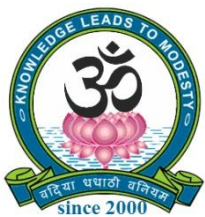


Bachelor of Science



Chemistry



SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

[An Autonomous College Affiliated to Periyar University, Salem, Tamil Nadu]

[Accredited by NAAC with 'A' Grade with CGPA of 3.27]

[Recognized 2(f) & 12(B) Status under UGC Act of 1956]

Katteri – 636 902, Uthangarai (Tk), Krishnagiri (Dt)

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DEGREE OF BACHELOR OF SCIENCE IN CHEMISTRY

CHOICE BASED CREDIT SYSTEM (CBCS)

REGULATIONS AND SYLLABUS FOR

B.SC. CHEMISTRY PROGRAMME

(SEMESTER PATTERN)

**(For Students Admitted in the College from the
Academic Year 2020-2021 Onwards)**



Programme Outcomes (POs)

PO1	Graduates are prepared to be creators of new knowledge leading to innovation and entrepreneurship employable in various sectors such as private, government, and research organizations
PO2	Graduates are trained to evolve new technologies in their own discipline.
PO3	Graduates are groomed to engage in lifelong learning process by exploring their knowledge independently
PO4	Graduates are framed to design and conduct experiments /demos/create models to analyze and interpret data.
PO5	Graduates ought to have the ability of effectively communicating the findings of Physical sciences; incorporating with existing knowledge

Programme Specific Outcomes (PSOs)

PSO1	Human and Social Values and Responsibilities in the context of learning Chemistry
PSO2	Communicative Skills and the Creative scientific mind towards learning chemistry
PSO3	Positive approach towards Environment and Ecology from the Chemistry perspective
PSO4	Critical thinking and the Analytical mind, students develop for the in depth knowledge in advanced-level Chemistry
PSO5	The relevance of extension of Chemistry in the social context for solving social issues
PSO6	Employability Skills shall enable the students to find jobs in core- chemistry and other related fields
PSO7	Entrepreneurial Skills shall empower the students to start their own industries / business in core-chemistry fields
PSO8	Analytical or Experimental Skills make the students capable of doing higher-level research works in the emerging fields of chemistry



SRI VIDYA MANDIR ARTS & SCIENCE COLLEGE

(Autonomous)

Bachelor of Science (B.Sc.) in Chemistry

Programme Pattern and Syllabus (CBCS)

(For Students Admitted in the College from the Academic Year 2020-2021 Onwards)

Sl. No	Nature of the Course	Course Code	Name of the Course	Hours / Week	Credits	Marks		
						CIA	ESE	Total
SEMESTER I								
1	Language I	20UTA1F01	Tamil - I	6	3	25	75	100
2	English I	20UEN1F01	English - I	6	3	25	75	100
3	Value Education*	20UVE101	Value Education	2	1	25	75	100
4	Core-I	20UCH1C01	General Chemistry I	5	4	25	75	100
5	Core practical-I	20UCH1P01	Inorganic Qualitative Analysis-I and Complex Preparation	3	3	40	60	100
6	Allied I	20UMA1A01	Allied Mathematics-I	5	4	25	75	100
		20UZO1A01	Allied Zoology-I					
7	Allied-I Practical	20UMA1AP01	Allied Mathematics Practical -I	3	3	40	60	100
		20UZO1AP01	Allied Zoology Practical -I					
Total				30	21	205	495	700
SEMESTER II								
8	Language II	20UTA2F02	Tamil - II	5	3	25	75	100
9	English II	20UEN2F02	English - II	5	3	25	75	100
10	EVS	20UES201	Environmental Studies	2	1	25	75	100
11	Core-II	20UCH2C02	General Chemistry II	5	4	25	75	100
12	SBEC I	20UCH2S01	Food and Nutrition	2	1	25	75	100
13	Core practical-II	20UCH2P02	Practical II: Inorganic Qualitative Analysis-II	3	3	40	60	100
14	Allied II	20UMA2A02	Allied Mathematics-II	5	4	25	75	100
		20UZO2A02	Allied Zoology-II					
15	Allied-I Practical	20UMA2AP02	Allied Mathematics Practical -II	3	3	40	60	100



