



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM
B.Sc Analytical Chemistry Syllabus (w.e.f: 2020-21 A.Y)

UG Program (4 Years Honors)
CBCS- 2020-21

B.Sc
Analytical Chemistry



Syllabus and Model Question Papers



ADIKAVI NANNAYA UNIVERSITY :: RAJAHMAHENDRAVARAM
B.Sc Analytical Chemistry Syllabus (w.e.f: 2020-21 A.Y)

STRUCTURE OF CHEMISTRY CORE SYLLABUS

Sem	Course No	Course Name	Course Type (T/P/L)	Hrs/Week	Credits	Max. Marks	Max. Marks
				Science: 4+2	Science: 4+1	Count/Internal/ Mid Assessment	Sem- End Exam
I	1	Basic Principles & Laboratory Operations	T	4	4	25	75
	2	Practical – I	L	2	1	-	50
II	3	Quantitative Methods of Analysis	T	4	4	25	75
	4	Quantitative Analysis	L	2	1	-	50
III	5	Separation Methods – I	T	4	4	25	75
	6	Separation Techniques	L	2	1	-	50
IV	7	Separation Methods – II	T	4	4	25	75
	8	Separation Techniques	L	2	1	-	50
	9 (Open Course)	Analytical Biochemistry and Environmental Chemistry	T	4	4	25	75
	10	Analysis of Bio Products	L	2	1	-	50



Objectives and outcome of the programme Analytical Chemistry:

Analytical Chemistry is an applied, experimental field of science and is based not only on chemistry, but also on physics, biology, information theory and many fields of technology. It is of fundamental importance not only to all branches of chemistry but also to all biological sciences, engineering sciences, health, medicine, pharmaceuticals, environment, industrial processes, quality control and implementation of legislation.

The objective of B.Sc Analytical chemistry course is to provide students exposure to chemistry, physics, biological sciences, environmental science, computer application, instrumentation and analytical techniques. In this three-year course spread over six semesters, there are 10 papers of Analytical chemistry 7 papers of chemistry and 7 Mathematics. In the last semester of this course, there is a provision for one cluster elective papers out of two cluster elective papers, viz.

After graduating in Analytical Chemistry the students can pursue academics in Chemistry, bioinformatics, forensic science, biochemistry and other disciplines of inter- disciplinary sciences. They can also use it as a stepping stone to pharmaceutical industry and for Research and Development in industry.

Course Structure

All theory papers will have 4 hours per week and practicals will have 2 hours per week upto Semester IV (Second year). In final year all theory papers will have 3 hours per week and practicals will have 2 hours per week in Semester V and V I (Final year).

Each Theory Paper shall be of 100 marks and Practical Paper shall be of 50 marks.

Total Number of Papers: 21

Mathematics : 7 Papers
Chemistry : 7 Papers
Analytical Chemistry : 7 Papers



B.Sc.	Semester - I	Credits: 4
Course: 1	Basic Principles & Laboratory Operations	Hrs/Wk: 4

Objectives:

The objective of this course is to make students aware about the SI Units, concentration terms, various analytical methods, types of errors in chemical analysis, statistical tests of data and safe usage of chemicals and its waste. And Thermal Gravimetric

Course Learning Outcomes:

By the end of the course, the students will be able to:

Understand about SI units

Learn use of analytical equipment

Know types of errors in chemical analysis

Handle statistical tests of data

Know safety with chemicals and waste.

Basic Principles & Laboratory Operations

UNIT I:

I. Basic Concepts:

12hrs

A. SI Units: Definitions of the Seven Basic Units (Mass, Length, Time, Temperature, Amount of substance, Electrical current and Luminous intensity), Derived units, Conversion between units, Significant figures.

B. Chemical concentrations

i) Mole, molar mass

ii) Calculations in grams and moles iii) Solutions and their concentrations:

a) Molar concentration b) Analytical molarity c) Equilibrium molarity of a particular species d) Percent concentration e) Parts per million/billion (ppm, ppb) f) Volume ratios for dilution procedures g) p-functions.

