

Sri Venkateswara University, Tirupati

**Syllabus for Chemistry (Major) in consonance with Curriculum frame work
w.e.f. AY 2025-26**

COURSE STRUCTURE (for Semesters I to VI)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1	General Chemistry	3	3
			Qualitative Analysis of Simple Salt	2	1
		2	Inorganic Chemistry	3	3
			Inorganic Preparations	2	1
	II	3	Organic Chemistry – I (Structural Theory & Hydrocarbons)	3	3
			Organic Preparations	2	1
		4	Physical Chemistry – I (States of Matter, Phase rule & Surface Chemistry)	3	3
			Physical Chemistry – I Practical	2	1
II	III	5	Organic Chemistry – II (Halogenated Hydrocarbons and Oxygen Containing Functional Groups)	3	3
			Organic Qualitative Analysis	2	1
		6	Physical Chemistry – II (Solutions and Electrochemistry)	3	3
			Physical Chemistry – II Practical	2	1
		7	Coordination Chemistry	3	3
			Preparation of Coordination Compounds	2	1
	IV	8	Organic Chemistry-III (Nitrogen Containing Organic Compounds & Biomolecules)	3	3
			Organic Chemistry-III Practical	2	1
		9	Physical Chemistry – III (Ionic equilibrium and Thermodynamics)	3	3

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
			Qualitative Analysis of Inorganic Mixture	2	1

III		10	Applied and Physical Chemistry	3	3
			Applied and Physical Chemistry Practical	2	1
	V	11	Organic Spectroscopy	3	3
			Organic Spectral Problems	2	1
		12 A	Analytical Methods in Chemistry	3	3
			Analytical Methods in Chemistry Practical	2	1
		13 A	Separation techniques and Chromatography	3	3
			Separation techniques and Chromatographic Techniques	2	1
	VI	14 A	Green Chemistry and Nanotechnology	3	3
			Green Chemistry and Nanotechnology - Practical	2	1
		15 A	Environment and Industrial Chemicals	3	3
			Environment and Industrial Chemicals Practical	2	1

Note: In the III Year (during the V and VI Semesters), students are required to select a pair of electives from one of the **Two** specified domains. **For example: if set 'A' is chosen, courses 12 to 15 to be chosen as 12 A, 13 A, 14 A and 15 A.** To ensure in-depth understanding and skill development in the chosen domain, students must continue with the same domain electives in both the V and VI Semesters.


(BOS chairman)
Dr. V. PRABHAKAR RAO
M.Sc., M.Phil, Ph.D.
LECTURER IN CHEMISTRY
Dr. YSR GOVT. DEGREE COLLEGE
VEDURUKUPPAM - 517 500
CHITTOOR (DIST), A.P.

SEMESTER-I

COURSE 1: GENERAL CHEMISTRY

Theory

Credits: 3

3 hrs/week

(Total: 45 hrs)

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I. LEARNING OBJECTIVES:

1. To understand the structure of the atom and its relation to periodic properties.
2. To explain different types of chemical bonding-ionic, covalent, metallic, hydrogen bonding.
3. To apply bonding theories to predict molecular structure and bonding nature.
4. To correlate periodic trends with physical and chemical properties of elements.
5. To evaluate practical applications of nuclear chemistry in science and industry

II. COURSE OUTCOMES:

At the end of the course the student will be able to

1. Describe the electronic configuration of elements and periodic trends.
2. Analyze the formation and properties of ionic and covalent compounds.
3. Apply VSEPR, hybridization, and MOT to predict molecular geometry and bonding.
4. Explain metallic bonding, hydrogen bonding, and intermolecular forces and relate them to physical properties.
5. Explain types of radioactivity, nuclear reactions, and real-life applications.

III. SYLLABUS:

UNIT-1: ATOMIC STRUCTURE AND PERIODIC TABLE

(9 h)

Electronic configuration-Aufbau principle, Hund's rule and Pauli's exclusion principle. Periodic law and arrangement of elements in the periodic table, horizontal, vertical, and diagonal relationships in the periodic table. Definition and periodic trends of atomic radii, ionic radii, covalent radii, ionization potential, electron affinity, and electronegativity, Pauling scale, variable valency, inert-pair effect.

UNIT-2: IONIC BOND

(9 h)

Definition and properties of ionic compounds, factors favouring the formation of ionic compounds, Lattice energy: definition, factors affecting lattice energy, Born-Haber cycle - enthalpy of formation of ionic compound and stability, Covalent character in ionic compounds - polarization and Fajan's rules, effects of polarization.

UNIT- 3: COVALENT BOND

(9 h)

Valence Bond theory: Hybridization of atomic orbitals and geometry of molecules - BeCl_2 , BF_3 , CH_4 , PCl_5 , and SF_6

VSEPR model: Effect of bonding and nonbonding electrons on the structure of molecules - NH_3 , H_2O , SF_4 , ICl_2^- and XeF_4

Molecular orbital theory: Postulates, LCAO method, construction of M.O. diagrams for homo nuclear and hetero nuclear diatomic molecules (N_2 , O_2 , CO and NO), bond order, magnetic nature.

