth edition, 2007.
Reference Books	<ol style="list-style-type: none"> 5. P.L.Soni, MohanKatyal, Textbook of Inorganic chemistry; Sultan Chand and Company, New Delhi, twentieth edition, 2007. 6. B.R.Puri, L.R.Sharma, M.S.Pathania, Textbook Physical Chemistry; Vishal Publishing Co., New Delhi, fortyfourth edition, 2018. 7. B.K, Sharma, Industrial Chemistry; GOEL publishing house, Meerut, sixteenth edition, 2014.
Course Learning Outcomes (for Mapping with POs and PSOs) 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 the organic reactions.

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

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

CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3

Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
CO5	3	3	3	3	3
Weightage	15	15	15	15	15
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

CHEMISTRY FOR PHYSICAL SCIENCES I
(FOR MATHEMATICS & PHYSICS STUDENTS)

Time: 3 Hours

Max. Marks: 75

SECTION – A (10 X 2 = 20)

Answer ALL the questions.

1. What are isotopes? Give an example.
2. What is the bond order of nitrogen?
3. What is LPG?
4. Write any two applications of NPK fertilizer.
5. Chloroacetic acid is stronger than acetic acid. Why?
6. State Huckel's rule.
7. Write the mathematical statement of first law of thermodynamics.
8. What is phase rule?
9. What is Rf value?
10. Define crystallization.

SECTION – B (5 X 5 = 25)

Answer ALL the questions.

11. (a) Using MO diagram calculate the bond order of Helium.
Or
(b) Write notes on nuclear fission using suitable example.
12. (a) Write notes on Natural gas and water gas.
Or
(b) Write the preparation and uses of superphosphate and Urea.
13. (a) Explain the geometry of ethylene on the basis of hybridization.
Or
(b) Write the mechanism of Friedel- Craft's alkylation.
14. (a) Write the statements of second law of thermodynamics.
Or
(b) Explain the phase diagram of water system.
15. (a) Write notes on distillation.
Or
(b) Explain the principle and working of column chromatography.

SECTION – B (3 X 10 = 30)

Answer any THREE of the following questions.

16. Write the applications of radioisotopes.
17. Give Synthesis, properties and uses of silicones.
18. Explain hyper conjugation and steric effect with suitable example.
19. Explain the applications of a simple eutectic system using the phase diagram of Pb-Ag system.
20. Explain the principle, working and applications of Thin layer chromatography.

Paper No.	Generic Elective V					
Category	Generic Elective	Year	I/ II	Credits	1	Course Code
		Semester	I/III			
Instructional hours per week	Lecture	Tutorial	Lab Practice		Total	
		-	-	2		2
Prerequisites						
Objectives of the course	<p>This course aims to provide knowledge on the</p> <ul style="list-style-type: none"> basics of preparation of solutions. principles and practical experience of volumetric analysis 					
Course Outline	<p>VOLUMETRIC ANALYSIS</p> <ol style="list-style-type: none"> 1. Estimation of sodium hydroxide using standard sodium carbonate. 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 hydroxide. 6. Estimation of magnesium using EDTA. 7. Estimation of ferrous ion using diphenyl amine as indicator. 					
Reference Books	V.Venkateswaran, R.Veerasingam, A.R.Kulandaivelu, Basic Principles of Practical Chemistry; Sultan Chand & sons, Second edition, 1997.					
<p>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</p>						
CO /PSO	PSO1	PSO2	PSO3	PSO4	PSO5	
CO1	3	3	3	3	3	
CO2	3	3	3	3	3	
CO3	3	3	3	3	3	
CO4	3	3	3	3	3	
Weightage	12	12	12	12	12	

Weighted percentage of Course Contribution to PSOs	3.0	3.0	3.0	3.0	3.0
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Level of Correlation between PSO's and CO's

CO /PO	PO1	PO2	PO3	PO4	PO5
CO1	3	3	3	3	3
CO2	3	3	3	3	3
CO3	3	3	3	3	3
CO4	3	3	3	3	3
Weightage	12	12	12	12	12
Weighted percentage of Course Contribution to POs	3.0	3.0	3.0	3.0	3.0

Level of Correlation between PO's and CO's

SCHEME OF VALUATION

**CHEMISTRY PRACTICAL FOR PHYSICAL AND
BIOLOGICAL SCIENCES**

(for Mathematics and Physics – I Year/I Semester; for Botany and Zoology II Year/III Semester)

Internal assessment: 25 Marks

External assessment: 75 marks

Total: 100 marks

Max. Marks: 75

Record: 15 Marks

Volumetric Analysis: 60 Marks

Volumetric Analysis : 60 Marks (Maximum)

Short Procedure : 10 Marks

Error upto 2 % : 50 Marks

2 to 3 % : 40 Marks

3 to 4 % : 30 Marks

4 to 5 % : 20 Marks

> 5 % : 10 Marks

Arithmetic error : Deduct 1 mark

Wrong calculation : Deduct 20 % of marks scored

No calculation : Deduct 40 % of marks scored

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