C. Preparation of solutions: standard solutions, primary standards, secondary standards.

UNIT II:

12hrs

Introduction to Analytical Chemistry and Analytical Methods -I

i) General steps in chemical analysis

ii) Introduction to methods of detecting analytes

Physical, Electromagnetic radiations and Electric charge

iii) Single pan analytical balance: (operation and theory of the balance, construction details, errors in weighing, care of an analytical balance).

UNIT III:

12hrs

Introduction to Analytical Chemistry and Analytical Methods - II

Description and use of common laboratory apparatus: Volumetric flasks, burettes, pipettes, meniscus readers, weighing bottles, different types of funnels chromatographic columns, chromatographic jars, desiccators, drying ovens, filter crucibles, rubber policeman. Calibration and use of volumetric glass ware.

pH meter: components of pH meter, use of pH Meter, maintenance of pH meter, application of data. Laboratory notebook



UNIT IV :

12hrs

Errors in Chemical Analysis

Types of errors, Accuracy and Precision, Absolute and relative uncertainty, propagation of uncertainty. The Gaussian distribution, mean and standard deviation, confidence intervals. Statistical tests of data (the F test, the t test, Q test for bad data, the method of least squares). Calibration curve. Laboratory notebook. Safety with chemicals and waste.

UNIT V:

12hrs

Principles of Thermogravimetry:

Thermometric methods – Principles of TGA, DTA and Thermometric titrations – application of CaC_2O_4 , H_2O , $(\text{CH}_3\text{COO})_2\text{Ca}$, H_2O and HCl Vs NaOH Thermometric titrations.

Teaching Learning Process:

Conventional chalk and board teaching, Visit chemical industries/ Drug industries to get information about the various instruments used in industries ICT enabled classes. Power point presentations. Interactive sessions. To get recent information through the internet.

TEXT BOOKS:

1. Seamus P.J. Higson: Analytical Chemistry.
2. Douglas A. Skoog and Donald M. West: Fundamentals of Analytical Chemistry.
3. Adion A. Gordus: Schaum's Outline of Analytical Chemistry, Tata McGraw-Hill.
4. Gary D. Christian: Analytical Chemistry.
5. Freifelder and Kealy: Analytical Chemistry.
6. Daniel C Harris: Exploring Chemical Analysis.
7. Daniel C Harris: Quantitative Chemical Analysis.

Assessment Methods:

- Presentations by Individual Student
- Class tests Laboratory test written assignment(s)



B.Sc.	Semester - I	Credits: 1
Course: 1(L)	Practical – I Lab	Hrs/Wk: 2

LABORATORY COURSE -I **30 hrs (2 h / w)**

Practical-I (At the end of Semester-I)

1. Use and calibration of volumetric equipment (volumetric flasks, pipette's and burette's).
2. Preparation of standard solutions of acids and bases.
3. Estimation of sodium carbonate by titrating with hydrochloric acid.
4. Preparation of standard solution of EDTA.
5. Estimation of magnesium using EDTA.
6. Use of pH meter: determination of pH of given dilute solutions of shampoos and soaps
7. Titration of acid-base using pH meter.
8. Preparation of buffers.

SUGGESTED BOOKS:

1. Seamus P.J. Higson: Analytical Chemistry.
2. Douglas A. Skoog and Donald M. West: Fundamentals of Analytical Chemistry.
3. Adion A. Gordus: Schaum's Outline of Analytical Chemistry, Tata McGraw-Hill.
4. Gary D. Christian: Analytical Chemistry.
5. Freifelder and Kealy: Analytical Chemistry.
6. Daniel C Harris: Exploring Chemical Analysis.
7. Daniel C Harris: Quantitative Chemical Analysis.



MODEL QUESTION COURSE
B. Sc DEGREE EXAMINATION
SEMESTER: I

Course 1: Basic Principles & Laboratory Operations

Time: 3Hrs.

