GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

NAAC REACCREDITED WITH B++

Bachelor of Science (B.Sc) CHEMISTRY DEGREE COURSE

CHOICE BASED CREDIT SYSTEM (CBCS) – REGULATIONS AND SYLLABUS

(Effective from the Academic Year: 2017 – 2018 onwards)

REGULATIONS

1. CONDITION FOR ADMISSION

A candidate who has passed the Higher Secondary Examination(Academic stream) conducted by Department of School education, Tamilnadu or an examination accepted as equivalent to 10+2 courses including CBSE, that are recognized by Periyar University, are eligible for admission to B.Sc Chemistry course. The candidates requesting admission to B.Sc Chemistry course shall have passed the qualifying examination with the mandatory subjects under any one of the following groups:

Group I : Maths, Physics, Chemistry and Computer Science

Group II : Maths, Physics, Chemistry and Biology

Group III : Physics, Chemistry, Botany and Zoology

Along with the aforesaid conditions for admission of students, the latest guidelines issued by the government of Tamilnadu through the Director of Collegiate Education, Chennai – 6 may be followed.

2. DURATION OF THE COURSE

B.Sc Chemistry Course (Degree of Bachelor of Science) consists of three consecutive academic years comprising of six semesters.

3. COURSE OF STUDY:

Detailed course of study and scheme of examination is provided in Table 1.

Table 1. The Course Structure and Scheme of Examination for the six semesters shall be as follows:

Sem. No.	Part	Course Code	Title of the Course	Exam Duration (hours)	Credit	Mark		
						IA	SE	Total
01	I	17FTL01	Tamil Language Course –I	3	3	25	75	100
01	II	17FEL01	English Language Course –I	3	3	25	75	100
01	III	17UCH01	Core Course – I: Organic, Inorganic & Physical Chemistry – I	3	5	25	75	100
01	III	17AMT01 17ABY01 17AZL01	Allied Maths -I / Allied Botony-I / Allied Zoology-I	3 3 3	3 3 3	25 25 25	75 75 75	100
01	IV	17UVABE	Common Course : Value Based Education	3	2	25	75	100
Total credits and marks					**16**			**500**
02	I	17FTL02	Tamil Language Course – II	3	3	25	75	100
02	II	17FEL02	English Language Course –II	3	3	25	75	100
02	III	17UCH02	Core Course –II Organic, Inorganic & Physical Chemistry – II	3	5	25	75	100
02	III	17AMT02 17ABY02 17AZL02	Allied Maths -II / Allied Botony-II / Allied Zoology-II	3 3 3	3 3 3	25 25 25	75 75 75	100
02	III	17UCHP1	Core Practical-I Volumetric Estimation	3	3	40	60	100
02	III	17AMT03 17ABYP1 17AZLP1	Allied Maths-III Allied Botany Practical Allied Zoology Practical	3 3 3	4 4 4	25 40 40	75 60 60	100
02	IV	17UENST	Common Course : Environmental Science	3	2	25	75	100
Total Credits and marks					**23**			**700**

Contd.,

Sem. No	Part	Course Code	Title of the Course	Exam Duration (hours)	Credit	Mark		
						IA	SE	Total
03	**I**	17FTL03	Tamil Language Course –III	3	3	25	75	100
03	**II**	17FEL03	English Language Course –III	3	3	25	75	100
03	**III**	17UCH03	Core Course –III: Organic, Inorganic & Physical Chemistry-III	3	4	25	75	100
03	**III**	17APY01	Allied Physics-I	3	3	25	75	100
03	**IV**	17UCHN1	Non major elective Course –I : Chemistry In Daily Life -I	3	2	25	75	100
03	**IV**	17UCHS1	Skill based elective course: I Industrial Chemistry	3	2	25	75	100
Total credits and marks					**17**			**600**
04	**I**	17FTL04	Tamil Language Course –IV	3	3	25	75	100
04	**II**	17FEL04	English Language Course –IV	3	3	25	75	100
04	**III**	17UCH04	Core Course –IV: Organic, Inorganic & Physical Chemistry–IV	3	4	25	75	100
04	**III**	17APY02	Allied Physics-II	3	3	25	75	100
04	**III**	17UCHP2	Core Practical – II: Inorganic qualitative analysis and preparation	3	3	40	60	100
04	**III**	17APYP1	Allied Physics Practical-I	3	4	40	60	100
04	**IV**	17UCHN2	Non major elective Course – II: Chemistry In Daily Life -II	3	2	25	75	100
04	**IV**	17UCHS2	Skill based elective Course – II: Textile & Dye Chemistry	3	2	25	75	100
04	**V**	17UEXAT	Common course: Extension Activities	**-**	**1**	--	--	--
Total credits and marls					**25**			**800**

Contd.,

Sem. No	Part	Course Code	Title of the Course	Exam Duration (hours)	Credit	Mark		
						IA	SE	Total
05	**III**	17UCH05	Core Course V: Inorganic Chemistry-I	3	6	25	75	100
05	**III**	17UCH06	Core Course VI: Organic Chemistry-I	3	6	25	75	100
05	**III**	17UCH07	Core Course VII: Physical Chemistry-I	3	6	25	75	100
05	**III**	17UCHM1	Major Based elective course –I: Spectroscopy	3	5	25	75	100
05	**IV**	17UCHS3	Skill based elective Course-III: Pharmaceutical Chemistry	3	2	25	75	100
05	**IV**	17UCHS4	Skill based elective Course-IV: Agricultural Chemistry	3	2	25	75	100
Total credits and marks					**27**			**600**
06	**III**	17UCH08	Core Course VIII: Inorganic Chemistry-II	3	5	25	75	100
06	**III**	17UCH09	Core Course IX: Organic Chemistry-II	3	5	25	75	100
06	**III**	17UCH10	Core Course X: Physical Chemistry-II	3	5	25	75	100
06	**III**	17UCHM2	Major based Elective Course-II: Analytical Chemistry	3	5	25	75	100
06	**IV**	17UCHS5	Skill Based elective Course V: Food chemistry	3	2	25	75	100
06	**IV**	17UCHS6	Skill Based elective Course VI: Polymer chemistry	3	2	25	75	100
06	**III**	17UCHP3	Core Practical III: Physical Chemistry Practical	3	3	40	60	100
06	**III**	17UCHM3	Major based elective Practical : Organic practical and Gravimetric estimation	6	5	40	60	100
Total Credits and marks					**32**			**800**
Credits and marks grand total					**140**			**4000**

4. EXAMINATIONS

The theory examination shall be three hours duration to each course at the end of each semester. The practical Examination foe UG courses shall be of three hours duration and will be conducted at the end of the even semester as II, IV and VI along with the theory papers. **The maximum mark for each paper and practical is 100**. The candidate failing to get the minimum marks required for passing in any theory papers/ subjects shall be permitted to appear for each failed subject(s) in the subsequent semester / examination. The candidate failing to get the minimum marks required for passing in any practical, may be permitted to appear in the subsequent / next regular even semester only. **There is no statuary provision to conduct instant or supplementary examination for the practical in the even semesters**.

5. PASSING MINIMUM:

For Theory Examination:

The breakup of marks shall be: 75 by written examinations [Semester External or S.E.] and 25 by Internal Assessment [I.A.]. The passing minimum for all theory papers (semester external) shall be 38 out of 75. The break up for internal assessment marks for theory papers will be as follows: Attendance: 5 + Assignment: 5 + Assignment 10 + Test: 10 = 25 Marks. There is no passing minimum for internal assessment. The passing minimum mark for all theory papers shall be 50 marks with both internal and external marks added together under the mandatory requirement that the candidate has secured not less than 38 out of 75 in the written examination. Candidates who score less than 38 out of 75 in the theory papers and secure more than 50 with internal assessment (out of 100), have NOT secured the passing minimum and are required to reappear for those papers in the subsequent semesters. Revaluation of theory papers, re-totalling of marks, supplementary and instant examination, and transparency of theory papers is allowed as per Government Arts College Autonomous and Periyar University norms. Candidates need to apply to the COE, through the Principal with proper endorsement and recommendation by the concerned tutor and head of department.

For Practical Examination:

The Practical Examinations for UG Courses will be conducted at the end of the even semester as II, IV, and VI Semesters. The breakup of marks shall be Practical Examination - 60 marks and Internal Assessment - 40 marks. The breakup for internal assessment marks shall be Practical class Attendance 5 marks + Model Practical performance 15 marks + Continuous assessment in practical class 15 Marks. There is no passing minimum for internal assessment for the practical. The passing minimum mark for all practical papers shall be 50 marks with both internal and external marks added together under the mandatory requirement that the candidate has secured not less than 30 out of 60 in

the written examination. Candidates who score less than 30 out of 60 in the theory papers and secure more than 50 with internal assessment (out of 100), have NOT secured the passing minimum and are required to reappear for those practical in the subsequent even semesters. The distribution of marks for practical examination is as per Table 2.

Table 2 Distribution of marks for practical examinations

17UCHP1 Core Practical-I Volumetric Estimation (3Hrs)	**Marks**	**17UCHP2 Core Practical-II Inorganic Qualitative Analysis and Preparation (3Hrs)**	**Marks**
Estimation	45	Qualitative analysis	30
Procedure	05	Preparation	20
Record	10	Record	10
Internal Assessment	40	Internal Assessment	40
Total	100	Total	100

17UCHP3Core Practical-III Physical Chemistry Practical (3Hrs)	**Marks**	**17UCHM3 Major based Elective Practical : Organic Practical and Gravimetric Estimation (6Hrs)**	**Marks**
Physical chemistry experiments	50	Organic Qualitative Analysis Organic Preparation	15 10
		Gravimetric estimation	25
Record	10	Record	10
Internal Assessment	40	Internal Assessment	40
Total	100	Total	100

Revaluation, re-totalling of marks, supplementary or instant examination, and transparency of all theory papers are permitted and revaluation, re-totalling of marks, supplementary or instant examination, and transparency of all practical papers are NOT permitted as per TANSCHE CBCS guidelines for UG science courses, Government Arts College Autonomous and Periyar University norms/guidelines. The candidate has to apply and re-appear for the practical examination at the subsequent EVEN semester only.

6. CLASSIFICATION OF SUCCESSFUL CANDIDATES:

The performance of the student is indicated by the Grades and the corresponding Grade Point (GP), Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA).

Grade	**Cumulative Grade Points Average**	**Grade Description**	**Range of Marks**
O	9.0-10	Outstanding	90-100
D+	8.0-8.9	Excellent	80-89
D	7.5-7.9	Distinction	75-79
A+	7.0-7.4	Very Good	70-74
A	6.0-6.9	Good	60-69
B	5.0-5.9	Satisfactory	50-59
RA	0	Re-Appear	0-49
ABSENT	0.0	ABSENT	ABSENT

A student is deemed to have completed a course successfully and earned the appropriate credit, **only if, the candidate has earned a grade of B or above. RA denotes the candidate should Re-Appear for the examination**.

GP = Marks obtained in a course x Credits / 10

GPA = Total Grade points earned in a semester / Total Credits registered in a semester

CGPA = Sum of Grade Points earned / Sum of Credits registered

Classification of CGPA

9 and Above	I CLASS-OUTSTANDING
8 and 8.9	I CLASS-EXCELLENT
7. 5 and 7.9	I CLASS-DISTINCTION
6. 0 and 7.4	I CLASS
5. 0 and 5.9	II CLASS

The above classification is based on the marks secured by a candidate in Part III Major and Allied and part IV including Non-Major electives(NME) and Skill based elective courses(SBE).

7. Question Paper Pattern

The question paper pattern for theory papers shall be as follows:

Duration of examination: 3 Hours

Maximum Marks : 75

Part A: 10 x 2 = 20 Marks

No. of questions = 10 (Without internal choice)

All questions will carry equal marks. All questions are compulsory

Two questions will be set from each unit without internal choice

Each answer should be about 50 words.

Part B: 5 x 5 =25 Marks

No. of questions = 5 [With internal choice: as (a) or (b)]

All questions will carry equal marks. All questions are to be answered

(One question will be set from each unit with internal choice)

Each answer should be about 300 to 500 words.

Part C: (3X 10 = 30)

No. of questions = 5(without internal choice)

All the questions will carry equal marks. Any three questions out of five are to be answered

(one question will be set from each unit)

Each answer should be about 1000 to 1200 words.

The question paper pattern / format for the practical will vary from the above.

8. RANKING:

Candidates who have passed all the examinations prescribed for the course **in their first appearance ONLY are eligible for ranking**. A candidate who is **absent** for one or more papers in a semester examination and who later appears for the same paper or papers in the subsequent semester

examination **is NOT eligible for ranking** even though he/she has completed the course within three academic years / six semesters from their year of admission. The maximum duration for thecompletion of UG programme shall not exceed twelve semesters. The scheme for completion shall be consecutive twelve semesters.

9. Attendance Requirement & Condonation of Attendance:

For Theory Examinations

The attendance shall be calculated on the basis of 90 days / 450 instructional hours per semester. Candidates are mandatorily required to have 75% or above in attendance to apply and appear for theory examinations without condonation of attendance. Those candidates whose attendance ranges from 66 to 74% may appear for the theory and practical examination after payment of the appropriate condonation fee (Rs 500) through proper channel. The candidates with attendance percentage ranging from 50 to 65 cannot appear for the present theory examinations. They are mandatorily required to pay the condonation fee for the present semester and may be permitted to appear for the lapsed theory papers in the next or subsequent semester only. **A candidate who is absent for the theory examinations after paying the condonation fees has to repay the condonation fees for appearing in the next or subsequent semester.** Candidates whose attendance is below 50% are barred from the theory examinations and mandatorily have to redo the course as per Government Arts College Autonomous and Periyar University norms/guidelines in force.