		20UZO2AP02	Allied Zoology practical - II					
Total				30	22	230	570	800
SEMESTER-III								
16	Language III	20UTA3F03	Tamil - III	5	3	25	75	100
17	English III	20UEN3F03	English - III	5	3	25	75	100
18	NMEC - I	20UCH3N01	Non Major Elective Course - I	2	1	25	75	100
19	Core-III	20UCH3C03	General Chemistry III	6	4	25	75	100
20	Core Practical-III	20UCH3P03	Practical III: Volumetric Analysis- I	3	3	40	60	100
21	Allied-III	20UPH3A01	Allied Physics-I	6	4	25	75	100
22	Allied Practical-III	20UPH3AP01	Allied Physics Practical - I	3	3	40	60	100
Total				30	21	205	495	700
SEMESTER IV								
23	Language IV	20UTA4F04	Tamil - IV	5	3	25	75	100
24	English IV	20UEN4F04	English - IV	5	3	25	75	100
25	NMEC - I	20UCH4N02	Non Major Elective Course - I	2	1	25	75	100
26	SBEC II	20UCH4S02	Polymer Chemistry	2	1	25	75	100
27	Core - IV	20UCH4C04	General Chemistry IV	5	4	25	75	100
28	Core practical - IV	20UCH4P04	Practical IV: Volumetric Analysis- II	3	3	40	60	100
29	Allied - IV	20UPH4A02	Allied Physics-II	5	4	25	75	100
30	Allied Practical - IV	20UPH4AP02	Allied Physics Practical - II	3	3	40	60	100
Total				30	22	230	570	800
SEMESTER V								
31	Core -V	20UCH5C05	Inorganic Chemistry I	4	4	25	75	100
32	Core - VI	20UCH5C06	Organic Chemistry I	4	4	25	75	100
33	Core -VII	20UCH5C07	Physical Chemistry I	5	4	25	75	100
34	Elective I	20UCHE01	Analytical Chemistry I	4	3	25	75	100
35	SBEC -III	20UCH5S03	Agricultural Chemistry	2	1	25	75	100
36	SBEC -IV	20UCH5S04	Dye Chemistry	2	1	25	75	100
37	CorePractical -	20UCH5P05	Practical IV:Gravimetric	3	3	40	60	100



	V		Estimation I					
38	Core Practical - VI	20UCH5P06	Practical V: Physical Chemistry Practical I	3	3	40	60	100
39	Core Practical - VII	20UCH5P07	Practical VI: Organic Chemistry Practical I	3	3	40	60	100
Total				30	26	270	630	900
SEMESTER VI								
40	Core - VIII	20UCH6C08	Inorganic Chemistry II	4	4	25	75	100
41	Core - IX	20UCH6C09	Organic Chemistry II	4	4	25	75	100
42	Core - X	20UCH6C10	Physical Chemistry II	5	4	25	75	100
43	Elective II	20UCH6E02	Analytical Chemistry II	4	3	25	75	100
44	SBEC - V	20UCH6S05	Pharmaceutical Chemistry	2	1	25	75	100
45	SBEC - VI	20UCH6S06	Industrial Chemistry	2	1	25	75	100
46	Core Practical - VIII	20UCH6P08	Practical V: Gravimetric Estimation II	3	3	40	60	100
47	Core Practical - IX	20UCH6P09	Practical V: Physical Chemistry Practical II	3	3	40	60	100
48	Core Practical - X	20UCH6P10	Practical V: Organic Chemistry Practical	3	3	40	60	100
49	Extension Activities (SWAYAM)			-	2	-	-	-
Total				30	28	270	630	900
Cumulative Total				180	140	1410	3390	4800

Note

- CBCS – Choice Based Credit system
 CIA – Continuous Internal Assessment
 ESE – End of Semester Examinations
 SWAYAM – Study Webs of Active-Learning for Young Aspiring Minds
 NPTEL – National Programme on Technology Enhanced Learning