Max. Marks: 75

Section - A

Answer any **FIVE** of the following questions. Each carries **FIVE** marks

5 X 5 = 25 M

1. Explain the terms Mole and molar mass.
2. Explain in brief about the general steps in chemical analysis
3. Write short note on methods of detecting analytes.
4. What is a Laboratory note book?
5. Write account on types of errors, Accuracy and Precision
6. Describe the safety with chemicals and waste.
7. What are thermometric methods
8. Explain how the calibration of volumetric glass ware is done

Section - B

Answer **ALL** the questions. Each carries **TEN** marks

5 X 10 = 50 M

9. a) Explain standard solutions, primary standards and secondary standards giving examples

(OR)

b) Explain the terms

a) Molar concentration b) Analytical molarity c) Equilibrium molarity of a particular species d) Percent concentration e) Parts per million and billion

10. a) Write an essay on the operation and theory of the Single pan analytical balance

(OR)

b) Explain errors in weighing, care of an analytical balance

11. a) Describe the use of any five common laboratory apparatus

(OR)

b) What is a pH meter and describe the components of pH meter and its use

12. a) Explain the Gaussian distribution, mean and standard deviations

(OR)

b) Explain the statistical tests of data. Write in detail about i) F test ii) t test

13. a) Explain the Principles of TGA and DTA in detail

(OR)

b) What are thermometric titrations and write its applications



B.Sc.	Semester - II	Credits: 4
Course: 2	Quantitative Methods Of Analysis	Hrs/Wk: 4

Objectives:

The objective of this course is to make students aware about the gravimetric and volumetric methods of analysis, various types of titrations, equilibria principles, various centrifugation methods, polarography and environmental analysis.

Course Learning Outcomes:

At the completion of this course, students should be able to understand:

Various quantitative methods of analysis like Gravimetric Analysis Volumetric methods of analysis, Various Centrifugation Methods, Polarography and Environmental Analysis

UNIT I: 12hrs

Gravimetric Analysis - I

A. Precipitation methods. General principles

B. Volatilization methods. General principles - determination of the sodium hydrogen carbonates content of antacid tablets

C. Properties of precipitates and precipitating reagents: Particle size, Filterability of Precipitates - Crystalline Precipitates - Co-precipitation - Precipitation from Homogeneous

D. Drying and Ignition of precipitates

UNIT II: 12hrs

Volumetric Analysis

A. Definitions: Titrimetry, Volumetric titrimetry, Gravimetric titrimetry, Coulometric titrimetry.

B. The equivalence point, the end point; Classification of volumetric methods, theory of indicators and buffers – Equilibria Principles - Aqueous and non-aqueous acid-base titration - Redox titrations - Complexometric titrations - Precipitation titrations

C. Typical problems in volumetric titrimetry:

D. Sigmoidal Titration Curves

UNIT III: 12hrs

Centrifugation Methods:

A. Introduction

B. Sedimentation and relative centrifugal force

C. Different types of rotors.

D. Density gradient

E. Types of centrifugation techniques.

UNIT IV: 12hrs

Polarography

Basic principles – Dropping Mercury Electrode (DME) – Advantages and Disadvantages. Diffusion current – The Ilkovic equation (derivation not required). Half – Wave potential – Experimental set up – Applications. Determination of Copper and Zinc in Brass.

UNIT V: 12hrs

Introduction to Environmental Analysis:

A. Sampling method

B. Environmental pollution from industrial effluents and radiochemical waste.

C. Introduction to water and waste analysis.



TEXT BOOKS:

1. Analytical Chemistry- Methods of Separation (R.V. Dilts).
2. Laboratory Handbook of Chromatographic Methods (O. Mikes, R.A. Chalmers).
3. F.W. Fifield and D. Kealy: Analytical Chemistry.
4. Vogel's textbook of quantitative chemical analysis, 6th edition
5. Vogel's textbook of quantitative chemical analysis, 7th edition.
6. Keith Wilson and John Walker: Practical Biochemistry.