For Practical examinations

The attendance shall be calculated on the basis of 180 days / 900 instructional hours per year combining the odd and even semesters. Candidates are mandatorily required to have 75% or above in attendance to apply and appear for the practical examinations without condonation of attendance. Those candidates whose attendance ranges from 66 to 74% may appear for the practical examination after payment of the appropriate condonation fee (Rs 500) through proper channel. The candidates with attendance percentage ranging from 50 to 65 cannot appear for the present practical examinations. They are mandatorily required to pay the condonation fee for the present semester and may be permitted to appear for the lapsed practical papers in the next or subsequent even semester only. **A candidate who is absent for the practical examinations after paying the condonation fees has to repay the condonation fees for appearing in the next or subsequent semester.**Candidates whose attendance is below 50% are barred from the practical examinations and mandatorily have to redo the course as per Government Arts College Autonomous and Periyar University norms/guidelines in force.

A candidate whose attendance for theory and practical classes calculated separately is within 66 to 74%, has to pay condonation fees separately for theory and practical examinations as Rs 500 + 500 =

Rs 1000. Condonation fees are separate for theory and practical examinations and are NOT to be combined as a single fee of Rs 500. The candidate will be allowed to appear for both theory and practical examinations under the condition that the condonation fees have been paid for both theory and practical examinations.

10. COMMENCEMENT OF THIS REGULATION:

This regulation shall take effect from the academic year 2017-2018. The students admitted to the first year of the UG Chemistry courses from 2017-2018 and thereafter shall follow these regulations.

12. TRANSITORY PROVISION:

Candidates who were admitted to the B.Sc Chemistry Course of study are **permitted to appear for the examination under this regulation for a period of 6 years from their year of admission to the course(up to 2022-2023). Arrear candidates will be permitted to appear for the examination under this regulation up to three consecutive years or six consecutive semesters from their final or third years of their final or third year of their course. The maximum duration for the completion of UG programme shall not exceed twelve consecutive semesters.**

12. BREAK UP OF INTERNAL ASSESSMENT

For Theory Examinations

There is no passing minimum for internal assessment for theory examinations. The break up is as follows: Attendance: 5 + Assignments: 10 + Test: 10 = 25 Marks.

The marks for attendance are given as follows:

Attendance percentage	**Marks**
> 95	5
91 to 95	4
86 to 90	3
81 to 85	2
76 to 80	1
Below 75	0

The marks for assignments are given as follows:

Candidates has to write at least one assignments per unit of a theory paper. An average of any three assessment mark will be taken for IA.

The marks for test will be given as below:

An average of any two Class test mark as part of continuous assessment awarded by the respective teacher and model examination mark will be taken as test mark for IA.

For Practical Examinations

There is no passing minimum for internal assessment for practical examinations. The break up is as follows:

Attendance: 10 + Class performance on continuous assessment 15 + Model Practical tests: 15 = 40 Marks.

The marks for attendance are given as follows:

Attendance percentage	**Marks**
> 95	10
91 to 95	8
86 to 90	6
81 to 85	4
76 to 80	2
Below 75	0

13. FACULTY ADVISOR

For all UG classes there will be a faculty Advisor (Tutor – in Charge). Students shall consult them for their clarifications and guidance.

14. ACADEMIC COUNCIL RATIFICATION AND APPROVAL.

These guidelines and regulations will be effective from the academic year 2017-2018. Any changes to these guidelines and regulation will be subject to the ratification and written approval of the academic council. Any subsequent changes may be done by the BOS after written permission / communication from the academic council. The changes are to be put up with justification for ratification and written approval of the academic council.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

FIRST SEMESTER

CORE COURSE-I ORGANIC, INORGANIC & PHYSICAL CHEMISTRY-I
COURSE CODE : 17UCH01

Learning Objectives [75 Hours]

- To learn the basic concepts of Atomic structure, Quantum number.
- To know about Schrodinger wave equation.
- To understand the electronic structure of atom.
- To learn the basic concepts of electronic effect.
- To understand the behaviour of Ideal, Real gases.
- To understand about the Inorganic Semi-micro Analysis.

Learning outcomes:

- Students knew about atomic structure and Quantum numbers.
- Students learnt the Wave properties and Schrodinger wave equation
- Students will be able to write the Electronic configuration.
- Understood the basic concepts of Electronic Effects.
- Understood the behavior of Ideal, Real gases.
- Students learnt the Inorganic Semimicro Analysis.

UNIT-I Atomic Structure

Fundamental particles of matter – their composition –Comparison between Rutherford's model of atom and Bohr's model-Outline of the Bohr-Sommerfield model-its limitations-Black body radiation-Photo electric effect- De Broglie theory-Heisenberg's uncertainty principle- Quantum numbers.

Wave mechanical concept of atom – Schrodinger's wave equation (derivation not needed)-significance of $\Psi$and Ψ^2 – Eigen functions and Eigen values-shapes of different orbitals – Differences between an orbit and orbital.

UNIT- II Electronic structure

Aufbau principle and its limitations - Pauli's Exclusion principle and its application-Hund's rule-its basis and applications - stability of half-filled and fully - filled orbitals, (n+l) rule.

Periodic properties: Atomic and ionic radii, Ionization Energy, Electron affinity and Electronegativity – Definition, Variation of the periodic properties along periods and groups-theoretical explanation for the variations.

s, p, d and f block elements-classification and characteristic properties.

UNIT - III Basic Concepts of Electronic effects

Electron displacement effects :

Inductive, Inductomeric and Steric effects-their effect on properties of compounds

Mesomeric, resonance, hyperconjugation-localised and delocalised chemical bond

Intermolecular interactions-Dipole-Dipole interaction, van der Waals forces, hydrogen bond and its types-effect of intermolecular forces on physical properties-melting point, boiling point and solubility.

Reactive intermediates -carbocations, carbanions, free radicals and carbenes with examples.

Cycloalkanes-Wurtz reaction, Dieckmann ring closure & reduction of aromatic hydrocarbons - .Baeyer's strain theory and its limitations-Sache-Mohr theory– Ring strain in small rings (cyclopropane and cyclobutane)-theory of strainless rings.

UNIT – IV The Gaseous State

Behaviour of ideal gases.

Kinetic theory and temperature-Boltzmann constant-Maxwell's distribution of molecular velocities-types of molecular velocities- -collision diameter-collision freqeuency-mean free path-Degrees of freedom of gaseous molecules-Principle of equipartition of energy

Behaviour of Real gases

Deviations from ideal behaviour- -Explanation of deviations - Boyle point. The virial equation of state-derivation of the principle of corresponding states.

UNIT – V Qualitative and Volumetric Analysis

Principle of Qualitative analysis: Basic principles of Inorganic semimicro analysis-semimicro techniques-principles involved in Na_2CO_3 extract preparation-common ion effect and solubility product and their applications in qualitative analysis - separation of cations into groups.

Principle 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 and iodimetric titrations-calculations of equivalent weight - Theories of acid-base, redox, adsorption and fluorescence indicators and choice of indicators.

References:

1. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan.
2. Castellan. G.W, Physical Chemistry, Naropa Publishing House.
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4. Tiwari, Malhotra and Vishoni, Organic chemistry, Vol I and II , Vikas Publishing House.
5. Raj K. Bansal, A Text Book of Organic Chemistry, Wiley Eastern.
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GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

SECOND SEMESTER

CORE COURSE-II ORGANIC, INORGANIC & PHYSICAL CHEMISTRY- II

COURSE CODE : 17UCH02

Learning Objectives [75 Hours]

- To learn the basic concepts of bond formation and types of bonds.
- To understand Fajan's Rule.
- To learn about Hydrides, Carbides and Nitrides.
- To learn about Noble gases.
- To study about Alkane, Alkynes.
- To learn SN_1, SN_2, SN_i reaction meachanisms.
- To understand Aromaticity.
- To lean liquid state and liquid crystals and their application

Learning outcomes:

- Students leant about bond formation and its types.
- Understood the Fajan's Rule.
- Learnt about Hydries, Carbides, Nitrides.
- Learnt nobel gases and its properties.
- Study about Alkane, Alkynes.
- Learnt about SN_1, SN_2, SN_i reaction meachanisms.
- Students Uunderstood Aromaticity.
- Leant about liquid state and liquid crystals and their application.

UNIT – I Chemical Bond

Ionic bond-mode of formation – properties of ionic compounds-inert pair effect-Born-Haber cycle-polarisation of ions-factors affecting polarisation-importance of polarisation of ions-Fajan's rules and applications.

Covalent Bond-mode of formation-properties of covalent compounds-Valence Bond theory-Postulates of Pauling-Slater's theory-Different types of overlapping. Molecular orbital theory-Postulates-Bonding and antibonding molecular orbitals-Tabulation of various M.Os formed from

atomic orbitals-Energy level diagrams for M.Os-Bond order-Electronic configuration of Hetero nuclear diatomic molecules - CO, NO and HF

Coordinate Bond-mode of formation-importance of coordinate bond in the formation of metal complexes.

UNIT-II

Hydrides-Classification-Types of Hydrides-Ionic Hydrides-LiH and NaH-Preparation, properties, uses and structure. Covalent Hydrides – silanes - General study - Chemistry of monosilanes and disilanes-Differences between silanes and alkanes. Metallic Hydrides-Preparation, properties, structure and uses (A brief study) Complex Hydrides-$NaBH_4$ and $LiAlH_4$-preparation, properties, uses and structure.

Carbides-Preparation, properties and technical applications.

Nitrides – Preparation , properties and uses.

Noble Gases-position of Noble gases in the periodic Table – Preparation, properties and structure of compounds of Xenon.

UNIT-III

Alkenes- Nomenclature and classification of dienes-isolated, conjugated and cumulated dienes synthesis of dienes- 1,2 and 1,4 additions-thermodynamic and kinetic controlled products-Diels - Alder reaction

Electrophilic and free redical mechanism of addition in alkenes-Markownikoff's rule-peroxide effect-mechanism of Hydroboration, Ozonolysis and allylic substitution by NBS-polymerisation

Alkynes- Acidity of alkynes-formation of acetylides-oxidation - ozonolysis and hydroboration, addition of water with $HgSO_4$ catalyst.

UNIT-IV

Reaction mechanism I

Aliphatic nucleophilic substitution- SN_1, SN_2 and SN_i reactions – Reactivity-effects of structure of substrate, attacking nucleophile, leaving group and reaction medium- Elimination reactions-mechanisms of E_1 and E_2 reactions-Hofmann and Saytzef rule.

Aromatic hydrocarbons and aromaticity-reasonance in benzene- aromaticity-Huckel's (4n+2) rule and its simple applications.

Reaction mechanism II

Electrophilic substitution reactions in aromatic compounds-general mechanism –Nitration, Halogenation, Sulphonation, Friedel-Crafts acylation and alkylation-directive influence – Orientation-ortho/para ratio

Polynuclear aromatic hydrocarbons- naphthalene and anthracene -isolation, synthesis, properties, and uses.

UNIT-V

5.1 The liquid state:

Structure of liquids-Vapour-pressure-Trouton's rule - surface tension - surface energy-some effects of surface tension-viscosity-effect of temperature on viscosity (Experimental determination of surface tension and viscosity not necessary)-Refractive index-specific refraction-molar refraction. Physical properties and chemical constitution-Molar volume and Parachor.

5.2 Liquid crystals (The mesomorphic state)

Classification of liquid crystals-Smectic liquid crystals-Nematic liquid crystals-Cholesteric liquid crystals- applications.

References:

1. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan.
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GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

THIRD SEMESTER

CORE COURSE-III: ORGANIC, INORGANIC & PHYSICAL CHEMISTRY-III

COURSE CODE : 17UCH03

Learning Objectives [60 Hours]

- To learn the basic concepts regarding principles of inorganic analysis and applications of qualitative analysis.
- To know about solvents, p-block elements, group study, aromaticity, electrophilic and nucleophilic substitution reactions, elimination reactions, mechanism.
- To learn second law of thermodynamics, derivation of equations, related problems, applications wherever necessary.

Learning outcomes:

- Students will be able to write simple reaction mechanisms.
- Studied about transition metals, its properties and applications.
- Had introduction on thermodynamics of matters
- Learnt about the hybrid phases of matters like emulsions, colloids etc.,
- Learnt on the parameters which affect the new bond formation and bond breakage.

UNIT-I Transition Elements and Group Study

Transition Elements – position in the Periodic Table-General characteristics and properties of d-block elements. Occurrence, extraction, properties and uses of Titanium, Zirconium, Molybdenum, Tungsten and Platinum.

Chemistry of Titanium dioxide, Titanium tetrachloride, Vanadium pentoxide, Ammonium Vanadate, Zirconium dioxide, Zirconium halides, Ammonium molybdate, Molybdenum blue, Tungsten trioxide, Tungsten Bronzes, Chloroplatinic acid and Barium Platinocyanide. Group study of Ti, V and Cr groups.

UNIT-II

Reaction mechanism-III

Mechanism of -Kolbe's reaction, Reimer-Tiemann reaction, Gattermann, Lederer- Manasse and Houben-Hoesch reactions.