Major Elective Courses

- 1 Analytical chemistry-I
2. Analytical chemistry-II

**Non-Major Elective Courses**

1. Communication English / Hindi
2. Basic Computer Applications

List of Extension Activities

1. National Cade Corps (NCC)
2. National Service Scheme (NSS)
3. Youth Red Cross (YRC)
4. Physical Education (PYE)
5. Eco Club (ECC)
6. Red Ribbon Club (RRC)
7. Women Empowerment Cell (WEC)



PROGRAMME SYLLABUS



Program: B.Sc. Chemistry				
Core – I		Course Code: 20UCH1C01		Course Title: General Chemistry – I
Semester	Hours/Week	Total Hours	Credits	Total Marks
I	6	90	4	100

Course Objectives

1. Students shall explain the behavior and interactions between matter and energy at both the atomic and molecular levels.
2. Students shall use standardized names and symbols to represent atoms, molecules, ions and apply on chemical reactions.
3. Students shall predict the atomic structure, chemical bonding or molecular geometry based on accepted models.
4. Students shall apply quantitative reasoning skills to matter and energy and also study the physical or chemical changes that occur.
5. Students shall use accepted models to describe the reactions between gaseous systems and become aware of their physical properties.
6. Students shall demonstrate competence in collecting and interpreting data from their knowledge on analytical techniques.

UNIT- 1 Atomic Structure -I (18 Hours)

1.1. Dual nature of matter- Debroglie equation- derivation and limitation-Heisenberg's uncertainty principle- Schrodinger's wave equation(derivation not needed)-postulates of Bohr atom model-origin of Hydrogen spectrum

1.2. Quantum numbers-Pauli's Exclusion principle and its application-Hund's rule- its basis and applications - stability of half-filled and fully – filled orbitals- Aufbau principle and its limitations.Differences between an orbit and orbital-shapes of different orbitals

UNIT-II Atomic Structure –II (18 Hours)

2.1. Periodic properties: Atomic and ionic radii, Ionization Energy, Electron affinity and Electro negativity – Definition, Variation of the periodic properties along periods and groups-



theoretical explanation for the variations. Measurement of electronegativity using Pauling's scale and Mulliken scale.

2.2. Radioactivity-Isotopes, Isobar, Isotones- Radioactive series- Uranium series-Thorium series-Actinium series-Neptunium series.

UNIT-III Analytical chemistry (18 Hours)

3.1. Handling of chemicals – Safety and hygiene in chemical laboratory-storage and handling of chemicals, handling of acids, ethers, toxic and poisonous chemicals, antidotes. Threshold vapour concentration and first aid procedure.

3.2. Principles of Volumetric analysis- Definition of molarity, molality, normality and mole fraction-Definition and examples for Primary and Secondary standards. Theories of acid-base, redox, iodometric, iodimetric and complexometric titrations.

UNIT – IV Structure and Bonding of Alkanes and Alkenes (18 Hours)

4.1. IUPAC Nomenclature – aliphatic and aromatic compounds of simple functional groups – Hybridization and structure of Methane – ethylene – acetylene.

4.2 Alkane – Ethane preparation - properties and conformation analysis – octane number – cetane number

4.3 Alkenes-preparation, electrophilic and free radical mechanism of addition – Markownikoff's Rule – Anti Markownikoff's Rule -mechanism of hydroboration.

4.4 Electron displacement effects: Inductive and steric effects-their effect on properties of compounds, resonance, hyperconjugation - localised and delocalized chemical bond.

UNIT V The first law of thermodynamics (18 Hours)

5.1. Terminology of Thermodynamics-Thermodynamic equilibrium-Nature of work and heat-Law of conservation of energy- first law of thermodynamics-Internal energy-Enthalpy of a system- Heat capacity of a system-Expansion of an ideal gas-work done in reversible isothermal expansion-work done in reversible isothermal compression-work done in reversible adiabatic expansion – Joule-Thomson effect, Joule-Thomson coefficient-Inversion temperature - zeroth law of thermodynamics-Absolute temperature scale - Kirchoff's equation.

