

P.B.SIDDHARTHA COLLEGE OF ARTS & SCIENCE:: VIJAYAWADA

Semester-wise revised syllabus under CBCS, 2020-21

Analytical Methods in Chemistry-2

(Skill Enhancement Course (Elective), Credits: 03)

Course Code: CHESE T02

Offered to B.Sc (MPC)

Domain Subject: CHEMISTRY

Semester: V

Max.Marks :100(CCIA 25 + SEE: 75)

Theory Hrs./Week: 3

I Learning Outcomes: Students after successful completion of the course will be able to:

CO1. Remember the basic concepts of Chromatography like paper, TLC, Column, GC & HPLC (PO7)

CO2. Understand the significance of paper, TLC, Column, GC & HPLC in separation and identification of compounds (PO1, PO7) .

CO3. Apply the conceptual knowledge gained in the techniques of chromatography in separating and identifying the chemical compounds as and when required (PO1).

CO4. Analyse that how far one chromatographic technique is much use full in separation and identification of compounds over the other chromatographic technique (PO1,PO7).

II Syllabus (Total Hours: 45 including Unit tests etc.)

Unit-1: Chromatography-Introduction and classification

7 hours

Principle, Classification of chromatographic methods, Nature of adsorbents, eluents, R_f values, factors affecting R_f values.

UNIT-2: TLC and paper chromatography

12 hours

1. Thin layer chromatography: Principle, Experimental procedure, preparation of plates, adsorbents and solvents, development of chromatogram, detection of spots, applications and advantages.

2. Paper Chromatography: Principle, Experimental procedure, choice of paper and solvents, various modes of development- ascending, descending, radial and two dimensional, applications.

UNIT-3: Column chromatography

10 hours

1. Column chromatography: Principle, classification, Experimental procedure, stationary and mobile phases, development of the Chromatogram, applications, **factors affecting the column efficiency.**

2. Applications:- Separation of .Methylene Blue and Fluorene by column chromatography.

UNIT-4: Gas chromatography:

8 hours

Basic principles. Different types of GC techniques. Selection of columns and carrier gases.

Instrumentation. Detectors-Thermal conductivity detector, Flame ionization detector, R_f values.

Applications in the separation of amino acids & estrogens

UNIT-5: High Performance liquid chromatography (HPLC):**8 hours**

Basic principles. Normal and reversed Phases. Selection of column and mobile phase. Instrumentation. Detectors- RID, UV detector Rf values. Applications in the separation, separation of anions, barbiturates, tropane alkaloids.

III References

1. Fundamental so Analytical Chemistry by F.James Holler, Stanley R Crouch, DonaldM.Westand Douglas A.Skoog, Ninth edition, Cengage.
2. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and KevinA.Schug, Seventh edition, Wiley.
3. Quantitative analysis by R.A.Day Jr. and A.L.Underwood, Sixth edition, Pearson.
4. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition/ Pearson.

Text Books:

1. Instrumental methods of chemical analysis by B K Sharma
2. Instrumental methods of chemical analysis by Gurudeep & Chatwal Anand

Reference materials on the web/web links:

1. [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_\(Analytical_Chemistry\)/Instrumental_Analysis/Chromatography/Gas_Chromatography](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Instrumental_Analysis/Chromatography/Gas_Chromatography)
2. <https://lab-training.com/hplc-high-performance-liquid-chromatography/>

VI Co-Curricular Activities:

a) Mandatory :(Lab/field training of students by teacher (lab: 10+ fields: 05):

1. For Teacher: Training of students by the teacher in laboratory and field for not less than 15 hours on the field techniques/skills of determination of hardness of water, using the calorimeter and or Spectrophotometer, preparation of TLC plate, identification of spots in TLC and Paper chromatographic techniques, loading of column, selection of solvent system, separation of amino acids and dyes mixture using chromatographic techniques.

Google classroom created during instruction of course by the teacher concerned for sharing relevant material and conducting exams.