IV- 4: METALLIC AND HYDROGEN BONDS

(9 h)

Metallic bond: Definition, metallic properties, free electron theory, band theory of metals. Explanation of conductors, semiconductors and insulators.

Hydrogen bonding: Definition, intra and inter-molecular hydrogen bonding, influence on the physical properties of molecules, Van der Waals forces, dipole-dipole interactions.

UNIT-5: NUCLEAR CHEMISTRY

(9 h)

Definition, Isotopes, n/p ratio, binding energy, types of radioactivity, Soddy-Fajan's displacement law, Law of Radioactivity, Radioactive decay series, Nuclear Reactions- Fission and Fusion, Applications of radioactivity in agriculture and medicine.

IV. REFERENCES:

1. J.D. Lee, Concise Inorganic Chemistry, 5th ed., Blackwell Science, London, 1996.
2. B. R. Puri, L.R. Sharma, K.C. Kalia, Principles of Inorganic Chemistry, Shoban Lal Nagin Chand and Co., 1996.
3. D.F. Shriver and P.W. Atkins, Inorganic Chemistry, 3rd ed., W. H. Freeman and Co, London,
4. James E. Huheey, **Inorganic Chemistry: Principles of Structure and Reactivity**, 4th ed., 2017.
5. W.U. Malik, G.D Tuli, R.D Madan, Selected Topics in Inorganic Chemistry, S. Chand Publishing, 1998.
6. H.J. Amikar, Essentials of Nuclear Chemistry, New Age International Publishers, 2015.

V. PROPOSED ACTIVITIES:

1. Chart on periodic trends like radii, ionization energy, electronegativity across groups/periods.
2. Worksheet solving- MOT diagrams and hybridization problems.
3. Model Building-Build 3D structures using kits/software for CH₄, PCl₅, XeF₄ etc.

VI. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS

1. Continuous Internal Evaluation (CIA): Monitoring the progress of student's learning.
2. Class Tests, Worksheets, Quizzes, Industrial/Field visits, Student seminars, Poster and PPT presentations, Peer learning, Project-based learning, Assignments, Debates, Group Discussions: Enhances critical thinking skills.
3. Semester End Examination (SEE): Critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

SEMESTER: I
COURSE 1: QUALITATIVE ANALYSIS OF SIMPLE SALTS

Practicals

Credits: 1

2 hrs/w

(Total: 30 hrs)

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I. LEARNING OBJECTIVES:

1. To understand the theoretical principles behind classical qualitative analysis of cations and anions.
2. To develop the ability to identify common cations and anions in inorganic salts.
3. To practice laboratory safety and correct handling of reagents.
4. To record and interpret observations accurately in systematic salt analysis.

II. COURSE OUTCOMES:

At the end of the course the student will be able to

1. Proper use of glassware, equipment and chemicals in the laboratory
2. Apply systematic procedures to identify one cation and one anion in a given inorganic salt.
3. Analyze reactions based on solubility, color changes, and precipitate formation.
4. Interpret results to draw conclusions and confirm the identity of ions.

III. SYLLABUS:

Analysis of simple salts containing **one anion and one cation** from the following:

Anions: Carbonate, sulphate, chloride, bromide, acetate, nitrate, borate

Cations: Lead, copper, iron, aluminium, zinc, nickel, manganese, calcium, barium, ammonium.

IV. REFERENCES

1. G. Svehla, Vogel's Textbook of Qualitative Inorganic Analysis, Pearson Education, 2008.
2. K. Nagaraj, S. Kamalesu, S. Lokhandwala, N.M. Parekh, Textbook of Semi-micro Inorganic Qualitative Analysis, Notion Press, 2023.
3. G. Pass, H. Sutcliffe, Practical Inorganic Chemistry. 2nd edition, John-Wiley & Sons, 2020.

V. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS

1. Internal Practical Assessment
2. Lab Record Evaluation
3. Final Practical Examination
4. Oral/Viva Voce

Model question paper- Semester: I
Subject: Chemistry Major wef: 2025- 26

COURSE 1: GENERAL CHEMISTRY

Max. time: 3 hrs

Max. marks: 75

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Section: A

Answer any 5 of the following 10 questions. Each question carries 3 marks (2 questions should be given from each unit) **5 QX 3 M = 15 M**

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Section: B

Answer 5 of the following 10 questions following internal choice. Each question carries 12 marks (2 questions should be given from each unit)

5 QX 12 M = 60 M

11. Questions 11 & 12 from unit 1. One should be answered.
- 12.
13. Question 13 & 14 from unit 2. One should be answered
- 14.
15. Question 15 & 16 from unit 3. One should be answered
- 16.
17. Question 17 & 18 from unit 4. One should be answered
- 18.
19. Question 19 & 20 from unit 5. One should be answered
- 20.