**Text Books**

1. Puri B R, Sharma L R and Kalia K K, Principles of Inorganic Chemistry, 23rd Ed., (1993) Shoban Lal Nagin Chand & Co., New Delhi.
2. Bhal B S and Arun Bhal, Advanced Organic Chemistry, 12th Ed., (1997), Sultan Chand & Co., New Delhi.
3. Puri B R, Sharma L R and Kalia K K, Principles of Physical Chemistry, 23rd Ed., (1993) Shoban LalNagin Chand & Co., New Delhi.

Reference Books

1. Lee J D, Concise Inorganic Chemistry, 5th Ed., (2006), Black Well Science, UK.
2. Morrison R T, Boyd R N and Batcharjee S K, Organic Chemistry, 7th Ed., (2009), Pearson New York
3. Peter Atkins and Julio De Paula, Atkin's Physical Chemistry, 4th Ed., (2006), Oxford University Press, New Delhi.

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Identify structure of atom	K1
CO2	Understand the concept of Dual nature of matter and atomic character in some molecules	K2
CO3	Illustrate the importance of storage and handling of chemicals	K3
CO4	Analyse the Safety and hygiene in chemical laboratory	K4
CO5	Evaluate the techniques of thermochemistry	K5&K6
CO6	Formulate the structure and bonding reactions shown by organic molecules	K5&K6

K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6 –Create



Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	M	S
CO2	S	H	M	H	H
CO3	H	M	S	S	M
CO4	H	H	H	M	S
CO5	S	S	M	H	S
CO6	H	S	S	S	S

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Chemistry				
Core Practical – I		Course Code: 20UCH1CP01		Course Title: Inorganic Qualitative Analysis – I & Complex Preparation
Semester I	Hours/Week 3	Total Hours 45	Credits 3	Total Marks 100

Course Objectives

(a). To Analysis of Inorganic salt containing one anion and one cation. Semi-micro method using the conventional scheme to be adopted.

Anions to be Studied - I

Carbonate, Sulphide, Sulphate, Nitrate, Chloride, Bromide.

Cations to be Analyzed – II

Lead, Copper, Cadmium, Bismuth, Aluminium, Iron, Nickel, Zinc and Ammonium.

Preparation of Inorganic Compounds - II

1. Tetrammine copper II sulphate
2. Tris (thiourea) copper I chloride
3. Potassium trioxalato ferrate (II)
4. Chloropentammine cobalt (III) chloride
5. Ferrous ammonium sulphate
6. Microcosmic salt

Acid Radical 15 Marks

Basic Radical 10 Marks

Preparation 10 Marks

Record 10 Marks

Viva Voce 10 Marks

Procedure 05 Marks

TOTAL 60 MARKS

Reference:

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, (2nd edition), New Delhi, Sultan Chand & sons, (1997)

Course Outcomes

- * Students shall learn the techniques of semi micro qualitative analysis of inorganic salt mixtures.
- * Students become familiar with elimination of interfering acid radicals.



Program: B.Sc. Chemistry				
Core –II	Course Code: 20UCH2C02		Course Title: General Chemistry – II	
Semester	Hours/Week	Total Hours	Credits	Total Marks
II	5	90	4	100

Course Objectives

1. Students shall understand the concepts of chemical bonding
2. Students shall become aware of the fundamental aspects of reaction intermediate and its influence on chemical properties
3. Students will learn the chemical aspects of cycloalkanes
4. Students shall become aware of the chemistry of aromatic hydrocarbons
5. Students shall learn the Second law of Thermodynamic principles
6. Students shall learn to apply the concept of thermodynamics in real life context.

UNIT – I Chemical Bonding-I (18 Hours)

1.1. Ionic bond-condition for the formation of ionic bond -inert pair effect-Born Haber cycle-polarization of ions- Fajan's rules and applications. Covalent Bond-mode of formation-properties of covalent compounds-Octet theory- Explanation of the failure of Octet rule- Comparison of the properties of Ionic and Covalent compounds –

1.2 Co-ordinate bond – mode of formation –properties of co-ordinate bond –Nature of Metallic bond by Electron – gas theory –Hydrogen bond –mode of formation – properties of Hydrogen bonds-Types of Hydrogen bonds . Vander waals force-definition –Types-applications.

