VIVEKANANDA COLLEGE

College with Potential for Excellence

Residential & Autonomous – A Gurukula Institute of Life-Training Re-accredited (3rd Cycle) with 'A' Grade (CGPA 3.59 out of 4.00) by NAAC

Affiliated to Madurai Kamaraj University

(Managed by Sri Ramakrishna Tapovanam, Tirupparaitturai, Trichy)

TIRUVEDAKAM WEST, MADURAI DISTRICT- 625 234

www.vivekanandacollege.ac.in

Post Graduate and Research Department of Chemistry

Programme**: B.Sc. Chemistry**

Learning Outcomes based Curriculum Framework (LOCF)

(For those students admitted during the Academic Year 2021-22 and after)

DEPARTMENT OF CHEMISTRY

Programme: B.Sc. Chemistry, (CBCS and LOCF)

(For those students who admitted during the Academic Year 2021-22 and after)

PART – III: **Core Practical**		SEMESTER **I & II**
Course Title: **VOLUMETRIC ANALYSIS AND ORGANIC ESTIMATION**		
Course Code: **07CP23**	Hours per week: **3**	Credits: - **4**
CIA Marks: - 40	ESE Marks: - 60	Total Marks: - 100

Preamble

Students are enabled to

- ✓ acquire knowledge of hand on experiment on volumetric analysis, this leads them to develop the knowledge in the principles of concentration, primary and secondary standards.

Course Outcomes (CO)

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

CO	CO Statements	Knowledge Level
CO1	Anticipate, recognize, and respond properly to potential hazards in laboratory procedures	K1, K2 & K3
CO2	Perform accurate quantitative measurements	K1, K2 & K3
CO3	Interpret experimental results and draw reasonable conclusions	K1, K2 & K3
CO4	Keep accurate and complete experimental records	K1, K2 & K3
CO5	Interpret experimental results and draw reasonable conclusions	K1, K2 & K3
CO6	Communicate effectively through oral and written reports	K1, K2 & K3

K1-Remembering **K2-Understanding** **K3-Applying**

Syllabus

UNIT-I: VOLUMETRIC ANALYSIS

Principle: Volumetric estimation: Principe, standard solution, analyte, titrant, indicator, end point, equivalent point, primary standard and secondary standard, preparation of standard solution.

Concentration terms: Mole concept – molecular formula – molecular weight – equivalent weight –normality – molality – molarity – weight percentage – problems related to preparation of different concentrations of solutions – list of lab apparatus and their uses.

[A double titration involving the preparation of a primary standard, standardization of the link solution and estimation of the given analyte.]

UNIT-II: **ACIDIMETRY AND ALKALIMETRY**

1. Estimation of H_2SO_4 *vs.* NaOH using a standard oxalic acid.
2. Estimation of HCl *vs.* NaOH using a standard oxalic acid.
3. Estimation of NaOH *vs.* H_2SO_4 using a standard Na_2CO_3.
4. Estimation of Na_2CO_3 *vs.* HCl using a standard Na_2CO_3.

UNIT-III: **REDOX TITRATIONS**

Permanganometry

5. Estimation of oxalic acid *vs.* $KMnO_4$ using a standard oxalic acid.
6. Estimation of ferrous sulphate *vs.* $KMnO_4$ using a standard oxalic acid.
7. Estimation of Mohr's salt *vs.* $KMnO_4$ using a standard oxalic acid.

Dichrometry

8. Estimation of ferrous ion
9. Estimation of ferric ion using external indicator

UNIT-IV: IODOMETRY, IODIMETRY AND EDTA TITRATION

Iodometry and iodimetry

10. Estimation of potassium dichromate
11. Estimation of potassium permanganate
12. Estimation of copper

EDTA titration

13. Estimation of hardness of water using EDTA

UNIT-V: ORGANIC ESTIMATION

14. Estimation of phenol by brominating method
15. Estimation of aniline by brominating method
16. Estimation of Ascorbic acid

Text Book

1. Venkateswaran, V., Veerasamy, R. and Kulandaivelu, A.R, *Basic Principles of Practical Chemistry*, 2nd Ed., Sultan Chand & Sons, New Delhi, 2017.
2. Thomas, A.O, *B.Sc. Main Practical Chemistry*, Scientific Book Centre, Cannanore, 2003.

