

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)
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SEMESTER-II

COURSE 4: PHYSICAL CHEMISTRY-I

Theory

Credits: 3

3 hrs/week

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I. LEARNING OBJECTIVES:

1. To understand the theoretical principles governing gases, liquids, solids, and colloidal systems.
2. To apply gas laws and interpret the behavior of real and ideal gases.
3. To describe physical properties of matter in various states and relate them to structural features.
4. To interpret phase diagrams and apply Gibbs' phase rule to one- and two-component systems.

II. COURSE OUTCOMES:

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

1. Explain gas laws, ideal and real gases behaviour, and critical phenomena.
2. Describe properties of liquids and classify types and applications of liquid crystals.
3. Derive Bragg's equation and identify types of crystal defects.
4. Apply the phase rule to interpret phase diagrams and systems with eutectic/congruent/incongruent points.
5. Differentiate between types of adsorption and colloidal systems, and evaluate their applications.

III. SYLLABUS:

UNIT-1: GASEOUS STATE

(9 h)

Gas laws, Ideal Gas equation, Vander Waal's equation of state (with derivation), Andrew's isotherms of carbon dioxide, Critical phenomena-critical temperature, pressure and volume (derivation not required), Relationship between critical constants and van der Waal's constants (with derivation), Law of corresponding states, Joule-Thomson effect, Inversion temperature.

UNIT-2: LIQUID STATE

(9 h)

Physical properties of liquids: Definition of vapour pressure, boiling point, surface tension and coefficient of viscosity, Effect of temperature and addition of solutes on surface tension and viscosity.

Liquid crystals: Mesomorphic state, Differences between liquid crystal and solid/liquid. Classification of liquid crystals into Smectic, Nematic and cholesteric, Application of liquid crystals as LCD devices.

UNIT-3: SOLID STATE

(9 h)

Law of constancy of interfacial angles, The law of rationality of indices-Miller indices, Symmetry in crystals, definition of lattice point, space lattice, unit cell, Bravais lattices and crystal systems, X-ray diffraction and crystal structure, Bragg's law and its derivation, Defects in crystals: Stoichiometric and Non-stoichiometric defects.

UNIT-4: PHASE RULE

(9 h)

The concept of phase, components, degrees of freedom, Gibbs phase rule, Phase diagram of one component system – water system, Definition and examples for systems having congruent and incongruent melting point, Study of Phase diagrams of Simple eutectic systems (i) Pb-Ag system, desilverisation of lead (ii) NaCl-Water system, freezing mixtures

UNIT-5: SURFACE CHEMISTRY

(9 h)

Colloids: Definition and classification of Colloids, Coagulation of colloids, Hardy-Schulze rule. Stability of colloids, Protection of Colloids-Gold number.

Adsorption: Definition, Physical and chemical adsorption, Freundlich and Langmuir adsorption isotherm (with derivation), applications of adsorption.

IV. REFERENCES:

1. P.W. Atkins, J.de., Paula, Atkin's Physical Chemistry, 10th Edition, Oxford University Press, 2014.
2. D.W. Ball, Physical Chemistry, 2nd Edition, Cengage Learning, 2017.
3. G.W. Castellan, Physical Chemistry, 4th Edition, Narosa, 2014.
4. K.L. Kapoor, A Textbook of Physical Chemistry, 6th Edition, McGraw-Hill Education, 2015.

V. PROPOSED ACTIVITIES:

1. Model building: Bravais lattices and symmetry in crystals
2. Chart preparation of phase diagrams (Water, Pb-Ag, NaCl-H₂O)
3. PPT: Adsorption isotherms or colloidal behavior.
4. List out applications of Liquid crystals in different display devices.
5. Peer Teaching: Phase rule and eutectic systems

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-II

COURSE 4: PHYSICAL CHEMISTRY-I PRACTICAL

Practical

Credits: 1

2 hrs/week

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I. LEARNING OBJECTIVES:

1. To understand the concepts of surface tension and viscosity of liquids.
2. To familiarize students with using different lab equipment and glassware for the determination of the coefficient of viscosity and surface tension.
3. To gain hands-on experience in preparing colloidal solutions.

II. COURSE OUTCOMES:

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

1. Use glassware, equipment and follow experimental procedures in the laboratory.
2. Determine surface tension and viscosity using standard experimental techniques.
3. Prepare colloidal solutions and study their stability.
4. Conduct adsorption experiments and verify Freundlich isotherm

III. SYLLABUS:

1. Determination of surface tension of liquid by drop count method.
2. Determination of surface tension of liquid by drop weight method.
3. Determination of coefficient of viscosity of an organic liquid.
4. Preparation of sols: $\text{Al}(\text{OH})_3$, $\text{Fe}(\text{OH})_3$ and starch.
5. Adsorption of acetic acid on animal charcoal, verification of Freundlich isotherm.

IV. REFERENCES:

1. B.D. Khosla, V.C. Garg, A. Gulati, Senior Practical Physical Chemistry, R. Chand & Co, New Delhi, 2015.
2. K.L. Kapoor, A Textbook of Physical Chemistry, McGraw-Hill Education, 2019.
3. C.W. Garland, J.W. Nibler, D.P. Shoemaker, Experiments in Physical Chemistry, 8th Edition, McGraw-Hill, New York, 2003.

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: II
Subject: Chemistry Major
Single major program wef: 2025- 26

COURSE 4: PHYSICAL CHEMISTRY – I
(STATES OF MATTER, PHASE RULE & SURFACE 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.