2. For Student: Student shall visit a related industry/chemistry laboratory in universities/research organizations/private sector facility and observe the chromatographic techniques used for the separation of compounds. Write their observations and submit a hand written fieldwork/project work report not exceeding 10 pages in the given format to the teacher.

3. Max marks for Fieldwork/project work Report: 05.

4. Suggested Format for Fieldwork/project work: Title page, student details, index page, details of place visited, observations, findings, and acknowledgements.

5. Unit tests (IE).

b) Suggested Co-Curricular Activities

1. Training of students by related industrial experts.

2. Assignments, Seminars and Quiz (on related topics).

3. Visits to facilities, firms, research organizations etc.

4. Invited lectures and presentations on related topics by field/industrial experts.

Suggested Question paper pattern

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SECTION-A

Short answer questions (25 Marks: 5x5)

Answer any Five questions. Each carries 5 marks.

At least 1 question should be given from each unit

- 1) What is the basic principle involved in chromatography, explain nature of adsorbents-L1
- 2) How to prepare TLC plates-L3
- 3) Explain Ascending and descending techniques in paper chromatography-L2
- 4) Explain the classification of column chromatography-L2
- 5) Write briefly about experimental procedure for column chromatography-L2
- 6) Explain the schematic diagram of G.C-L2
- 7) Explain schematic diagram of HPLC-L2
- 8) Write experimental procedure of TLC.-L2

SECTION-B

Answer the following questions.

(Total: 5x10=50 Marks)

- 9 (a) How do the chromatographic methods are classified? Explain any one-L2

Or

- (b) Define R_f value, Explain factors effecting the R_f values-L2

- 10 (a) Discuss the applications of TLC.-L3

Or

- (b) Explain the applications of paper chromatography-L3

- 11(a) Explain the factors effecting the column efficiency in CC-L2

Or

- (b) Discuss the separation of methylene blue and fluorescein by C C.-L2

- 12 (a) Explain different types detectors used in G.C-L2.

Or

- (b) Explain the separation of Amino acids by G.C-L2

- 13 (a) Explain the different detectors used in HPLC-L2

Or

- (b) Explain the separation of Anions and Barbiturates by HPLC-L2

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Analytical Methods in Chemistry-2- PRACTICAL SYLLABUS

(Skill Enhancement Course (Elective), Credits: 02)

Course Code: CHESE P02

Domain Subject: CHEMISTRY

Max.Marks :50(CCIA 10 + SEE: 40)

Offered to B.Sc (MPC)

Semester: V

Practical Hrs./Week: 3

I Learning Outcomes: On successful completion of this practical course, student shall be able to:

CO1. Perform the separation of a given dye mixture using TLC (PO1)

CO2. Learn the preparation of TLC plates (PO1, PO7)

CO3. Demonstrate the separation of mixture of amino acids using paper chromatography (PO1)

CO4. Acquire skills in using column chromatography for the separation of dye mixture (PO7)

II Practical (Laboratory) Syllabus: (30hrs)

1. Separation of a given dye mixture (methyl orange and methylene blue) using TLC (using alumina as adsorbent).
2. Separation of different amino acids using paper chromatography.
3. Separation of given mixture of amino acids (glycine and phenyl alanine) using ascending paper chromatography.
4. Estimation of Fe^{+2} by using thiocyanate by calorimeter.
5. Separation of sugars using TLC
6. Verification of Beer lambert's law. (Using potassium permanganate solution) using colorimeter /spectrophotometer.

III Lab References:

1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
2. Vogel A. I. Practical Organic Chemistry, Longman Group Ltd.
3. Bansal R.K. Laboratory Manual of Organic Chemistry, Wiley- Eastern.
4. Ahluwalia V. K. and Aggarwal R. Comprehensive Practical Organic Chemistry, University press.
5. Mann F.Gand Saunders B.C, Practical Organic Chemistry, Pearson Education.

Sample suggested question paper pattern: Practical's

Evaluation scheme	Marks
Experiment performance	30
Practical record	5
Viva	5
Total	40