B.Sc.	Semester - II	Credits: 1
Course: 2(L)	Quantitative Analysis Lab	Hrs/Wk: 2

LABORATORY COURSE -II

30 hrs (2 h / w)

Practical-II Quantitative Analysis (At the end of Semester-II)

1. Determination of the pKa and Equivalent Weight of a weak acid by potentiometric pH titration.
2. Determination of the strength of the given magnesium sulphate solution using EDTA and Eriochrome black –T as the indicator.
3. Determination of the capacity of an anionic exchange resin.
4. Homogeneous precipitation of the Nickel as its Dimethyl glyoxime.
5. Analysis of soil
 - i) Determination of pH of soil.
 - ii) Determination of total soluble salts.
 - iii) Determination of carbonate and bicarbonate.

Suggested Readings:

1. Analytical Chemistry- Methods of Separation (R. V. Dilts).
2. Laboratory Handbook of Chromatographic Methods (O. Mikes, R.A. Chalmers).
3. F.W. Fifield and D. Kealy: Analytical Chemistry.
4. Vogel's textbook of quantitative chemical analysis, 6th edition.
5. Vogel's textbook of quantitative chemical analysis, 7th edition.
6. Keith Wilson and John Walker: Practical Biochemistry.

Teaching Learning Process:

- Conventional chalk and board teaching, Visit chemical industries to get information about the technologies and environmental pollution from industrial effluents.
- ICT enabled classes. Power point presentations. Interactive sessions, Debate.

Assessment Methods:

- Presentations by Individual Student
- Class Tests
- Written assignment(s)
- End semester University theory and practical examination



MODEL QUESTION COURSE

B. Sc DEGREE EXAMINATION

SEMESTER: II

Course 2: QUANTITATIVE METHODS OF ANALYSIS

Time: 3Hrs.

Max. Marks: 75

Section - A

Answer any **FIVE** of the following questions. Each carries **FIVE** marks **5 X 5 = 25 M**

1. Explain in brief about the co-precipitation of Gravimetry.
2. Explain in brief about the general practical gravimetric procedures
3. Write short note on Coulometric titrimetry.
4. Explain the theory of indicators and buffers?
5. What are the different types of rotors used in centrifugation?
6. What is polarography write its applications
7. Write the Ilkovic equation and explain its significance
8. Explain the different types of sampling methods adopted in environmental analysis

Section - B

Answer **ALL** the questions. Each carries **TEN** marks **5 X 10 = 50 M**

9. a) Explain the general principles of precipitation methods of gravimetric analysis
(OR)
b) Explain the general principles of volatilization methods of gravimetric analysis.
10. a) Write an essay on the Aqueous and non-aqueous acid-base titration with examples
(OR)
b) Explain the redox titration, Complexometric titrations and precipitation titrations with examples.
11. a) Describe the determination of Copper and Zinc in brass using polarography
(OR)
b) Explain the experimental set up the instruments used in Polarography and write its applications.
12. a) Explain the sedimentation and relative centrifugal force in detail
(OR)
b) Explain the different types of centrifugation techniques with examples.
13. a) Explain the Environmental pollution from industrial effluents and radiochemical waste.
(OR)
b) What are the water pollutants and explain the different methods of waste analysis?



B.Sc.	Semester - III	Credits: 4
Course: 3	Separation Methods - I	Hrs/Wk: 4

Objective:

To acquire basic knowledge of the analytical chemistry of important techniques that will provide the basis for their industrial production methods. To provide an adequate mastery of analytical methods used for the determination of commercial/domestic raw materials and finished product quality.

Course Learning Outcomes:

By the end of this course, students will be able to:

- Become familiar with fundamental concepts of partition coefficients and their role in achieving separations across different types of chromatography.
- Develop the core skills to parse existing chromatographic protocols and identify the key factors influencing a chromatography experiment.
- Understand the underlying assumptions of the most common chromatographic separation techniques and approaches to method validation.
- Understand the concept of solubility and their application in separation using distribution law.
- Learn application of dialysis and membrane for various techniques.

UNIT I:

12hrs

Solvent Extraction:

Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, Continuous extraction and counter current extraction. Synergism, Application Determination of Iron (III)

Ion Exchange: Introduction, action of ion exchange resins, separation of inorganic mixtures, applications, Solvent extraction: Principle and process,

UNIT II:

12hrs

Chromatography:

A. Classification of chromatographic methods: Principle of differential migration, description of the chromatographic process, distribution coefficients, modes of chromatography, performing column chromatography.