UNIT – II Chemical Bonding - II (18 Hours)

2.1 Valency bond theory – postulates – different types of overlapping - Comparative study of VB and MO theory. Hydrides – types of hydrides – preparation, properties , uses and structure of NaBH_4 and LiAlH_4 .

2.2. Molecular orbital theory – postulates –Bonding , anti –bonding molecular orbitals – Energy level diagram for molecular orbitals-bond order – magnetic property – C_2 , N_2 , O_2 -



Energy level diagram for molecular orbitals-bond order – magnetic property of Hetero nuclear diatomic molecules – CO , NO .

UNIT – III Reaction intermediates (18 Hours)

- 3.1. Reaction intermediates: carbocation, carbanion, free radicals-formation and stability.
- 3.2. Aliphatic nucleophilic substitution- SN1, SN2 and SNi reactions – mechanism and stereochemistry. Competition between substitution and elimination.
- 3.3. Elimination reactions-mechanisms of E1 and E2 reactions- Hofmann and Saytzeff rule.
- 3.4. Dienes-isolated and conjugated dienes - 1, 3 butadiene preparation and properties - 1, 2 and 1, 4-addition.

UNIT – IV Cycloalkanes and Aromatic Hydrocarbons (18 Hours)

- 4.1. Cycloalkanes- methods of formation-Wurtz reaction, Dieckmann ring closure and Baeyer's strain theory and its limitations.
- 4.2. Electrophilic substitution reactions in aromatic compounds- general mechanism – Nitration, Halogenation, Sulphonation, Friedel- Crafts acylation and alkylation. Nuclear and side chain halogenation.
- 4.3. Polynuclear aromatic hydrocarbons- naphthalene, anthracene -isolation, synthesis and properties

UNIT – V Second law of thermodynamics-I(18 Hours)

- 4.1. Limitations of the first law-need for second law- spontaneous processes-cyclic process-Carnot cycle – efficiency - Carnot theorem-Thermodynamic scale of temperature.
- 4.2. Concept of entropy-Entropy-a state function-Entropy change in isothermal expansion of an ideal gas-entropy change in reversible and irreversible processes-Clausius inequality-Entropy change accompanying change of phase—Entropy of mixture of ideal gases-entropy of mixing physical significance of entropy.

Text Books:

1. Puri B R, Sharma L R and Kalia K K, Principles of Inorganic Chemistry, 23rd Ed., (1993) Shoban Lal Nagin Chand & Co., New Delhi.
2. Bhal B S and Arun Bhal, Advanced Organic Chemistry, 12th Ed., (1997) Sultan Chand & Co., New Delhi.



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3. Peter Atkins and Julio De Paula, Atkin's Physical Chemistry, 4th Ed., (2006), Oxford University Press, New Delhi.

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Define chemical bonding	K1
CO2	Understand the concept of different types of overlapping	K2
CO3	Illustrate the importance of Second law of thermodynamics and concept of entropy	K3
CO4	Analyse the Electrophilic substitution reactions in aromatic compounds	K4
CO5	Evaluate the Reaction intermediates	K5&K6
CO6	Formulate the Molecular orbital theory	K5&K6

K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6 –Create

Mapping of COs with POs

PO \ CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	H	M
CO2	S	M	M	H	H
CO3	M	H	H	H	H
CO4	H	M	M	M	S
CO5	S	S	M	M	S
CO6	H	H	S	S	M

S - Strong

H - High

M - Medium

L – Low



Program: B.Sc. Chemistry				
Core Practical – II		Course Code: 20UCH2CP02		Course Title : Qualitative Analysis of Inorganic Salt Mixture-II
Semester II	Hours/Week 3	Total Hours 45	Credits 3	Total Marks 100

Course Objective

Analysis of mixture containing two cations and two anions of which one will be an Interfering ion. Semi-micro methods using the conventional scheme to be adopted.