Preparation and uses of Cresols, nitrophenols, aminophenols, di and trihydric phenols-alpha and beta naphthols. Epoxides-synthesis, properties and uses, Crown ethers.

Reaction mechanism IV

Addition to Carbon – Hetero multiple bond - Addition of HCN, NH_2OH, 2,4-dinitrophenyl hydrazine, semicarbazide & Grignard reagent. Mechanism of Mannich, Reformatsky and haloform reactions. Mechanism of reduction of carbonyl group by $NaBH_4$, $LiAlH_4$ –Wolf-Kishner, Clemmensen and MPV reductions.

UNIT III Carboxylic acids

Carboxylic acids

Unsaturated acids-preparation and properties of acrylic, crotonic and cinnamic acids. Hydroxy acids-classification –Action of heat on α,β,γ and δ acids. Dicarboxylic acids-preparation of malonic, succinic, glutaric and adipic acids. Action of heat on these acids.

Reaction mechanism V

Mechanism of conversion of acids into acid derivatives-esterification including trans esterification. Hydrolysis of esters-mechanism - effect of substituents-structural and steric factors.

Tautomerism-definition-keto-enol, amido-imido and nitro-acinitro tautomerisms-acid-base inter conversion mechanism. Malonic and Acetoacetic esters - characteristic reactions of active methylene group -synthetic uses.

UNIT IV

The Solid State - Difference between crystalline and amorphous solids-isotropy and anisotropy -space lattice and unit cell- Bravis lattices- -Lattice energy-Born-Lande equation- Law of rational indices-Miller indices-X ray diffraction-Bragg's equation-Experimental methods.

The colloidal State

Definition of colloids-classification of colloids - solids in liquids (sols) - properties-kinetic, optical and electrical-stability of colloids, protective action-Hardy-Schulze law, gold number.

Liquids in liquids (emulsions): Types of emulsions-preparation, emulsifier

Liquids in solids (gels): classification, preparation and properties, inhibition-general applications of colloids.

UNIT V

The first law of thermodynamics and thermochemistry

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-Flame and explosion temperatures.

References:

1. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan.
2. Castellan. G.W, Physical Chemistry, Naropa Publishing House.
3. Walter J. Moore, Physical Chemistry, Orient Longamann.
4. Tiwari, Malhotra and Vishoni, Organic chemistry, Vol I and II ,Vikas Publishing House.
5. Raj K. Bansal, A Text Book of Organic Chemistry, Wiley Eastern.
6. Singh, Mukarji and Kapoor, Organic Chemistry, Mac Millan.
7. Jain.M.K, Principles of Organic Chemistry-Vishal publishing Co.
8. Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.
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10. Madan.R.D., Inorganic Chemistry, S. Chand & Co.,
11. Dutta, Inorganic Chemistry, Science Book Association.
12. www.organic-chemistry.org
13. www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
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GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

THIRD SEMESTER

SKILL BASED ELECTIVE COURSE -I : INDUSTRIAL CHEMISTRY
COURSE CODE : 17UCHS1

15 Hours

Learning Objectives:

- To learn about the cement, its manufacture and setting mechanism
- To learn about paints, its types and formulations
- To learn about the manufacture of industrial gases
- To learn about the water treatment methods

Learning outcome:

- Learnt about cement, how it works, setting mechanism etc.,
- Students can understand the types of paints, its applications
- Learnt about the industrial gas production and its applications
- Studied about the processes of water treatment methods.

Unit-I

Cement: manufacture – Wet process and dry process. Setting of cement. Cement Industries in India. Grading of cements and its importance – m-sand.

Unit-II

Paints & varnishes: Primary constituents of paints, dispersion medium (solvent), binder, pigments, oil based paints, latex(alkyd resins), formulation of paints and varnishes – Pain industries in India.

Unit-III

Petroleum: Origin, refining, Cracking, reforming knocking and octane number, LPG, synthetic gas, synthetic petrol, Fuel gases.

Unit-IV

Large scale production, storage, hazards and uses of coal gas, water gas, producer gas and oil gas.

Unit-V

Water treatment – Ion exchange, electrodialysis, reverse osmosis, softening of hard water – lime soda process – Zeolite process – Internal conditioning methods.

References

1. B.N. Chakrabarthy, Industrial chemistry, Oxford & IBH publishing co., New Delhi, 1981.
2. B.K.Sharma, Industrial chemistry, Goel Publishing House, Meerut.
3. P.P.singh, T.M.joseph, R.G.Dhavale, College Industrial Chemistry, Himalaya publishing House, Bombay, 4th edn., 1983.
4. www.philipmarshall.net/pdf/turner_paint_6-9_12.pdf
5. www.nzic.org.nz/ChemProcesses/polymers/10D.pdf
6. www.chemistryislife.com/the

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B. Sc. CHEMISTRY

FOURTH SEMESTER

CORE COURSE-IV ORGANIC, INORGANIC & PHYSICAL CHEMISTRY -IV

COURSE CODE : 17UCH04 [60 Hours]

Learning objectives:

- Students study about the first law of thermodynamics in previous semester and now study about the second law of thermodynamics
- To learn about the nucleus, the forces of origin, radio activity, stellar energy etc.,
- To learn about the importance of amine group in day to day life, its industrial applications and basic chemistry involved etc.,
- To study the heterocyclic chemistry, preparation properties

Learning outcome:

- Get introduced to second law of thermodynamics
- Learnt about the nucleus, the forces of origin, radio activity, stellar energy etc.,
- Studied about the importance of amine group in day to day life its industrial applications and basic chemistry
- Studied about the heterocyclic chemistry, preparation and properties.

UNIT-I Nuclear Chemistry

Nuclear stability-n/p ratio- nuclear forces-Exchange theory and nuclear fluid theory.

Natural radioactivity – modes of decay-Geiger – Nuttal rule. Units of radioactivity – Kinetics of radioactive disintegration-Half life and average life-Radioactive equilibrium – Numerical problems. Mass defect and binding energy - Artificial transmutation and artificial radioactivity.

Nuclear fission and nuclear fusion-mechanisms-applications-differences – Stellar Energy. Application of radioactive isotopes-C-14 dating, rock dating –Numerical problems - isotopes as tracers-study of reaction mechanism (e.g. ester hydrolysis), radio diagnosis and radiotherapy. Nuclear reactors-types-common features like fuels, moderators, coolant control materials, reactor shielding- uses-Nuclear reactors in India. –Nuclear fuels.

UNIT II Heterocyclic Compounds

Preparation, properties and uses of furan, pyrrole & thiophene and their aromatic character. Synthesis and reactions of pyridine and piperidine-comparative study of basicity of pyrrole, pyridine and piperidine with amines.

Condensed five and six membered heterocyclic compounds-preparation of indole, benzofuran, quinoline and isoquinoline-Fischer indole synthesis, Skraup synthesis and Bischer-Napieralski synthesis- Electrophilic substitution reactions.

UNIT III Chemistry of amines

Aliphatic amines – separation of amines – Hinsberg's and Hoffmann methods – preparation and properties of dimethyl amine, trimethylamine, ethylene diamine and hexamethylene diamine.

Derivatives of aniline – acetanilide – N-methylaniline and N,N'-dimethylaniline – Preparation and properties. Diazonium compounds – diazotization mechanism - diazonium ion as a weak electrophile – preparation and synthetic uses of diazoacetic ester and diazomethane.

UNIT-IV Second law of thermodynamics-I

Limitations of the first law-need for second law-spontaneous processes-cyclic process- Carnot cycle – Efficiency –(problems). Carnot theorem-Thermodynamic scale of temperature.

Concept of entropy-Entropy- 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-calculation of entropy changes of an ideal gas with changes in P, V and T –Entropy of mixture of ideal gases-Entropy of mixing-physical significance of entropy.

UNIT-V Second law of thermodynamics-II

Work and free energy functions-Maxwell's relationships criteria for reversible and irreversible processes -Gibbs-Helmholtz equation-Partial molar free energy. Concept of chemical potential- Gibb's Duhem equation - Chemical potential in a system of ideal gases - Duhem-Margulus equation. Clapeyron equation- Clapeyron-Clausius equation-Applications of Clapeyron-Clausius equation-concept of fugacity- Determination of Fugacity of a gas- Fugacity of a liquid component in a liquid solution-concept of activity-activity coefficient-standard states.

Third law of thermodynamics

Nernst heat theorem-statement of III law-Evaluation of absolute entropy from heat capacity measurements-Test for the validity of the law.

References :

1. Finar I.L. Organic Chemistry, Vol I and II – ELBS.
2. Morrison and Boyd, Organic Chemistry, Allyn and Bacon Inc.
3. Bajapai. D.N, Advanced Physical Chemistry, S.Chand & Co.,
4. Gurudeep R. Chatwal, Physical Chemistry.
5. Jain. S, and S.P. Jauhar, Physical Chemistry – principles and problems, Tata McGraw Hill
6. Philips and Williams, Inorganic Chemistry, Oxford University press, Vol I and II.
7. Cotton and Wilkinson, Advanced Inorganic Chemistry Wiley Eastern Private Ltd.
8. www.organic-chemistry.org
9. www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
10. www.chemguide.co.uk/orgmenu.html
11. www.chem.umass.edu/~samal/orginorgsites.html

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B. Sc. CHEMISTRY

FOURTH SEMESTER

SKILL BASED ELECTIVE COURSE-II: TEXTILE AND DYE CHEMISTRY
COURSE CODE : 17UCHS2 [15 Hours]

Learning objectives:

- To learn about the fibers (both natural and synthetic) and its applications
- To learn about sizing methods and uses.
- To know about the dyes and its preparation and chemistry behind the colour.
- To know about various dyeing process.

Learning outcome:

- Learnt about the basics of fiber and their origin.
- Studied on the techniques of sizing methods and its importance.
- Get introduced on the dyes and its chemistry.
- Studied about the techniques of dyeing.

Unit – I Fiber science

Natural fibers – cotton, wool, silk – General characteristics, synthetic fibers – Preparation, properties and applications of polyamide (Nylon 6,6) – Polyester – polyacrylonitrile– viscose fibers.

Unit-II

Sizing and desizing – purpose – desizing methods. Scouring – purpose – Principle - alkali scouring, Acid scouring – Kier boiling. Bleaching – Methods (Hypochlorite, peroxide and bleaching powder bleaching).

Unit-III Dyes and Dye Intermediates

Basic concept of dye – definition – requirement of a good dye – nomenclature of dye. Classification of dyes based on the mode of application (acid, base, direct, mordant, vat and ingrain dyes) and their structure (nitroso, azo, xanthene, anthroquinone).

Unit –IV

Dyeing – methods of dyeing – Direct dyeing – Vat dyeing – mordant dyeing – substantive dyeing – disperse dyeing – basic operations in dyeing. Manufacture of dye: Rhodamine B.

Unit-V Dye application: Dyeing process

Application of the dye (for cotton fabric, for printing purpose and indigosol process). Non-textile uses of dyes. Textile and dye effluents – characteristics, effect of untreated effluents.

References :

1. Shenai V.A An introduction to Dye stuff and Intermediates Sevak publications, Wadela, Mumbai-3.
2. Abrahard E.N. – Outlines of chemistry for dye stuff and Intermediates – Chemical Publishing, New York.
3. Shenai V. ATechnology of textile processing,
    a) Textile Fibre. Vol.
    b) Techniques of Bleaching Vol. III
    c) Principles of dyeing Vol. IV
4. Synthetic Organic Dyes by Chatwal and Anand.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

FIFTH SEMESTER

CORE COURSE V : INORGANIC CHEMISTRY – I

COURSE CODE : 17UCH05 [60 Hours]

Learning objectives:

- To learn the acid base concepts
- To study about the f block elements
- To learn the coordination chemistry and development through various theories
- To study the reactions of coordination compounds

Learning outcome:

- Learned about the properties of acids and bases and their types
- Studied about the f block elements
- Get introduced on coordination chemistry evolution and theories
- Learned the mechanism of coordination compounds on reactions

UNIT-I Concept of acids, bases and Non aqueous solvents

Acids and Bases: Arrhenius, Bronsted-Lowry, the Lux-Flood, Solvent system and Lewis concepts of acids and bases. Relative strength of acids and bases - Effect of solvent-Levelling effect-Usanovich concept.

Hard and Soft Acids and Bases-classification of acids and bases as hard and soft – examples-Pearson's HSAB principle, acid-base strength, hardness and softness, Symbiosis, theoretical basis of hardness and softness, electronegativity and hard and soft species. Applications of HSAB principle

Non-aqueous solvents - physical properties of a solvent, types of solvents and their general characteristics. Reactions in non-aqueous solvents with reference to liq. NH_3 and liq. SO_2- Comparison.

UNIT-II Chemistry of f-block elements

Position in the Periodic Table - General characteristics of Lanthanides and Actinides-Lanthanide contraction and its consequences.

Isolation of Lanthanides from Monazite using fractional crystallization and Ion exchange resin method.

Actinides-occurrence and preparation

Chemistry of Thorium and Uranium - Important compounds - preparation, properties and uses of Uranyl nitrate, Uranium hexafluoride, Thorium dioxide and Thorium nitrate.

Comparison of Lanthanides and Actinides - comparison of d-block and f-block elements.

Elements with atomic number 104 and 105, their position in the periodic table.

UNIT-III Coordination Chemistry -Introduction

Definition of the terms - Classification of ligands - Nomenclature of co-ordination complexes - chelating ligands and chelates -chelate effect-explanation. Co-ordination Number and stereochemistry of complexes.