B. Chromatography – theory and practice: Introduction, the chromatograph (elution time and volume), capacity factor, column efficiency and resolution, sample preparation

UNIT III:

12hrs

A. Techniques of paper chromatography: experimental modifications, various modes of development, nature of the paper, detection of spots, retardation factors, factors that affect the reproducibility of R_f values (due to paper, solvent system, sample, development procedure), selection of solvent, quantitative analysis. Applications

B. Thin layer chromatography: stationary phase, adsorbents, liquid phase supports, plate preparation, mobile phase, sample application, development, saturation of chamber, detection of spot, R_f values (effect of adsorbent, solvent, solute, development process), quantitative analysis, applications



UNIT IV:

12hrs

Column Chromatography.

A. General: columns, matrix materials, stationary phase, column packing, application of sample, column development and sample elution, detectors and fraction collectors, applications.

B. High performance liquid chromatography: Principle, column, matrices and stationary phases, column packing, mobile phase and pumps, application of sample, detectors, applications.

C. Adsorption chromatography: Principle, adsorbents, solvents, nature of solute, operating parameters, retention volumes and times, applications.

UNIT V:

12hrs

A. Liquid-liquid partition, chromatography: Principle, normal phase chromatography, reversed- phase liquid chromatography, reversed phase liquid chromatography, applications.

B. Ion- exchange chromatography: Principle, ion exchangers, ion- exchange equilibria, ion-exchange resin selectivity, column operations (column development, detection of solute bands), factors affecting retention volumes, applications

TEXT BOOKS:

1. F.W. Fifield and D. Kealy : Analytical Chemistry.
2. Daniel C Harris: Exploring chemical analysis.
3. Daniel C Harris: Quantitative chemical analysis.
4. R.V. Dilts Analytical Chemistry- Methods of Separation.
5. O. Mikes, R.A. Chalmers: Laboratory Handbook of Chromatographic Methods.



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B.Sc Analytical Chemistry Syllabus (w.e.f: 2020-21 A.Y)

B.Sc.	Semester - III	Credits: 1
Course: 3(L)	Separation Techniques Lab	Hrs/Wk: 2

LABORATORY COURSE -III

30 hrs (2 h / w)

1. Determination of R_f value of amino acids using paper chromatography.
2. Separation and identification of monosaccharide present in a given mixture by paper chromatography.
3. Determination of equivalent conductance of a weak electrolyte (acetic acid) at different concentrations.
4. Determination of adulterant in some common food items:
 - i) Chicory in coffee powder, ii) Foreign resin in asafetida iii) Chilli powder
 - iv) Turmeric powder v) Pulses

Suggested Readings:

1. F.W. Fifield and D. Kealy : Analytical Chemistry.
2. Daniel C Harris: Exploring chemical analysis.
3. Daniel C Harris: Quantitative chemical analysis.
4. R.V. Dilts Analytical Chemistry- Methods of Separation.
5. O. Mikes, R.A. Chalmers: Laboratory Handbook of Chromatographic Methods.

Teaching Learning Process:

- Teaching Learning Process for the course is visualized as largely student-focused. Transaction through an intelligent mix of conventional and modern methods. Engaging students in cooperative learning.
- Learning through quiz design.
- Problem solving to enhance comprehension.

Assessment Methods:

- Assessment will be done on the basis of regular class test, presentations and assignments as a part of internal assessment during the course as per the curriculum.
- End semester university examination will be held for both theory and practical.
- In practical, assessment will be done based on continuous evaluation, performance in the experiment on the date of examination and viva voce



MODEL QUESTION COURSE
B. Sc DEGREE EXAMINATION
SEMESTER: III
Course 3: SEPARATION METHODS - I

Time: 3Hrs.