Cations to be studied

Lead, Copper, Bismuth, Cadmium, Iron, Aluminium Zinc, Manganese, Cobalt, Nickel, Barium, Calcium, Strontium, Magnesium and Ammonium.

Anions to be studied

Carbonate, Sulphide, Sulphate, Nitrate, Chloride, Bromide, Fluoride, Borate, Oxalate and Phosphate.

RECORD 10 Marks

VIVA VOCE 10 Marks

ACID RADICALS 20 Marks

BASIC RADICALS 20 Marks

Total 60 Marks

REFERENCE BOOKS:

1. Venkateswaran V, Veeraswamy R., Kulandaivelu A.R., Basic Principles of Practical Chemistry, (2nd edition), New Delhi, Sultan Chand & sons, (1997)

Course Outcomes

- * Students shall learn the techniques of titrimetric analyses.
- * Students will become familiar with safe-handling of chemical balance



Program: B.Sc. Chemistry				
SBEC – I		Course Code: 20UCH2S01	Course Title : Food and Nutrition	
Semester	Hours/Week	Total Hours	Credits	Total Marks
II	2	30	1	100

Course Objectives

1. To study the Sources of foods, its types and constituents.
2. To know about Mal nutrition, poor nutritional status and guidelines for good health.
3. To study about Food poisoning and Food adulteration.
4. To study about Food spoilage and Food preservation.
5. To know about Sources, requirement and deficiency diseases of vitamins and minerals.

UNIT – I FOOD SOURCES

1.1. Sources of foods, types, constituents of foods-carbohydrate, protein, fats.Oils, colours, flavours and natural toxicants.

UNIT – II NUTRITION

- 2.1. Definition of nutrition, nutrients, functions. Nutritional status – Definition, signs of good and poor nutritional status.
- 2.2. Mal nutrition- Definition, forms, causes and remedy.
- 2.3. Health –Definition, guidelines for good health.

UNIT – III FOOD POISONING AND ADULTERATION

- 3.1. Food poisoning- Sources, causes and remedy.
- 3.2 Causes and remedies for acidity, gastritis, indigestion and constipation
- 3.3. Food adulteration- Types of adulterants- intentional and incidental, effects and detection.

UNIT – IV FOOD PRESERVATION AND PROCESSING

- 4.1. Food spoilage, causes of food spoilage, types of Food spoilage
- 4.2. Food preservation-preservation and processing by heating - sterilization, pasteurization.

UNIT – V VITAMINS AND MINERALS

- 5.1. Sources, requirement and deficiency diseases of A, C, K, E1 and B1, B2.



5.2. Mineral elements in food-source, function, deficiency diseases and daily requirements of Na, K, Mg, Fe, S and P

Reference Books

1. Seema **Yadav**, **Food Chemistry**, Anmol publishing (P) Ltd, New Delhi
2. Car H. Synder, **The Extraordinary Chemistry for ordinary thing**, John Wiley & sons inc., New York, 1992.
3. B.Sivasankar, **Food Processing and Preservation** – PHI Learning (P) Ltd, New Delhi-11001.
4. B.Srilakshmi, **Nutrition science**. Third edition, New age International (P) Ltd. New Delhi, Chennai.

Course Outcomes (COs)

On successful completion of the course, the students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Define Sources of foods	K1
CO2	Understand the concept of Mal nutrition	K2
CO3	Illustrate the importance of Food poisoning and Food adulteration	K3
CO4	Analyze the Food spoilage and Food preservation	K4
CO5	Evaluate the Sources, requirement and deficiency diseases of vitamins and minerals	K5&K6

K1– Remember, K2– Understand, K3– Apply, K4 –Analyze, K5– Evaluate, K6 –Create



Mapping of COs with POs

PO CO	PO1	PO2	PO3	PO4	PO5
CO1	S	H	H	H	M
CO2	S	M	M	H	H
CO3	M	H	H	H	H
CO4	H	M	M	M	S
CO5	S	S	M	M	S
CO6	H	H	S	S	M

S - Strong

H - High

M - Medium

L – Low