Reference Books

1. Gnanaprakasam, N.S and Ramamurthy, G. *Organic Chemistry Lab Manual*, S. Viswanathan, Pvt. Ltd, 2007.
2. Jeffery, G.H., Basset J and others, *Vogel's Textbook of Quantitative Chemical Analysis*, ELBS, 5th Ed., London, 1989.
3. Furniss B.S. et al, *Vogel's Textbook of Organic Chemistry*, ELBS, 5th Ed., London, 1989.

E - Resources

1. https://www.youtube.com/watch?v=KyZtyEF6kqk
2. https://www.youtube.com/watch?v=ka62KfMgRv8
3. https://www.youtube.com/watch?v=hxYorBeMhnc
4. https://www.youtube.com/watch?v=xOQ6tweyWuE
5. https://www.youtube.com/watch?v=bHkFSavcU5I

Distribution of marks

Max marks: 100

Internal	**: 40 marks**	**External**	**: 60 marks**
Attendance	: 5 marks	Estimation	: 30 marks
Laboratory performance and model practical	: 20 marks	Simple procedure Record note book	: 10 marks : 10 marks
Viva-voce	: 5 marks	Viva-voce	: 10 marks
Observation note book	: 10 marks		
Total	: 40 marks	Total	: 60 marks

For Volumetric Estimation if the student have

Less than 2% Error - 30 marks
2-3% Error - 25 Marks
3-4% Error - 20 marks
3-5% Error - 15 marks
Greater than 5% - 10 marks

DEPARTMENT OF CHEMISTRY

Programme: B.Sc. Chemistry, (CBCS and LOCF)

(For those students who admitted during the Academic Year 2021-22 and after)

PART – III: **Core Practical**		SEMESTER **III & IV**
Course Title: **ORGANIC ANALYSIS AND PREPARATION**		
Course Code: **07CP43**	Hours per week: **3**	Credits: **- 4**
CIA Marks: - 40	ESE Marks: - 60	Total Marks: - 100

Preamble

Students are enabled to

- ✓ Carry out the qualitative analysis of an organic substance, to exhibit the derivative for functional group and to perform the preparation of organic compounds

Course Outcomes

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

CO	CO Statement	Knowledge level
CO1	Anticipate, recognize, and respond properly to potential hazards in laboratory procedures	K1, K2 & K3
CO2	Perform accurate qualitative analysis and prepare organic compounds	K1, K2 & K3
CO3	Interpret experimental results and draw reasonable conclusions	K1, K2 & K3
CO4	Keep accurate and complete experimental records	K1, K2 & K3
CO5	Interpret experimental results and draw reasonable conclusions	K1, K2 & K3
CO6	Communicate effectively through oral and written reports	K1, K2 & K3

K1-Remembering **K2-Understanding** **K3-Applying**

Syllabus

UNIT-I: ANALYTICAL CHEMISTRY

Introduction, Chemical analysis, qualitative and quantitative analysis - Sampling procedure, sampling in different physical state –gases, liquids, solids, sample storage, handling of chemicals & equipment, hazards, safety measures, laboratory hygiene & safety.

UNIT-II: SEPARATION AND PURIFICATION TECHNIQUES

Crystallization, Precipitation, solvent extraction, extraction by chemically active solvents, Continuous extraction, Soxhlet extraction.

Recrystallization, Sublimation, Distillation -Fraction distillation, Steam Distillation, Azeotropic distillation & Vacuum distillation.