Werner's theory-conductivity and precipitation studies -Sidgwick's theory-Effective Atomic Number concept.

Isomerism in complexes-Structural Isomerism—types. Stereoisomerism-Geometrical isomerism in 4 and 6 coordinated complexes-methods to distinguish between Cis-and Trans-isomers Optical isomerism in 4-and 6-coordinated complexes-Resolution of racemic mixtures.

Stability of complexes-thermodynamic and kinetic stability-definition-Stepwise and overall stability constants –Factors affecting the stability of complexes.

UNIT-IV

Coordination Theories

Theories of bonding in complexes - Valence Bond Theory - Postulates –Hybridisation and geometries of complexes-Outer orbital and inner orbital octahedral complexes. Square planar and tetrahedral complexes -V.B. Theory and magnetic properties of complexes-limitations of V.B. Theory.

Crystal Field Theory: Postulates, d-orbital splitting in octahedral, tetrahedral and square planar complexes-strong and weak ligands-Spectrochemical series-High spin and low spin complexes-C.F. Theory and magnetic properties of complexes-Crystal Field Stabilisation Energy (CFSE) -Calculation of CFSE values of d^1 to d^{10} Octahedral and Tetrahedral complexes- C.F. Theory and colour of complexes-limitations of C.F.Theory - comparison between VBT and CFT.

UNIT-V Reaction Mechanism and Application of Complexes

Substitution reactions in square planar complexes-Trans effect – Series and theories of Trans effect - polarisation theory and π-bonding theory- uses.

Application of coordination compounds in Qualitative and Quantitative analysis-separation of Copper and Cadmium ions, Cobalt and Nickel ions- Identification of Cu, Fe, and Ni. Complexometric Titrations - Principles and Titrations using EDTA.

EDTA -Applications- Sequesterisation, Estimation of metals, hardness of water.

REFERENCE BOOKS:

1) Cotton and Wilkinson, Advanced Inorganic Chemistry Wiley Eastern Private Ltd.
2) Manku.G.S., Inorganic Chemistry Tata Mcgraw Hill.
3) Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.
4) Puri and Sharma, Text book of Inorganic Chemistry-Vishal publishing co.
5) Madan.R.D., Inorganic Chemistry, S. Chand & Co.,
6) Dutta, Inorganic Chemistry, Science Book Association.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

FIFTH SEMESTER

CORE COURSE VI : ORGANIC CHEMISTRY – I

COURSE CODE : 17UCH06 (60 Hours)

Learning objectives:

- To get introduced with different type of stereo chemical representations
- To learn the different form of signs and notations used in stereo chemistry
- To learn isomerism and its types
- To learn various conformations of chemical structure and its energy relations
- To study about amino acids and its importance
- To get introduction on natural products

Learning outcomes:

- Students will be able to recognize the terms and symbols of stereo representations
- They will be able to differentiate between different forms of representations
- Students are able to identify the Isomerisms
- To get knowledge on the conformers and energy relations
- They studied about the amino acids and natural products

UNIT I Stereoisomerism-I

Definition-Classification : Optical and Geometrical isomerism.

Optical isomerism – Optical activity-Optical and Specific rotations-conditions for optical activity-asymmetric centre-Chirality-achiral molecules-meaning of (+) and (-) and D and L notations-Elements of symmetry.

Projection formulae-Fischer, Flying Wedge, Sawhorse and Newmann projection formulae-Notation of optical isomers- Cahn-Ingold –Prelog rules – *R, S* notations for optical isomers with one and two asymmetric Carbon atoms - *erythro* and *threo* representations.

Racemisation-methods of racemisation (by substitution and tautomerism) - Resolution-methods of resolution (mechanical, seeding, biochemical and conversion to diastereoisomers)- Asymmetric synthesis (partial and absolute synthesis) Walden inversion.

Optical activity of allenes, spiranes and biphenyls.

UNIT-II Stereoisomerism-II

Geometrical isomerism- *cis*-trans, *syn-anti* and *E, Z* notations-geometrical isomerism in maleic and fumaric acids and unsymmetrical ketoximes-methods of distinguishing geometrical isomers using melting point, dipole moment, dehydration, cyclisation and heat of hydrogenation.

Conformational Analysis-introduction of terms-conformers-dihedral angle, torsional strain, conformational analysis of ethane, ethylene glycol, chlorohydrin and n-butane including energy diagrams-conformers of cyclohexane (chair, boat and skew boat forms)-axial and equatorial bonds-ring flipping showing axial equatorial inter conversions-conformers of mono and disubstituted cyclohexanes-1,2 and 1,3 interactions-Conformation and stereochemistry of Cis and Trans decalins.

UNIT-III Amino acids and proteins

Amino acids-classification- Essential and non-essential amino acids-preparation of alpha amino acids-glycine, alanine and tryptophan-General properties of amino acids-Zwitter ions, isoelectric point.

Peptides-synthesis - Bergmann method-structure determination of polypeptides-end group analysis.

Proteins-classification based on physical and chemical properties and on physiological functions-primary and secondary structure of proteins-helical and sheet structures (elementary treatment only) – Denaturation of proteins.

UNIT- IV

Photochemistry of Carbonyl Compounds – Norrish type I and II reactions.

Ureides and Nucleic acids

Ureides-classification-pyrimidines-thymine, uracil and cytosine-purines-adenine and guanine – synthesis (structural elucidation not necessary).

Nucleic acids-structures of ribose and 2-deoxyribose- DNA and RNA – their components – Biological functions of nucleic acids-Elementary ideas on replication and protein synthesis.

UNIT V Chemistry of natural products

Alkaloids -classification- isolation– general methods of determination of structure of alkaloids-synthesis and structural elucidation of piperine, conine and nicotine.

Terpenes-classification-isolation- isoprene rule-synthesis and structural elucidation of citral, geraniol, α-terpeneol and α-pinene.

REFERENCE BOOKS

1. Bhal. B.S, and Arun Bhal, A Text book of Organic Chemistry.
2. Soni.P.L., Text Book of Organic Chemistry, Sultan Chand and Sons.
3. Tiwari, Malhotra and Vishoni, Organic chemistry, Vol I and II , Vikas Publishing House.
4. Raj K. Bansal, A Text Book of Organic Chemistry, Wiley Eastern.
5. Singh, Mukarji and Kapoor, Organic Chemistry, Mac Millan.
6. Jain.M.K, Principles of Organic Chemistry-Vishal publishing Co.
7. Kalsi.P.S, Stereo Chemistry conformation and mechanism, Wiley Eastern Ltd.,
8. Nasipuri.D, Stereo Chemistry of Organic Compounds, Wiley Eastern Ltd.,

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

FIFTH SEMESTER

CORE COURSE VII : PHYSICAL CHEMISTRY – I

COURSE CODE : 17UCH07 (60 Hours)

Learning objectives:

- To learn about solutions and its behavior
- To know about the thermodynamic properties of solution
- To study the chemical equilibria and various isotherms
- To study the fundamentals of chemical kinetics.
- To study the governing factors of a light driven chemical reactions

Learning outcomes:

- Students are able to understand solution properties
- They are able to understand the chemical equilibria
- Know about the speed of the reaction
- To understand light and energy relations

UNIT-I Solutions

Solutions of gases in liquids – Henry's law- solutions of liquids in liquids-Raoult's law-Binary liquid mixture-ideal solution-deviation from ideal behaviour-Thermodynamics of ideal solutions-V.P-Composition curves, V-P-temperature curves - Azeotropic distillation.

Nernst's Distribution law - Thermodynamic derivation - applications. Solvent extraction. Thermodynamic derivation for elevation of boiling point and depression of freezing point. Van't Hoff factor - Abnormal molecular mass - Degree of dissociation and association.

UNIT-II Chemical Equilibrium

Thermodynamic derivation of equilibrium constants – Kp and Kc -Relations between Kp and Kc –problem- Standard free energy change - Derivation of Van't Hoff reaction isotherm

De Donder's treatment of chemical equilibria - concept of chemical affinity (no derivation)-Temperature dependence of equilibrium constant - van't Hoff isochore - Pressure dependence of equilibrium constant.

Adsorption- Physical and chemical adsorption - Types of adsorption isotherms-Freundlich adsorption isotherm - Derivation of Langmuir adsorption isotherm - BET isotherm (postulates only) BET equation (statement) - Determination of surface area -Applications of adsorption.

UNIT-III Chemical Kinetics-I

The concept of reaction rates. Effect of temperature, pressure, catalyst and other factors on reaction rates. Order and molecularity of a reaction. Derivation of integrated rate equations for zero, first, second order reaction (same and different initial concentrations of reactants) and third order reaction (same initial concentrations only).

Methods of determining the order of a reaction - Experimental methods in the study of kinetics - volumetry, manometry, polarimetry and colorimetry.

Kinetics of fast reactions by temperature jump method (no derivation). Effect of temperature on reaction rates-Derivation of Arrhenius equation-concept of activation energy-determination of Arrhenius frequency factor and energy of activation.

UNIT-IV Chemical Kinetics-II

Collision theory of reaction rates - Derivation of rate constant of a bimolecular reaction from collision theory - Failures of CT.

Lindemann theory of Unimolecular reactions.

Theory of Absolute Reaction Rates - Thermodynamic derivation of rate constant for a bimolecular reaction based on ARRT-comparison between ARRT and CT. Significance of free energy of activation and entropy of activation.

Kinetics of complex reactions - opposing, consecutive and parallel reactions-one example with mechanism (no derivation).

UNIT-V Photochemistry

Consequences of light absorption - The Jablonski diagram-non radiative transitions-radiative transitions-Grotthus-Draper law -The Stark Einstein law of photochemical equivalence-Quantum efficiency-quantum yield-(problems).

Energy transfer in photochemical reactions - photosensitisation - Photosynthesis in plants- Chemiluminescence - fluorescence and phosphorescence - lasers-uses of lasers.

Photochemical reactions - Kinetics of hydrogen - bromine reactions - decomposition of HI – Photolysis of aldehydes and ketones (Mechanism only)

REFERENCE BOOKS

1. Glasstone.S, Text Book of Physical Chemistry, Mac Millian.
2. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan.
3. Gurudeep R. Chatwal, Physical Chemistry.
4. Jain. S, and S.P. Jauhar, Physical Chemistry – principles and problems, Tata McGraw Hill.
5. Laidler.K.J, Chemical Kinetics, Harpet and Row New York.
6. Banwell, Fundamentals of Molecular spectroscopy Tata McGraw Hill.
7. Kundu and Jain, Physical Chemistry, S. Chand.
8. Nagi and Anand, Physical Chemistry – Wiley Estern.
9. Latham.J.L, and Burgess.A.E, Chemical Kinectics, Butler worth.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

FIFTH SEMESTER

MAJOR BASED ELECTIVE COURSE I : SPECTROSCOPY

COURSE CODE : 17UCHM1 **[60 Hours]**

Learning objectives:

- To study various spectral techniques
- To learn the principles and applications of spectroscopy
- Learn to interpret simple spectroscopic data to information
- To know the mass determining technique
- Learn to Identify and estimation of metals

Learning outcome

- Students understand the basic concepts of different spectral techniques
- Learned the instrumentation and various components of the spectrophotometers
- Introduced to interpret the spectrochemical information into useful Informations
- Learned the technique to identify and estimate the metals and metal mixtures

UNIT 1 Spectrophotometric and Colorimetric analysis

General Introduction- Electromagnetic radiation

UV-Visible spectroscopy –-Beer-Lambert's law – Instrumentation – spectrophotometer – block diagram with description of components – Types of electronic transitions – chromophore and auxochromes – absorption bands – factors affecting λ_{max} and intensity – applications.

Colorimetry – principle –photoelectric colorimeter –estimation of Cu, Fe and Ni.

UNIT II Infrared and Raman Spectroscopy

Infrared spectroscopy – Theory –Instrumentation – block diagram with description of components – sampling techniques – stretching and bending vibrations –vibrational frequencies – vibrational modes of H_2O and CO_2 – study of hydrogen bonding. Interpretation of IR spectra of Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethyl amine, Ethyl bromide, Toluene and Isopropyl phenyl ketone.

Raman Spectroscopy – Rayleigh and Raman scattering – stoke and antistoke lines instrumentation – block diagram – differences between IR & Raman spectroscopy – Mutual exclusion principle –applications.

UNIT III ^{1}H-NMR Spectroscopy

NMR spectroscopy – principle of nuclear magnetic resonance – basic instrumentation –number of signals –chemical shift – shielding and deshielding –spin –spin coupling and coupling constants – TMS as NMR standard – interpretation of NMR spectra of simple organic compounds such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethyl Bromide, Toluene and Isopropyl phenyl ketone.

UNIT IV Mass Spectroscopy

Mass spectroscopy – basic principles – instrumentation – molecular ion peak, base peak, metastable peak, isotopic peak and their uses. Nitrogen rule – ring rule – fragmentation –Mclafferty rearrangement –Interpretation of mass spectra of simple organic compounds such as Acetone, Anisole, Benzaldehyde, Ethyl acetate, Ethylamine, Ethyl bromide, Toluene and isopropyl phenyl ketone.

UNIT V Absorption and Emission Spectroscopy

Atomic Absorption spectroscopy- Principle, Instrumentation, and applications.

Flame photometry – Principle, Instrumentation, and applications.