Max. Marks: 75

Section - A

Answer any **FIVE** of the following questions. Each carries **FIVE** marks

5 X 5 = 25 M

1. Explain in brief about the Batch extraction
2. Explain the principle of differential migration
3. Write a short note on modes of chromatography.
4. Explain the various modes of development of paper chromatography
5. Write a short notes on the adsorption chromatography
6. Write a short notes on different types of detectors used in HPLC
7. What is normal phase chromatography, give an example
8. Explain the reversed phase liquid chromatography

Section - B

Answer **ALL** the questions. Each carries **TEN** marks

5 X 10 = 50 M

9. a) Explain the principle of solvent extraction in detail. ii) Explain the determination of Iron (III)

(OR)

- b) Explain the action of ion exchange resins and separation of inorganic mixtures.

10. a) Write an essay on the general principles of chromatography in detail

(OR)

- b) Explain the terms i) column efficiency and resolution ii) Sample preparation and iii) Chromatograph .

11. a) Describe the techniques of paper chromatography and its applications

(OR)

- b) Explain the experimental set up of the thin layer chromatography with a detailed note of its applications in quantitative analysis.

12. a) Explain the principle of column chromatography and its applications

(OR)

- b) Explain the principle and the parts involved in HPLC.

13. a) Explain the principle and ion exchangers of Ion exchange chromatography

(OR)

- b) Write an essay on liquid-liquid partition chromatography



B.Sc.	Semester - IV	Credits: 4
Course: 4	Separation Methods – II	Hrs/Wk: 4

Objective:

- Objective of this course is to learn the separation techniques and its application

Course Learning Outcomes:

- At the end of the course, student should be able to understand:
- Various types of separation techniques and their applications
- Electrophoresis techniques and Centrifugation techniques

UNIT I: 12hrs

Gel, Affinity and Gas Chromatography

A. Gel chromatography: Principle, types of gels, separation by gel chromatography, applications.

B. Affinity chromatography: Principle, materials, selection and attachment of ligand, practical procedure, applications,

C. Gas- liquid chromatography: Apparatus and materials, preparation and application of samples, separation conditions, detectors, applications.

UNIT II: 12hrs

Electrophoresis –I

Theory and classification, factors affecting mobility, macromolecular size and charge interactions with supporting electrolyte, pH and concentration discontinuities, factors affecting electrophoresis phenomena: electrolysis,

UNIT III: 12hrs

Electrophoresis –II

Electro-osmosis, temperature and supporting media; instrumentation, methodology, preparation of gel-staining and de-staining, preparative zone electrophoresis, continuous electrophoresis, applications.

UNIT IV: 12hrs

Dialysis and Membrane Filtration

A. Principle, apparatus, support media (paper, cellulose acetate membranes, gels)

B. Filters- nitrocellulose, fiberglass, polycarbonate

C. General Laboratory methods.

UNIT V: 12hrs

Centrifugation Methods:

Introduction, sedimentation and relative centrifugal force, different types of rotors, density gradients, types of centrifugation techniques.



TEXTBOOKS:

1. R.V. Dilts: Analytical Chemistry- Methods of Separation.
2. O. Mikes, R.A. Chalmers: Laboratory Handbook of Chromatographic Methods.
3. F.W. Fifield and D.Kealy: Principles and practice of analytical chemistry.
4. Vogel's textbook of quantitative chemical analysis, 6th edition.
5. Vogel's textbook of quantitative chemical analysis, 7th edition.
6. Keith Wilson and John Walker: Practical Biochemistry.
7. Chromatography: Basic Principles, Sample Preparations and Related Methods by Elsa Lundanes, Leon Reubsæet, Tyge Greibrokk, John Wiley and Sons, 2013
8. Introduction to Modern Liquid Chromatography by Lloyd R. Snyder, Joseph J.
9. Kirkland and John W. Dolan, Wiley
10. Practical HPLC Method Development by Lloyd R. Snyder, Wiley-Interscience



B.Sc.	Semester - IV	Credits: 1
Course: 4(L)	Separation Techniques Lab	Hrs/Wk: 2

LABORATORY COURSE -IV

Practical-IV Separation Techniques

30 hrs (2 h / w)

1. Determination of the strength of the given HCl solution by titrating it against NaOH solution conductometrically.
2. Determination of residual chlorine in city water supply using colorimetry.
3. Determination of adsorption isotherm of acetic acid on activated charcoal. Determination of the adsorption constant (k)
4. Determination of nicotine content in cigarette tobacco.