UNIT-III: SYSTEMATIC ANALYSIS -ORGANIC COMPOUNDS

a) Tests for special elements: nitrogen, halogens and sulphur
b) Tests for saturation / unsaturation
c) Tests for aliphatic and aromatic character
d) Organic compounds containing one functional group and characterization - phenol, aldehyde, ketone, carboxylic acid, dicarboxylic acid (aliphatic and aromatic), ester, primary amine, halogen in nucleus and side chain, carbohydrates, diamides (urea and thiourea), amides, anilides and nitro compounds.
e) Preparation of solid derivative by modification of functional groups as possible.
Systematic Analysis using preliminary, identification and confirmatory tests and derivative preparation with chemical equations for all positive tests expected.
f) Analysis of purity of organic compound using thin layer chromatography (TLC)

(Minimum ten compounds to be analyzed)

UNIT-IV: Preparation of organic compound using Microwave oven (Green synthesis)

1. Dibenzal propanone
2. 2,3-diphenyl quinoxaline
3. Dihydropyridine
4. Phenytoin

UNIT-V

Purification of organic compounds using column chromatography
Determination of Melting / Boiling points of organic compounds using Digital melting point apparatus.

Text Books

1. Venkateswaran, V., Veerasamy, R. and Kulandaivelu, A.R. *Basic Principles of Practical Chemistry*, 2nd Ed., Sultan Chand & Sons, New Delhi, 2017.
2. Gnanaprakasam, N.S. and Ramamurthy, G. *Organic Chemistry Lab Manual*, S. Viswanathan, Pvt.Ltd, 2007.

Reference Books

1. Thomas, A.O. *Practical Chemistry*, 7th Ed., Scientific Book Centre, Kannur, 1999.
2. Furniss, B.S., Hannaford, A.J., Smith, P.W.G. and Tatchell, A.R. *Vogel's Textbook of Practical Organic Chemistry*, 5th Ed., Longman Scientific & Technical, 1989.
3. Mann, F.G. and Saunders, B.C., *Practical Organic Chemistry*, 4th Ed., Pearson Education, 2009.
4. Ahluwalia, V.K. and Dhingra, S. *Comprehensive Practical Organic Chemistry: Qualitative Analysis*, Universities Press, 2000.

E - Resources

1. https://www.youtube.com/watch?v=YTH9RU-xzqM
2. https://www.youtube.com/watch?v=FUo428guKt0
3. https://www.youtube.com/watch?v=n4esSHxz_J8
4. https://www.youtube.com/watch?v=FuqNEIfsE-Q
5. https://www.youtube.com/watch?v=g5nfiFMCkbQ

Distribution of marks

Max marks: 100

Internal	**: 40 marks**	**External**	**: 60 marks**
Attendance	: 5 marks	Organic analysis	: 30 marks
Laboratory performance and model practical	: 20 marks	Organic preparation	: 10 marks
		Record note book	: 10 marks
Viva-voce	: 5 marks	Viva-voce	: 10 marks
Observation note book	: 10 marks		
Total	: 40 marks	Total	: 60 marks

Organic preparation (10 marks)	
Procedure	: 2 marks
Crude sample	: 6 marks
Recrystallized sample	: 2 marks
Total	**: 10 marks**

Organic analysis (30 Marks)	
Procedure	: 10 marks
Elements present	: 4 marks
Aliphatic or aromatic	: 3 marks
Saturated or unsaturated	: 3 marks
Functional group	: 7 marks
Derivative	: 3 marks
Total	**: 30 marks**

DEPARTMENT OF CHEMISTRY

Programme: B.Sc. Chemistry, (CBCS and LOCF)

(For those students who admitted during the Academic Year 2021-22 and after)

PART – III: **Core Practical**		SEMESTER **V & VI**
Course Title: **INORGANIC ANALYSIS AND GRAVIMETRIC ESTIMATION**		
Course Code: **07CP62**	Hours per week: **6**	Credits: **- 4**
CIA Marks: - 40	ESE Marks: - 60	Total Marks: - 100

Preamble

Students are enabled to

- ✓ Learn the techniques of semi micro qualitative analysis of inorganic salt mixtures.
- ✓ Study the tests for acidic and basic radicals.
- ✓ Get the knowledge on hand on experience of gravimetric analysis.