Photo electron spectroscopy- Principle, PES of diatomic molecules and poly atomic molecules(HCl, HBr, HI, CO, NH_3, and H_2O), Core electron PES, X-ray photoelectron spectroscopy(ESCA) applications.

REFERENCE BOOKS

1. William Kemp, Organic Spectroscopy – ELBS.
2. Sharma.Y.R, Elementary Organic Spectroscopy, Principles and applications- S. Chand & Co.,
3. Gopalan.R, Subramaniam.P.S, and Rengarajan.K, Elemants of Analytical Chemistry – Sultan Chand & Sons.
4. Ramachandra Sastry.A, Analytical Chemistry – K.C.S. Desikan & Co.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

FIFTH SEMESTER

SKILL BASED ELECTIVE COURSE III : PHARMACEUTICAL CHEMISTRY

COURSE CODE : 17UCHS3 **[45 Hours]**

Learning objectives:

- To learn the basics of pharmaceutical chemistry and the terms
- To study the antibiotics and sulphadrugs, their role and mechanism of disinfection
- To study the analgesics and antipyretics, their role and mechanism of disinfection
- To learn the nerve stimulants and anticancer drugs

Learning outcomes

- Studied about the antibiotics and sulphadrugs
- Learned about the analgesics and antipyretics
- Learned about CNS drugs and anticancer drugs

UNIT – I

Introduction

Definition of the terms – drug, pharmacophore, pharmacodynamics, pharmacology, bacteria, virus, fungus, actinomycetes, metabolites, antimetabolites, LD50, ED50.

Therapeutic index – their use in selecting drugs – Assay of drugs – Chemical and biological assays

Action of drugs – actions at cellular, extracellular sites, drug receptors and biological responses. Metabolism of drugs – oxidation, reduction, hydrolysis, and conjugation.

UNIT-II

Sulphonamides-mechanism and action of sulphadrugs – preparation and uses of sulphadiazine, sulphathiazole, sulphapyridine and sulphafurazole.

Antibiotics –definition – classification as broad and narrow spectrum antibiotics –penicillin, ampicillin, erythromycin, chlorampenicol, tetracycline –structure and mode of action only – SAR of Chlorampenicol.

UNIT–III Analgesics –

Definition and actions, narcotic and non-narcotic analgesics –Structure, pharmacological action and uses of Morphine and its derivatives(heroin, codeine), synthetic analgesics – pethidine and methadone – SAR of morphine.

Antipyretic analgesics – Preparation, structure and uses of salicylic acid derivatives – (methyl salicylate, aspirin), p-aminophenol derivatives (para acetamol, phenacetin) and ibuprofen.

UNIT – IV

Antiseptics and disinfectants –definition and distinction – phenol co-efficient- Structure and uses of phenolic compounds(Cresols, thymol)– Chlorinated compounds(chlorhexidine, chloroxylenol), dyes (crystal violet, acridine), cationic surfactants (benzalkonium chloride), formaldehyde and nitrofurazone.

Anaesthetics –definition –classification –local and general –volatile, nitrous oxide, ether, choloroform, cyclopropane –uses and disadvantages –nonvolatile –intravenous – thiopental sodium, methohexidine, propanoid- local anaesthetics –cocaine and benzocaine.

antianaemic drugs – Iron containing drugs, vitamin B_{12} and folic acid – mode of action.

UNIT V

Drugs affecting CNS – definition, examples for tranquilisers, sedatives, hypnotics, psychotogenic drugs –chlorpromazine and its derivatives, barbitone.

Diabetes – types and control of diabetes – role of insulin -hypoglycemic agents –sulphonyl urea, biguanides.

Cancer therapy –tumer, types and causes - mode of action of thiodopa, cyclophosphoramide, cisplatin, 5-flurocil, use of phytochemicals in cancer therapy – Taxol, Vincrystin. AIDS – causes, prevention, control and treatment.

Indian medicinal plants and uses – Aloe vera, Papaya, Neem, tulasi, kilanelli, semparuthi, adathoda, nilavembu, sirianangai and thoothuvalai,

REFERENCE BOOKS

1. Singh.H and Kapoor.V.K, Vallabh Prakashan Organic Pharmaceutical Chemistry – New Delhi.
2. Bentley and Drivers, Pharmaceutical Chemistry.
3. Allion Chidambaram, Pharmaceutical Chemistry.
4. Chatwal, Organic Pharmaceutical Chemistry.
5. Jayashree Ghosh, S, Pharmaceutical Chemistry – Chand & Co.,
6. Chatwal, Inorganic Pharmaceutical Chemistry.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

FIFTH SEMESTER

SKILL BASED ELECTIVE COURSE IV : AGRICULTURAL CHEMISTRY

COURSE CODE : 17UCHS4 [45 hours]

Learning objectives:

- To learn about importance of water and water analysis
- To study about the various types of soil and its characteristics
- To study about the pesticides, fertilizer and insecticides

Learning outcome:

- Students get introduced on water treatments and analysis
- Learned about the soil and its types
- Learned the chemistry of fertilizer and uses
- Learned about the insecticides and pesticides

Unit-I Water sources for agricultural – water treatment & water analysis

Water analysis: determination of hardness of water, acidity, alkalinity, pH value, amount of free CO, fluoride content, chloride content and their estimations. Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), chlorine demand and their determinations, recycling of water.

Unit-II Chemistry of soil –Soil classification and soil analysis

Definition of soils. Classification of soils, Properties of soils – Physical properties and mechanical analysis. Structure and texture. Soil water, soil air, and soil temperature. Chemical properties – soil-mineral, matter-soil colloids, ion-exchange reactions. Soil fertility and its evolution.

Soil organic matter and their influence on soil properties. C-N ratio effects, soil reactions. Soil pH, acidity, alkalinity, buffering of soils and its effects on the availability of N, P, K, Ca, Mg, I, Mn & sulphuric acid. Soil salinity, acid and alkaline soils - their formation and reclamation.

Unit-III Fertilizers

Primary nutrients, secondary nutrients and micro nutrients on plant growth and development, Importance of nitrogenous fertilizers. Nitrogen cycle and fixation of atmosphere nitrogen. Principle and manufacture of ammonium nitrate, ammonium sulphate, urea and nitrolin. Harmful effects of chemical fertilizers-Eutrophication.

Unit-IV

Phosphate fertilizers, preparation and uses of mono and diammonium phosphates, super phosphate and triple super phosphate. Potassium fertilizers – potassium nitrate, potassium chloride. Mixed fertilizers. Methods of compost in green manuring, concentrated organic manures and their chemical composition. Oil cakes, blood meal.

Unit-V Pesticides and Insecticides

Introduction, – insecticides, fungicides and herbicides. Application and toxicity,Bordax mixture. Insect killers and repellants(alithrin), fluorine compounds, boron compounds, arsenic compounds, pyridine compounds. Harmful effects of DDT, BHC.

REFERENCE BOOKS

1. Brady.N.C, The Nature and properties of soils – Eruasia Publishing House (P) Ltd.,
2. Jones.V.S, Fertilizers and soil fertility – Prentice Hall of India, New Delhi.
3. Fracer.D.E.H, Chemistry of Pesticides – D.Van Nostrand Co.,
4. Nature and properties of soils – harry, O-Buckman Nyle C Brandy.
5. Soil science – A Sankara
6. Insecticides, Pesticides and agro- based Industries – R.K.Gupta, R.C.Palfal and K.Goel.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

SIXTH SEMESTER

CORE COURSE VIII : INORGANIC CHEMISTRY – II

COURSE CODE : 17UCH08 (60 Hours)

Learning objectives:

- To learn the mechanism of biological processes and importance of metal therein
- To study about the organometallic chemistry
- To know the iodine and inter-halogen compounds
- To study about the symmetry and its operation in inorganic compounds

Learning outcome:

- Students are able to know the importance of trace elements in body metabolism
- They learn about the organometallic chemistry
- Learned about the inter halogen compounds and iodine chemistry
- Students get introduced on symmetry and fixing of it and importance

UNIT-I

Bioinorganic Chemistry : Essential and trace elements in Biological processes- Biological role of Haemoglobin and Chlorophyll (elementary idea of structure and mechanism of their action). Metal carbonyls-Bonding in carbonyls-Mono and binuclear Carbonyls of Ni, Fe, Cr, Co and Mn-Hybridisation and structure. Preparation, properties and uses. Silicates-classification and structure–examples. Composition, properties and uses of beryl, asbestos, talc, mica, feldspar, ultramarines and zeolite.

UNIT II

Organometallic compounds : Definition-classification-ionic, σ-bonded and non-classically bonded organometallic compounds – examples - nature of carbon-metal bond. General methods of preparation – formation by addition and substitution reactions. General properties of organometallic compounds - physical and chemical characteristics.

Organometallic compounds of Li & B - preparation, properties, structure and uses. Olefin complexes - Zeise salt –synthesis and structure. Cyclopentadienyl complexes-Ferrocene-Preparation, properties, structure and uses. Uses of organometallic compounds.

UNIT-III

Solids: Band theory of conductors , semiconductors and insulators. Bragg's law and application of X-ray diffraction to crystal studies-structure of NaCl, LiCl and ZnS. Imperfections in a crystal-Outline of Schottky defects, Frenkel defects, metal excess and metal deficiency defects and line defects.

UNIT IV

Iodine and Inter halogen compounds: Basic properties of iodine(Compounds containing monovalent and trivalent iodine cation), Inter halogen compounds- general preparation, properties and uses. Preparation, properties and uses of ICl, IBr, ICl_3, IF_5, Poly halide ions and poly halides, pseudo halide ions and pseudohalogens. Similarities and dissimilarities between halogens and pseudohalogens.

UNIT V

Symmetry Elements and Symmetry operations – point groups - point groups of simple molecules like H_2, HCl, CO_2, H_2O, BF_3, NH_3,CH_2Cl_2, $[PtCl_4]^{2-}$, PCl_5, *cis* and *trans* isomers of $[Pt(NH_3)_2\,Cl_2]$

Magnetic properties of molecules: Magnetic susceptibility. Types of magnetic behaviour-diamagnetism and paramagnetism, Temperature dependent ferromagnetism and antiferromagnetism-Temperature independent paramagnetism- determination of magnetic moment using Guoy Balance-Applications of magnetic measurements

REFERENCE BOOKS:

1) Cotton and Wilkinson, Advanced Inorganic Chemistry Wiley Eastern Private Ltd.
2) Manku.G.S., Inorganic Chemistry Tata Mcgraw Hill.
3) Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.
4) Puri and Sharma, Text book of Inorganic Chemistry-Vishal publishing co.
5) Madan.R.D., Inorganic Chemistry, S. Chand & Co.,
6) Dutta, Inorganic Chemistry, Science Book Association.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

SIXTH SEMESTER

CORE COURSE XI : ORGANIC CHEMISTRY-II

COURSE CODE : 17UCH09 (60 Hours)

Learning objectives :

- To learn about the sugar chemistry
- To study about the vitamins and antibiotics
- To study the various molecular rearrangements
- To learn the application and mechanism of various reagents

Learning outcome:

- Studied about the chemistry of sugar
- Studied about the structure and activity of antibiotics and vitamins
- Learned about the molecular rearrangements
- Will be able to choose the correct reagents for the given reactions

UNIT I

Carbohydrates-I : Classification. Monosaccharides -Reactions of Glucose and Fructose-osazone formation. Constitution of glucose and fructose - open chain structure - Configuration and ring structure – mutarotation - determination of ring size. Haworth's projection formulae and conformation of monosaccharides. Interconversions of monosaccharides – epimerization - conversion of pentose to hexose and vice versa-aldose to ketose and vice versa.

UNIT II

Carbohydrates-II : Disaccharides - Preparation, properties, uses and structural elucidation of sucrose, maltose, lactose. Polysaccharides - structure of starch and cellulose-properties-derivatives of cellulose.

UNIT III

Vitamins and antibiotics : Vitamins-occurrence and biological importance of Vitamin A, Thiamine, Riboflavin, Pyridoxin and Ascorbic acid. – Synthesis and structural elucidation of thiamine, pyridoxin and ascorbic acid. Antibiotics-structural elucidation of penicillin G and chloromycetin.

UNIT IV

Molecular rearrangements : Classification as anionotropic, cationotropic and intermolecular and intramolecular. Mechanisms of pinacol-pinacolone, Beckmann, benzidine, Hofmann, Curtius, Lossen, Schmidt, benzilic acid, Fries and Cope rearrangements.

UNIT V

Reagents :

Important reagents and their applications in organic chemistry : $AlCl_3$, BF_3, $LiAlH_4$, $NaBH_4$, PCl_5 ,P_2O_5, Na/ethanol, alcoholic KOH, H_2/Ni, H_2/Pd-$BaSO_4$, Zn/Hg-HCl, H_2N-NH_2/C_2H_5ONa, Ag_2O, HIO_4, Lead tetra acetate and Osmium tetroxide.

REFERENCE BOOKS

1. Finar 1.L. Organic Chemistry, Vol I and II – ELBS.
2. Morrison and Boyd, Organic Chemistry, Allyn and Bacon Inc.
3. Solomons, T.W.G, Organic Chemistry, John Wiley.
4. Bhal. B.S, and Arun Bhal, A Text book of Organic Chemistry.
5. Soni.P.L., Text Book of Organic Chemistry, Sultan Chand and Sons.
6. Agarwal and Manivasagam -Reactions and Reagents- Pragati Prakashan

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

SIXTH SEMESTER

CORE COURSE X : PHYSICAL CHEMISTRY II

COURSE CODE : 17UCH10 (60 Hours)

Learning objectives :

- To study the basic terms and components phase rule
- To study the basics of electrochemistry
- To study about electrochemical reactions in batteries and cells
- To study the various theories of electrolytes

Learning outcome:

- Students gets introduced about the electrochemistry
- Able to understand the chemical reactions of batteries
- Learned the physical concepts of the electrodics.