SUGGESSTED TEXT BOOKS:

1. Principles & Practices of Chromatography by R. P. W. Scott, Library for Science
2. Fundamentals of Analytical Chemistry, VIII Edn., D. A. Skoog, D. M. West, F.J.
3. Holler and S.R.Crouch, Thomson Brooks/Cole Publishers, 2004.
4. Principles of Instrumental Analysis by D.A. Skoog, F.J. Holler and T.A. Nieman, 5th
5. Edition (1998), Harcourt Brace & Company, Florida.
6. Instrumental Methods of Chemical Analysis, B. K. Sharma, Goel Publishing House. Meerut.
7. Instrumental Methods of Chemical Analysis, Chatwal and Anand, Himalaya Publishing

Teaching Learning Process:

- Lectures using teaching aid (chalk/power point/videos),
- Group discussion, • Presentations,
- Advise to students to prepare a report.

Assessment Methods:

- Presentation by individual student b. Class test
- Laboratory test
- Written assignments
- End semester University theory and practical examinations



MODEL QUESTION COURSE
B. Sc DEGREE EXAMINATION
SEMESTER: IV
Course 4: Separation Methods – II

Time: 3Hrs.

Max. Marks: 75

Section - A

Answer any **FIVE** of the following questions. Each carries **FIVE** marks **5 X 5 = 25 M**

1. Write a short note on selection and attachment of ligands in affinity chromatography
2. Explain the principle of electro - osmosis
3. Write a short note on the classification of electrophoresis
4. Explain the various applications of electrophoresis
5. Write a short note on the Filters- nitrocellulose related to dialysis
6. Write a short note on membrane filtration of fiberglass and polycarbonate
7. Write a short note on the support media used in membrane filtration
8. Explain the density gradients of centrifugation

Section - B

Answer **ALL** the questions. Each carries **TEN** marks

5 X 10 = 50 M

9. a) Explain the principle of gel chromatography and its applications
(OR)
b) Explain the gas – liquid chromatography and its applications
10. a) Write an essay on the factors affecting mobility, macromolecular size and charge interactions with supporting electrolyte
(OR)
b) Explain in detail about the factors affecting electrophoresis phenomena
11. a) Describe the instrumentation, methodology, preparation of gel-staining and de-staining
(OR)
b) Explain the preparative zone electrophoresis and continuous electrophoresis
12. a) Explain the principle of dialysis and membrane filtration
(OR)
b) Explain the general laboratory methods of membrane filtration
13. a) Explain the principle and types of centrifugation methods
(OR)
b) Write an essay on the sedimentation and relative centrifugal force methods



B.Sc.	Semester - IV	Credits: 4
Course: 5	Analytical Biochemistry and Environmental Chemistry	Hrs/Wk: 4

Objectives:

The Objective of the course is to learn about proteins, enzymes, nucleic acids and lipids, using suitable examples

Learning Outcomes:

By the end of the course, the students will be able to:

- Learn how the structure of biomolecules determines their reactivity and biological uses.
- Know biochemistry of diseases.

UNIT I:

12 hrs

Basic understanding of the Structures, Properties and Functions of Carbohydrates, Lipids and Proteins

1. Isolation and characterization of polysaccharides.
2. Classification of lipids, properties, functions and Biochemical functions of steroid hormones.
3. Proteins- structure, classification, isolation, characterization and functions.
4. Biochemistry of peptide hormones.

UNIT II:

12 hrs

Biochemistry of Disease: A Diagnostic approach Clinical chemistry: A diagnostic approach by blood analysis.

1. Blood: Composition and functions of blood, blood coagulation.
2. Blood collection and preservation of samples.
3. Anemia
4. Regulation, estimation and interpretation of data for blood sugar, urea, creatinine, cholesterol and bilirubin.

