

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

Semester-wise revised syllabus under CBCS, 2020-21

Analytical Methods in Chemistry-1

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

Course Code: CHESET01

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 quantitative analysis data treatment, separation techniques and spectrophotometry (PO7)

CO2. Acquire knowledge on the concepts quantitative analysis data treatment, separation techniques and spectrophotometry (PO1, PO7)

CO3. Apply the conceptual knowledge gained in the areas of quantitative analysis data treatment, separation techniques and spectrophotometry in the chosen job role (PO1)

CO4. Analyse that how far the quantitative methods, data treatment methods separation techniques and spectrophotometric methods are use full in accurate analysis (PO1).

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

Unit-1: Quantitative analysis-1

8 hours

1. A brief introduction to analytical methods in chemistry
2. Principles of volumetric analysis, concentration terms- Molarity, Normality, v/v, w/v, ppm and ppb, preparing solutions- Standard solution, primary standards and secondary standards.
2. Description and use of common laboratory apparatus- volumetric flask, burette, pipette, beakers, measuring cylinders.

Unit-2: Quantitative analysis-2

12hours

1. Principles of volumetric analysis: Theories of acid-base (including study of acid-base titration curves), redox, complex metric, iodometric and precipitation titrations-choice of indicators for the saturations.
2. Principles of gravimetric analysis: precipitation, coagulation, peptization, co precipitation, post precipitation, digestion, filtration, and washing of precipitate, drying and ignition.

Unit-3: Treatment of analytical data

8hours

Types of errors- Relative and absolute, significant figures and its importance, accuracy – methods of expressing accuracy, errors- Determinate and indeterminate and minimization of errors, precision- methods of expressing precision, standard deviation and confidence interval.

Unit-4: Separation techniques**5 hours**

1. Solvent Extraction: Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism. Application-Determination of Iron (III).
2. Ion Exchange method: Introduction, action of ion exchange resins, applications.

UNIT-5: Spectrophotometry**12 hours**

Principle, Instrumentation: Single beam and double beam spectrometer, Beer- Lambert's law-Derivation and deviations from Beer-Lambert's law, applications of Beer- Lambert's law-Quantitative determination of Fe^{+2} , Mn^{+2} and Pb^{+2} . Determination of PK value of indicator, determination of Glucose in blood.

III References

1. Analytical Chemistry by Gary D.Christian, Purnendu K.Dasgupta and Kevin A.Schug, Seventh edition, Wiley.
2. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.
3. Text book of Environmental Chemistry and Pollution Control by S.S.Dara and D.D.Mishra, Revised edition, S Chand & Co Ltd.

Text Books:

1. Instrumental methods of chemical analysis by B K Sharma
2. Separation methods MN Sastry

Reference materials on the web/web links:

1. [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_\(Analytical_Chemistry\)/Quantifying_Nature/Volumetric_Chemical_Analysis_\(Shiundu\)/14.1%3A_Sampling_and_Statistical_Analysis_of_Data](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Quantifying_Nature/Volumetric_Chemical_Analysis_(Shiundu)/14.1%3A_Sampling_and_Statistical_Analysis_of_Data)
2. <https://vlab.amrita.edu/?sub=2&brch=190&sim=338&cnt=1>

IV Co-Curricular Activities:

a) Mandatory (Lab/field training of students by teacher (lab: 10 + field: 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 calibration of pH meter, Strong acid vs strong base titration using pH meter, determination of chloride ion, estimation of water quality parameters and estimation of Iron(II). 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. 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

Semester-wise revised syllabus under CBCS, 2020-21

Title of the Course: **Analytical Methods in Chemistry-1**

Course Code: CHESET01

Offered to B.S.c MPC

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. Explain the preparation of v/v based with suitable examples-L2
2. Discuss the significance of quantitative analysis in Chemistry-L2
3. Explain the need of drying the precipitate in gravimetric analysis-L2
4. Discuss the principal involved in Idometric titrations-L2
5. Define accuracy and explain the methods of expressing accuracy-L2
6. Discuss the principal and theory involved in solvent extraction-L1
7. Illustrate the importance of significant figures in qualitative analysis-L3
8. Explain the quantitative determination of Pb^{+2} by spectrophotometric methods-L3

SECTION-B

Answer the following questions.

(Total: 5x10=50 Marks)

9(a) Discuss the detail about the primary and secondary standards with suitable examples-L2

Or

9(b) Describe the role of the following apparatus in analytical chemistry I) Volumetric flask
II) Burette III) Pipette –L2

10(a) Elaborate the theory involved in complexometric and acid base titrations-L2

Or

10(b) Write a note on the following terms in gravimetric analysis I) Precipitation II) Digestion
III) Filtration-L2

11(a) Define error, discuss in detail about various types of errors encountered in quantitative analysis-L2

Or

11(b) Elaborate the methods used for minimization of errors-L2

12(a) Discuss the various factors which effect solvent extraction-L2

Or

12(b) Explain in detail about role of Ion exchange resins in separation of compounds-L2

13(a) Explain the role of spectrophotometry in the determination of PK value of an indicator-L2

Or

13(b) Give a detailed account on various factors responsible for deviation from Beer's-
Lambert's law-L2

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

Semester-wise revised syllabus under CBCS, 2020-21

Analytical methods in Chemistry-1-PRACTICAL SYLLABUS

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

Course Code: CHESEP01

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. Estimate Iron (II) using standard Potassium dichromate solution (PO1)

CO2. Learn the procedure for the estimation of total hardness of water (PO7)

CO3. Demonstrate the determination of chloride using Mohr's method (PO1, PO7)

CO4. Acquire skills in the operation and calibration of pH meter (PO1)

II Practical (Laboratory) Syllabus :(30hrs)

1. Estimation of Iron(II) using standard Potassium dichromate solution (using DPA indicator)
2. Estimation of total hardness of water using EDTA
3. Determination of chloride ion by Mohr's method
4. Study the effect on pH of addition of HCl/NaOH to solutions of acetic acid, sodium acetate and their mixtures.
5. Preparation of buffer solutions of different pH (i) Sodium acetate-acetic acid, (ii) Ammonium chloride-ammonium hydroxide.
6. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base.
7. Determination of dissociation constant of a weak acid.

II Lab References:

1. Text book of Vogel's Quantitative Chemical Analysis, Sixth edition, Pearson.

Sample suggested question paper pattern: Practical's

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