Course Outcomes (CO)

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

CO	CO Statement	Knowledge Level
CO1	Anticipate, recognize, and respond properly to potential hazards in laboratory procedures	K1, K2 & K3
CO2	Perform accurate qualitative and quantitative measurements	K1, K2 & K3
CO3	Interpret experimental results and draw reasonable conclusions	K1, K2 & K3
CO4	Keep accurate and complete experimental records	K1, K2 & K3
CO5	Interpret experimental results and draw reasonable conclusions	K1, K2 & K3
CO6	Communicate effectively through oral and written reports	K1, K2 & K3

K1-Remembering **K2-Understanding** **K3-Applying**

Syllabus

UNIT-I: INORGANIC QUALITATIVE AND QUANTITATIVE ANALYSIS

Semi-micro analysis: Introduction – Classification of methods of analysis – Advantages – Apparatus used – Preliminary tests – Spot tests.

Gravimetric analysis: Introduction – Apparatus used – Precipitation – Digestion – Filtration and washing – Advantages of using sintered crucible over the use of filter paper – Drying and Ignition of the precipitate – Common Errors.

UNIT-II: REAGENTS AND SOLUTIONS

Preparation of laboratory reagents for inorganic qualitative analysis – Spot test reagents – Solid reagents – Solutions and reagents for gravimetric analysis – Gravimetric factors.

UNIT-III: GENERAL REACTIONS OF INORGANIC QUALITATIVE ANALYSIS

Study the general reactions of common anions: Carbonates, sulphite, sulphate, nitrites, nitrate, chloride, borate, phosphate and oxalate.

General reactions of common cations: Group – I cations, group – II cations, group – III cations – group – IV cations, group – V cations and group VI cations.

UNIT-IV: QUALITATIVE ANALYSIS

Systematic qualitative analysis of mixtures containing two cations and two anions from the following with one interfering radical by semi-micro method only. Identification and confirmation tests and spot tests expected.

Cations: Pb, Bi, Cu, Sn, Fe, Al, Cr, Ni, Co, Zn, Mn, Ca, Ba, Sr, Mg and NH_4^+.

Anions: Acetate, oxalate, tartarate, borate, chromate, chloride, iodide, bromide, nitrate, carbonate, sulphide, sulphate and phosphate.

(Minimum of eight mixtures (with interfering anions) to be analysed)

UNIT-V: QUANTITATIVE ANALYSIS

Gravimetric analysis

1. Estimation of Lead as Lead chromate
2. Estimation of Barium as Barium chromate
3. Estimation of Calcium as Calcium oxalate monohydrate
4. Estimation of Copper as Copper thiocyanate
5. **Estimation of Nickel as Nickel (II) dimethylglyoxime**.

Text Books

1. Venkateswaran, V., Veerasamy, R. and Kulandaivelu, A.R., *Basic Principles of Practical Chemistry*, 2nd Ed., Sultan Chand & Sons, New Delhi, 2017.
2. Thomas, A.O. *Practical Chemistry*, 7th Ed., Scientific Book Centre, Kannur, 1999**.**

Reference Books

1. Svehla, G. *Vogel's Qualitative Inorganic Analysis*, 7th Ed., Pearson Education, New Delhi, 2006**.**
2. Ramanujam, V.V., *Inorganic Semi Micro Qualitative Analysis*, 3rd Ed., The National Publishing Company, Chennai, 1974.

E - Resources

1. https://www.youtube.com/watch?v=yMChYvgTfkQ
2. https://www.youtube.com/watch?v=WIxhmGbWk94
3. https://www.youtube.com/watch?v=XZB261mv4bQ
4. https://www.youtube.com/watch?v=UGczbI9gy1U
5. https://www.youtube.com/watch?v=nPWgbniFpww

Distribution of marks

Max marks: 100

Internal	**: 40 marks**	**External**	**: 60 marks**
Attendance	: 5 marks	Qualitative analysis	: 20 marks
Laboratory performance and model practical	: 20 marks	Gravimetric estimation	: 20 marks
		Record note book	: 10 marks
Viva-voce	: 5 marks	Viva-voce	: 10 marks
Observation note book	: 10 marks		
Total	: 40 marks	Total	: 60 marks

Qualitative semi micro analysis (20 marks)		**Gravimetric Estimation (20 marks)**	
Four radicals with correct procedure	: 20 marks	Procedure	: 5 marks
		Estimation	: 15 marks
Three radicals with correct procedure	: 15 marks	Less than 2 % Error	: 15 marks
		2-3% Error	: 14 marks
Two radicals with correct procedure	: 10 marks	2-3% Error	: 12 marks
		2-3% Error	: 10 marks
		Greater than 5% Error	: 8 marks