UNIT-I

Phase Rule : Definition of terms - Derivation of phase rule -One component systems-H_2O system, Sulphur system – explanation using Clausius - Clapeyron equation - supercooling and sublimation.

Two component systems - solid liquid equilibria - reduced phase rule – simple eutectic systems-Ag-Pb only-Compound formation with congruent melting point- Mg-Zn system only. Peritectic change, $FeCl_3$-H_2O system, KI-H_2O system-efflorescence-deliquescence. C.S.T-phenol water system – nicotine water system and triethylamine water system.

UNIT – II

Electro chemistry

Metallic and electrolytic conductance –Definitions of specific, equivalent and molar conductances – Relation between them – measurement of conductance and cell constant. Variation of conductance with dilution – Qualitative explanation – Strong and weak electrolytes. Migration of ions – transport number – determination by Hittorf's and moving boundary methods – Kohlrausch's law –

applications – calculation of equivalent conductance for weak electrolytes and determination of transport number.

Ionic mobilities and Ionic conductances. Diffusion and ionic mobility- molar ionic conductance and viscosity- Walden rule.

Application of conductance measurements – Degree of dissociation of weak electrolytes – Determination of Ionic product of water – Determination of solubility of sparingly soluble salts – conductometric titrations.

UNIT – III

Theory of strong electrolytes – Debye – Huckel – Onsager theory – verification of Onsager equation – Wien and Debye – Falkenhagen effect.

Activity and activity co-efficients of strong electrolytes – ionic strength.

Ostwalds dilution law – determination of dissociation constants – Ionic product of water – pH value. Buffer solution – Henderson's equations – uses of Buffers including living systems – common ion effect – solubility product principle – relation to solubility – Applications in qualitative and quantitative analysis.

Hydrolysis of salts – expression for hydrolysis constant – Degree of hydrolysis and pH of salt solutions for different types of salts – Determination of Degree of hydrolysis – conductance and distribution methods.

UNIT – IV

Galvanic cells – Reversible and Irreversible cells – EMF and it's measurement – Weston Standard cell – types of reversible single electrodes – standard Hydrogen electrode – calomel electrode – Derivation of Nernst equation both for emf of cells and single electrode potentials – Nernst theory for single electrode potential – standard reduction potentials – electro chemical series – significance.

Application of emf measurements – Application of Gibbs – Helmholtz equation to galvanic cells – calculation of thermodyamic quantities – pH using hydrogen, quinhydrone and glass electrodes – potentiometric titrations.

UNIT - V

Concentration cells with and without transference – LJP expression – applications of concentrations cells – valency of ions – transport number – solubility product – activity coefficient.

Storage cells – Lead storage battery – mechanism of charging and discharging. Ni-Cd battery, Li ion battery. Fuel cells (hydrogen – oxygen cell only) – concept of polarization – over voltage-decomposition voltage.

REFERENCE BOOKS

1. Glasstone.S, Text Book of Physical Chemistry, Mac Millian.
2. Glasstone and Lewis, Elements of Physical Chemistry, Mac Millan.
3. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan.
4. Castellan. G.W, Physical Chemistry, Naropa Publishing House.
5. Bajapai. D.N, Advanced Physical Chemistry, S.Chand & Co.,
6. Gurudeep R. Chatwal, Physical Chemistry.
7. Nagi and Anand, Physical Chemistry – Wiley Estern.
8. Kapoor. K.L., Physical Chemistry, Mac, Millan.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

SIXTH SEMESTER

MAJOR BASED ELECTIVE COURSE II : ANALYTICAL CHEMISTRY

COURSE CODE : 17UCHM2 **[60 Hours]**

Learning objectives :

- To study about the data analysis and correction methods of analytical chemistry
- To study about precipitation reactions
- To know about the liquid and solid purification techniques
- To know about the thermo analytical techniques

Learning outcome:

- Students know about the correction methods and data analysis
- Learned about the liquid and solid purification techniques
- Learned the principle, instrumentation and applications of thermo analytical chemistry

UNIT 1

The Role of Analytical Chemistry

Safety Measures: Handling reagents and solutions – acids, alkali, bromine water, phenol, inflammable substances etc., - disposal of wastes, waste chemicals and fumes.

Data analysis – idea of significant figures – its importance – accuracy – methods of expressing accuracy – error analysis – types of errors – precision – methods of expressing precision – mean, median, mean deviation, standard deviation and confidence limits.

Chemical and single pan balance – precautions in using balance – source of error in weighing – correction of buoyancy, temperature effects – calibration of weights.

UNIT II

Precipitation

Principle – theories of precipitation – solubility product and precipitation – factors affecting solubility. Conditions of precipitation-co- precipitation & post precipitation, reduction of errors, Precipitation from homogeneous solution – washing and drying of precipitate.

Choice of the precipitant – specific and selective precipitants – Cupferon, Dimethyglyoxime, Ethylene diamine, 8-Hydroxy quinoline, - Use of masking agent.

Crucibles – types , care and uses. Calculations in Gravimetric analysis – use of gravimetric factor.

UNIT-III Purification Techniques

Purification of organic compounds – Solvent extraction, Soxhlet extraction, Crystallization – Fractional crystallization and Sublimation – Principle – Technique and advantages. Purification of liquids – distillation, fractional distillation, vacuum distillation – steam distillation – azeotropic distillation, criteria of purity, melting point, boiling point, refractive index and density.

UNIT-IV Chromatographic Techniques

Column Chromatography – principle, types of adsorbents, preparation of the column, elution, recovery of substances and applications.

TLC – principle, choice of adsorbent and solvent, preparation of chromatoplates, R_f – values, factors affecting the R_f values. Significance of R_f values

Paper chromatography- Principle, Solvents used, development of chromatogram, ascending, descending and radial paper chromatography. Paper electrophoresis – separation of amino acids and other applications.

Ion –exchange chromatography – principle – types of resins – requirements of a good resin – action of resins – experimental techniques.

UNIT V Thermo Analytical Methods

Principle – thermogravimetric analysis and differential analysis – discussion of various components with block diagram – TGA & DTA curves of $CuSO_4.5H_2O$, $MgC_2O_4.H_2O$ and $Ca(OOCCH_3)_2.H_2O$ – Simultaneous DTA-TGA curves of $SrCO_3$ in air and $CaC_2O_4.H_2O$ in air and in CO_2-factors affecting TGA & DTA curves. Thermometric titrations – principle- apparatus – applications.

REFERENCE BOOKS

1. Douglas A, Skoog and Donal M. West Hort, Fundamentals of analytical Chemistry Rinechan and Winston Inc., New York.
2. Janarthanam.P.B, Physico – Chemical Techniques of Analysis Vol I & II – Asian Publishing House Bombay.
3. William Kemp, Organic Spectroscopy – ELBS.
4. Sharma.Y.R, Elementary Organic Spectroscopy, Principles and applications- S. Chand & Co.,
5. Gopalan.R, Subramaniam.P.S, and Rengarajan.K, Elemants of Analytical Chemistry – Sultan Chand & Sons.
6. Ramachandra Sastry.A, Analytical Chemistry – K.C.S. Desikan & Co.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

SIXTH SEMESTER

SKILL BASED ELECTIVE COURSE V : FOOD CHEMISTRY

COURSE CODE : 17UCHS5 **[45 Hours]**

Learning objectives:

- To learn about food adulteration
- To know about food poisoning
- To study the food preservation and food wastage
- To learn about vitamins and minerals

Learning outcome:

- Students know about food adulteration
- Learned about the food poisoning
- Know the techniques of food preservation
- Learned about the vitamins and minerals

UNIT-I FOOD ADULTERATION

Food – sources – functions – food groups – food in relation to health – objectives of cooking. Adulterants – common adulterants in different foods – milk and milk products, vegetable oils, and fats, spices and condiments, cereals, pulses, sweetening agents and beverages – Principles involved in the analysis of detection and prevention of food adulteration.

UNIT-II FOOD POISONING AND ADDITIVES

Food poisoning – Sources, causes and remedies – Causes and remedies for acidity, gastritis, indigestion and constipation.

Food additives – Definition – classification - their functions – Artificial sweeteners – saccharin, – food flavours – esters, aldehydes and heterocyclic compounds. Antioxidants. Food colours – changes in cooking – Spurious colours. Mono sodium glutamate.

UNIT-III FOOD PRESERVATION AND PROCESSING

Food preservatives – Definition – classification – food spoilage – definition – prevention. Methods of preservation – freezing (principles and types) – drying and dehydration (definition and types) – food irradiation – thermal processing (pasteurization, sterilisation and blanching).

UNIT-IV VITAMINS

Vitamins - classification, sources, functions and deficiencies. Fat soluble vitamins (A, D, E and K), water soluble vitamins (Vitamin C and B-Complex), - B_6, Folic acid and B_{12} – Fortification with vitamins – Effect of cooking on vitamins – different methods of cooking of vegetables and fruits.

UNIT-V MINERALS

Sources, functions, bioavailability and deficiency of the following minerals (calcium, iron, iodine, fluorine, sodium and potassium) – Fortification with minerals – Effect of cooking on minerals – Estimation of metals in tea dust.

Reference Books:

1. Food Science - III Edition - B. Sri Lakshmi. New Age International Publisher, 2005.
2. Food Chemistry - Lilian Hoagland Meyer CBS Publishers & Distributors, 2004.
3. Food Science, Nutrition and Health - Brian.A.Fox, Allan G.Cameron Edward Arnold, London.
4. Fundamentals of Foods and Nutrition - Mudambi. R.Sumathi, and Raja gopal, M.V. – Wiley Eastern Ltd., Madras.
5. Handbook of Food and Nutrition - M. Swaminathan - Bangalore Printing and Publishing Co. Ltd., Bangalore.
6. Norman N. Potter , Food science, CBS publishers and distributors, New Delhi. 1994.
7. Lillian Hoagoland Meyer, Food Chemistry, CBS publishers and distributors, New Delhi. 1994.
8. Srilakshmi B., Food Science, New age International Pvt. Ltd. Publishers, III ed. 2003.
9. Siva Sankar B., Food Processing and Preservation. Prentice – Hall of India Pvt. Ltd., New Delhi. 2002.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

SIXTH SEMESTER

SKILL BASED ELECTIVE COURSE VI : POLYMER CHEMISTRY

COURSE CODE : 17UCHS6 [45 Hours]

Learning Objectives :

- To provide the students the importance of polymers and an exposure to polymer science.
- To know various types of polymerization
- To know the applications of commercial polymers

Learning Outcome :

- Learned about the difference between organic chemicals and polymers
- Learned about its types and various polymerization techniques
- Learned about its applications

UNIT – 1

Basic Concepts: Monomer – Repeat unit - Functionality – Polymer – Degree of Polymerisation - Stereo Specificity. Types of polymerization (addition, condensation and co polymerization) Classification of polymers based on chemical structure and applications.

UNIT – II

Nature of Polymers : Amorphous – Crystalline – Crystalline Melting point(Tm) - Glass transition temperature (Tg), Relationship between Tm and Tg and its significance.
Molecular weight of polymers – Polydispersion - Number and weight average molecular weight -End group Analysis – Viscosity method – Colligative property measurements.

UNIT – III

Polymerisation techniques : Bulk, Solution, suspension and Emulsion Polymerisation .
Polymer Processing techniques: calendaring, casting (rotational, die, film), moulding (injection, extrusion, blow and compression)

UNIT – IV

Synthetic Polymers – Preparation, properties and uses of Polythene, PET, PVC, PP and PS. Natural and synthetic rubbers – Constitution of natural rubber, Butyl rubber, Buna rubber, (Buna – S and Buna – N) Neoprene, Thiocol, Polyurethane and Silicone rubbers.

UNIT – V

Plastics and Resins

Definitions: Thermoplastic and thermosetting resins – Compounding of Plastics – Preparation, properties and uses of phenol – Formaldehyde (bakelite), Epoxide resin and Thermocole – Difference between Thermoplastics and Thermosetting plastics.

Reference Books

1. V.R. Gowariker, Polymer Science, Wiley Eastern, 1995.

2. G.S. Misra, Introductory Polymer Chemistry, New Age International (Pvt) Limited, 1996.

3. F. N. Billmeyer, Textbook of Polymer Science, Wiley Interscience, 1971.

4. A. Kumar and S. K. Gupta, Fundamentals and Polymer Science and Engineering, Tata McGraw-Hill, 1978.

5. Polymer Chemistry, Sharma.B.K Goel Publishing House, Meerut- 1989.

6. Polymer Chemistry. Arora M.G. Vadar M.S. - Anmol publications (p) Ltd., New Delhi 1989.

7. Polymer Chemistry - An introduction - M.P. Stevens, oxford.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

ALLIED CHEMISTRY

FIRST/ THIRD SEMESTER

PAPER-I: INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-I

COURSE CODE : 17ACH01

(90 HOURS)

Unit-I

Chemical Bonding

1.1 Molecular Orbital Theory-bonding, antibonding and non-bonding orbitals.

M.O. diagrams of Hydrogen, Helium, Nitrogen, Fluorine and Nitric Oxide-discussion of bond order and magnetic properties.