UNIT III:

12 hrs

Microbiological Tests and Assays:

Microbiological assay of antibiotics, (Standard preparations and units of activity, test organisms and inoculum, apparatus, methods: cylinder or cup plate method and two level factorial assay (ampicillin), microbial limit test (preliminary testing, medium soyabean casein digest agar medium only) and total microbial count only)

UNIT IV:

12 hrs

Standardization and Quality Control of different Dosage Forms:

Brief introduction to different dosage forms with the IP requirements, analytical methods for the following: Tablets (aspirin), additives used in tablet manufacture, capsules (Rifampicin), powders (Sodium benzoate), solutions (saline, NaCl) suspensions (barium sulphate–limit test for impurity), mouthwashes (Ointments (salicylic acid)

UNIT V:

12 hrs

Concept and scope of environmental chemistry – Classification of water pollutants – Characterization – Dissolved Oxygen – BOD – COD - Waste water treatment (General). Disposal of radioactive wastes. Pollution due to some typical industries like Textile, Pulp and Paper, Electroplating, Dairy, Cane sugar.



TEXT BOOKS:

1. T. G. Cooper: Tool of Biochemistry.
2. Keith Wilson and John Walker: Practical Biochemistry.
3. Alan H Gowenlock: Varley's Practical Clinical Biochemistry.
4. Thomas M. Devlin: Textbook of Biochemistry.
5. Jeremy M. Berg, John L Tymoczko, Lubert Stryer: Biochemistry.
6. G. P. Talwar and M Srivastava: Textbook of Biochemistry and
7. Human Biology.



B.Sc.	Semester - IV	Credits: 1
Course: 5(L)	Separation Techniques Lab	Hrs/Wk: 2

Laboratory Course-V Analysis of Bio Products

30 hrs (2 h / w)

Identification and estimation of the following:

1. Carbohydrates – qualitative and quantitative.
2. Lipids – qualitative.
3. Determination of the iodine number of oil.
4. Determination of the saponification number of oil.
5. Determination of cholesterol using Liebermann- Burchard reaction.
6. Proteins – qualitative.
7. Determination of protein by the Biuret reaction.

Suggested Readings Books:

1. A.L.Lehninger: Biochemistry.
2. O. Mikes, R.A. Chalmers: Laboratory Handbook of Chromatographic Methods.
3. Environmental chemistry by A.K.De
4. A text book of engineering chemistry by S.S.Dara
5. A text book of Industrial chemistry by B.K.Sharma

Teaching Learning Process:

- Lectures using teaching aid (chalk/power point/videos),
- Group discussion, • Presentations,
- Advise to students to prepare a report.

Assessment Methods:

- Presentation by individual student b. Class test
- Laboratory test
- Written assignments
- End semester University theory and practical examinations



MODEL QUESTION COURSE

B. Sc DEGREE EXAMINATION

SEMESTER: IV

Course 5: Analytical Biochemistry and Environmental Chemistry

Time: 3Hrs.

Max. Marks: 75

Section - A

Answer any **FIVE** of the following questions. Each carries **FIVE** marks

5 X 5 = 25 M

1. Write a short note on characterization of polysaccharides
2. What are lipids? Write their properties
3. Write a short note on the Blood collection and preservation of samples.
4. Explain the microbial limit test
5. Write a short note on the different dosage forms with the IP requirements
6. Write a short note on the additives used in tablet manufacture
7. Explain the Classification of water pollutants
8. Explain in brief about the Waste water treatment

Section - B

Answer **ALL** the questions. Each carries **TEN** marks

5 X 10 = 50 M

9. a) Explain the Biochemical functions of steroid hormones
(OR)
b) Explain the characterization and functions of proteins
10. a) Write an essay on the Composition and functions of blood and blood coagulation.
(OR)
b) Explain in detail about regulation, estimation and interpretation of data for blood sugar
11. a) Describe the Microbiological assay of antibiotics in detail
(OR)
b) Explain the cup plate method and two level factorial assay of ampicillin
12. a) Explain IP requirements and analytical methods for the aspirin and Rifampicin
(OR)
b) Explain the standardization and Quality Control and dosage Forms of mouthwashes and ointments
13. a) Explain in detail about the disposal of radioactive wastes
(OR)
b) Describe the pollution due to the industries of Pulp, Paper and Textile