DEPARTMENT OF CHEMISTRY

Programme: B.Sc. Chemistry, (CBCS and LOCF)

(For those students who admitted during the Academic Year 2021-22 and after)

PART – IV: **Skill Based Theory**		SEMESTER **VI**
Course Title: **INDUSTRIAL CHEMISTRY AND CLINICAL CHEMISTRY**		
Course Code: **07SB61**	Hours per week: **2**	Credits: **2**
CIA Marks: **25 Marks**	ESE Marks**:75 Marks**	Total Marks: **100 Marks**

Preamble

Students are enabled to

- ✓ Gain knowledge about utilities in chemical industries
- ✓ Study the industrial process of sugar and paper industry
- ✓ Develop skills in industrial chemistry preparation
- ✓ Learn the skills of clinical hygiene and biochemical analysis

Course Outcomes (CO)

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

No.	Course Outcome	Knowledge Level (according to Bloom's Taxonomy)
CO 1	familiarizes explain the chemistry involved in sugar and paper industries	K1, K2 & K3
CO 2	Describe the synthetic methods of oils, soaps, detergents and employ the oils, soaps, detergents in various applications.	K1, K2 &K3
CO 3	Comprehend the chemistry behind articles used in day-to-day life	K1, K2& K3
CO 4	Discuss the processes of clinical hygiene	K1, K2& K3
CO 5	Analyze urine and blood samples for their compositions	K1, K2& K3

K1-Remembering **K2-Understanding** **K3-Applying**

Syllabus

UNIT-I: SUGAR AND PAPER INDUSTRY

Sugar industry: Double sulphitation process, refining and grading of sugar. Saccharin: Synthesis and uses as a sugar substitute. Ethanol: Manufacture from molasses by fermentation.

Paper industry: Manufacture of paper – production of sulphite pulp and conversion to paper, bleaching, filling, sizing and calendaring – world production of sugar and paper.

UNIT-II: SOAPS AND DETERGENTS

Manufacture of soaps – toilet and transparent soaps – Detergents: Synthetic detergents, surface active agents and their classification – manufacture of anionic, cationic and non ionic detergents and shampoo – advantages of detergents over soaps.

UNIT-III: CHEMICALS IN DAY-TO-DAY LIFE

Preparation and uses of the following articles: Aroma sticks, safety matches, writing inks, mixed fruit jam, liquid blue, syrup, chalk crayons, white phenyl and black phenyl, washing powder, cleaning powder, nail polishes, wax candles and moth balls.

UNIT-IV: CLINICAL HYGIENE

Definition – importance of hygiene – personal and domestic hygiene (WHO standard) – types of hygiene – sterilization of surgical instruments – disinfectants – antiseptics – sanitation.

UNIT-V: BIOCHEMICAL ANALYSIS

Urine analysis: Determination of sugar, albumin, bile salt and pile pigment in urine.

Blood analysis: Composition of blood – blood grouping – determination of blood groups and matching – blood pressure – hypertension –determination of glucose in serum.

Hands on Experiments: 1. Extraction of Starch from Potato
2. Extraction of Casein from Milk

Field visits: One full day visit to a medical research laboratory and to chemical industry.

Text Book

1. Sharma, B.K. *Industrial Chemistry*, Goel Publishing House, Meerut, 2016.
2. Jeyashree Gosh, *A text book of Pharmaceutical Chemistry*, S. Chand & Company, 2014.

Reference Books

1. Chakrabarty, B.N. *Industrial Chemistry*, Oxford & IBH Publishing Co. Pvt. Ltd., 1983.
2. Plummer, D. *Practical Biochemistry*, Tata McGraw-Hills Publishing Company, 2005.

E - Resources

1. https://www.youtube.com/watch?v=EzPGmsY1owA
2. https://www.youtube.com/watch?v=Aa-qpS4TXvA
3. https://www.youtube.com/watch?v=9ysPKkwsqXo
4. https://www.youtube.com/watch?v=PkeZG1n7pP4
5. https://www.youtube.com/watch?v=p70AaqotHnc