1.2. Hydrides-classification and characteristics - preparation, properties and uses of Borazole, $NaBH_4$ and $LiAlH_4$.

1.3. Carbonyls-mononuclear and polynuclear carbonyls-Examples.

Preparation, properties and structure of $Cr(CO)_6$, $Fe(CO)_5$ and $Ni(CO)_4$.

Unit-II Nuclear Chemistry

2.1. Fundamental particles of Nucleus – nuclide, isotopes, isobars and isotones

2.2. Natural radioactivity-radioactive series including Neptunium series-Group displacement law.

2.3. Nuclear Binding energy, mass defect-Calculations.

2.4.Nuclear Fission and Nuclear Fusion-differences – Stellar energy.

2.5. Artificial Radioactivity-Preparation of transuranium elements –Np, Pu, Cf, Es and No.

2.6. Applications of radioistopes-C-14 dating, rock dating, isotopes as tracers, study of Reaction mechanism (ester hydrolysis) radio-diagnosis and radiotherapy.

Unit-III

3.1. Covalent Bond-Orbital Overlap-Hybridisation – Geometry of Organic molecules-Methane, Ethylene, Acetylene and Benzene.

3.2. Electron displacement Effects: Inductive, Resonance, Hyper conjugative & steric effects. Their effect on the properties of compounds.

3.3. Isomerisms:

(a) Geometrical isomerism: In alkene (2-butene only)

(b) Optical isomerism: lactic and tartaric acid

(c) Conformational analysis of ethane and n-butane.

Unit-IV

4.1 Aromatic compounds – Aromaticity – Huckel's rule. Heterocyclic compounds:- Preparation, properties and uses of Furan, Thiophene, Pyrrole and Pyridine.

4.2 Polymer chemistry: Classification of polymers (natural and synthetic) – (thermoplastic and thermosetting resins) – rubber (Buna-S, Buna-N) polyamides (Nylon 6,6), polyesters (PET), PVC- (starting materials and uses only).

Unit-V

5.1. Principle of volumetric analysis : Normality, Molality, Molarity, Mole fraction, mole concept. Primary and secondary standards. solutions.

5.2. Solutions: Raoult's law for ideal solutions – positive and negative deviations. Types and examples of solutions: solid in liquid, gas in liquid and liquid in liquid (totally miscible, partially miscible and immiscible liquid pairs).

5.3. Chromatography: principle and application of column, paper and thin layer chromatography.

References:

1. Maron and Lando, Fundamentals of Physical Chemistry, Collier, Mac Millan.
2. Castellan. G.W, Physical Chemistry, Naropa Publishing House.
3. Walter J. Moore, Physical Chemistry, Orient Longamann.

4. Tiwari, Malhotra and Vishoni, Organic chemistry, Vol I and II , Vikas Publishing House.
5. Raj K. Bansal, A Text Book of Organic Chemistry, Wiley Eastern.
6. Singh, Mukarji and Kapoor, Organic Chemistry, Mac Millan.
7. Jain.M.K, Principles of Organic Chemistry-Vishal publishing Co.
8. Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.
9. Puri and Sharma, Text book of Inorganic Chemistry-Vishal publishing co.
10. Madan.R.D., Inorganic Chemistry, S. Chand & Co.,
11. Dutta, Inorganic Chemistry, Science Book Association.
12. www.organic-chemistry.org/
13. www2.chemistry.msu.edu/faculty/reusch/VirtTxtJml/intro1.htm
14. www.chemguide.co.uk/orgmenu.html
15. www.chem.umass.edu/~samal/orginorgsites.html

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

ALLIED CHEMISTRY

SECOND/ FOURTH SEMESTER

PAPER-II: INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-II

COURSE CODE : 17ACH02

(90 HOURS)

UNIT-I

1.1. Co-ordination chemistry-definition of terms-classification of ligands-Nomenclature - Chelation-Examples. Chelate effect-explanation.

1.2. Werner's theory- Sidgwick's theory-Effective Atomic Number concept.

1.3. Pauling's theory-postulates-Application to octahedral, square planar and tetrahedral complexes.

1.4. Biological role of Haemoglobin and Chlorophyll (Elementary idea of structure and mechanism of action).

1.5. EDTA –applications (Determination of hardness of water).

UNIT – II

2.1 Carbohydrates: Classification – preparation, properties and uses of Glucose and Fructose - Mutarotation. Preparation properties and uses of Sucrose and lactose. Preparation and Properties of Starch, Cellulose and derivatives of Cellulose. Inter conversion of Glucose to Fructose and vice versa.

2.2. Amino Acids-classification, preparation and properties of Glycine and Alanine. Preparation of peptides (Bergmann method only).

2.3. Proteins: classification according to composition, biological function and shape. Denaturation of proteins.

UNIT-III

3.1. Chemotherapy: Preparation, uses and mode of action of sulpha drugs-prontosil, sulphadiazine and sulphafurazole. Uses of penicillin, chloramphenicol and streptomycin, Definition

and one example each for-analgesics, antipyretics, tranquilizers, sedatives, hypnotics, local anaesthetics and general anaesthetics.

3.2. Cause and treatment of diabetes, cancer and AIDS.

3.3. Indian Medicinal Plants and uses- Nilavembu, sirianangai, thothuvalai, adathoda, papaya.

UNIT-IV

4.1. Photochemistry: Grothus-Draper law and Stark-Einstien's law of photochemical equivalence. Quantum yield. Example for photochemical reactions- Hydrogen-Chlorine reaction (elementary idea only) photosynthesis. Phosphorescence, Fluorescence.

4.2. Renewable sources of energy: solar, wind, tidal, hydrothermal, geothermal energy. Non-renewable sources of energy: coal, petroleum fuels, LPG, CNG

UNIT-V

5.1. Electro Chemistry: Specific and equivalent conductivities – their determination – Kohlrausch law -measurement of conductance – conductometric titrations(strong acid versus strong base, weak acid versus weak base)

5.2. Galvanic cells-EMF-standard electrode potentials, reference electrodes (SHE and calomel) – Electrochemical series.

5.3. Batteries: Introduction – Dry cell, Lead acid storage battery

5.4. Corrosion: Definition – types of corrosion (Dry and wet corrosion) - prevention (Electroplating method only).

Reference books:

1. Soni.P.L, Text Book of Inorganic Chemistry, Sultan Chand & Sons.
2.Puri and Sharma, Text book of Inorganic Chemistry-Vishal publishing 3.Soni.P.L., Text Book of Organic Chemistry, Sultan Chand and Sons.
4. Jain.M.K, Principles of Organic Chemistry-Vishal publishing Co.
5. Kundu and Jain, Physical Chemistry, S. Chand.
6. Puri,Sharma and Pathania, Text-book of Physical Chemistry, Vishal Publishing co

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

FIRST SEMESTER

COOMON COURSE : VALUE EDUCATION

COURSE CODE : 17UVABE [15 Hours]

Unit –I

Concept of human values, Value education towards personal development

Aim of education and value education: Evolution of value oriented education: Concept of Human values: types of values: components of value education.

Personal Development : Self analysis and introspection: sensitization towards gender equality, physically challenged, intellectually challenges. Respect to age, experience, maturity, family members, neighbours, co-workers.

Character formation towards positive personality: Truthfulness, constructivity, Sacrifice, Sincerity, Self Control, Altrusion, Tolerance, Scientific Vision.

Unit-II

Value Education Towards National and Global development

National and International Values:

Constitutional or national values – Democracy, socialism, secularism, equality, justice, liberty, freedom and fraternity.

Social Values – Pity and probity, self control, universal brotherhood.

Professional values – knowledge thirst, sincerity in profession, regularity, punctuality and faith.

Unit –III

Religious Values – Tolerance, wisdom, character.

Aesthetic values – Knowledge thirst, sincerity in profession, regularity, punctuality and faith.

Unit –III

Religious Values –Tolerance, wisdom, character.

Aesthetic values – Love and appreciation of literature and fine arts and respect for the same.

National Integration and understanding.

Unit-IV

Impact of Global Development on Ethics and Values

Conflict of cross – Cultural influences, mass media, cross-border education, materialistic values, professional challenges and compromise.

Modern challenges of Adolescent emotions and behavior, sex and spirituality: Comparison and competition: positive and negative thoughts.

Adolescent emotions, arrogance, anger, sexual instability, selfishness, defiance.

Unit-V

Therapeutic Measures

Control of mind through

a. Simplified physical exercise

b. Meditation – Objectives, types, effect on body, mind and soul

c. Yoga – Objectives, types, asanas.

d. Activities:

(i) Moralization of desires

(ii) Neutralization of anger

(iii) Eradication of worries

(iv) Benefits of blessings.

Reference books

1. Value education for health, happiness and harmony, the world community service centre Vethari Publication

2. Philosophy of Universal Magnetism (Bio-magnetism, Universal magnetism). The World Community Service Centre Vethari Publication .

3. Thirrukural with English translation of Rev. Dr.G.U.Pope, Uma publications.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

SECOND SEMESTER

COOMON COURSE : ENVIRONMENTAL STUDIES

COURSE CODE : 17UENST [15 Hours]

Unit –I

Natural resources

Definition, scope, importance and public awareness.

Forest resources; Deforestation, mining, dams and their effects on forest.

Water Resources: Utilization of surface and ground water, floods, benefit and problems.

Mineral resources: Environmental effects of extracting and using mineral resources

Unit-II

Ecosystems

Concept, structure and functions of ecosystem. Procedure, consumers and decomposers.

Energy flow in the ecosystem. Ecological succession. Food chain, food webs and ecological pyramids.

Outline of important ecosystem.

Unit-III

Biodiversity and pollution

Threats to biodiversity: Habitat loss poaching of wildlife, man wild life conflicts.

Endangered and endemic species of India.

Environmental pollution: Causes, effects and control measures. Role of individual in the prevention of pollution of Air, water and soil.

Solid waste management : causes, effects and control measures of urban and industrial wastes. Disaster management: Floods, earthquake, cyclone and landslides.

Unit-IV

Social issues and Environment

From unsustainable to sustainable development.

Environmental ethics: Issues and problems – solutions.

Climate change global warming, acid rain, ozone layer depletion.

Unit – V

Population issues and legislation

An outline of environmental pollution Act.

Population explosion and problems.

Environment and human health.

REFERENCE BOOKS

1. Miller .T.G Jr Environmental Sciences, Wadsworth Publishing Co.,

2. A text book of environmental studies – P.Arul – Environmental Agency Chennai -42.

3. Environmental Science – P.D.Sharma.

4. Arunachalam, N et al (2000). Environmental Science & Engineering, Charulatha Publications, Chennai.

5. Kumaraswamy, K etal (2000). Environmental Studies, Bharathidasan University, Trichy-24.

Editorial board, Periyar EVR college professors, Environmental studies, Trichy – 23.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

THIRD SEMESTER

NON MAJOR ELECTIVE COURSE : CHEMISTRY IN DAILY LIFE –I

COURSE CODE : 17UCHN1 [15 Hours]

Note: *Structure and chemical equations not required.*

Learning objectives:

- To learn the water properties
- To study about dyes and fibers
- To learn the medicinal terms
- To study the food Adulterants and Indian Medicinal Plants

Learning outcome:

- Learned about the quality of water and their importants
- Studied about the properties of fibers and dyes
- Get knowledge of medicinal terms
- Learned the adulterants types and properties of medicinal plants

Unit - I

Water Chemistry

Introduction, Sources of water impurities, Hard and Soft water, Degree of Hardness, Types of Hardness, Scale and Sludge Formation in boiler and its prevention. Caustic embrittlements, softening of water, properties of drinking water, Break point chlorination, desalination of Brackish water - water purification – mechanism of domestic RO system – Ozone treatment.

Unit II

Fibers and Dyes

Fibers: Natural fibers – cotton, wool, silk – General Characteristics, Synthetic fibers – properties and uses – Nylon 6,6- Polyester – Polyacrylonitrile – Viscose fibers.

Dyes:Requirements of a dye - Classification based on mode of application to the fabric - Applications of dyes (general study). Ancient and modern colours – Mention of indigo and alizarin.

Unit - III

Pharmaceutical chemistry

Drug: Chemical name, generic name and trade names with examples. Terminology: Prodrug, pharmacy, pharmacology, pharmacophore, pharmacognosy, pharmacodynamics and pharmacokinetics (elementary idea only). Antipyretics, analgesics, antacids, antihistamines, antibiotics, antiseptics, disinfectants, anaesthetics, tranquilizers, narcotics, antidepressants and psychedelic drugs (definition and examples). Side effects of OTC drugs like paracetamol, ibuprofen, diclofenac. General idea of antibiotic and antimalarial drug resistance.

Unit - IV

Food

Common Adulterants in Different Foods:Milk and milk products, vegetable oils, cereals, tea, coffee powder, chilly powder and beverages.

Food Additives:Antioxidants and food preservatives – Commonly used permitted and non-permitted food colours - Artificial sweeteners – Taste enhancers - Artificial ripening of fruits and its side effects.

Modern Food Habits:Definition and health effects of fast foods, instant foods, dehydrated foods and junk foods. Harmful effects of modern food habits.

Importance of milk and coconut water.

Unit - V

Indian Medicinal Plants and Important Diseases

Indian medicinal plants and uses – Aloe vera, Neem, tulsi, kilanelli, semparuthi, adathoda, nilavembu, sirianangai and thoothuvalai.

Diabetes – types and control of diabetes – role of insulin.

Cancer therapy –tumer, types and causes – use of common vegetables and fruits to prevent cancer, (curcumin, grape, strawberry, rosemary, tomato, tea, brucolli, ginger, saffron)

AIDS – causes, prevention, control and treatment.

REFERENCE BOOKS

1. B.K. Sharma, *Industrial Chemistry*, 11th Edition, Goel publishing House, Meerut, 2000.
2. K.S. Tewari, N.K. Vishnoi and S.N. Mehrotra, *A Textbook of Organic Chemistry*, 2nd Edition, Vikas Publishing House (Pvt.) Ltd., New Delhi, 2004.
3. Gurdeep R. Chatwal, *Synthetic Drugs*, Himalaya Publishing House, Bombay, 1995.
4. Jayashree Ghosh, *A Textbook of Pharmaceutical Chemistry*, 3rd Edition, S. Chand and Company Ltd., New Delhi, 1999.
5. Lillian Hoagland Meyer, *Food Chemistry*, 1st Edition, CBS Publishers & Distributors, New Delhi, 2004.
6. Engineering Chemistry by Jain and Jain Publisher, DhanpatRai Publishing Co.
7. Indian materia medica https://archive.org/

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

FOURTH SEMESTER

NON MAJOR ELECTIVE COURSE : CHEMISTRY IN DAILY LIFE-II

COURSE CODE : 17UCHN2 [15 Hours]

Learning objectives:

- To learn the important of fuels
- To study about agricultural
- To learn the Cleansing Agents and Cosmetics
- To study Nanotechnology and battery
- To study about Vitamins and Minerals

Learning outcome:

- Learned about types and qualities of fuels
- Understand the Fertilizer and Pesticides
- Gain the knowledge Cleansing Agents and Cosmetics
- Learned the Nanotechnology, battery, Vitamins and Minerals

Unit - I

Fuels

Definition and classification of fuels – Characteristics of a good fuel – Combustion - Calorific value – Wood.

Coal: Classification based on carbon content – Fractional distillation products of coal and uses of various fractions. Petroleum: Origin – Fractional distillation – Different fractions, their composition and uses.

Petrol: Knocking - Octane number - Aviation fuel. Diesel: Cetane number. Flash point. Natural gas, biogas and

Natural gases, CNG, LPG, and Methane: Composition and uses.

Pollution due to burning of fossil fuels.

Solar energy and solar cells (applications only).

Unit - II

Agriculture

Fertilizers:Essential nutrients for plants – NPK value - Natural and synthetic fertilizers - Nitrogenous, phosphatic and potash fertilizers (examples) – Impact of excessive use of fertilizers on environment – Bio fertilizers.

Pesticides:Classification - Insecticides, herbicides, rodenticides and fungicides (definition and examples only) – Non-degradable pesticides – Pesticide pollution and its impact on environment – Endosulfan disaster in Tamil Nadu (brief study). Pheromones.

Unit - III

Cleansing Agents and Cosmetics

Cleansing Agents:Soaps - Hard and soft soaps - Alkali content – TFM - Detergents (classification) – Cleaning action - Advantages and disadvantages of soaps and detergents - Shaving creams.

Shampoos: Ingredients and functions - Different kinds of shampoos (Anti-dandruff, anti-lice, herbal and baby shampoos). Tooth paste: Composition and health effects.

Cosmetics:__Hair dye:__ Chemicals used and its harmful effects.

Face and skin powders: Types, ingredients and functions. Cleansing creams: Cold creams, vanishing creams and bleach creams. Perfumes, antiperspirants, Sun screen preparations, nail polishes, lipsticks, rouges, eyebrow pencils and eye liners (ingredients and functions) – Harmful effects of cosmetics.

Unit - IV

Advanced Materials and Cements

Nanotechnology*:* Introduction - Potential uses of nanomaterials in computers, sensors in textiles, mobile electronic devices and vehicles - Medical applications of nanomaterials.

Storage cells: Types of battery and it applications

Cements: Introduction, Classification of cement and properties, chemical composition of cement, standards, Manufacturing or Portland Cement, Chemistry of Portland cement, Setting and hardening of cement, PCC and RCC.

Unit - V

Vitamins and Minerals

Vitamins: classification, sources, functions and deficiencies. Fat soluble vitamins (A, D, E and K), water soluble vitamins (Vitamin C and B-Complex)-Folic acid and B_{12}

Minerals: Sources, functions, bioavailability and deficiency of the following minerals (calcium, iron, iodine, fluorine, sodium and potassium)

REFERENCE BOOKS

1. B.K. Sharma, *Industrial Chemistry*, 11th Edition, Goel publishing House, Meerut, 2000.
2. K.S. Tewari, N.K. Vishnoi and S.N. Mehrotra, *A Textbook of Organic Chemistry*, 2nd Edition, Vikas Publishing House (Pvt.) Ltd., New Delhi, 2004.
3. Gurdeep R. Chatwal, *Synthetic Drugs*, Himalaya Publishing House, Bombay, 1995.
4. Jayashree Ghosh, *A Textbook of Pharmaceutical Chemistry*, 3rd Edition, S. Chand and Company Ltd., New Delhi, 1999.
5. Lillian Hoagland Meyer, *Food Chemistry*, 1st Edition, CBS Publishers & Distributors, New Delhi, 2004.
6. Engineering Chemistry by Jain and Jain Publisher, DhanpatRai Publishing Co.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

CORE COURSE PRACTICAL-I VOLUMETRIC ESTIMATION

COURSE CODE : 17UCHP1 **[45 hours]**

1. Acidimetry – Alkalimetry :
    a) Estimation of sodium hydroxide – standard sodium carbonate.
2. Permanganometry
    a) Estimation of ferrous iron
    b) Estimation of oxalic acid
    c) Estimation of calcium
3. Dichrometry
    a) Estimation of ferric iron using internal indicator
4. Iodometry and iodimetry
    a) Estimation copper
    b) Estimation of potassium dichromate
5. Complexometric Titrations
    a) Estimation of Zn and Mg using EDTA.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

CORE COURSE PRACTICAL-II : INORGANIC QUALITATIVE ANALYSIS AND PREPARATIONS

COURSE CODE : 17UCHP2 **[45 hours]**

1. Inorganic qualitative analysis : Analysis of a mixture containing two cations and two anions of which one will be an interfering ion. Semimicromethods using the conventional scheme with hydrogen sulphide may be adopted.

   Anions to be studied : Carbonate, nitrite, sulphide, sulphite, thiosulphate, sulphate, nitrate, fluoride, chloride, bromide, iodide, borate, oxalate, arsenite, arsenate, phosphate, chromate, tartrate, silicate.

   Cations to be studied : Silver, mercury, lead, bismuth, copper, cadmium, tin, antimony, arsenic, iron, aluminium, chromium, barium, strontium, calcium, sodium, potassium, magnesium, ammonium.

   Not to be given for examination

   Anions – nitrite, sulphide, sulphite, thiosulphate, arsenate, tartrate, chromate and silicate.

   Cations – Silver, mercury, tin, antimony, sodium and potassium.
2. Inorganic preparations :
   a) Ferrous ammonium sulphate
   b) Tetrammine Copper (II) sulphate
   c) Microcosmic Salt
   d) Ferric Alum

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

CORE COURSE PRACTICAL III: PHYSICAL CHEMISTRY EXPERIMENTS

COURSE CODE : 17UCHP3 [45 hours]

Physical Experiments

1. Kinetics
   a) Determination of rate constant – Acid catalysed hydrolysis of an ester (methyl acetate or ethyl acetate)
   b) Determination of rate constant for the reaction between potassium iodide and potassium persulphate.
   c) Determination of rate constant – acid catalysed iodination of acetone.
2. Molecular weight determination –Rast method
3. Heterogenous Equilibrium
   a) Effect of impurity on CST of phenol – water system and determination of concentration of sodium chloride / succinic acid.
   b) Simple eutectic system.
   d) Determination of transition temperature of hydrated salts – sodium thiosulfate, sodium acetate, strontium chloride and manganous chloride.
5. Electrochemistry :

a) Conductivity i) Determination of cell constant
   ii) Equivalent conductance of strong electrolytes
   iii) Conductometric titration- acid base titration

b) Potentiometry : Potentiometric titration – acid-base titration.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

MAJOR BASED ELECTIVE PRACTICAL: ORGANIC PRACTICAL AND GRAVIMETRIC ESTIMATIONS

COURSE CODE : 17UCHM3 [75 HOURS]

Organic Preparations

1. Preparations involving the following :
    a) Oxidation of benzaldehyde
    b) Hydrolysis of Methyl salicylate.
    c) Nitration – p-nitroacetanilide and m-dinitrobenzene
    d) Bromination – p- bromoacetanilide and tribromophenol
    e) Benzoylation — β-naphthylbenzoate
2. Determination of boiling point of liquids.
3. Analysis of organic compounds.

Characterization of organic compounds by their functional groups and confirmation by preparation of derivative. The following functional groups may be studied. Aldehydes, Ketones, carboxylic acids, aromatic primary and secondary amines, phenols, aromatic esters, amides, diamides, anilides, nitro compounds and monosaccharides.

GRAVIMETRIC ESTIMATIONS

1.Estimation of Barium as Barium sulphate

2.Estimation of Barium as Barium chromate

3.Estimation of Lead as Lead chromate

4.Estimation of Calcium as Calcium oxalate monohydrate

5.Estimation of Calcium as Calcium carbonate.

6.Estimation of Sulphate as Barium sulphate.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

ALLIED CHEMISTRY PRACTICAL

COURSE CODE : 17ACHP1 **45 hours**

Volumetric Estimation

I. TITRIMETRY

1. Estimation of Sodium hydroxide - Standard sodium carbonate.
2. Estimation of Hydrochloric acid-Standard Oxalic acid.
3. Estimation of Borax – Standard Sodium carbonate.
4. Estimation of Ferrous sulphate – Standard Mohr's Salt.
5. Estimation of Oxalic Acid – Standard Ferrous Sulphate.
6. Estimation of Sodium hydroxide – Standard. Potassium permanganate
7. Estimation of Ferrous iron using diphenylamine as internal indicator.

II. Organic Analysis :

1. Detection of elements- nitrogen, sulphur and halogens.
2. Detection of aliphatic or aromatic.
3. Detection of whether saturated or unsaturated compounds.
4. Preliminary tests and detection of functional groups :aldehydes, phenols, aromatic amines, aromatic acids, dicarboxylic acids, Urea , benzamide & carbohydrate.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS), SALEM-7

B.Sc. CHEMISTRY

THIRD SEMESTER

NON MAJOR ELECTIVE COURSE : CHEMISTRY IN DAILY LIFE –I

COURSE CODE : 17UNME1 [15 Hours]

Note: *Structure and chemical equations not required.*

Learning objectives:

- To learn the water properties
- To study about dyes and fibers
- To learn the medicinal terms
- To study the food Adulterants and Indian Medicinal Plants

Learning outcome:

- Learn about the quality of water and their importance.
- Study about the properties of fibers and dyes
- Get knowledge of medicinal terms
- Learn the adulterant types and properties of medicinal plants

Unit - I

Water Chemistry

Introduction, Sources of water impurities, Hard and Soft water, Degree of Hardness, Types of Hardness, Scale and Sludge Formation in boiler and its prevention. Caustic embrittlements, softening of water, properties of drinking water, Break point chlorination, desalination of Brackish water - water purification – mechanism of domestic RO system – Ozone treatment.

Unit II

Fibers and Dyes

Fibers: Natural fibers – cotton, wool, silk – General Characteristics, Synthetic fibers – properties and uses – Nylon 6,6- Polyester – Polyacrylonitrile – Viscose fibers.

Dyes:Requirements of a dye - Classification based on mode of application to the fabric - Applications of dyes (general study). Ancient and modern colours – Mention of indigo and alizarin.

Unit - III

Pharmaceutical chemistry

Drug: Chemical name, generic name and trade names with examples. Terminology: Prodrug, pharmacy, pharmacology, pharmacophore, pharmacognosy, pharmacodynamics and pharmacokinetics (elementary idea only). Antipyretics, analgesics, antacids, antihistamines, antibiotics, antiseptics, disinfectants, anaesthetics, tranquilizers, narcotics, antidepressants and psychedelic drugs (definition and examples). Side effects of OTC drugs like paracetamol, ibuprofen, diclofenac. General idea of antibiotic and antimalarial drug resistance.

Unit - IV

Food

Common Adulterants in Different Foods:Milk and milk products, vegetable oils, cereals, tea, coffee powder, chilly powder and beverages.

Food Additives:Antioxidants and food preservatives – Commonly used permitted and non-permitted food colours - Artificial sweeteners – Taste enhancers - Artificial ripening of fruits and its side effects.

Modern Food Habits:Definition and health effects of fast foods, instant foods, dehydrated foods and junk foods. Harmful effects of modern food habits.

Importance of milk and coconut water.

Unit - V

Indian Medicinal Plants and Important Diseases

Indian medicinal plants and uses – Aloe vera, Papaya,Neem, tulsi, kilanelli, semparuthi, adathoda, nilavembu, sirianangai and thoothuvalai.

Diabetes – types and control of diabetes – role of insulin.

Cancer therapy –tumer, types and causes – use of common vegetables and fruits to prevent cancer, (curcumin, grape, strawberry, rosemary, tomato, tea, brucolli, ginger, saffron)

AIDS – causes, prevention, control and treatment.

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